

ECOLOGY AND CONSERVATION OF BIRDS IN UPLAND AND ALPINE HABITATS

BRITISH ORNITHOLOGISTS' UNION

2014 ANNUAL CONFERENCE

UNIVERSITY OF LEICESTER, UK

1 – 3 APRIL 2014

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Ecology and conservation of birds in upland and alpine habitats

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Welcome to the BOU's 2014 Annual Conference

This year's annual BOU conference is on the theme of *Ecology and conservation of birds in alpine and upland habitats*. The bird species that occupy alpine meadows, moorlands, blanket bogs and upland woodlands are often specialists with relatively restricted distributions, and the ecology of many of these species remains rather poorly understood. However, many upland areas are subject to land use changes, increasing levels of recreational activity and renewable energy infrastructure development, and understanding the impacts of these changes on upland and alpine species is an important challenge.

Despite the low human population densities that characterise upland areas, and the access constraints often associated with their remote and rugged terrain, the uplands have a long history of human impacts. Historical woodland clearance and more recent widespread drainage, over-grazing of livestock and landscape management for game species have all influenced the structure and functioning of the uplands, with direct and indirect effects on the species that inhabit these regions. Alpine areas are also among the ecosystems likely to be most severely affected by current climatic changes, and there is an urgent need to identify opportunities to reduce the impacts of these changes on these fragile landscapes.

At this conference, researchers from throughout the world will present and discuss information from a wide array of different upland and alpine systems, in order to address how species cope with upland conditions and how they respond to environmental changes and management. We hope that the conference will provide an important platform for the future development of avian research in these wonderful landscapes.

We very much hope that you enjoy the conference.

Dr Jenny Gill | BOU President

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A BOU conference held at the University of Leicester, UK, 1 – 3 April 2014

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The **British Ornithologists' Union** (BOU), founded in 1858 by Professor Alfred Newton FRS, is one of the world's oldest ornithological bodies. The BOU's aim is to promote ornithology and a better understanding of ornithology, birds and related issues, within the scientific and birdwatching communities.

To help achieve this aim, the BOU organises regular meetings, seminars and conferences at which ornithologists and others can discuss and learn more about work being undertaken around the world and topical ornithological issues.

The BOU has been organising conferences and meetings for over 100 years, and they provide an opportunity for people, from widely differing professional backgrounds, to explore and relate to a discrete scientific theme of common interest. Recent topics have included *Ecosystem Services: do we need birds?*, *Migratory Birds*, *Birds and Disturbance*, *Renewable Energy and Birds*, *Lowland Farmland Birds* (in 1999 with follow up conferences in 2004 and 2009) and *Birds & Public Health*. Such meetings help to promote understanding of environmental issues and the sharing of knowledge, the presentation of contentious academic theories to critical public debate and the defence of such ideas lie at the heart of healthy science. The proceedings of many BOU conferences can be viewed for free online via WWW.BOUPROC.NET.

The BOU further achieves its aim by the quarterly publication of our international journal - *Ibis*. Established in 1859, *Ibis* - the world's leading ornithological journal - publishes work at the cutting edge of our understanding of the world's birdlife, be it behaviour, population dynamics, systematics, breeding biology, taxonomy, habitat use or conservation. *Ibis* is available in print and online – visit WWW.IBIS.AC.UK.

ACKNOWLEDGEMENTS

Ecology and conservation of birds in upland and alpine habitats, a conference organised and run by Graeme Buchanan (RSPB Centre for Conservation Science), Des Thompson (SNH), Dan Chamberlain (University of Turin), James-Pearce Higgins (BTO), Steve Dudley (BOU) and Angela Langford (BOU) on behalf of the British Ornithologists' Union.

The BOU is extremely grateful to Scottish Natural Heritage for their financial support of this conference.

The BOU is grateful to the individual speakers and their respective organisations for presenting their work at the conference.

CONFERENCE PROCEEDINGS

Abstracts, papers and other items from the oral and poster papers presented at the conference will be published online at WWW.BOUPROC.NET. Some presentations may appear as full papers in *Ibis* and will then be linked to from the conference abstract.

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ABSTRACTS

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TUES, 1 APR, 20.30

PLENARY

Avian strategies for living at high elevation: life history variation and coping mechanisms in mountain habitats

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Mountain ecosystems comprise over one-quarter of the global landbase and support a diverse array of birds during breeding and post-breeding seasons. Birds breed across elevations up to 6,600 meters, and have been recorded flying at altitudes above Mt. Everest. Although a few species are alpine specialists, the majority of birds inhabiting upland and mountain habitats in temperate zones are elevation generalists with wide ecological niches. Key abiotic factors (temperature, oxygen partial pressure, solar radiation) influencing avian biology co-vary with elevation. Thus, elevation gradients are excellent natural systems for testing hypotheses regarding the role of environmental variation in shaping avian life histories.

In North American temperate mountain systems at least 100 bird species breed successfully in harsh conditions where temperatures during the breeding season can vary by up to 50°C daily, and regularly approach freezing at night. Our research on fitness-related traits and indicators of competitiveness for ptarmigan and songbirds reveals that most birds living at high elevation are well adapted for their challenging habitats, and are not young or inferior individuals that have been excluded from higher quality low elevation habitats. In common garden experiments, high elevation birds released from their environmental constraints match or outperform their low elevation conspecifics. At high elevation, mountain birds have less than half as much time to breed each season, and produce 50-60% fewer offspring annually than conspecifics at lower elevations. However at high elevation, annual survival of adults is 15-20% higher, and offspring return rates are high – up to 20% - both of which may offset lower annual fecundity. These trends hold across latitudes as a global meta-analysis of vital rates showed consistent reductions in fecundity with increasing elevation for both temperate and tropical birds.

Several factors enable avian persistence in the alpine. Birds at high elevation tend to be larger-bodied, and are able to make behavioural and physiological adjustments to avoid severe stress responses and breeding failure

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due to hypoxia, delayed breeding or storm events. Some birds resist hypoxia effects via high elevation haemoglobin genotypes while others adjust their oxygen binding capacity biochemically in response to their elevation. We have much more to learn about the coping mechanisms birds use to solve the problem of living in mountain habitats and which abiotic and ecological factors pose the greatest challenges for them.

With respect to conservation, mountain habitats support stable populations of several open country passerines, such as Horned Larks, that are showing rapid declines at low elevations across North America. In western Canada, mountains serve as important autumn migration stopover habitats as songbirds fatten faster at high elevation than at low elevation. Hence mountains provide important refuge habitats for birds during both breeding and migration. Of concern, mountain habitats are experiencing globally significant increases in warming, extreme weather and rising tree- and shrub-lines, resulting in increasingly unreliable conditions for birds. It is critical to determine the vulnerabilities of high elevation birds to climate and other anthropogenic change to manage for their persistence in alpine and upland habitats.

Kathy Martin, Professor of Wildlife Ecology and Conservation, University of British Columbia, Canada, and a Senior Research Scientist with Environment Canada. Professor Martin has always been fascinated with how species persist in and cope with extreme and challenging environments. For several decades, she has conducted research on population ecology and life history variation of alpine and arctic grouse and songbirds breeding across elevation gradients. Dr. Martin is a Canadian delegate for the International Ornithological Union, a Fellow of the American Ornithologists' Union, and a Past President of the Society of Canadian Ornithologists.

Online profile: <http://profiles.forestry.ubc.ca/person/kathy-martin/>

The Centre for Alpine Studies: <http://alpine.forestry.ubc.ca/>

WEDS, 2 APR, 09.05 – 09.25

Forty years of distribution change in the uplands: insights from atlases

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From the first breeding bird atlas in 1968–72 to the recently completed Bird Atlas 2007–11 project, atlases offer the potential to examine pattern and change in distributions and, more recently, to investigate how spatial patterns of abundance may be changing. A key consideration, however, is the degree to which apparent changes may be biased by concurrent changes in recording effort. In this talk I will describe some of the changes that have taken place in breeding and wintering bird distributions in recent decades, emphasising how there are groups such as waders and raptors characterised by particular patterns of change, and discuss these in relation to potential drivers.

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Simon Gillings has worked at the BTO since 1995 on a range of large-scale and land-use issues. He is particularly interested in how data from birdwatchers and volunteer observers can be used to answer ecological questions. Most recently he has played a major role in the Bird Atlas 2007–11 project, from its inception in 2004 to its publication in 2013. He was responsible for the development of field and analytical methods and is currently engaged in research to understand some of the drivers of recent distribution and abundance changes.

WEDS, 2 APR, 09.25 – 09.45

Birds of the Swiss Alps – trends and challenges

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The “Alpine” biogeographic region in Europe consists of discrete mountain massifs, the Alps being one of the southern ones. The geographic situation is reflected in the composition of the bird species community, which consists of species with a more northern and others with a more southern overall range. The combined indicator “Swiss Bird index SBI[®] - Alpine habitats” has shown a slight increase but the population and range trends of the species of high altitude vary. Rock Ptarmigan is the species showing the strongest population decline, and climate change models predict a massive shrinking of its range over the next decades.

Apart from climate change, mountain habitats in the Alps have changed dramatically in the last decades. Intensification of agricultural management on the one hand, land abandonment on the other reduce or alter the habitat of breeding birds. Results of the monitoring programmes indicate that some species occurring over a wide altitudinal range are shifting the centre of their distribution upwards although so far this is not very obvious. Some species show differing trends in relation to altitude, indicating effects both of land-use and climate.

Verena Keller is a biologist working in the monitoring department of the Swiss Ornithological Institute in Sempach. The monitoring team, led together with Niklaus Zbinden and Hans Schmid, coordinates the monitoring projects of birds in Switzerland. Verena is responsible for conservation status assessment and waterbird monitoring. She also has a strong interest in international collaboration and is a board member of the European Bird Census Council. She gathered personal experience of alpine birds mostly from volunteer work for breeding bird atlases and common bird monitoring.

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WEDS, 2 APR, 09.45 – 10.05

Skiing, birds and biodiversity in the Alps

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In the Alps, the skiing industry holds a prominent role as a factor impacting the natural environment because of the large scale changes it causes. The most dramatic effect is represented by the construction of ski-pistes for downhill skiing, which causes removal of vegetation and of part of the soil during construction. This involves significant impacts on ecosystems along a broad altitudinal range that may affect both forest and treeless zones, effects being evident at both habitat and landscape levels. The combined length of ski-pistes in the Alps is estimated at several thousands of kilometers, thus the total area affected may be very large. Here, we summarise some of the key impacts of skiing on animal communities, taking examples from studies on birds, but also mammals and invertebrates, using evidence drawn mostly from the ten years of research we have carried out in the western Italian Alps.

For birds, several studies have demonstrated negative effects caused by the construction of ski-pistes in both forest and alpine grassland, which may be due to the creation of a highly disturbed and resource-poor habitat, although clearly for some species (grouse), collisions with infrastructure associated with ski-pistes are also important. In addition to the effects of habitat degradation and destruction caused by construction of the ski-piste itself, there appears to be a negative edge effect whereby bird communities have lower species richness, and/or lower occurrence rates, close to the ski-piste, which is again evident for both forest and Alpine grassland bird communities. This suggests that the construction of ski-pistes has a negative effect at a wider landscape scale. This is corroborated by detailed studies on Black Grouse which have shown negative effects (through physiological stress) caused by off-piste skiing. The evidence overall therefore indicates that for birds at least, skiing may have negative effects at a landscape scale which may therefore impact on populations, rather than just cause a local shift in bird distributions.

Other animal groups may be similarly affected by the construction of ski-pistes: certain ground beetle groups show lower abundance and diversity on ski-pistes, butterflies show a higher abundance on ski-pistes, but a lower diversity, and for most small mammals, ski-pistes are perceived as ecological barriers. Future research should concentrate on the mechanisms underlying breeding habitat selection in birds in the Alps, in order to understand if the avoidance of ski-pistes and surrounding areas by birds is underpinned by direct disturbance, physical alteration of habitats, or factors affecting productivity (e.g. feeding resources, predation, brood parasitism). Furthermore, there is a need to evaluate whether the effects on bird populations are extensive enough to be responsible for demographic impacts at a wider scale.

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Enrico Caprio is a naturalist who started his career with a PhD on forest bird ecology at the University of Turin, working on a project to evaluate the effects of forest fragmentation in lowland hills. He has focused his research on the impacts of human activities on bird populations and communities, including high altitude ski-pistes, agriculture and timing of migration with respect to climate change and meteorological conditions. He is also an active ringer, volunteer surveyor, birder and a committee member of GPSO, the Piedmont ornithology society.

WEDS, 2 APR, 10.05 – 10.30

Changes in some bird populations in upland Scandinavia

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Following a description of the principal bird assemblages of upland Scandinavia we describe some recent changes in bird populations. We have devised a multi-national bird indicator for the Fennoscandian mountain range in northern Europe (Finland, Sweden and Norway) based on 14 common species of montane, tundra and subalpine birch forest habitats. Data were collected at 262 alpine survey plots, mainly as a part of geographically representative national breeding bird monitoring schemes, spanning 10 degrees of latitude and 1600 km in a northeast-southwest direction.

During 2002–2012, nine of the 14 bird species declined significantly in numbers, in parallel to higher summer temperatures and precipitation (compared with the preceding 40 years). The population trends were similar in the three countries and among montane, tundra and subalpine birch forest species. Long-distance migrants declined less than residents and short-distance migrants.

Some potential causes of the declines are discussed, and we argue the importance of having long-term datasets in order to unravel climate-sensitive responses.

John Atle Kålås is a senior research scientist with NINA and a Principal Scientist in the Artsdatabanken (the Norwegian Biodiversity Information Centre). He has particular research interests in monitoring change in Scandinavian birds, and has a long-standing specialist interest in the Great Snipe, for which he led the publication of its Conservation Action Plan (under the auspices of the UN Convention on Migratory Species). He studied the Dotterel for his PhD at the University of Bergen, where he worked closely with his friend and mentor Ingvar Byrkjedal. He is senior editor of *The 2010 Norwegian Red List for Species*, which draws together data and information on 21,000 species.

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WEDS, 2 APR, 11.10 – 1130

Mountain forest biodiversity under climate change: compensating negative effects by increasing structural richness

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Species in mountain environments are expected to face a high risk of range contractions, if not local extinctions under climate change. Yet, most endothermic species are primarily not affected by physiological constraints, but indirectly by climate-induced changes of habitat quality. In mountain forests, where species largely depend on vegetation composition and structure, climate change effects may thus be mitigated by active management aiming at habitat enhancement.

We tested this hypothesis using four mountain bird species of conservation concern, Capercaillie (*Tetrao urogallus*), Hazel Grouse (*Bonasa bonasia*), Pygmy Owl (*Glaucidium passerinum*) and Three-toed Woodpecker (*Picoides tridactylus*), which are considered as indicators for complementary forest structural parameters and umbrella species for the associated species communities. Based on species data and environmental information collected at 300 1km²-plots distributed across three mountain ranges in Switzerland and southwestern Germany, we investigated (1) how species' distributions as well as local occurrence were explained by climate, landscape, and vegetation, (2) to what extent climate change and climate-induced vegetation changes will affect habitat suitability, and (3) whether these changes could be compensated by adaptive habitat management. Species presence was modelled under current climate, and then extrapolated to the conditions of 2050, assuming the moderate IPCC-scenario A1B.

Climate variables contributed significantly to explaining species occurrence, and expected climatic changes, as well as climate-induced vegetation trends, decreased the occurrence probability of all four species, particularly at the low-altitudinal margins of their distribution. These effects could be partly compensated by modifying single vegetation factors, but full compensation would only be achieved if several factors were changed in concert. The results illustrate the possibilities and limitations of adaptive conservation management for supporting mountain forest biodiversity under climate change.

Veronika Braunisch is a biologist with a main research focus on wildlife ecology and conservation, mainly in forest ecosystems. She is particularly interested in developing spatially explicit methods to analyse species-habitat interactions in various ways, in order to provide applicable fundamentals for conservation

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management. After her PhD in Freiburg, Germany, which served as the basis for the Federal Capercaillie Action Plan, she is working as a Post-Doc in conservation biology at the University of Bern, Switzerland and leads the “forest reserves” group at the Forest Research Institute of Baden-Württemberg, Germany. This double position enables her to bridge the gap between research and implementation and facilitates the transfer of scientific results into conservation practice and policy.

WEDS, 2 APR, 1130 – 11.50

Using the demography of a declining ring ouzel population to target conservation efforts

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Understanding how demographic variation translates into variation in population growth rate (λ) is central to understanding population dynamics. Such understanding ideally requires knowledge of the mean, variance and covariance among all demographic rates, allowing the potential and realised contribution of each rate to λ to be estimated. Such studies require integrated monitoring of all demographic rates across multiple years and are consequently rare, particularly in declining populations and for species with less tractable life-histories. We used 12-years of comprehensive demographic data from a declining Ring Ouzel population to estimate the mean, variance and covariance in all major demographic rates and estimate potential and realised demographic contributions to λ . Population size decreased from 39 to 13 breeding pairs (-67%) and mean λ was 0.91 during 1998-2009. This decrease did not reflect a substantial concurrent decrease in any single key demographic rate, but reflected varying combinations of demographic rates that consistently produced $\lambda < 1$. Basic prospective elasticity analysis indicated that λ was most sensitive to adult survival, closely followed by early-season reproductive success and early-brood first-year survival. In contrast, integrated elasticity analysis, accounting for estimated demographic covariance, indicated that λ was most sensitive to early-brood first-year survival, closely followed by re-nesting rate, early-season reproductive success, late-brood first-year survival and adult survival. Retrospective decomposition of variance suggested that first-year survival contributed most to observed variation in λ . However, demographic comparison with other related species suggested that adult survival, but not reproductive success or post-fledging survival, averaged lower than expected throughout the 12-year study. These data demonstrate that multiple approaches, including comprehensive demographic and comparative analyses and due consideration of conflicting answers, may be necessary to accurately diagnose the demographic basis of population change. We tested these predictions using demographic data collected from the same population during 2010-13, and present the

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results of a supplementary feeding experiment designed to test whether shortage of food for nestlings was impacting upon 1st year survival, and thus λ .

Innes Sim has been a birder from the age of 12, and pursued his interest in ornithology at Aberdeen University, where he graduated with a BSc (Hons) in Zoology. He then went on to work for RSPB and BTO on contracts of varying length, before joining RSPB's conservation science department in 1998. Since then he has worked on a variety of projects, including national black grouse and hen harrier surveys, red kite surveys in Spain, repeat upland bird surveys, and the ecology of buzzards in Shropshire. Since 1998, he has worked on understanding factors influencing the decline of ring ouzels in the UK, and went back to Aberdeen University to study for his PhD, where he graduated in July 2013. He continues to carry out scientific research on upland birds for RSPB Scotland.

WEDS, 2 APR, 11.50 – 12.10

Prospecting forays inform young golden eagles prior to emigrating from their natal home range

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Despite being the top avian predator in many northern upland ecosystems relatively little is known about the behaviour of golden eagles; especially during the lengthy period between fledging and subsequent settlement at a breeding site, when the primary dispersal behaviours occur. In most birds the dispersal process is usually initiated with a straight emigration from the natal site and the cessation of parental care. Yet for some species, particularly those with extended periods of parental care (such as many large raptors like golden eagles), individuals can carry out prospecting movements prior to dispersing. Prospecting behaviour probably involves individuals searching and evaluating sites, and may influence further decisions made at later stages of the dispersal process.

We used long life GPS satellite transmitters fitted to 24 nestling golden eagles to follow them as they dispersed. Young golden eagles emigrated from their natal home ranges from 44 days until 250 days after fledging. The rate at which individuals emigrated increased over time and individuals that developed motility more rapidly also emigrating earlier. Twenty two individuals made at least one distinct movement away from the natal home range prior to emigrating, with early departing individuals making fewer prospecting trips prior to a definitive departure. Individuals that prospected undertook up to 11 prospecting loops that lasted up to 10 days and with longer duration trips being longer in overall length and maximum distance explored from the natal home range. The direction of prospecting forays was

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positively correlated with the direction of eventual departure, but the penultimate exploration was no more correlated than less recent explorations indicating a non-random exploration direction.

We therefore provide evidence that with a high variation in emigration timing and propensity to prospect, young golden eagles probably make highly informed decisions early in the dispersal process. We speculate on the reasons why there is such wide variation in this exploratory process, that most likely gathers information on the environment into which, subsequently, young eagles venture as independent individuals.

Ewan Weston is a PhD student in the final stages of writing his thesis on "Juvenile dispersal behaviour in the golden eagle" with Natural Research Ltd and the University of Aberdeen. Since he was 15 years old he has been assisting with monitoring and ringing the golden eagles breeding in North-east Scotland. Although a majority his research activities currently centre on Golden Eagles, he also has a strong interest in breeding upland waders, and away from the uplands on red kites, wintering waders and terns.

WEDS, 2 APR, 12.10 – 12.30

Hen Harriers in the UK: a tale of contrasting fortunes

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The Hen Harrier is a highly controversial species in the UK. The species was nearly extirpated in the UK in the early 20th century due to systematic persecution by gamekeepers, but managed to cling on as a breeding species on remote Scottish islands (such as the Orkney Islands) and successfully recolonized mainland Britain following World War II. Recently, however, the population has once again started to decline in mainland Britain, and especially on managed grouse moors and has completely disappeared as a breeding species in England. In contrast, the population on the Orkney Islands, showed a very large decline during the 1980s and early 1990s, but has subsequently bounced back to pre-decline levels. In this talk we will consider the mixed fortunes of the harrier in different parts of the country, look at the factors that have been driving changes in abundance and consider the lessons for raptor conservation.

Arjun Amar carried out his PhD on the declining population of Hen Harriers on the Orkney Islands and then undertook post docs investigating their habitat use across Scotland's SPAs and their interactions with red grouse management. He is currently a Senior Lecturer at the Percy FitzPatrick Institute of African Ornithology, University of Cape Town, where his research focusses primarily on the conservation ecology of threatened raptors (e.g. Bearded Vulture, Marital Eagle), and on the population dynamics and polymorphism of urban raptors (e.g. Black Sparrowhawk). Prior to this, Arjun spent six years working as a

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Senior Conservation Scientist at the RSPB where his research focused on woodland birds and subsequently on upland issues, including the conservation of waders and raptors in the British Uplands.

WEDS, 2 APR, 14.30 – 14.50

Waders in the uplands – why are changes so patchy in space and time?

DES THOMPSON

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Of the seventeen wader species breeding in the British uplands the great majority have declined since the mid-1990s, and indeed have been declining since further back in time. Lapwing, redshank and curlew have shown some of the largest declines of all birds breeding in Britain. Why should this be so?

This paper explores the nature of these declines, and considers spatial and temporal patterns in changes. The most widely cited causes are: habitat change due to agricultural intensification, drainage and forestry (including forest edge effects); direct and indirect influences of sheep and deer grazing; muirburn; acidification and /or eutrophication; localised recreational disturbance; increases in generalist predation; spread of renewable energy developments; climate change; and factors outwith the breeding grounds. Little has been published on possible impacts of vegetation homogenisation (emerging from repeat-surveys of work done around fifty years ago), small mammal population fluctuations, disease, changes in soil composition, invertebrate assemblage and population dynamics, and abandonment of land management activities

Perhaps rather alarmingly, we still know very little about the ecology and habitat use of most waders in the uplands beyond a few specialist studies. There is a dearth of experimental data, and even the well monitored populations suggest a complexity of factors, some of which are confounding. By drawing on previous studies, this paper provides some pointers to new work.

Des Thompson is the Principal Adviser on Biodiversity in SNH, and manages the team working on biodiversity, climate change and the ecosystem approach. His main interests are in upland ecology and conservation. He retains an early fascination in waders, and more recently has developed an interest in raptors, and in particular the development of conservation frameworks. Like some of his contemporaries at the conference, and the shelduck he studied for his undergraduate degree project, he likes to dabble. He devised the SNH/SEPA PhD programme, and has been fortunate to collaborate with some exceptional researchers and conservationists. He is an Associate Editor of *Journal of Applied Ecology*, and Chairman-elect of the Field Studies Council.

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WEDS, 2 APR, 14.50 – 15.10

Understanding the drivers of recent Dotterel declines in Scotland

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Climatic changes are known to drive the distribution and abundance of many taxa worldwide. Montane species are thought to be particularly susceptible to these effects but evidence for this in bird species is scarce and often inconclusive. Due to the difficulties of working in these areas and the resulting lack of long term datasets, our understanding of the factors affecting the abundance and distribution of montane bird species is poor. However, the Scottish Dotterel population is an exception to this rule having been extensively surveyed over the last 30 years. Severe declines in the abundance of Dotterel and contractions in their Scottish range have been recorded across this period and these changes also coincide with well documented major changes in the Scottish climate.

The Scottish Dotterel population is thus a unique and ideal case study for investigating how climatic changes impact montane bird species. Although long proposed, no evidence has been given linking the abundance and distribution of montane bird species to changes in snow lie. We present a case for declines in the Scottish Dotterel population between 1987 and 1999 being at least partly driven by decreases in winter snow lie. This insight allows us to better target future research to identify the mechanisms mediating changes in the abundance and distribution of Dotterel and montane bird species more generally.

Alistair Baxter is currently in the second year of his PhD at Aberdeen University. He is an all-round wildlife and outdoors enthusiast. These passions led him to work for the Mauritian Wildlife Foundation and study for an MRes in Ecology, Evolution and Conservation at Imperial College London. During his Masters, he studied the impacts of weather on the feeding ecology of New Zealand Hihi in collaboration with ZSL. Alistair has developed a particular passion for upland and montane species and indulges this interest by spending most of his time when out of the office climbing year-round in the Scottish Highlands.

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WEDS, 2 APR, 15.10 – 15.30

Elevation promotes male-male competition and birdsong aggressiveness

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Elevation promotes the diversification of life histories and sexual strategies represent one example of this variation. Previous studies have suggested that sexual selection decreases along the elevational gradient because of the overriding effects of natural selection in harsh environments. By using an experimental approach, we examined variation in the intensity of male-male competition and sexual signalling as proxies of sexual selection in a territorial passerine (*Anthus spinoletta*) inhabiting a wide elevational gradient. We quantified high and low elevation male response to song playback (simulating territorial intrusions) and analysed the acoustic characteristics of the song at the lower and upper limits of the species' distribution in two replicate sites. We found that high elevation males responded with more aggressive behaviour (song displaying) than those from low elevations, and songs from highlands stimulated stronger displays than those from lowlands. Some song properties varied with elevation even over short distances, and a lower maximum frequency made the songs from high elevations more provocative. Intrasexual selection appears, therefore, to peak at the highest elevations, contrary to expectations. We propose that the short breeding season and marked synchrony at high elevations may be promoting stronger male-male competition, the same mechanisms that have been found to determine an increase in sexual selection along latitudinal gradients.

Giulia Bastianelli was born in Rome (Italy) where she holds a degree in Biological Sciences (Tor Vergata University of Rome, Italy, 2007) and a masters degree in Biological Sciences (Sapienza University of Rome, Italy, 2010). She also holds a masters degree in Biodiversity and Conservation Biology (Estación Biológica de Doñana and Pablo de Olavide University, Seville, Spain). She now lives in Oviedo (Spain) and is carrying out a PhD at the UMIB (Unidad mixta de investigación en biodiversidad, Oviedo University, Spanish National Research Council and the Government of Asturias). The thesis project looks at the mechanisms that determine the elevational distribution and the ecology of alpine passerine species.

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WEDS, 2 APR, 15.30 – 15.50

The population dynamics of wintering Purple Sandpipers in Britain

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The breeding range of the Purple Sandpiper *Calidris maritima* spans alpine and Arctic habitats between eastern Canada and islands off central Siberia. Given their low breeding densities and widely dispersed distribution, little is known about the status of the different geographical populations on the breeding grounds. However, it is possible to obtain information during winter when the birds are clumped along rocky shores. The main wader monitoring scheme in Britain caters primarily for estuarine waders, and does not encompass the main habitat for Purple Sandpipers. Therefore, we have to rely on the three non-estuarine surveys to examine changes in status. Unfortunately, these surveys have varied in coverage and given some confusing results. A comparison between the first and last non-estuarine surveys showed major declines along the east and south coasts and varying changes along the north and west. These regional variations are linked to differing origins of the wintering birds. The Norwegian population on the east coast has declined substantially, whilst the decline of the Canadian population in northern Scotland has not been as great. There may even have been local increase. Localised counts confirm the declines and indicate when these occurred. There is little additional demographic information about the Norwegian population other than annual survival (79% in the 1980s). However, there is better information about the Canadian birds from detailed studies in the Moray Firth. Here, the annual survival was 72-77% at different sites during 1980s-2000s, and showed no significant trend. By contrast, recruitment (based on the percentage of first-year birds) varied annually. A combination of recruitment and survival provided a population model that closely followed the decline, indicating that poor recruitment was largely responsible for the decline. The possibility that first-year birds short-stop on migration seems unlikely because the Canadian birds migrate in a single flight across the Atlantic from sub-Arctic Canada to the Britain and Ireland. In addition, there is a correlation between the percentage of first-year birds and summer snow fall in Baffin Island, suggesting that breeding success is linked to some weather pattern, though the mechanism is unclear given that it is a positive relationship. Nevertheless, this suggests that breeding success in Canada is affecting the size of the wintering population in northern Britain.

Ron Summers is a Principal Conservation Scientist engaged in ecological research in native pinewoods in Highland Scotland for the RSPB. As well as undertaking studies on habitat use, behaviour and population demography of pinewood birds (Capercaillie and crossbills), he has an interest in woodland history and how this affects woodland structure. Studies on sandpipers are carried out in his spare time along with amateur ornithologists. His PhD was on estuarine fish at Aberdeen University.

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WEDS, 2 APR, 16.20 – 16.50

Some of nature's changes in response to climate

CHRIS THOMAS

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Empirical evidence is clearly showing latitudinal and elevation changes of species over the past 40 years. These observed changes, together with a good correspondence between the projections and observed distribution shifts of arctic-alpine bird species over the past 15,000 years (for two grouse, alpine chough and snow finch), make credible the future potential range shifts extinctions of many high latitude and elevation species under climate change. However, the details are complicated. Consideration of the responses of species to local (microclimatic) variation in moisture availability and temperature can identify potential conservation options. However, these local conservation options become increasingly intractable at higher levels of global warming.

Chris Thomas is an ecologist at the University of York, known for his work on metapopulation dynamics, identifying the impacts of climate change on biodiversity, and developing conservation strategies to protect threatened species and ecosystems. He has written ~250 scientific articles and he has co-edited nine international scientific journals. Most of his research has been on butterflies and other insects, but he has also produced a smattering of papers on birds. His work has been widely quoted in the media and he has influenced the development of national and international policies for conservation and climate change.

WEDS, 2 APR, 16.50 – 17.10

Shifting habitats in the Alps

DAN CHAMBERLAIN*, MATTEO NEGRO, ENRICO CAPRIO & ANTONIO ROLANDO

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Climate change has resulted in upward elevational shifts in the distribution of animals and plants in many high altitude areas. The potential consequences of such changes for alpine bird communities were assessed by modelling data on breeding bird distributions estimated from point counts along altitudinal gradients at relatively high altitude (c. 1700-3100m) in relation to habitat, topography and temperature. These models were used to assess the sensitivity of species to potential future environmental change by estimating distributions under a range of scenarios of habitat and climate change. Distributions of the majority of forest or shrub nesting species remained stable or increased in response to climate change according to most scenarios as a result of elevational shifts in suitable habitats. However, open habitat

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species may face a severe decrease in distribution as grasslands are colonised by forest and shrubs, because much of the area considered is not at a sufficient altitude to accommodate further elevational shifts. This will be exacerbated if upward shifts in vegetation are constrained at high altitudes, due to negative impacts of loss of snow cover on soil properties, leading to a habitat 'squeeze' caused by an asymmetric response of vegetation zones to climate change at higher altitudes. Model outcomes suggested that management to maintain open habitats may not be sufficient for a number of species if climate change results in a mismatch between the distribution of suitable climates and suitable habitats. Water Pipit in particular is likely to be highly sensitive to such changes, as it is a high mountain specialist associated with colder temperatures and is strictly linked to open habitats. Open habitat bird species illustrate the potential threat to wider biodiversity of alpine grasslands which are likely to host a high diversity of a number of groups, such as flowers, carabid beetles, dung beetles and butterflies, not to mention other high altitude specialist bird species which were recorded too infrequently for analysis (e.g. Ptarmigan *Lagopus muta*, Alpine Accentor *Prunella collaris*, Snow Finch *Fringilla montifringilla*). The loss of alpine grasslands may therefore present a serious conservation problem in the future, not only for birds, but for the many other species associated with this habitat. Continued monitoring and research should be prioritised for this potentially threatened habitat, in particular at the interface between the grassland and bare rock habitats at higher altitudes where soil responses may be crucial for vegetation communities and consequently possible distributional shifts of alpine fauna.

Dan Chamberlain currently has a research position at the University of Turin, Italy. Following a DPhil on Blackbird ecology at the Edward Grey Institute, Oxford, Dan spent 15 years working for the British Trust for Ornithology, most recently as the Principal Ecologist for Climate Change and head of Population Ecology and Modelling. Over 17 years' post-doctoral experience has produced a large body of work on the ecology of birds in highly modified habitats, specifically farmland and urban areas. His current research is focussed on impacts of environmental change on biodiversity in alpine habitats, including birds, carabid beetles and dung beetles.

WEDS, 2 APR, 17.10 - 17.30

Altitudinal and topography selection of the Rock Ptarmigan in Switzerland

CLAIRE A. PERNOLLET^{1*}, FRÄNZI KORNER NIEVERGELT² & LUKAS JENNI²

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Aim

Through analysing the last three decades of Rock Ptarmigan (*Lagopus muta helvetica*) observations in Switzerland, we assessed annual altitudinal movements, topography selection and investigated whether this species is shifting upwards in its elevational distribution.

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Methods

Due to a potential observation bias, as observations may be affected by the altitudes visited by the observers, we compared the altitudinal and topographic parameters of the ptarmigan data with the entire observations of all bird species recorded between 1,700-3,100 m. For the topographic selection (altitude, slope steepness, slope exposure), a chi-square goodness-of-fit test was used and 95% confidence intervals were calculated as a backward procedure. To analyse altitudinal shifts of ptarmigans, we performed linear mixed models. Different biogeographical regions and seasons were distinguished in the analysis. Changes in climate were obtained from weather stations distributed throughout the subalpine and alpine area.

Results

Rock Ptarmigans are restricted to an altitudinal range (preferred between 2,300 and 3,100 m) that varies between biogeographical regions and show altitudinal movements throughout the year (lowest in January: 2,229 m, highest in September: 2,506 m). Ptarmigans favor the upper slopes and the ridges and tend to avoid the flat, the lower and the middle slopes. South facing slopes are avoided by this species, whereas North facing slopes are preferred. Significant shifts were detected for the Eastern Central Alps and Southern Alps. The effective shifts (slope difference "ptarmigan/all_birds") of 21.7 m/decade and 39.7 m/decade were registered, respectively. The difference is significant during the Male Courtship and the Nesting times in the East whereas it is effective all along the year in the South. Over the same period, an increase in mean temperature, a decrease in snow depth as well as snow duration is registered for Switzerland.

Discussion

Using data with different resolutions (Swiss Common Breeding Bird Monitoring Programme, Swiss Breeding Bird Atlas (both precision 1 km²), Swiss National Park database; data from the internet platform Ornitho.ch (precision <100 m)) provides a sensitive tool for basic research on habitat selection, altitudinal range boundaries and elevational shift measurements of high alpine species and could help to identify country-specific conservation needs. Recent multi-scale modeling approaches have provided evidence for future rock ptarmigan vertical and horizontal shifts (Huntley *et al.* 2007, Revmann *et al.* 2012) even though the cause-effect relationship with climate change is not always apparent.

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WEDS, 2 APR, 17.30 – 17.50

The impact of renewables on upland birds

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Renewable energy production is expanding rapidly, largely in response to climate change predictions, in an attempt to reduce carbon emissions from energy production. In the European Union, for example, there is a target of 20% of energy generation from renewable sources by 2020. The increasing demand for locations for renewable energy production creates a need to understand the impacts on birds, including those in upland areas, which may hold concentrations of species of conservation concern.

In Europe, six main forms of renewable energy production are in use in terrestrial environments (wind, solar, biomass, geothermal, hydropower and biofuel). These vary greatly in extent and capacity, from highly localised to continent-wide. Here we review the deployment of these energy production methods in upland areas, evidence of potential impacts on birds and likely future trends in capacity to meet targets for renewable energy production. Whilst the impacts of wind farms on birds have received the most attention to date, evidence also exists of impacts from other forms of renewable energy production. We focus on the UK and Europe, but draw more widely on studies where these are useful in highlighting potential impacts.

The impacts on birds are explored using information from studies of existing sites. Evidence of the likely main impacts, direct mortality, displacement due to disturbance, barrier effects and habitat loss, fragmentation or modification, is presented and discussed. Important knowledge gaps are highlighted, and mitigation measures which have the potential to minimise impacts are also summarized where relevant.

David Douglas is a Senior Conservation Scientist at the RSPB Centre for Conservation Science. David completed an MSc on the foraging behaviour of meadow pipit at the University of Bangor, a PhD on breeding ecology of yellowhammer at Aberdeen/Leeds Universities, and worked for BTO Scotland before joining the RSPB in 2009. His current role at the RSPB comprises research into the birds and wider biodiversity of the UK uplands.

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THURS, 3 APR, 09.00 – 09.30

Landscape transition through natural processes: implications for biodiversity of tree regeneration on moorland

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In the absence of sustained heavy grazing by large herbivores or large-scale burning, many mountain areas would naturally have higher levels of tree cover, with extensive zones of treeline scrub. Reduced grazing pressure has transformed landscapes in several mountainous regions of Europe in the twentieth century. For example, forest has rapidly developed over large tracts of Mediterranean land as traditional grazing has collapsed, causing declines in open country and early successional species. In Britain, especially in Scotland, there has been localised expansion of scrub as pressure from deer and sheep has eased in some areas. There has also been increased planting of native broadleaves. These recent changes in tree cover (in response to land use and conservation initiatives) give some insights to the types of bird assemblages that could potentially develop in the British uplands if large scale changes occurred in land management. In much of Scotland intensive control of red deer and limiting of domestic herbivores would be a pre-requisite for extensive scrub development, whereas in Wales deer populations are currently low and sheep density is the critical factor limiting regeneration. Based on work over the last 20 years in the Scottish Highlands and in Wales, we describe the bird assemblages that develop in moorland scrub and how they change with successional stage. We also present an analysis of fine-scale relationships between bird distribution and habitat attributes in a Scottish landscape with colonising trees. We will ask whether natural regeneration and planted young woodland offer similar habitat opportunities for birds. Growth rates of trees and changes in bird assemblages under natural regeneration are generally slow on the nutrient-poor soils and harsh climates prevailing over most of the British uplands. Especially in Scotland, where naturally regenerating scrub tends to be strongly dominated by birch and pine, vegetation structures are relatively simple compared with more diverse and dynamic forms of scrub occurring in lowlands with more mineral rich soils. Avian species richness in much upland scrub tends to be relatively low and there appears to be more overlap between scrub and mature woodland in the characteristic bird species than is the case in the lowlands. Nonetheless, several scrub specialists can be identified in the uplands. Widespread natural regeneration of scrub, and ultimately the development of tracts of 'natural' forest, could result in substantially richer biological communities in certain parts of the British uplands. We discuss the potential gains and losses that could emerge under scenarios of extensive scrub regeneration and consider the strategies that could lead to an acceptable balance of habitat types and conservation interests. Whether bird assemblages could ever develop in Britain similar to those occurring in the vast tracts of Scandinavian alpine scrub is questionable, given the lower diversity of topography and the insularity and relatively small-scale of the British uplands.

Rob Fuller is a Science Director at the British Trust for Ornithology. His main interests revolve around habitat selection in birds, especially how birds respond to changes in their habitat. He recently edited a

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book on *Birds and Habitat* published by Cambridge University Press. Much of his personal research focuses on the ecology of birds in scrub and woodland environments, though he also dabbles in breeding waders. Strategies for sustaining future biodiversity and the need for habitat restoration at landscape scales have also formed an increasing part of his work in recent years. He is one of the authors of *Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland*.

THURS, 3 APR, 09.30 – 09.50

Impacts of drainage and climate change on keystone insects and upland breeding birds

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The British uplands support a unique breeding bird assemblage. Several of the constituent species, such as Golden Plover, are highly dependent on crane flies (Diptera: Tipulidae) as a food source during the breeding season. However, crane fly larvae experience high mortality under drought conditions, meaning that upland drainage and climate change could drive declines in this key prey item, and in turn on the birds that rely on them, if they cause upland peatlands to become drier.

Drainage impacts on the system were explored using a large-scale empirical experiment in three British blanket bogs. As expected, crane fly abundance was positively correlated with soil moisture. Further, both moisture and crane fly abundance were lower in areas around active, open drainage ditches than in areas around blocked drains. This suggests that although drains lower water tables and reduce crane fly abundance, drain blocking, currently being undertaken for peatland restoration, might also help to maintain moisture-dependent peatland biological communities.

Possible climate change impacts on the system were then explored by combining field-derived empirical relationships with a model of peatland hydrology. The hydrological model was driven by simple climatic inputs, and was found to reasonably predict both seasonal water table fluctuations and mean water table

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depth when compared to data from dipwell observations. Modelled water table depths were significantly related to observed moisture, which in turn was significantly related to observed crane fly abundance.

When the model was driven by observed climate data from the recent past, modelled crane fly abundance was found to be significantly and positively related to observed abundance of Golden Plover, Dunlin and Red Grouse in the South Pennines, all species known to prey upon crane flies during the breeding season. Further, Golden Plover population trends appeared to be related to estimated crane fly abundance. When the model was driven by climate change projections, it was found that climate change could cause crane fly abundances to decline significantly throughout British blanket bogs, driven by falling summer water tables. Combining these results, we suggest that falling crane fly populations, caused by climate change or drainage, could substantially impact important upland breeding bird populations. Finding ways to maintain high abundances of peatland crane flies could therefore be a key consideration in helping more southerly populations of upland breeding birds adapt to climate change.

Matthew Carroll is a conservation scientist at the RSPB Centre for Conservation Science. He completed his PhD at the University of York in 2012, looking at the impacts of peatland drainage and climate change on crane flies, and the implications for the breeding birds that feed on them. He then worked as a post-doctoral researcher as part of a consortium assessing climate change risks for a suite of UK species. He now works at the RSPB, looking at how climate change impacts UK seabirds via changes to physical oceanography and key components of the marine food web.

THURS, 3 APR, 09.50 – 10.10

Grazing and moorland birds

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Grazing, especially by sheep, has long been a major land use in the UK uplands which has had a major impact on the vegetation in these areas. Recent changes in government policy and CAP reforms mean that sheep numbers have changed in the uplands. Linking sheep numbers directly to bird number is inappropriate due to local variation in the way vegetation responds to grazing pressure. Instead, linking bird abundance to major vegetation gradients which are themselves related to grazing can be used to assess how changes in livestock numbers might impact upon bird populations. These data can be useful in guiding both upland management at a site level, and forming policy for agri environment schemes at a national level. Here we identify which of a suite of the vegetation characteristics have the strongest correlation with the abundance of 11 moorland bird species. These are divided into those related to composition (dwarf shrub to grass gradient), height and heterogeneity. Heavily grazed areas would be

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expected to be dominated by short grass, while lightly grazed areas will be dominated by tall dwarf shrubs. From the form of the relationships between birds and these gradients we identify which species are likely to be affected, and how, by changes in grazing pressures in the uplands.

Graeme Buchanan is a senior conservation scientist at RSPB. After four years working on upland birds for RSPB, he now primarily works with GIS and remote sensing data, tracking land cover change, informing priority setting, mapping species distributions etc. However, he retains his interest in uplands and their birds, and spends much of his free time in the uplands.

THURS, 3 APR, 10.10 – 10.30

Game management and birds in the UK uplands

KATHY FLETCHER^{1*}, DAVE NEWBORN² & DAVID BAINES²

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Management of privately owned estates for game is a major land use across the British uplands. Sporting interests lie primarily with red deer and red grouse, but management for other wild gamebirds; black grouse, capercaillie, ptarmigan and grey partridge, often occurs on the same estates.

Gamebird management typically focuses on providing suitable habitat (through heather burning, grazing and bracken control) and reducing predation pressure and disease to enable a surplus of birds to be shot each autumn. We will review how game management for red grouse has shaped the uplands and the effect of specific management practises on game and other important upland bird species, including recent data collected by Game and Wildlife Conservation Trust.

Kathy Fletcher is a senior scientist working for the Game & Wildlife Conservation Trust (GWCT) in Scotland. Since completing her PhD on seabird ecology at Durham University in 2002, she has been working for the Trust undertaking applied research projects focussing on game management and its effects on game and other wildlife in the UK uplands.

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THURS, 3 APR, 11.10 – 11.40

The uplands as an agri-environment for bird conservation: what can we learn from comparisons with lowland farming systems?

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Europe's land surface is dominated by agriculture and this extends to upland and alpine habitats. Here, extensive grazing of domestic livestock is often the only agricultural use possible within bioclimatic constraints, co-existing with other land uses, including hunting, forestry, recreation, renewable energy generation and water storage.

The interaction between low-intensity agriculture and environmental variation in upland landscapes can support communities of exceptional biodiversity conservation importance set in the context of globally rare or unique cultural ecosystems; for example, the heather moorlands of the Atlantic fringe of Europe and the species-rich montane grasslands of the continental interior. Many High Nature Value farming systems are thus found in upland and alpine regions. This conservation importance extends to bird populations and the UK, for example, supports an upland breeding bird assemblage that is globally unique in both species composition and the high breeding density of some species.

Since the early 1990s, greening of Europe's Common Agricultural Policy has brought public funding of bird conservation management to agricultural landscapes through agri-environment schemes. In lowland farming systems these interventions have been the focus of intense scientific scrutiny, from the design of measures to their implementation and the evaluation of their cost-effectiveness in reversing population declines. Three previous BOU conferences have focused on these challenges. The link between agricultural policy change and bird conservation in upland and alpine habitats has, however, received much less attention. Here I review the evidence for agri-environment scheme and wider CAP impacts on bird populations in these landscapes from the perspectives of science, policy and conservation outcomes, explain similarities and differences in comparison with lowland agricultural systems, and ask whether the CAP can do more for upland bird conservation in the future.

Jeremy Wilson is Head of Conservation Science for RSPB Scotland, and manages the team leading RSPB's research on bird populations in upland and montane environments including, in recent years, studies of the impacts of grazing, forestry and grouse moor management, illegal killing of raptors, recreational disturbance, climate change and the development of windfarms. Jeremy's personal research background has focused more on lowland agriculture where he has over 20 years' experience of involvement in research to underpin design, implementation and monitoring of agri-environment interventions for birds of high conservation concern. He maintains a particular interest in the ecology and conservation of Corn Buntings, and the management of High Nature Value farming systems at the upland fringe. He is an Editor of *Ibis* and an Associate Editor of *Journal of Applied Ecology*.

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THURS, 3 APR, 11.40 – 12.00

Grouse moor management: effects on other upland birds in the UK

DAVID BAINES*, KATHY FLETCHER, DAVID HOWARTH, DAVID NEWBORN & MIKE RICHARDSON

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Management of privately owned heather moorland for sport shooting of red grouse occurs widely in the British uplands. Maximising grouse abundance for shooting occurs through employing gamekeepers to rotationally strip-burn heather habitat, to manage parasites that can cause cyclical fluctuations in grouse abundance, and to control predators. The intensity of grouse management varies regionally. Driven shooting yields the biggest shooting bags and is arguably the only economically sustainable form of grouse management, yet the intensity of underlying management, both through the degree of burning and the severity of predator removal, makes it more controversial than either walked-up shooting or no management for grouse at all.

The intensity of grouse management has considerable effects on the composition of upland bird communities. Analysis of breeding bird data from surveys of 90 moors in northern England and Scotland between 2007 and 2012 showed distinct differences in bird responses to the type of grouse management. Driven shooting supported up to 10-fold more golden plover, five-fold more lapwing and twice as many curlew than moors managed for walked-up shooting, which in turn supported more waders than moors with no grouse interest. Conversely, driven moors supported fewer raptors and corvids than either walked-up moors or non-grouse moors. Passerines were more plentiful on moors that were less intensely managed, but had more grass, bracken and scrub. These data suggest that a reduction in the intensity of moorland management, i.e. a move from driven to walked-up shooting, could result in fewer grouse and waders, but more raptors, corvids and passerines.

The mechanism whereby driven grouse moors support more waders was explored in a nine-year experiment on four moorland blocks in northern England. Here, heather burning and parasite management were kept constant over time, but predator control was switched between two blocks, whilst being kept constant on the remaining two blocks, where, on one block, predators were controlled throughout the duration, but not on the other block. Breeding success of grouse, golden plover, curlew and lapwing were two to five-fold higher on blocks where predators were controlled, which in turn increased breeding densities by two to three-fold.

Results from these two studies suggest that grouse moor management helps conserve several species of declining upland birds, particularly waders, but may do so at the expense of protected predatory and scavenging species, especially raptors. Our data suggest that a reduction in the intensity of grouse management may benefit raptors, but would risk accelerating the on-going decline of upland breeding waders.

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David Baines is Director of the GWCT's Upland Research Group and has been based in Teesdale since 1998. His areas of specialisation are grouse and parasite population dynamics, predator-prey interactions, and the conservation management of upland waders. He manages projects not only in northern England, but also throughout Scotland, where he and his team are considering removal of pine martens to conserve capercaillie and impacts of raptors on red grouse. David has worked for the Trust since 1989 having joined them direct from Durham University.

THURS, 3 APR, 12.00 – 12.20

Does intensive grouse moor management benefit the UK uplands?

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Sport shooting of Red Grouse (*Lagopus lagopus scoticus*) first developed in the UK in the 1850s and today is practised across large parts of the English and Scottish uplands. The most intensive form, driven-grouse shooting, is unique to the UK, is reliant on sufficient post-breeding densities of grouse (>60 birds km²) and is apparently increasingly popular among shooters. Production of a surplus of grouse for shooting requires a range of management practices (vegetation burning, drainage, predator control, grouse medication) and additional grazing management carried out by staff (or tenants) employed by sporting estates. The heather-dominated habitat mosaic, a characteristic feature of grouse shooting areas, is a product of over 150 years of grouse moor management.

Many moorland areas are protected under national and European law and, in places, may be afforded protection as National Parks or Areas of Outstanding Natural Beauty and, more widely, the upland ecosystem provides society with a range of ecosystem service benefits; much of our drinking water is sourced from grouse moors, deep peat soils storing carbon are the dominant soil type across some places managed for grouse shooting, and these same landscapes provide a range of recreational opportunities which are crucial to human well-being.

Advocates of grouse shooting argue that it is integral to the delivery of all these environmental and socio-economic benefits, is largely privately funded and is a preferable alternative to subsidised farming and forestry in the uplands. But are these arguments sound?

Certainly, legal control of generalist predators and good habitat management for grouse can benefit some priority birds and other species. However, the routine and continued illegal killing of birds of prey, the questionable killing of mountain hares (for the purposes of controlling louping ill, a disease that can

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kill grouse) and the increasingly intensive burning of blanket bog and other carbon-rich deep peat habitats, often on Sites of Special Scientific Interest and/or in drinking water catchments cast a long shadow over the environmental credentials of grouse moor management. Furthermore, the widespread treatment of red grouse with anthelmintic drugs (ingested as medicated grit) is claimed by grouse moor managers to have increased breeding success and post-breeding densities, dampened the cyclical nature of grouse populations and encouraged grouse moor managers to intensify management in areas formerly thought to be unsuitable for grouse production. Management is now more intensive and grouse bags higher than at any time since the 1930s. In parallel we note an increase in the number of pheasants and red-legged partridges being released in some moorland edge areas.

In this paper, we review the available evidence, present new data on the intensity of burning and its coincidence with deep peat soils, and question if intensive management for grouse shooting is in the best interests of the upland environment and society. Grouse shooting as practised today is weakly regulated. We identify a need for new regulation, better law enforcement and suggest that a reduction in the intensity of grouse moor management practices provides a more sustainable model for managing the uplands.

Pat Thompson has a life-long interest in upland birds and land-use stemming from my upbringing in the Highlands of Scotland. Prior to working for the RSPB, he undertook research on the population biology of Redshank and Lapwing. He has worked for the RSPB in a number of roles since 1995, taking up his current role as Senior Uplands Policy Officer in 2006. Working with colleagues from across the RSPB, we aim to raise awareness of the importance of the upland environment for society and to shape policies and support measures that improve the natural environment and secure a range vital upland ecosystem services. He works across the UK uplands with researchers, Government(s) and their agencies, non-governmental organisations, land owners and managers and those that represent their interests.

THURS, 3 APR, 12.20 – 12.40

Pixels, patterns and feathers – the utilisation of remotely sensed data to help understand the decline of Golden Plover *Pluvialis apricaria* in the Welsh uplands

HEATHER CRUMP

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Golden Plover populations have reduced in size over the past 30 years, with over 90 % declines seen in particular regions of the Welsh uplands (Crump *et al.*, 2012). There are many theories as to why these declines have occurred, two of which being climatic shifts and changes within the vegetation. In order to help identify if these two factors have been influential to populations in the Welsh uplands, high-resolution satellite imagery (WorldView-2), medium-resolution satellite imagery (Landsat) and MET Office

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gridded climatic data are utilised. This involves the use of a classification system developed as part of the European BIOdiversity multi- SOURCE monitoring System: from Space TO Species (BIOSOS) programme with parts of the FAO Land Cover Classification System, where sites are classified according to spectral uniqueness and from information inferred from vegetation indices. This is coupled with the climatic times-series and modelled to assess the changes in habitat suitability and therefore the likelihood of a feasible population, of golden plover between 1984 and 2012. The results from this analysis highlight some of the major pressures on golden plover and could help to inform policy for the future conservation of this species.

This study uses the Plynlimon SSSI in mid-Wales and parts of the Elan Valley as target sites. The results from this research form part of a PhD from Aberystwyth University.

Heather has been working in the Department of Geography and Earth Sciences at Aberystwyth University, in the Earth Observation Laboratory. Her primary interest is the utilization of geographical techniques in ecological research, with a focus upon ornithology. Her PhD was based upon the use of GIS and remote sensing technologies to help understand the decline of golden plover in the Welsh uplands. Her current post in the Spatial Modelling Laboratory in the Institute of Biological, Environmental and Rural Sciences concentrates around the use of species distribution models to predict the spread of livestock disease in Europe with climate change. She hopes to continue in the environmental sector and hopefully involve ornithology in her future career.

THURS, 3 APR, 12.40 – 13.00

Predation and upland birds

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The impacts of apparently increasing numbers of predators on avian prey populations are widely debated among stakeholders and the general public with the debate being particularly polarised in the UK. Some interest groups argue that predation is a natural process which could be mitigated mainly by habitat management, whereas other interest groups advocate culling of predators as the most efficient way to alleviate negative effects of predation.

There are no recent literature reviews of whether predation is actually limiting breeding birds in the UK. This has restricted our understanding of the perceived problem and blocked progress in resolving this conservation conflict. Here, we present results from a systematic review, which covered 66 studies, of which 18 were from upland habitats, published between 1988 and 2011. Together, these studies have

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examined whether 76 prey species breeding in the UK are limited by predation. For the purpose of this presentation, we focus on upland birds.

Our results confirm the notion that most avian and mammalian predators have increased numerically in the UK during recent decades. The proportion of studies reporting that predation could be a limiting factor for passerines was significantly higher for upland species (skylarks, meadow pipits and stonechats) than for woodland and lowland agricultural species. However, overall we found little general support that predation limit songbird populations in the UK. Our review shows that mainly ground-nesting and long-lived species (i.e. upland waders and gamebirds) can be limited by nest predation, primarily by generalist predators.

Increasing evidence suggests that both post-breeding numbers and following year's breeding populations of upland waders and gamebirds can be increased by lethal predator control. The effectiveness of non-lethal predator control (e.g. fencing) has been mixed and we encourage further work in this field. However, we argue that both lethal and non-lethal predator control only address the proximate cause of high levels of predation (i.e. high number of generalist predators). A more sustainable solution would be to understand the ultimate causes of why the predation pressure, in some circumstances, is unsustainably high. There is growing evidence that land-use patterns, such as upland conifer plantations, could be linked to unsustainably high predation. For example, several studies have shown an association between short distance to forestry plantation and declining wader populations. The direct mechanism behind this, i.e. whether nest predation increases near forestry plantations or whether adult birds avoid potentially risky areas near plantations, should be established as a matter of urgency. It is also possible, but still not studied, that large releases of non-native gamebirds for sport shooting might increase the carrying capacity of generalist predators.

In conclusion, generalist predators might limit populations of some ground-nesting non-passerines. For these species, predator removal may be necessary to halt population declines. However, this is a temporary remedy, and the ultimate causes of unsustainably high predation rates are often linked to land-use patterns. These land-uses should be changed to reduce predation on vulnerable bird species.

Swedish-born **Staffan Roos** has a life-long interest in birds and conservation. He has an MSc in Conservation Biology from Uppsala University and a PhD in Ecology from the Swedish University of Agricultural Sciences. His thesis explored the effects of corvids on habitat selection and breeding success of red-backed shrikes. After finishing his PhD, Staffan has worked on a range of project in Sweden, at Queen's University Belfast and at BTO Scotland. Since 2011, Staffan is a Senior Conservation Scientist at RSPB Scotland, where he leads a number of projects on predation and raptor ecology.

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THURS, 3 APR, 14.00 – 14.20

An EU perspective on what lies ahead for upland and alpine birds

MICHEAL O'BRIAIN

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Since 1979 the EU Birds Directive has provided a strong legal framework for the conservation of all species of wild birds naturally occurring within the European Union. Together with the 1992 Habitats Directive it also provides for the protection of habitats of EU conservation concern, especially within the framework of the Natura 2000 network of protected areas. This includes areas of high biodiversity value in alpine and upland areas that are important for the conservation of wild birds.

Implementation of EU nature legislation is at the core of EU biodiversity policy. The EU has set an ambitious target to halt and reverse the loss of biodiversity and ecosystem services by 2020. In 2011 the European Commission set out a strategy to help achieve this objective, comprised of 6 mutually supportive and inter-dependent targets. Target 1 focuses on implementation of EU nature legislation with a view to achieving a significant measurable improvement in conservation status. The Commission will issue an EU wide assessment in 2015 on conservation status of protected species and habitats, which will also assess key pressures and the role of Natura 2000.

Achieving the 2020 target will require effective management and restoration of Natura 2000 sites, while at the same time promoting the multiple benefits of the network. The Commission is encouraging co-operation between Member States in each of the different Biogeographical Regions and discussions, relevant to habitat conservation in upland and alpine areas, have started in the Atlantic, Boreal and Alpine regions of the EU. There also remains the challenge of reconciling economic developments, including energy projects such as wind farms, with the protection of biodiversity.

Achieving improvements within Natura 2000 and the wider countryside will require significant financial investments. In the context of EU support agricultural funds remain the most important source of funding. The newly reformed Common Agriculture Policy (CAP) provides to national and regional authorities a range of opportunities to promote biodiversity including: (i) greening measures in the first pillar, (ii) cross compliance and (iii) rural development measures in the second pillar of the CAP. The greening measures support agricultural practices for crop diversification, ecological focus areas and the maintenance of permanent grasslands. In addition, rural development measures contribute to the biodiversity target mainly through agri-environment-climate, organic farming and Natura 2000 measures.

Other relevant new policy initiatives under the EU Biodiversity Strategy include the development of green infrastructure, the mapping of ecosystems and their services and a new policy initiative on no-net loss, foreseen for 2015, which should provide a much stronger basis for managing and restoring natural capital. The Commission is also undertaking a fitness check of the Birds and Habitats Directives as part of

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a programme aimed at promoting better/smart EU legislation, making it more responsive to current and future challenges and helping improve implementation. A review of the EU Biodiversity Strategy in 2015 should help determine if the EU is on track to meet the 2020 biodiversity target. This evolving policy debate needs to be underpinned by a robust knowledge base.

Micheal O'Briain is Deputy Head of the Nature Unit of DG Environment in the European Commission, where he has worked on a range of nature and biodiversity policy issues since 1992. Micheal has played an active role in the establishment of the NATURA 2000 network under the Habitats and Birds Directives and co-ordinates work on financing and management of Natura 2000 and on the new fitness check of EU nature legislation. Prior to working in Brussels he was national director of the Irish Wildbird Conservancy (now BirdWatch Ireland).

THURS, 3 APR, 14.20 – 14.40

BirdLife perspective on changes since the 1980s

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At global level, relatively few European bird species of upland and alpine habitats are listed as threatened or near-threatened on the IUCN Red List. These include Egyptian Vulture *Neophron percnopterus* (EN), Cinereous Vulture *Aegypius monachus* (NT), Caucasian Grouse *Tetrao mlokosiewiczi* (NT), Rock Partridge *Alectoris graeca* (NT) and Eurasian Curlew *Numenius arquata* (NT). At European scale, some 30 upland and alpine birds are considered to be species of European conservation concern (SPECs), as listed in one or other editions of *Birds in Europe* (1994 and 2004) – BirdLife's comprehensive assessments of the conservation status of all European birds.

Compared with the larger numbers and proportions of SPECs characteristic of some other habitats, such as wetland and lowland farmland, this might be taken to suggest that upland birds are generally faring comparatively well. However, as the quality of the data provided for *Birds in Europe* makes clear, and the number of 'provisional' status assessments reflects, many upland birds are amongst the most poorly monitored species in Europe. This is particularly true of some montane species and passerines. The challenges to monitoring such species are obvious, but given the growing threats that they face (as described elsewhere at this conference), the consequences of not knowing how they are faring are becoming ever more serious.

With funding from the European Commission, BirdLife is currently collating and analysing new data from across Europe, to reassess the regional conservation status of all species and update *Birds in Europe*. This exercise has been integrated with the first round of a new reporting process under Article 12 of the Birds

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Directive, which means that EU Member States are now obliged to report on the population status and trends of every native bird species in their country every six years. The data set that emerges will be the most up-to-date, best available and widely agreed, as well as the official source of EU bird data until the next reporting round in 2019. It will be fascinating to see how upland birds have fared since the turn of the millennium – and to follow how Member States respond to the challenges of both monitoring and conserving these species over the coming years.

THURS, 3 APR, 14.40 – 15.10

Looking forward and looking back: drivers of change in European alpine and upland bird populations

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Although relatively depauperate in terms of species richness, the alpine and upland habitats of Europe support many specialised bird species which may be vulnerable to environmental change. These habitats have been the subject of significant land-use change in recent decades, from agricultural abandonment in some areas, to intensification in others, afforestation, increasing recreational use and renewable energy development. Upland species are also regarded as highly sensitive to climate change. Here we review the main threats which have been identified for alpine and upland birds in Europe and identify how their likely impact varies between species and location, collating data on recent trends in the direction and severity of these changes, which are then related to information about observed population trends. By looking back, we present a review of how human activity has affected these bird populations in recent decades. We then look forward, reviewing the results of recently published horizon scanning exercises to identify the potential for additional novel threats to impact upon birds in the European uplands, as well as considering the likely future direction of existing threats. We conclude by identifying what appear to be the most important drivers of change for upland birds, and therefore assessing the species which appear to be most at risk of future conservation threat.

James Pearce-Higgins Despite coming from East Anglia, James has had a long interest and background of work in upland birds. This started with a PhD studying Golden Plovers in the Peak District from 1995–1999, before leading a wide-range of research projects on upland birds during the eleven years he worked for RSPB Scotland. This included documenting the impacts of grazing on upland birds, assessing causes of decline in a range of species and assessing the impacts of wind farms on birds. During this time, he became increasingly interested in the impacts of climate change on potentially vulnerable upland species, and in 2010, he moved to the BTO where he now leads on the Trust's climate change work and

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manages the Population Ecology and Modelling team.

THURS, 3 APR, 15.10 – 15.40

The role of Ecology in addressing conflicts over upland birds

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Conservation conflicts are pervasive across the world, and the uplands of the UK are no exception. They occur when parties have different strongly held views of conservation and when one party acts against the interest of another. The standard model for dealing with these problematic issues is an "information-deficit" approach, whereby we use data to understand the ecological basis of conflicts and then improve communication to explain the data, raise awareness, develop effective policies and change the behaviour of those people involved in the conflict. Unfortunately this approach can prove ineffective or worse still, can aggravate conflicts. We will explore what ecology can contribute constructively to our understanding and management of conflict, and some of the reasons why ecological input into conflicts can fail. We will illustrate these arguments with examples from studies on conflicts over upland birds and in particular the ongoing and challenging conflict over hen harriers (*Circus cyaneus*) on moorland managed for red grouse (*Lagopus l. scoticus*) shooting. We will end by considering alternative models for tackling such conflicts.

Steve Redpath is an applied ecologist who has worked extensively on bird populations in the UK uplands. He got his PhD from Leeds University, then worked for the Institute of Terrestrial Ecology / Centre for Ecology & Hydrology for 17 years before moving to the University of Aberdeen in 2007, where he became Director of the Aberdeen Centre for Environmental Sustainability. His work on predation led me into the field of human-wildlife conflicts and he is increasingly interested in how we can effectively link natural and social sciences together with policy makers and stakeholders to tackle issues in environmental sustainability.

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POSTER ABSTRACTS

Abstracts are in alphabetical order by presenting author surname.

POSTER

Monitoring Lapwing Breeding Success in the South West Peak

SARA D J BARRETT¹, RICHARD M BLINDELL², TARA CHALLONER² & MARK J EDDOWES^{3*}

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Following recent declines in breeding wader populations (Lapwing *Vanellus vanellus*, Curlew *Numenius arquata* and Snipe *Gallinago gallinago*) in the South West Peak, attention has been directed towards monitoring of breeding performance with the objective of informing conservation management. Efforts have focused on monitoring of Lapwing which is the most practical subject and has sought to determine nest and chick survival rates and their contributions to overall breeding performance, measured in terms of chicks fledged per pair. Surveys focused on monitoring nests at several key upland grassland sites to identify the causes of nest losses, supported by the deployment of nest cameras and thermocrons, small temperature loggers placed in the base of nests. Initial survey work began in 2006 and more targeted monitoring work was undertaken from 2010 to 2013.

Across all sites, the average nest survival rate was 44% but varied between sites and years. Predation by nocturnal mammals (Fox and Badger) was the dominant cause of nest losses. With the laying of replacement clutches, the proportion of pairs successfully hatching a clutch was much higher at an average of around 80% and was more consistent than the nest survival rate between sites and years. At some sites, where rates of nest predation by mammals were somewhat higher than average, the proportion of pairs successfully hatching a clutch was more substantially affected and, in some cases, nest predation was devastating at the colony level. Initial results from one site indicate that mammal exclusion fencing can provide effective improvements in breeding performance. Disturbance by livestock was the second most common cause of nest loss. However, the nest loss rates associated with this cause are sufficiently low to have a minor impact on overall breeding success, given the extent to which the effects of lower levels of nest loss are offset by replacement clutches.

Chick survival rates were found to be around 33% and again varied widely between sites and years. Given the much higher overall proportion of pairs successfully hatching a clutch, chick survival appears to be the more significant factor limiting breeding success. Measures to improve chick survival would therefore appear to offer considerable conservation management potential. However, unlike nest loss and its

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primary causes, which were well-characterised by the available field observations, chick survival was difficult to quantify reliably and the causes of losses were not identified. In the absence of site specific information on chick loss, data from other studies, for example employing radio-tagging, may help inform conservation management strategy. However, this approach may fail to effectively target the more important factors operating at individual sites. Further and more detailed chick survival research at the individual site level may be beneficial. These observations highlight the challenges associated with effective site-specific conservation management which merit further and more detailed consideration.

POSTER

Eurasian Curlew Recovery Programme

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In 2008, the Eurasian Curlew was uplisted to globally Near Threatened by the IUCN in response to widespread declines across its breeding range. The UK is a stronghold for the species. With 68,000 breeding pairs, we may support up to 25% of the global breeding population. In addition, with 140,000 wintering birds we host one of the largest wintering populations, alongside Germany and the Netherlands. Not considering overseas territories, there few other, if any, IUCN Threatened or Near Threatened bird species for which the UK has such an international responsibility for. Recognising this fact, the RSPB is playing a lead role in coordinating recovery work for the curlew, both internationally and across the UK. We will present the findings of recent research and discuss the development of this recovery work across the species' range.

POSTER

Guiding survey efforts for the critically endangered Himalayan Quail (*Ophrysia superciliosa*) using environmental niche modelling and proxy species

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The Himalayan quail (*Ophrysia superciliosa*) is extremely rare and classified as Critically Endangered by the IUCN Red List. Previous search efforts in and around the Indian localities of Mussoorie and Nainital (historical specimen record collection localities) have failed to detect the species. The most recent calculations estimate that the species went extinct in the 1980s. We calculate a new likelihood of extinction (Optimal Linear Estimation date of extinction = 2023) using additional records from a new database and while wide confidence intervals preclude us from declaring extinction for certain, it is likely that based on available records (N=34) the species will become extinct if not imminently, then in the near future. As a precautionary principle it is necessary to increase and better target our immediate search efforts to avoid premature declarations of extinction. Normally, a species' habitat preferences as seen through an environmental niche model can act as a guide for survey efforts. However, it has been 137 years since the last reliable specimen record was collected and intensive habitat modifications have since occurred in those localities. As a result, it is unlikely that the current land cover in the locations of the historical specimen records reflect Himalayan quail habitat preferences. Thus, the temporal mismatch between specimen data and covariates makes it impossible to generate a full environmental niche model for the quail. To circumvent this, we investigate the use of two proxy species: cheer pheasant (*Catreus wallechi*) and Himalayan monal (*Lophophorus impejanus*) that taken together are thought to have habitat requirements that encapsulate those of the quail. First, we create climate and topography models for the quail (area = 9,734 km²) and the two proxy species: cheer pheasant (area = 104,228 km²) and Himalayan monal (area = 1,262,249 km²). We find that the climate and topography model for the proxy species have moderate to poor overlap with the Himalayan quail as measured by Spearman rank (cheer pheasant r^2 = 0.66; Himalayan monal r^2 = 0.72) and Cohen's kappa (cheer pheasant kappa = 0.12; Himalayan monal kappa = 0.43). We create full environmental niche models for the proxy species incorporating land cover and overlay these models with the quail climate model to identify suitable areas for surveys (area = 4,232 km²). We refine these suitable areas further using a measure of search effort to identify localities with suitable habitat and low search effort (area = 923 km²). Our results suggest the area surrounding Mussoorie as a potential target and that search efforts in Western Nepal would be better directed over the border in India.

 POSTER

Common buzzard *Buteo buteo* diet in relation to changes in vole abundance

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Predators whose most important prey are field voles *Microtus agrestis* are often assumed to increase their predation on other prey groups when vole abundances decline. However, this assumption may not

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be valid for all prey groups when there are a variety of prey groups and habitats available to predators. In Britain, voles are an important prey item for common buzzards *Buteo buteo*, and often form a principal component of the diet throughout much of their geographic range. Langholm Moor in south-west Scotland is an area of upland moorland managed for red grouse *Lagopus lagopus scoticus*, in which vole indices typically cycle over a three to four year period. We studied vole abundance and buzzard diet at Langholm Moor between 2011 and 2013, which encompassed a complete vole cycle. Breeding buzzards on Langholm Moor have previously been shown to eat red grouse in small numbers alongside their preferred vole prey. Buzzard diet was monitored at 13 – 16 nests each year using motion triggered cameras, analysis of prey remains and pellet content. An Index of Relative Importance was used to assess the importance of various prey groups to buzzard diet and it was found that the proportion of voles in buzzard diet decreased in line with vole indices. We hypothesised that when vole availability diminished, buzzards would switch to increased predation of red grouse and their chicks. However, grouse were less frequent in buzzard diet when vole indices were low. Instead, buzzards switched to eating more lagomorphs, moles, shrews and corvids; prey groups typically associated with moorland fringe and farmland habitats. This may suggest that when provisioning their chicks, buzzards take red grouse only incidentally while hunting for voles within moorland habitats. When assessing diet and investigating predator impact on prey species, knowledge of all resources and habitats that are available to predators is important.

POSTER

Small Wind Turbines (SWTs) and bird activity around the South Pennine Moors Special Protection Area

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Research on the ecological effects of wind turbines has, to date, focussed on wind farms with multiple large turbines. With financial incentives available within the UK for small-scale electricity generation, there is a trend towards the construction of small wind turbines (SWTs) in areas of high wind resource. The ecological effects of SWTs are not well understood, making it difficult for local authorities to make informed planning decisions. Our study was undertaken within three kilometres of the South Pennine Moors Special Protection Area (SPMSPA) boundary and within the boundaries of three unitary authorities. Within this area, 80 turbines were identified as having gained planning permission. Of these, 59 were visually confirmed as built (average density 0.28 turbines per km²).

Literature on the impact of SWTs on birds is currently extremely limited, with research so far directed toward bird flight activity in close proximity to turbines. In our study, 24 of the 59 built turbines were

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surveyed for breeding birds using distance sampling line transects positioned along existing public rights of way. All bird sightings within 100 metres of the transect line and within a 500 metre radial distance (250 metres for densely clustered turbines) of the turbine were recorded. Species, behaviour and group size were noted and a GPS waypoint was attributed to the observation.

The aim of this study was to investigate whether bird population density and activity varies as a function of distance from turbines. Bird locations were determined using a laser range finder and projected as a waypoint using a hand held GPS unit. As the transects lines were not straight, distance to the transect line from an observation was calculated as the shortest linear distance in place of radial distance and angle. Line transects were divided and grouped into sections based on distance from a turbine (in 100 metre radial increments as concentric circles around the turbine), facilitating the comparison of bird density and activity within different distance bands around a turbine. Habitat data were also collected for each turbine distance band as a covariate.

In excess of 1100 bird encounters were recorded (with many records comprising multiple individuals), including over 45 species. Northern Lapwing (*Vanellus vanellus*), Eurasian Curlew (*Numenius arquata*) and Common Skylark (*Alauda arvensis*) were the most numerous species of primary interest. The majority of records consisted of passerines such as Meadow Pipit (*Anthus pratensis*), Common Starling (*Sturnus vulgaris*), Carrion Crow (*Corvus carone*) and Western Jackdaw (*Corvus monedula*). Data collected in 2013 will be compiled and analysed with further data collected in 2014. We hope to expand the number of turbines surveyed and examine the effect of localised cumulative turbine construction on bird activity.

POSTER

Status of breeding Dotterel *Charadrius morinellus* in Britain 2011

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The 2011 RSPB/SNH Montane Survey revealed a 43% decline in the number of Dotterel breeding in the UK since the 1999 survey. The estimated population of 423 breeding males (95% CL 279 - 644) were found predominantly in the Eastern Highlands and largely absent from previously occupied sites in the North and West Highlands. No Dotterel were found in Wales or northern England. There has been a significant shift in the altitude of occupied Dotterel sites between 1987-2011, with higher sites being occupied in the later survey.

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Aims

To estimate the number of breeding Dotterel in the UK and in Scottish regions, and to compare these with the relevant estimates from previous national surveys. In addition, to look for changes in mean altitude of occupied sites.

Methods

Surveys were carried out on a stratified random sample of montane sites and on all SPAs/SSSIs (for which Dotterel are a designating feature) as a full census between mid-June and mid-July, repeating methods used in national surveys in 198/88 and 1999. Population estimates and 95% confidence intervals were calculated by extrapolation and bootstrapping, and randomization tests used to assess change between survey periods.

Results

The figures illustrate the decrease in site occupancy and population size in Dotterel breeding in Britain since the 1980s. Overall the national population has declined from 981 (95%CI 873-1101) in the 1987/88 survey to 423 (95% CIs 279-644) a significant 43% decline since 1999 when the population was estimated to be 747 (95% CIs 592-1357).

The mean altitude of occupied Dotterel sites differed significantly between the surveys, suggesting that altitudinal range occupied by Dotterel has changed as the population has declined.

Conclusions

Dotterel declined in the UK between 1999 and 2011 by over 40%. The estimated population of 423 breeding males were found predominantly in the Eastern Highlands and largely absent from previously occupied sites in the North and West Highlands. Further research is ongoing to understand the drivers of this population decline, particularly into the impacts of climate change on montane habitats and effects of habitat changes on Dotterel breeding in Scotland.

POSTER

Habitat use and ranging behaviour of GPS tracked Golden Eagles in northern Sweden

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There is a need for developing methods for reliable environmental impact assessment of wind farms in Sweden, and to facilitate the establishment of “eagle friendly” wind farms. During 2010 and 2011 a total of 43 adult and juvenile golden eagles in northern Sweden were marked with GPS transmitters, to provide information on the species’ home range, habitat selection and ranging behaviour.

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Breeding eagles had home ranges of 60–605 km², and some wandered long distances after breeding. Generalised, circular buffer zones centred on the nest, from which wind farm establishment is excluded, are inadequate and should ideally be specifically adapted to each territory.

Eagles preferred clearcuts and avoided dense forest habitats. Eagles could be encouraged away from wind farms by minimizing clearfelled areas whilst encouraging dense forest within the wind farm. Steep slopes and cliffs were particularly favoured by eagles, and wind turbines should not be placed at these locations. High, forested plateaus could be exploited, as long as turbines are sited away from steep slopes.

Adult golden eagles occasionally undertook long-distance movements during both summer and winter. Juveniles migrated south and spent their first winter in southern and central Sweden, and migrated north the following spring to the Scandinavian mountain region. Thus, conservation management measures may need to be directed towards wintering sites and migration routes as well as breeding season home ranges.

POSTER

Upland Villages Micro-Hotspots of Avian Biodiversity: a case study of Sainj Valley, Western Himalayas

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Upland villages have played pivotal role in the development of socio-economic and cultural life of Himalayan people. However, their role in terms of biodiversity conservation has been largely ignored and poorly understood. Therefore, I surveyed 14 villages of Sainj valley, Himachal Pradesh, India. This valley has number of upland villages which still practices traditional farming methods for cultivation of food crops. These villages are located in the eco-zone of Great Himalayan National Park (an Endemic Bird Area identified by Birdlife International) between the mid altitudinal ranges of Western Himalaya (1300-2800 m a. s. l). I classified villages into two categories (i) 'lower villages' - located in between 1300-1700m (ii) and 'upland villages' are located in between 1700-2800m. Beyond 2800m there were no villages recorded in the valley. Breeding bird surveys were conducted in spring season (April-May) 2013. A variable radius point count method was used to count birds. A total of 38 point counts in lower villages and 69 point counts in upland villages were carried out. Estimate S (Version 8.2) was used to compute species richness and perform rarefaction analysis of surveyed villages. The estimated true mean species richness for upland villages was recorded as 65.86 ± 3.52 S.D which was higher compared to lower villages which was recorded as 44.74 ± 3.02 S.D. The upland villages support some of the rare and threatened bird species like *Catreus wallichii*, *Lophophorus impejanus* and *Lophura leucomelanos*. The bird communities showed

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mixed assemblage of forest and agricultural bird species. These villages were visited by forest bird species like *Dendrocopus himalayensis*, *Mycerobas icteroides*, and *Columba hodgsonii* for foraging. Moreover, the use of eco-friendly agriculture techniques brings about a moderate level of anthropogenic disturbance which results into high species richness of birds in upland villages. Thus, these villages act like micro hotspot of biodiversity where man and bird can coexist. Therefore, there is urgent need to conserve upland villages of Western Himalayas.

POSTER

Physiological tolerances of high temperatures in fynbos birds and implications for climate change.

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The Fynbos biome of South Africa is the smallest of the world's floral kingdoms, and covers a narrow band of coastline and mountains in the southwestern corner of South Africa. However, despite its small size it is also a biodiversity hotspot. This region supports a rich diversity of birds, and seven species are endemic to the fynbos biome. Many of these species have ranges centred in the montane Fynbos habitats.

Climate change is a major threat to the biodiversity of this biome, and the region is expected to become both hotter and drier in the next few decades. Recent climate envelope models suggest that many of the montane species' ranges might be restricted by temperature. With increasing temperatures the availability and extent of suitable cool habitat will be drastically reduced. These predictions paint a sombre picture for the future distributions of many of these species. However, these models are largely correlative and require additional empirical data on factors driving distributions.

We investigated physiological responses to heat in 12 species inhabiting the fynbos mountain regions, including six of the fynbos endemic species. We measured evaporative water loss, metabolic rate and body temperature at air temperatures ranging from 24°C to 42°C. We tested predictions that species with a highly specialized, high altitude distribution would show lower temperature thresholds compared to generalized species.

Preliminary data showed that the air temperature where birds started panting and where evaporative water loss (EWL) rates increased, ranged from 32°C to almost 38°C. The rate of EWL increased as a

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function of increasing air temperature and the magnitude of these increases was dramatic in some species. The two species that prefer montane habitat, Protea Seedeater (*Crithagra leucopterus*) and Cape Rock-jumper (*Chaetops frenatus*), started panting before temperatures reached 34°C and showed > 3-fold increase in EWL rates at 38°C. This pattern was also seen for Victorin's Warbler (*Cryptillas victorini*). The two nectarivorous species (with a more widespread distribution within the biome) seem to tolerate heat better. Orange-breasted Sunbird (*Anthobaphes violacea*) and Cape Sugarbird (*Promerops cafer*) only started panting at ambient temperatures above 35°C and showed < 3-fold increase in EWL at 38°C.

Our data provide vital information on the vulnerability of these endemic species to climate change. These findings illustrate the importance of including mechanistic data into climate change predictions. Finally, these data provide support that climate envelope predictions, combined with comparative mechanistic data, might be valuable for identifying potential range restrictions driven by temperature in montane species.

POSTER

Ecology and conservation biology of the Cape Parrot *Poicephalus robustus* in afromontane forests of South Africa.

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Until a decade ago little was known of the biology, ecology, taxonomy or conservation biology of the endemic Cape Parrot. The aim of this research was to question the bird's species status; to determine the factors limiting its distribution and abundance, including illegal trading and disease epidemiology; and to make plans for its conservation. Results from ecology, morphology, behaviour and microsatellites clearly demonstrated the Cape Parrot to be a good species. Intensive and long-term field studies revealed the species to be critically-endangered; a habitat specialist being largely confined to afromontane yellowwood (*Podocarpus* spp.) forests (also threatened habitats); and with a restricted and fragmented distribution (in the E Cape, the former Transkei, and Limpopo provinces). Field and laboratory research revealed a specialist feeder largely dependent on the kernels of the stones of the fruits of yellowwood trees. Mast fruiting is likely necessary for successful reproduction. The preferred habitat is species poor and of low productivity, and in many crunch years, causes the parrots to raid fruit orchards.

Results show the entire global wild populations of Cape Parrots approximates 1500 individuals, and that they are subject to illegal trading, habitat loss and fragmentation, mortality from fruit farmers, and infection from psittacine beak and feather disease, a fatal circovirus. Molecular genetics have not only confirmed the species status, but are assessing the phylogeography of the wild meta-population and the

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heterozygosity and paternity of the captive population of ~ 200 individuals. Plans for the conservation of the species include captive breeding, ongoing census, supply of artificial nest boxes, tree planting, control of illegal trade, preparation of a vaccine against PBFD virus, and an upgrading of its CITES status to Appendix 1.

POSTER

A case study of the impacts of wind farm construction on breeding Golden Plovers

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Upland areas within the UK host many bird species of conservation importance and also provide a significant wind resource away from densely populated area. This means they are often deemed suitable for wind farm development. The extent to which this overlap may impact on breeding upland species at the landscape scale depends on the response of birds to individual developments. We investigated the impacts of a wind farm on breeding European Golden Plover (*Pluvialis apricaria*) at a site located on blanket bog in the north of Scotland. Covering a five year period before, during and after construction repeat surveys of the wind farm site and surrounding area were used to assess any changes in abundance, distribution and breeding success with adult colour ringing providing additional information. Effects during construction consisted of a limited decrease in occupancy close to the wind farm infrastructure. Post-construction birds were lost from most of the area formally occupied within the wind farm. There was no evidence for changes in breeding success within the wind farm and we suggest that losses may have occurred directly through displacement and/or indirectly due to low recruitment of new pairs into territories vacated, either through displacement or natural mortality. Distribution and colour ring data suggest that displaced pairs did not resettle in areas immediately adjacent to the wind farm. If these pairs continued to breed they may have been displaced beyond the radius of our survey area. As the main decreases occurred in the period post construction it is possible that a behavioural avoidance of turbine infrastructure is key explanatory factor.

POSTER

Associations between new native woodland creation and population change in Scottish black grouse *Tetrao tetrix*

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Woodland expansion in the UK is likely to be strongly favoured in marginal upland areas. Consequently, work is urgently required to determine the impacts on priority upland birds. One of these species, the black grouse *Tetrao tetrix* is listed in the UK as a bird of High Conservation Concern. Previous work found that the decline in numbers of lekking males between 1990 and 2002, in one of the core Scottish strongholds, was highly correlated with forest maturation/canopy closure (Pearce-Higgins *et al.* 2007). Subsequently, the population underwent a remarkable recovery over the following ten years; however correlates of this increase, potentially related to the creation of new native woodland (NNW), have not been examined. Replicating the analytical approach used by Pearce-Higgins *et al.* (2007), we re-analysed a satellite image of a 700-km² area in Perthshire, while including areas of NNWs which accounted for the fourth most common habitat (5.5%) in the study area. Both the occurrence and size of black grouse leks were positively associated with NNW plots, but remained strongly negatively associated with mature commercial plantation. Changes in lek size before and after the creation of NNW plots were related with a weak quadratic effect of woodland area. We discuss management actions for NNW plots, particularly in relation to the size, maturation and field layer processes within NNWs.

POSTER

The influence of aviation noise on passerine vocalisation and ecology

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Birds rely on vocal signals to defend breeding territories, attract mates and maintain contact with flock members. Urban and road noise can decrease the signal-to-noise ratio, resulting in the masking of calls or song. Individuals can combat signal masking by altering the amplitude, frequency or temporal parameters of the signal. Unlike the constant, low frequency noise associated with urban areas and road traffic, aircraft noise consists of infrequent bouts of extreme amplitude. The effect of aircraft noise on birds has yet to be studied in detail. Strategies to overcome masking from aircraft noise probably differ from those used by birds exposed to other sources of anthropogenic noise. Over the course of three field seasons we will examine the effects of aircraft noise on bird song structure and function. This will be achieved by comparing the singing behaviour and song structure of four passerine species between control sites and sites around Manchester International airport. Comparisons of nesting success, vigilance and population density will provide additional information on the effects of aircraft disturbance on bird ecology. With the likely addition of a new runway for

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the south of England this the ideal time to improve our understanding of the impacts of aircraft noise on birdlife.