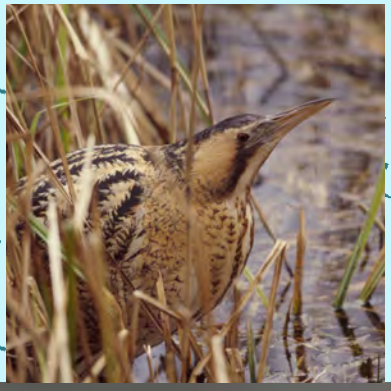
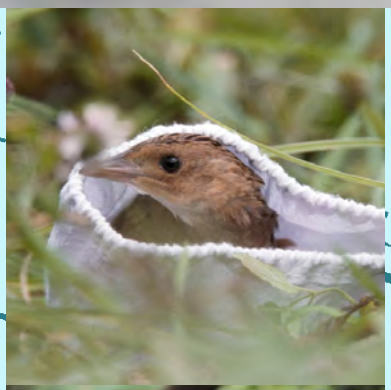
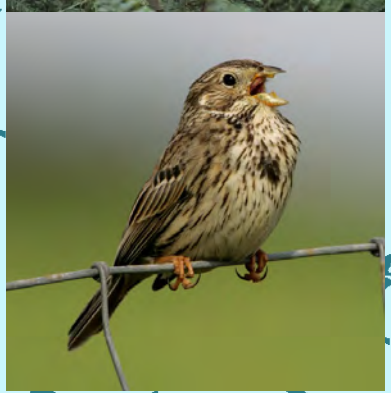
# EOU2013UK



# PROGRAMME & ABSTRACTS





## NORWICH

27–31 AUGUST 2013

University of East Anglia

## 9th Conference of the European Ornithologists' Union

wwww.norwich.eounion.org

**hosted by**

the University of East Anglia

**supported by**

British Ornithologists' Union

British Trust for Ornithology

Edward Grey Institute

RSPB

# EOU2013UK — Local Organisers

**EOU**2013**UK** is organised and sponsored by some of the UK's leading ornithological organisations, research institutes and bird conservation bodies.

## British Ornithologists' Union — www.bou.org.uk

The BOU is a worldwide society publishing the world's leading ornithilogical journal, IBIS. The BOU supports students studying ornithology including their attendance at conferences, including this first EOU meeting in the UK. The BOU also runs a Career Development Bursary scheme for early career reasearchers and awards Small Ornithological Research Grants annually to projects around the world.

## British Trust for Ornithology — www.bto.org

The BTO is a scientific research organisation specialising in birds and their habitats. We undertake impartial research and analysis to advance the understanding of natural systems. The BTO provides high quality, impartial and policy-relevant data and information, relied upon for informed decision making. We work in partnership with the academic and conservation science communities, Government, and the private and voluntary sectors.

## Edward Grey Institute of Field Ornithology — www.zoo.ox.ac.uk/egi

The Edward Grey Institute of Field Ornithology (EGI) is part of the Department of Zoology of the University of Oxford. Founded in 1937, it researches the behaviour, ecology, evolution and conservation of birds, emphasizing the need to understand organisms in their natural environments. The EGI is well known for its groundbreaking population studies of birds, and was a founding supporter of EOU.

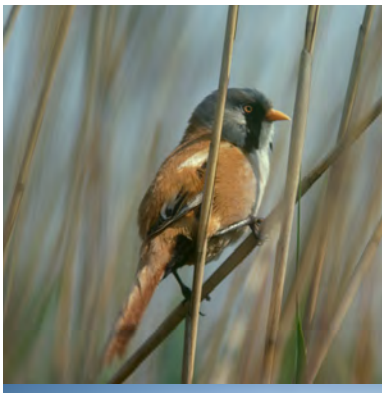
## RSPB — www.rspb.org.uk

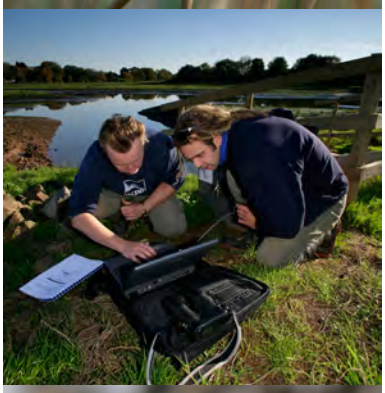
The RSPB speaks out for birds and wildlife, tackling the problems that threaten our environment. We are the largest wildlife conservation organisation in Europe, with over a million members. We work to secure the conservation of wildlife through research, education, habitat management and advocacy. We are part of BirdLife International

## University of East Anglia — www.uea.ac.uk

The University of East Anglia (UEA) is an internationally renowned university that provides top quality academic, social and cultural facilities to over 14,000 students. It is a leading member of the Norwich Research Park, one of Europe's biggest concentrations of researchers in environmental science, and the campus is located on 362 acres of parkland and woodland.

## 9th Conference of the European Ornithologists' Union





# PROGRAMME & ABSTRACTS

**Edited by**
Steve Dudley, Jenny Gill,
Aldina Franco, Nathalie Gilbert,
Danielle Peruffo, Alice Risely,
Amy Romans & Lewis Spurgin

European Ornithologists' Union
Norwich, UK

**PROGRAMME & ABSTRACTS**

Editing & Preparation: Steve Dudley, Jenny Gill, Aldina Franco, Nathalie Gilbert, Danielle Peruffo, Alice Risely, Amy Romans & Lewis Spurgin
Design & Layout: Steve Dudley, BOU

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**WEBSITES**

EOU conference website: Rafal Bajaczyk
EOU bookings pages (hosted by BOU): Angela Langford & Steve Dudley, BOU

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# EOU2013UK

## 9th Conference of the European Ornithologists' Union

**CONFERENCE ORGANISERS**

British Ornithologists' Union
British Trust for Ornithology
Edward Grey Institute of Field Ornithology
RSPB
University of East Anglia

**LOCAL ORGANISING COMMITTEE**

**Rob Fuller** | BTO | Chairman
**Steve Dudley** | BOU
**David Gibbons** | RSPB
**Jenny Gill** | UEA
**Andy Gosler** | EGI
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Supported by Angela Langford | BOU

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**Graham Martin** | University of Birmingham, UK
**Stoyan C. Nikolov** | Central Laboratory of General Ecology, Sofia, Bulgaria
**Tomasz Wesolowski** | Wroclaw University, Poland

The organisers would like to thank all those who helped prepare the programme and organise the conference. In particular, we would like to thank Angela Langford (BOU) and the University of East Anglia volunteers, José Alves, Tom Finch, Nathalie Gilbert, Danielle Gilroy, Karen Hornigold, Becky Laidlaw, Danielle Peruffo, Alice Risely, Amy Romans, Philip Saunders, Lewis Spurgin, Martin Sullivan and Leila Walker.

# CONTENTS

# Welcome to the EOU's 2013 conference

Ornithologists are generally fascinated by their study objects; they love to study birds. Therefore, despite recent economical downturns and hardships, funding cuts, and other obstacles affecting many people in Europe, ornithologists manage to do fairly well. This is clearly demonstrated by a large number of attending delegates, coming from every corner of Europe and beyond, as well as by a diverse set of scientific presentations. Like their highly mobile study subjects, many ornithologists have recently become wanderers, often having worked in several different countries by the mid-point of their careers, producing great benefits in terms of the cross-fertilization of ideas and practices. The second visible and very positive current tendency is a growing number of international teams carrying out continent-wide collaborative studies. The promotion of such interactions in Europe is the role of the EOU and conferences are the most important means by which it achieves its objectives. This abstract book, containing a rich and varied set of talks and posters, shows that the Norwich conference will certainly fulfil that purpose. For that we have to thank not only the speakers and the authors of the posters, but the symposium organisers and the Scientific Programme Committee (under the chairmanship of Nikita Chernetsov), who have solicited contributions from all over Europe and drawn them together into an exciting programme.

The EOU, without staff and almost without financial resources, depends on the voluntary efforts of many people. Conferences depend on the hard work of the organising team in the host country and our UK hosts have done us proud. They have provided excellent arrangements. This will allow us to get the most out of both the programme and the informal part of the conference – discussions and making new contacts are such an important part of our meetings. A significant part of the organisation of this conference has been to provide modest financial support for young ornithologists and for those from lower income countries, to help them to participate in the meeting. In addition to the contribution from the EOU, the British Ornithologists' Union has funded the attendance of 45 student and early-career researchers and the BOU and Swarovski are sponsoring prizes for the best student oral and poster presentations.

Continuity and communication between conferences depends on the EOU's Council. A new team of officers and Council members is to be elected at the General Meeting on Thursday, to which all conference participants are invited. Please give the EOU and their officers your support, share with them ideas about how the work of the Union may be developed, so that European ornithology continues to flourish and to grow in strength and effectiveness.

Welcome to Norwich and to EOU 2013! Enjoy the conference!

**Tomasz Wesołowski**
EOU President

# PROGRAMME

## TUESDAY, 27 August 2013

| | |
|---|---|
| 1400 | **EOU Council Meeting**<br>Council House |
| 1700 | **Registration opens**<br>The Hive, Union House |
| 1900 | **OPENING RECEPTION and buffet**<br>The Hive, Union House |
| 2030 | **PLENARY LECTURE**<br>Lecture Theatre 1<br><br>**Tim Birkhead**<br>Ten Thousand Birds: Ornithology since Darwin |
| 2030 | Exhibition Hall closes |

## WEDNESDAY, 28 August 2013

| | |
|---|---|
| 0700 onwards | **Breakfast** – sitting 1<br>The Zest restaurant |
| 0745 onwards | **Breakfast** – sitting 2<br>The Zest restaurant |
| 0840 | **OPENING CEREMONY**<br>Lecture Theatre 1 |
| 0900 | **PLENARY LECTURE**<br>Lecture Theatre 1<br><br>**Leo Fusani**<br>The evolutionary and physiological mechanisms of elaborate courtship displays |
| 0950 | **Coffee break**<br>The Hive and Exhibition Hall, Union House<br><br>A chance to view posters and exhibitor stands |

## 1030 – 1230 **SYMPOSIA** – PARALLEL SESSIONS (X4)

### Symposium 1 Lecture Theatre 1

**Adapting bird conservation to climate change: where models meet reality**
Conveners: Malcolm Ausden & James Pearce-Higgins

1030 **Hartley, A.**
The reliability of climate change projections for assessing the impact of climate change on biodiversity

1100 **Ausden, M., Ockendon, N., Beale, C., Carroll, M., Dodd, A., Johnston, A., Oliver T. & Pearce-Higgins, J.W.**
The implications of climate change for species prioritisation and site management

1130 **Carroll, M., Ewing, S., Owen, E. & Bolton, M.**
Modelling the impacts of climate change on seabirds in the UK

1150 **Monnet, A., Hardouin, L. A., Hingrat, Y., Robert, A. & Jiguet F.**
Linking individual survival to dispersal along habitat suitability gradient: a case study of the North African Houbara Bustard *Chlamydotis undulata*

1210 **Telensky, T., Anton, M., Herrando, S., Brotons, L., Klvaňa, P., Cep, K.J., Jel Nek, M. & Reif, J.**
How does climate limit bird populations? Lessons from the Czech Republic and Catalonia

### Symposium 4 Lecture Theatre 2

**Direct and indirect effects of pesticides on birds**
Conveners: David Gibbons & Lukas Jenni

1030 **Poulin, B.**
Indirect effects of Bti mosquito control on birds in the Camargue, France

1100 **Mineau, P.**
Birds and insecticides - from organophosphates to the neonicotinoids. Are we jumping from the frying pan into the fire?

1130 **Morrissey, C., Michelson, C., Main, A., Clark, B., Cessna, A., Headley, J. & Mineau, P.**
Losing bugs and birds: Investigating the impact of neonicotinoid insecticides on agricultural wetlands of Prairie Canada

1150 **López Antia, A., Ortiz Santaliestra, M.E. & Mateo, R.**
Risks of imidacloprid-treated seeds for Red-legged Partridges *Alectoris rufa*

1210 **Elovskaya, S., Skryleva, L. & Miklyaeva, M.**
The change of morphological features of chicks exposed to pesticides

**Symposium 9** **Lecture Theatre 3**

## Forest management and woodpecker ecology: can the differing interests comply?

Conveners: Volker Zajner & Gilberto Pasinelli

1030 **Jackson, J.**
Shifting benchmarks, forest management, and the significance of niche variation in woodpeckers: lessons from the Red-cockaded *Picoides borealis* and Ivory-billed *Campephilus principalis* Woodpeckers

1100 **Robles, H.**
Reconciling forestry and conservation: the case of the Middle Spotted Woodpecker *Dendrocopos medius* in traditional forest landscapes

1130 **Smith, K.**
Long term studies of dead wood resources and a generalist woodpecker, Great Spotted Woodpecker *Dendrocopos major*, in managed and unmanaged woodlands in southern England

1150 **Wilk, T.**
Do woodpeckers need "roadless" areas? – small-scale and large-scale factors affecting distribution of rare woodpecker species in Polish Carpathian mountains

1210 **Zahner, V.**
Tree selection, competition and predation on Black Woodpecker *Dryocopus martius* cavities under the aspect of a changing forest management in beech trees *Fagus sylvatica*

**Symposium 15** **Lecture Theatre 4**

## Movements and distribution of Afro-Palaeartic migratory birds in relation to environmental conditions in sub-Saharan Africa

Conveners: Chris Hewson, Phil Atkinson & Kasper Thorup

1030 **Thorup, K.**
Tracking seasonal changes in resources across continents: Movements of trans-equatorial Afro-Palearctic migrants

1100 **Klaassen, R.**
Generic wind patterns and the crossing of a formidable barrier, the Sahara desert

1130 **Hewson, C., Atkinson, P., Conway, G. & Henderson, I.**
Spring migration strategies of Afro-Palearctic migrants wintering in central & southern Africa and breeding in Britain

1150 **Pedersen L., Fraser K.C., Kyser T.K., Tøttrup A.P.**
Combining stable isotope analysis and geolocator data to investigate links between wintering and breeding grounds of a long-distance Eurasian-African migrant, the Red-backed Shrike *Lanius collurio*

1210 **Wesołowski, T., Hobson, K., Van Wilgenburg, S. & Maziarz, M.**
A multi-isotope approach to establishing migratory connectivity in Palearctic-Afrotropical migrants: An example using Wood Warblers *Phylloscopus sibilatrix* from the Białowieża Forest, Poland

1230 **Lunch**
The Hive, Union House

Chance to view posters and exhibitor stands

1400 **PLENARY LECTURE**
Lecture Theatre 1

**Jennifer Gill**
Migratory connectivity in birds: causes and conservation implications

1450 **Coffee break**
The Hive and Exhibition Hall, Union House

A chance to view posters and exhibitor stands

**1530 – 1730** **CONTRIBUTED ORAL PROGRAMME**
PARALLEL SESSIONS (X4)

**Contr. Orals 1** **Lecture Theatre 1**

## Dispersal and phenotype

1530 **Perrig, M., Grüebler, M. & Keil H.,Naef-Daenzer, B.**
Natal dispersal in Little Owls *Athene noctua* – short but effective

1550 **Laaksonen, T., Schuett, W., Calhim, S., Dall, S.R., Järvistö, P. & Velmala, W.**
Where to arrive and where to go from there: dispersal behavior at settlement

1610 **Naef-Daenzer, B. & Grüebler, M.U.**
Ecological determinants of post-fledging survival. A framework for a review

1630 **Van Noordwijk, A.J.**
Measuring the selection against inbreeding in island populations of Blue Tits *Cyanistes caeruleus* and Great Tits *Parus major*

1650 **Tablado, Z., Bötsch, Y., Almasi, B., Jenni-Eiermann, S. & Jenni, L.**
Factors modulating bird response to disturbance at multiple scales: a review

1710 **Plummer, K.E., Bearhop, S., Leech, D.I. & Chamberlain, D.E., Blount J.D.**
Winter supplementary feeding alters the phenotypic structure of Blue Tit *Cyanistes caeruleus* populations

**Contr. Orals 2** **Lecture Theatre 2**

## Birds and their environment

1530 **Smith, S., Costantini, D., Nager, R. & Metcalfe, N.**
Why don't animals grow as fast as they can? The link between oxidative stress and growth in wild Blue Tits *Cyanistes caeruleus*

1550 **Liu, Y. & Griesser, M.**
Environmental factors influence both abundance and genetic diversity in a widespread bird species

1610 **Nilsson, J., Walkup, J., Evans, P., Reid, J., Metcalfe, N. & Monaghan, P.**
Early condition, oxidative stress and telomere dynamics in nestling Common Starlings *Sturnus vulgaris zetlandicus*

1630 **Sumasgutner, P., Gamauf, A. & Krenn, H.**
The unexpected costs of city life: Are buildings ecological traps for urban breeding Eurasian Kestrels *Falco tinnunculus*?

1650 **Aguirre, J.I., Banda, E., Pineda, J., Herrera, A. & Antonio, M.T.**
House Sparrow *Passer domesticus* as a model for the analysis of species decline in urban areas

1710 **Goutte, A., Bustamante, P., Barbraud, C., Weimeskirch, H. & Chastel, O.**
Fitness consequences of mercury exposure in Antarctic top predators

**Contr. Orals 3** **Lecture Theatre 3**

## Information, ecology, and models

1530 **Bodey, T., Kane, A., Votier, S., Hamer, K., Jackson, A., Patrick, S., Wakefield, E. & Bearhop, S.**
Information transfer explains colony specific habitat use in a long-distance forager, the Northern Gannet *Morus bassanus*

1550 **Homberger, B., Korner, F. & Jenni, L.**
Behavioural traits and their consequences for survival in re-introduced populations of Grey Partridges *Perdix perdix*

1610 **Grizard, S., Ndithia, H., Salles, J.F. & Tieleman, B.I.**
How do microorganisms shape lark eggs: matching microbial communities of eggshells and antimicrobial properties of albumen under temperate and tropical environments

1630 **Brambilla, M., Bergero, V., Celada, C., Falco, R., Ficetola, G.F., Gustin, M., Saporetti, F., Tattoni, C. & Pedrini, P.**
How can Species Distribution Models promote bird conservation? New applications to go beyond the simple mapping of suitable areas

1650 **Baillie, S., Robinson, R., Johnston, A. & Green, R.**
Integrated modelling of bird populations - the value of direct measures of recruitment

1710 **Anderson, D., Metcalfe, N., Parish, D. & McCracken, D.**
Yellowhammer *Emberiza citrinella* ecology in a grassland dominated landscape

**Contr. Orals 4** **Lecture Theatre 4**

## Bird migration

1530 **Hegemann, A., Marra, P.P. & Tieleman, B.I.**
Wintering at home or wintering abroad? Partial migration has carry-over effects on immune function, body mass and return rates of Skylarks *Alauda arvensis*

1550 **Conklin, J.**
There are no low-quality godwits in New Zealand

1610 **Dittmann, T., Åkesson, S., Alerstam, T., Kulemeyer, C., Liechti, F., Muheim, R., Schulz, A., Sjöberg, S., Steuri, T., Weidauer, A. & Coppack, T.**
From individual decisions to mass migration events: factors shaping migration patterns in songbirds crossing the open sea

1630 **Boström, J.E., Åkesson, S. & Alerstam, T.**
Where on earth can animals use a geomagnetic bi-coordinate map for navigation?

1650 **Sinelschikova, A. & Vorotkov, M.**
Compensation for wind drift by thrushes during autumn nocturnal migratory flight

1710 **Lupi, S., Cianchetti, M., Cardinale, M. & Fusani, L.**
Physiological conditions influence stopover decision during migration in Black Redstart *Phoenicurus ochruros*, European Robin *Erithacus rubecula* and Common Stonechat *Saxicola torquata*

1730 **POSTER SESSION**
Exhibition Hall, Union House

1915 onwards **Dinner** – sitting 1
The Zest restaurant

2000 onwards **Dinner** – sitting 2
The Zest restaurant

2000 Exhibition Hall closes

# THURSDAY, 29 August 2013

0700 onwards **Breakfast** – sitting 1
The Zest restaurant

0745 onwards **Breakfast** – sitting 2
The Zest restaurant

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0900 **PLENARY LECTURE**
Lecture Theatre 1

**Anton Krištin**
Food and foraging in insectivorous birds: theories, methods and applications

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0950 **Coffee break**
The Hive and Exhibition Hall, Union House

A chance to view posters and exhibitor stands

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**1030 – 1230** **SYMPOSIA** – PARALLEL SESSIONS (X5)

**Symposium 5** **Lecture Theatre 1**

## Drivers of change: a landscape approach to bird conservation in the Sahel

Conveners: Danaë Sheehan, Phil Atkinson & Bernd de Bruijn

1030 **Wymenga, E., Zwarts, L. & Van Der Kamp, J.**
Wetlands and birds in a drier Sahel

1100 **Zwarts, L. & Wymenga, E.**
Why European woodland birds spending the winter in the Sahel are in decline

1130 **Kristensen, M.W., Tøttrup, A.P. & Thorup, K.**
Land-use effects on spatial behaviour and population density of Palearctic migrants wintering in West Africa

1150 **Ma, Z., Hua, N., Choi, C., Peng, H. & Battley, P.**
Differentiating stopover and staging sites for long-distance migratory shorebirds: Length of stay and fuel deposition of Great Knots *Calidris tenuirostris* in the Yellow Sea

1210 **Rees, E., Brown, M. & Newth, J.**
Incidence of embedded shotgun pellets in Bewick's Swans *Cygnus columbianus bewickii* and Whooper Swans *Cygnus cygnus* wintering in the UK

**Symposium 6** **Lecture Theatre 2**

## Ecological correlates of coloniality in birds

Conveners: Katarzyna Wojczulanis-Jakubas & Magdalena Zagalska-Neubauer

1030 **Wanless, S.**
Effects of changing environmental conditions on colonial behaviour and foraging dynamics of seabirds in the North Sea

1100 **Skórka, P. & Lenda, M.**
Landscape-scale settlement patterns and space use of colonial gulls

1130 **Nager, R., Cross, A., Luxmoore, R., McGill, R. & Furness, B.**
Seabird colony sites: a habitat engineered by seabirds

1150 **Wojczulanis-Jakubas, K., Jakubas, D. & Chastel, O.**
Mating in a dense colony – sexual behaviour and stress level in a colonial seabird, the Little Auk *Alle alle*

1210 **Zagalska-Neubauer, M. & Neubauer, G.**
Alternative mating tactics in colonial birds – the importance of ecological factors

**Symposium 8** **Lecture Theatre 3**

## European ethno-ornithology and conservation

Conveners: Andrew G. Gosler & Maris Strazds

1030 **Gosler, A & Gosford, R.**
A brief introduction to European Ethno-ornithology and Conservation

1100 **Strazds, M., Ratkeviča, M. & Mārdega, I.**
A history of bird names in Latvia: from folk songs to company logos and press-releases; do they reflect attitudes to the environment?

1130 **Vansteelant, W. & Verhelst, B.**
One million raptors over a Georgian village

1150 **Greggor, A.**
Cultural interactions between bird and human populations

1210 **Hopper, N.G., Reynolds, S.J. & Gosler, A.G.**
The meaning of Magpies *Pica pica* – avian cultural heritage as motivation for avian conservation

**Symposium 13** **Lecture Theatre 4**

## Individual variation in predation risk management: current research into underlying causes and ecological consequences

Conveners: Will Cresswell & John L. Quinn

1030 **Cresswell, W.**
The ecological consequences of the relative importance of personality and behavioural flexibility to predation risk management

1100 **Quinn, J. L.**
Does personality explain predation and predation risk management? A review of the empirical evidence

1130 **Mathot, K., Nicolaus, M., Kempenaers, B. & Dingemanse, N.**
Individual differences in metabolic rate predict the willingness to forage under increased perceived predation danger in Great Tits *Parus major*

1150 **Van Den Hout, P.J., Van Gils, J.A., Robin, F., Van Der Geest, M., Lok, T., Spaans, B. & Piersma, T.**
Cryptic interference explains danger-prone behaviour in a gregarious shorebird

1210 **Thomson, R., Sirkiä, P., Villers, A. & Laaksonen, T.**
Temporal peaks in social information: prospectors investigate conspecific nests after a simulated predator visit

**Symposium 3** **Lecture Theatre 5** (Drama Studio)

## Bird aircraft interactions: collisions and avoidance

Conveners: Tom Kelly & Luit Buurma

1030 **Dolbeer, R.**
Birds and aircraft: fighting for airspace in ever more crowded skies

1100 **Blackwell, B.**
Exploiting avian vision with aircraft lighting to reduce bird strikes

1130 **Buurma, L.**
Socializing observations of the sky; remotely sensing the aerial life of the Common Swift *Apus apus*

1150 **Kelly, T.C.**
Tau-theory and the avoidance behaviour shown by birds to moving aircraft

1210 **Dekker, A. & Van Gasteren, H.**
Bird strike prevention by mutual separation

1230 **Lunch**
The Hive, Union House

Chance to view posters and exhibitor stands

1400 **PLENARY LECTURE**
Lecture Theatre 1

**Beatriz Arroyo**
Integrating behaviour and conseravtion management:
insights from studies on Montagu's Harriers

1450 **Coffee break**
The Hive and Exhibition Hall, Union House

A chance to view posters and exhibitor stands

**1530 – 1730** **SYMPOSIA** – PARALLEL SESSIONS (X5)

**Symposium 16** **Lecture Theatre 1**

## Numbers and distribution of birds in Northern Eurasia

Conveners: Sergej A. Soloviev & Alia R. Sataeva

1530 **Soloviev, S.A.**
Spatial organization of the birds in Tobol-Irtysh forest-steppe and steppe (south-western Siberia and Northern Kazakhstan)

1600 **Mischenko, A.L. & Sukhanova, O.**
Trends of bird populations in Central Russian flood plains under changing land-use and climate

1630 **Ewing, S.**
Changes in the distribution of montane and upland birds in montane regions of Scotland during a period of climate change

1650 **Korňan, M.**
Breeding bird assemblage dynamics in the primeval temperate beech-fir forest in the Western Carpathians (Slovakia)

1710 **Reif. J.**
When wildlife needs human disturbance: the role of early successional habitats for specialized and threatened bird species

**Symposium 14** **Lecture Theatre 2**

## Migratory bird conservation at the flyway scale: big problems call for big solutions

Conveners: Danaë Sheehan, Marcus Kohler & Willem Van den Bossche

1530 **Crockford, N., Jones, V., Kohler, M., Ndang'ang'a, P.K., Sheehan, D. & Van Den Bossche, W.**
Migratory bird conservation at the flyway scale: approaches to practical implementation in Africa-Eurasia

1600 **De Bruijn, B., Crockford, N., Osinubi, S.T. & Sheehan, D.**:
Conservation of long-distance migrant landbirds in the African-Eurasian flyway – how can science and policy align?

1630 **Verkuil, Y.I., Crockford, N., Piersma, T. & Fuller, R.A.**
Averting disastrous tidal flat loss in the East Asian-Australasian Flyway

1650 **Dunn, J. & Morris, A.**
Turtle Doves *Stretopelia turtur,* Trial Plots and Trichomonas: conserving the UK's only migrant dove

1710 **Mallord, J., Sheehan, D., Orsman, C., Roberts, J., Cristinacce, A., Skeen, R., Vickery, J. & Buchanan, G.**
Flyway-scale research to identify causes of population decline in the Wood Warbler *Phylloscopus sibilatrix*

**Symposium 11** **Lecture Theatre 3**

## Hybridization in birds

Conveners: Christoph Randler & Magdalena Zagalska-Neubauer

1530 **Randler, C.**
Hybridization in birds

1600 **Rubtsov, A.**
Reproductive isolation and species definition in birds

1630 **Marova, I.M., Shipilina, D.A., Fedorov, V.V. & Ivanitskii, V.V.**
Hybridization zone between Eastern European Chiffchaff *Phylloscopus collybita abietinus* and Siberian Chiffchaff *Phylloscopus (collybita) tristis*

1650 **Neubauer, G. & Zagalska-Neubauer, M.**
Intermediate migratory programs between two species of large gull

**CONTRIBUTED ORAL PRESENTATION**

1710 **Langston R., Teuten E.**
Tracking adult Northern Gannets *Morus bassanus* at sea to investigate foraging ranges during and post-breeding in relation to offshore wind farm proposal areas

**Symposium 10** **Lecture Theatre 4**

## Avian vision and glass collision – saving birds by understanding what they see

Conveners: Martin Rössler & Graham Martin

1530 **Martin, G.R.**
Human artefacts through birds' eyes

1600 **Rössler, M.**
Saving birds by marking glass

1630 **Osorio, D.**
Bird photoreceptors and the perception of colour, form and motion

1650 **Kelber, A., Chavez, J. & Lind, O.**
Visual thresholds in birds – behavioural tests

1710 **Håstad, O. & Ödeen, A.**
Avian UV vision and window markings

**Symposium 12** **Lecture Theatre 5** (Drama Studio)

## Implications of resource pulses in forests for bird populations

Conveners: Gilberto Pasinelli & Kenneth Schmidt

1530 **Wesołowski, T.**
Impact of resource pulses on breeding bird populations in a primeval temperate forest (Białowieża National Park, Poland)

1600 **Schmidt, K.**
Consumer pulses, avian breeding habitat selection, and population dynamics: Do pulses constrain information use?

1630 **Burgess, M., Smith, K.W., Mallord, J. & Shutt, J.**
Temporal patterns in the abundance of caterpillars and aerial invertebrates in British oakwoods in spring and the implications for the breeding performance of resident and long distance migrant bird species

1650 **Benkman, C.**
Resource fluctuations, density dependence, and speciation in crossbills

**CONTRIBUTED ORAL PRESENTATION**

1710 **Both C.**
Changing phenology when phenotypic plasticity does not suffice: evidence for evolution in action?

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1730 – 2000 A chance to view posters and exhibitor stands
Exhibition Hall, Union House

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|---|---|
| 1745 | **BOU & BTO EARLY CAREER RESEARCHER JOURNAL WORKSHOP**<br>Lecture Theatre 4 |
| 1845 | **EOU AGM**<br>Lecture Theatre 1 |
| 1915 onwards | **Dinner** – sitting 1<br>The Zest restaurant |
| 2000 onwards | **Dinner** – sitting 2<br>The Zest restaurant |
| 2000 | Exhibition Hall closes |

# FRIDAY, 30 August 2013

| | |
|---|---|
| 0700 onwards | **Breakfast** – sitting 1<br>The Zest restaurant |
| 0745 onwards | **Breakfast** – sitting 2<br>The Zest restaurant |
| 0830 | Field Trips – depart from UEA campus |
| 1700 | Field Trips – arrive back at UEA campus |
| 1900 | Coaches leave for St Andrew's Hall |
| 2000 | **CONFERENCE DINNER**<br>St Andrew's Hall, Norwich |
| 2200 | Shuttle coach return to campus. Last coach leaves St Andrew's Hall at 2300. |

# SATURDAY, 31 August 2013

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|---|---|
| 0700 onwards | **Breakfast** – sitting 1<br>The Zest restaurant |
| 0745 onwards | **Breakfast** – sitting 2<br>The Zest restaurant |

## 0900 – 1100 **SYMPOSIA** – PARALLEL SESSIONS (X4)

### Symposium 2 Lecture Theatre 1

### Avian morphology and evolution
Conveners: N. V. Zelenkov & A. V. Zinoviev

0900 **Zinoviev, A.V.**
Hind limb morphology as a key for understanding avian evolution

0930 **Amar, A. & Koeslag, A.**
Polymorphism in the Black Sparrowhawk *Accipiter melanoleucus*: inheritance patterns, clinal variation and potential adaptive function

1000 **Gwiazda R. & Flis A.**
Sex differences in the parental care of Little Bitterns *Ixobrychus minutus* during the nesting period

1020 **Larsen, C., Speed, M. & Berenbrink, M.**
Evolution and ecological correlates of facial bristles in Caprimulgiformes with emphasis on the nightjars (Caprimulgidae)

1040 **Ödeen, A., Dimitrova, M., Lisney, T.J., Rubene, D., Rózsa, J., Tauson, R., Wall, H., Løvlie, H., Canton, C. & Håstad, O.**
Visual temporal resolution in birds

### Symposium 7 Lecture Theatre 2

### Effects of climate change on Mediterranean birds
Conveners: Aldina Franco & Ines Catry

0900 **Brotons, L. & Herrando, S.**
Indirect effects of climate change on Mediterranean birds: the role of land use changes and fire

0930 **Catry, I., Franco, A.M.A. & Moreira, F.**
Impact of weather on the breeding performance in Lesser Kestrels *Falco naumanni*: adapting conservation efforts to face climate change

1000 **Bustamante, J., Rodríguez, C., Baena, M. & Marín, J.**
Sensor networks to monitor birds in a changing environment:
The HORUS project to monitor a Lesser Kestrel *Falco naumanni* colony

1020 **Silva, J.P., Freire, J., Leitão, P.J., Palmeirim, J.M. & Moreira, F.**
Identifying areas resilient to climate change: A case study of Little Bustards *Tetrax tetrax*

1040 **Correia, R., Palmeirim, J.M. & Franco, A.**
Can climate change explain the increasing number of over-wintering birds in Iberia? A niche analysis approach

**Symposium 17** **Lecture Theatre 3**

## Palearctic-African migrants in West and East Africa – similar or different non-breeding strategies

Convener: Agnieszka Ożarowska

0900 **Ożarowska, A.**
Similar or different migration strategy in two sister species wintering in the eastern part of the sub-Saharan Africa

0930 **Tøttrup, A.P., Onrubia, A., Robles, J.L., Klaassen, R.H.G., Strandberg, R., Vardanis, Y., Willemoes Kristensen, M., Alerstam, T. & Thorup, K.**
Unraveling population-specific variation in spatio-temporal migration patterns in a long-distance migratory passerine, the Red-backed Shrike *Lanius collurio*

1000 **Van Wijk, R.E. & Hahn, S.**
Lessons from huge variation in migration patterns in Eurasian Hoopoes *Upupa epops* and its potential consequences for general concepts in bird migration

1020 **Sorensen, M.**
Great Reed Warblers *Acrocephalus arundinaceus* in winter: song, territoriality, and individual success of a trans-Saharan migratory bird

1040 **Remisiewicz, M., Tree, A.J. & Underhill, L.G.**
Primary moult patterns of Greenshanks *Tringa nebularia* along the western and eastern migration routes to Africa

**Symposium 18** **Lecture Theatre 4**

## The Whinchat *Saxicola rubetra*: a common bird or cause for concern across Europe? Identifying demographic limitations on a long-distance migrant grassland species

Conveners: Ian Henderson, Damijan Denac & Davorin Tome

0900 **Henderson, I. & Cresswell, W.**
Combining large-scale patterns of breeding abundance with site based ecological studies in winter and summer to identify drivers of population change in Whinchats *Saxicola rubetra*

0930 **Grüebler, M.U., Spaar, R., Britschgi, A.,Graf, R., Horch, P., Jacot, A., Korner, P., Müller, M., Naef-Daenzer, B., Schuler, H., Strebel, G., Arlettaz, R.**
Whinchats *Saxicola rubetra* impacted by the intensification of farming practices: lessons from Swiss populations

1000 **Blackburn, E. & Cresswell, W.**
The wintering ecology of Whinchats *Saxicola rubetra*

1020 **Tome, D. & Denac, D.**
The Whinchat *Saxicola rubetra* – a cause for concern, at least from the Slovenian point of view

| | |
|---|---|
| 1040 | **Taylor, J., Henderson, I., Hartley, I. & Ash, D.**<br>Comparing variation in habitat use and productivity with estimates of survival and recruitment in a declining migrant bird: the Whinchat *Saxicola rubetra* on Salisbury Plain, England |
| 1100 | **Coffee break**<br>The Hive and Exhibition Hall, Union House<br><br>Last chance to view posters and exhibitor stands – hall closes at 1140 |
| 1140 | **PLENARY LECTURE**<br>Lecture Theatre 1<br><br>**Åke Lindström**<br>The extraordinary long-distance migrations of birds: new techniques and new insights |
| 1300 | **Lunch**<br>The Hive, Union House |
| 1400 | Departure |

# **ABSTRACTS** – PLENARY

In presentation order

SESSION: Plenary | 27 Aug 2013 | 2030

## TEN THOUSAND BIRDS: ORNITHOLOGY SINCE DARWIN

TIM BIRKHEAD

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We know more about birds than any other group of animals. Over the past century and a half our knowledge has grown exponentially and the total number of publications on birds is almost unbelievable. What drives someone to become an ornithologist? What does it take? How can you make your mark as an ornithologist? The answers to these and other questions lie in knowing how ornithology developed as a profession. Histories can be dull, but the people who made ornithology what it is today provide an extraordinary rich tapestry of wonderful stories. It may not always be obvious, but ornithologists are merely people, and they exhibit the full panoply of human attributes: ambition, intelligence, greed, jealousy and infidelity. This talk will describe how those traits have created the extraordinary phenomenon we call ornithology.

## THE EVOLUTIONARY AND PHYSIOLOGICAL MECHANISMS OF ELABORATE COURTSHIP DISPLAYS

LEONIDA FUSANI

Department of Life Sciences and Biotechnology, University of Ferrara, Italy. Email: leofusani@gmail.com

Many bird species have spectacular courtship displays during which males exhibit elaborate plumage while performing complex dances. Among the most acrobatic of these species are the Neotropical manakins (Pipridae). During the breeding season, 'bearded' manakins of the genus *Manacus* aggregate in leks where each male clears a small court on the forest floor to perform his displays. The evolution of these behaviours is driven by sexual selection, which is particularly intense in lekking species where females choose mates based on their behavioural and morphological features. In this talk, I will present the results of our studies of the proximate and ultimate causes of courtship behaviour of golden-collared manakins (*Manacus vitellinus*). We found that the acrobatic courtship dances of these birds are accompanied by unique morphological and physiological adaptations involving muscular, neural, and hormonal systems. Detailed analyses of male courtship using high-speed video recordings show that the displays require extreme accuracy and neuromuscular coordination. Indeed, females mate preferentially with males who perform their displays at a faster pace while maintaining an exquisite postural control. The females themselves challenge the males to perform at their extreme limits, testing in this way the neuromuscular and aerobic capacities of their potential mates. In fact, in these birds even the cardiovascular system has been recruited in the array of systems involved in courtship. All together, these studies reveal evolutionary and physiological mechanisms that underlie the spectacular courtship displays of manakins.

## MIGRATORY CONNECTIVITY IN BIRDS: CAUSES AND CONSERVATION IMPLICATIONS

JENNIFER A. GILL

School of Biological Sciences, University of East Anglia, Norwich Research Park, Norwich, UK. Email: J.Gill@uea.ac.uk

Populations of many migratory bird species are currently experiencing quite rapid declines in abundance. Identifying the causes of these declines, and thus designing appropriate conservation actions, is complex because of the huge distances over which they travel, and the large number of locations on which individuals can depend throughout their migratory range. In addition, migratory connectivity and seasonal interactions can mean that the effects of conditions in one season can be exacerbated, or reduced, by conditions experienced in the other season. Using a long-term study of Icelandic black-tailed godwits, in which marked individuals are tracked by a network of > 2000 volunteers throughout Europe, we explore (1) the influence of migratory connectivity and seasonal interactions on individual fitness, (2) the mechanisms through which migratory connectivity is established and maintained and (3) the implications of migratory connectivity for population-scale processes and conservation strategies. The mechanisms linking the conditions experienced in each season by migratory birds can be key drivers of individual fitness, and have direct implications for important ecological processes such as population regulation, range expansion rates and phenological responses to climate change, and these will be explored.

## FOOD AND FORAGING IN INSECTIVOROUS BIRDS: THEORIES, METHODS AND APPLICATIONS

ANTON KRIŠTÍN

Institute of Forest Ecology SAS, Štúrova 2, Zvolen, Slovakia. Email: kristin@savzv.sk

Food availability is a key factor in life decisions, influencing individual longevity and social relationships. Diet spectra and foraging ecology is well described in plant-eating bird species (e.g. frugivores, granivores). However, foraging interactions between birds and invertebrates (insects) are far from being fully understood. Food and foraging ecology is particularly known in farmland insectivorous birds, but using various methods making it difficult to synthesise. The talk will review the highlights and show new perspectives of foraging studies. Foraging niche and guild concepts in many bird assemblages are often not clear. I summarize our long-term research (1980-2012), based on analyses of food spectra (near 2 million prey items) in 84 insectivorous bird species (9 orders, 33 families), mainly from the breeding period and forest habitats in central Europe. We used and standardized four methods of food sampling and identification. Forest-dwelling insectivorous passerines are frequently opportunistic in foraging, but we found clear taxonomic and size preferences in prey selection, with regard to species, season and habitat. So-called 'optimal preferred food items' (regarding size and taxonomic status) are limiting factors for survival of several endangered and declining species (case studies: *Lanius minor*, *Upupa epops*, *Otus scops*, *Athene noctua*). The role of big insect species (>20 mm, mostly beetles and orthopterans) in the food of these birds may be critical. Analyzing the importance of different invertebrates in passerines, woodpeckers, roller, hoopoe and bee eater we found that the most important prey species are the caterpillars of Lepidoptera and imagos of Coleoptera, Hymenoptera, Homoptera, Diptera, Orthoptera and Araneidea. We show several examples of anti-predatory protection of insect prey (colour, toxins, scent), but many aposematic and poisonous invertebrate prey species are not refused *a priori* by birds. On the other hand, we analysed also food surplus, and how it influences foraging and mating behaviour of birds. There remain still many open questions how birds reflect food surplus. Current climate change brings many new questions about seasonal patterns of foraging as well offspring feeding (adaptive hypotheses). Thus, as many researchers postulated already, knowledge of food and foraging in insectivorous birds is not adequate and new properly designed experiments in field and aviaries are needed.

## INTEGRATING BEHAVIOUR AND CONSERVATION MANAGEMENT: INSIGHTS FROM STUDIES ON MONTAGU´S HARRIERS

BEATRIZ ARROYO

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The connections between behavioural sciences and conservation have been emphasized in recent years. Various studies have shown that even descriptive behavioural studies can play a part in solving conservation problems, and that ignoring behavioural data may lead to failure of management programs. There is also a growing interest in behavioural responses to anthropogenic disturbance, and these may also include management programs themselves. The Montagu´s harrier (*Circus pygargus*) is a ground-nesting raptor with two striking characteristics: it is very sociable, being a facultative colonial breeder which may nest in loose groups of up to 20-30 pairs; and it nests mainly within crops in western Europe (its original breeding habitat being grasslands and marshlands). Work with this species has thus focused on two distinct areas. On the one hand, conservation efforts to protect nests and nestlings at harvest time have been carried out for decades in different European countries. On the other hand, studies to evaluate causes and consequences of social behaviour in this species have also been numerous. I review both, highlighting how these two aspects are tightly interrelated. Various empirical and experimental studies have assessed the putative causal factors promoting coloniality in this species. Montagu´s harriers use colonies as platforms to advertise individual quality for mate choice, and social behaviour is associated with more efficient defense against predators and higher interspecific competition for food. Advantages and disadvantages of coloniality are not equally shared among different individuals. Conspecific attraction influences spatial distribution, and explains a mismatch between harrier and resource distributions. Additionally, and as other non-territorial species, Montagu´s harriers may forage at great distances from the nests. These characteristics imply that conservation based on reserves or protected areas is mostly inefficient for this species: occupancy of those reserves for breeding is not directly dependent on reserve quality, and these areas would need to be very large to provide for foraging needs. Cost-efficiency of alternative measures (like negotiating with farmers to delay harvest, leaving an unharvested buffer around the nest, or removal-relocation of nestlings at harvest time) varies according to the number of nests within each field and predation risks, and thus with degree of coloniality. Knowledge of factors influencing the degree of coloniality in given areas, and the relationship between individual quality and social behaviour, may thus help with decision-making for management programs. Finally, data from 17 years research in France suggests that repeated exposure of harriers to humans selects for aggressive individuals. Therefore, "invasive" conservation management (visiting nests and manipulating nestlings to protect at harvest time) may in turn affect their social behaviour and spatial patterns. These data highlight the role animal behaviour plays in conservation practice, and I discuss the advantages of integrating data from both disciplines for developing practical and efficient conservation solutions.

## THE EXTRAORDINARY LONG-DISTANCE MIGRATIONS OF BIRDS: NEW TECHNIQUES AND NEW INSIGHTS

ÅKE LINDSTRÖM

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Only a few decades ago, details about the travels of individual migrants in time and space came from either a few separate geographic positions (ringing recoveries), or short stretches of migratory flight (radar). From these data, together with general observations of the temporal and spatial appearance of species and populations, we built our view of migratory journeys. In the last two decades, new tracking techniques have revolutionized migratory studies by making it possible to follow individual birds in great detail and year-around: radio transmitters tracked via satellites, GPS loggers, and the much smaller and cheaper light-loggers (geo-locators). New and exciting knowledge is being published at an increasing rate. One of the more striking new insights is the length of non-stop flights. Whereas flight distances of 4000–5000 km were thought of as absolute and breath-taking maxima, just in the last few years, individuals of a handful of species have been recorded to fly as much as 6000-11000 km non-stop. New migration routes, often including unexpected detours, have also been revealed. Further, one of the most difficult and yet important questions can finally be addressed: When during the year do migrants die? There are also examples of how local conditions along the migration route can impact the timing of migration thousands of km away. I will present some of these recent findings and discuss how they may have affected our view of causes, constraints and consequences of long-distance migration.

# ABSTRACTS – SYMPOSIA, CONTRIBUTED ORALS AND POSTERS

In alphabetical order by lead/presenting author

SESSION: POSTER (1)

## INFLUENCE OF GRAZING ON GROUND FORAGING BIRDS IN MANAGED CORK AND HOLM OAK WOODLANDS

ACÁCIO, M., LOPES, P., MEYER, C., RAINHO, A., PALMEIRIM, J.

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*Montado* (or *Dehesa*) is an agro-silvo-pastoral system that covers about 4 million hectares in the Iberian Peninsula and is the main land cover type in southern Portugal. The tree layer is dominated by holm oaks (*Quercus rotundifolia*) and/or cork oaks (*Q. suber*), and the ground cover is often influenced by low intensity agriculture and extensive livestock grazing. These practices allow the preservation of high levels of biodiversity, including a rich bird fauna that forages on the ground. However, management practices are changing, so it is crucial to understand how different management scenarios affect *montado* and its bird community. The objectives of our study were to (i) identify the characteristics of the sites chosen by ground-foraging birds; (ii) determine how grazing influences those characteristics; (iii) quantify the effect of grazing on the abundance of ground-feeding birds, and (iv) propose grazing management strategies to preserve bird diversity in *montado*. We evaluated the effect of three levels of sheep grazing – no grazing, light and intensive grazing – on the foraging activity of birds in 12 fenced plots. We counted foraging birds along transects within those plots, and used generalized linear mixed models to compare abundances among the three grazing levels. In addition, we located with precision the sites where birds were observed feeding on the ground and characterized them (vegetation height, abundance of invertebrates, dung and acorns, percentage of bare ground, revolved soil and dead leaves). We used conditional logit models to determine which characteristics are preferred by feeding birds and used principal components analysis to evaluate the influence of grazing on those characteristics. The results showed that grazing determines the characteristics of the ground level habitat and influences where birds forage. All ground-foraging bird species fed mostly where grassy vegetation was shorter than average and most preferred sites with comparatively high arthropod abundance, which are habitat characteristics directly or indirectly influenced by grazing. However, different species tend to choose dissimilar grazing intensities to forage: species that mostly pluck insects from the vegetation are particularly abundant in fields with light grazing, but several other species prefer to forage on plots with intensive grazing. Therefore, it is important to maintain a mosaic of grazing regimes, to preserve foraging opportunities for a greater diversity of birds, well integrated with the economic exploitation of *montado* systems.

## HOUSE SPARROW *PASSER DOMESTICUS* AS A MODEL FOR THE ANALYSIS OF SPECIES DECLINE IN URBAN AREAS

AGUIRRE, J.I.[1], BANDA, E.[1], PINEDA, J.[1], HERRERA, A.[1], ANTONIO, M.T.[2]

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During the last decades a sharp decline of house sparrows *Passer domesticus* has been occurring. Among the various factors that may be involved in these declines, several authors proposed the loss of green areas, the use of new construction materials, interspecific competition with other species for food resources, predators, even the influence of electromagnetic waves or air pollutants on productivity. No clear factors have been identified yet, being probably a multifactorial problem. The species specific approach is also necessary since such trend has not been detected for other closely-related species such as tree sparrows *Passer montanus*. Physiological elements, since they are mediated by environmental stressors and negative trends identified for house sparrows *Passer domesticus* may play a key role in revealing the effects of the proposed stressors. The aims of this research were to: 1) Identify if the trends found in other European cities for this species were occurring in central Spain. 2) Determine to which extent the factor/factors affecting declines acted over the entire population or just a fraction of it. 3) Identify if physiological or nutritional traits mediated by environmental factors could be an explanation for the declines. In order to identify population trends, standardized ringing data from 10 populations followed over a 15 year period were analyzed. Ratios of juveniles/adults were also obtained to assess annual variation in productivity. Results highlighted negative trends in city populations over the study years whereas no differences were found for the ratio of juveniles/adults, revealing an overall effect over the entire population rather than over a particular age group. An urbanization gradient was then established to test whether city size was involved in some physiological traits such as nutritional state, oxidative stress (oxidative damage and the endogenous antioxidant system), chronic stress indicators and immune response. Populations from more urbanized areas had poorer nutritional status, with lower values of haemoglobin, hematocrit and cholesterol. Individuals from those areas displayed higher oxidative damage revealed by greater concentrations of oxidized proteins and reduced antioxidant capacity, indicated by the reduction in the activity of superoxide dismutase. Concerning immunological state lymphocytes proportion and innate immunity was significantly lower in urban sparrows. All the results suggest that urban sparrows are more exposed to stressors revealed by an altered nutritional status and immune capacity. The present research reveals that house sparrow is an excellent model to test the effects of the proposed population decline hypotheses. Results highlight a strong effect of stressors on nutrition and physiology of this species inhabiting urban areas which in the last term may lead to reduce fitness or general body condition.

SESSION: POSTER (2)

## EFFECTS OF NESTING HABITAT STRUCTURE AND FEEDING HABITS ON DIFFERENT INDICATORS OF BREEDING SUCCESS IN IBERIAN BARN OWLS *TYTO ALBA*

ALMEIDA, D.[1], MERINO-AGUIRRE, R.[2], FLETCHER, D. H.[1], VEIGA, J.P.[3]

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The barn owl *Tyto alba* is a common species of European owls. This medium sized nocturnal bird of prey inhabits a wide variety of habitats and feeds predominantly on micromammals, although insects, reptiles, birds and bats are also taken. The barn owl is very tolerant of human presence and is frequently associated with anthropic environments. However, European populations are undergoing a sharp decline, mainly because of the loss of suitable foraging habitat and nesting sites. Assessment of habitat structure at the nest scale, the provisioning of nestlings and their effects on breeding success is relevant to the conservation of barn owls, particularly in the Iberian Peninsula where information on breeding ecology of this species is scarce. Thus, the aim of this work was to analyse the relationships between nesting habitat structure and dietary traits in order to assess the effect on brood size, body condition and nutritional status of Iberian barn owl chicks. We sampled 15 nests in central Spain during spring 2010. At each nest, the number of chicks was recorded. Blood samples were extracted from each chick (brachial vein) to quantify blood parameters (glucose, total proteins, triglycerides and alkaline phosphatase), and weight and morphometric data were recorded to estimate body condition. Smaller pellets (10–15 per nest) were collected and examined to determine the diet of chicks. Geographical coordinates were recorded with a GPS. Habitat structure (i.e. vegetation features, relief, altitude and distance to aquatic or urban environments) was characterised for each nest site by GIS. Habitat and dietary data were analysed using PCA and DCA. Relationships between habitat structure, dietary indices and breeding success were performed with partial correlations (covariates: weight and structural size of chicks). The most important prey species was the house mouse (*Mus musculus*) which occurred in more than 35% of the pellets, made up over one fifth of the total prey and over a quarter of total ingested biomass. Prey richness and prey diversity were higher in more complex habitats. Large brood sizes were more frequent in urban-influenced environments, with a higher consumption of human-associated Muridae (house mouse and brown rat (*Rattus norvegicus*)). Conversely, chicks showed better body condition and nutritional status (glucose, proteins and alkaline phosphatase levels) in mountainous habitats with well developed vegetation where diet was based on wild micromammals species such as wood mouse (*Apodemus sylvaticus*), Etruscan shrew (*Suncus etruscus*) and Cabrera's vole (*Microtus cabrerae*). We suggest management measures to increase habitat complexity and consequently dietary diversity in the barn owl of the Iberian Peninsula. These conservation strategies would contribute towards improved breeding success and the recovery of its populations in Mediterranean Europe.

SESSION: POSTER (3)

## INDIVIDUAL-LEVEL CONSEQUENCES OF HABITAT CHANGE ALONG A MIGRATION ROUTE

ALVES, J. A.[1], GUNNARSSON, T.G.[2], APPLETON, G. F.[3], POTTS, P. M.[4], SUTHERLAND, W. J.[5], GILL J. A.[1]

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Adult migrants tend to exhibit very high levels of individual fidelity at both spatial and temporal scales, and this may influence their capacity to respond to current levels of environmental change. Understanding how migratory species respond to environmental changes, and the consequences of those responses, is therefore key, especially for longed-lived species which might experience several forms of environmental change throughout their lifetime. Since the 1990s, the ecology and population dynamics of Icelandic black-tailed godwits *Limosa limosa islandica* have been studied in detail, and marked individuals have been tracked throughout their migratory range by a network of volunteer observers. This tracking information allows individual use of breeding, passage and wintering sites to be established, and the fitness consequences of occupying breeding and winter sites of differing quality have been quantified.

Icelandic godwits traditionally winter in estuarine habitats foraging on macrobenthos but, over the last decade, an increasing proportion of individuals have started to use freshwater sites (e.g. rice-fields) foraging primarily on plant material. During pre-nuptial migration a similar change in the use of habitats has occurred with godwits increasingly using wet grasslands in England and the Netherlands. Finally, agricultural expansion in Iceland has created landscape mosaics on previously natural habitat and godwits have recently started to nest in arable land (e.g. hayfields). Here, we explore the fitness consequences of occupying differing winter, passage and breeding sites, the level of connectivity between these sites and potential individual level consequences of the current environmental changes influencing different parts of the migratory range.

SESSION: POSTER (4)

## THE EFFECT OF SURPLUS FOOD ON REPRODUCTIVE BEHAVIOUR AND SUCCESS IN THREE TIT SPECIES

AMAN, J.[1], MAHR, K.[1], MOLLING, A.[1], RIEGLER, G.[1], HOI, H.[2]

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A controversial debate is currently going on in relation to the role of prolonged winterfeeding of birds. One positive effect mentioned in line with prolonged winter feeding is an increase in adult body condition which may affect reproductive behaviour (e.g. start of laying) and reproductive success (e.g. clutch size or nestling development). A negative effect of food supplementation could be an increased competition over food resources (e.g. via increased breeding density or territorial intrusions etc.).

Whether additional food offered during the onset of the breeding period affects reproductive behaviour and breeding success was investigated in three sympatric tit species, namely Blue Tits *Cyanistes caeruleus*, Great Tits *Parus major and Marsh Tits Parus palustris*.

In a supplementary food experiment, feeders were offered about two weeks prior to start of egg laying in randomly selected territories of the three species and compared to control territories without extra food supply.

To evaluate the effect of extra food in line with the two options mentioned above, we recorded several parameters regarding (i) breeding phenology and reproductive success and (ii) interspecific competition (e.g. territorial intrusions, defence behaviour etc.). Our results revealed a significant positive effect on breeding phenology as well as certain parameters regarding reproductive success. However the effect size did vary between different tit species. We did not find an obvious effect due to increased competition.

## POLYMORPHISM IN THE BLACK SPARROWHAWK *ACCIPITER MELANOLEUCUS*: INHERITANCE PATTERNS, CLINAL VARIATION AND POTENTIAL ADAPTIVE FUNCTION.

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Persistent phenotypic polymorphism occurs in around 3.5% of birds species, although its occurrence is not distributed equally across all bird families or genera. Raptors show a disproportionally high frequency of polymorphism, and amongst raptors it is particularly frequent within the *Accipiter* genus, where around a quarter of species display more than one morph. However, no systematic study of polymorphism in this genus has ever taken place. Using a long-term study of the black sparrowhawk, a widespread African polymorphic raptor, we first demonstrate that the species shows two discrete morphs (rather than continuous polymorphism) and that morph is invariant over time. We then demonstrate that morph type was genetically determined, with a two allele one locus autosomal inheritance pattern, with the alleles coding for light morphs being dominant. Using data from unpublished sources, we then demonstrate a pattern of clinal variation in morph ratio throughout their South African range, which correlated with the seasonality of the rainfall in the different regions. Dark morphs occurred more frequently in areas where a greater proportion of precipitation fell during the winter breeding season. Lastly, we explore whether dark morph birds have a selective advantage in these rainy breeding condition, testing whether survival or breeding success differed between the morphs in this area and exploring the mechanisms that might be driving any such differences.

## YELLOWHAMMER *EMBERIZA CITRINELLA* ECOLOGY IN A GRASSLAND DOMINATED LANDSCAPE

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Farmland birds in Europe have declined as agriculture has intensified, with granivorous specialists disproportionately affected. Despite grassland based farming being widespread, farmland bird research to date has focussed on mixed and arable farms. Yellowhammers are a red-listed species in the UK. This study investigated year round habitat requirements, diet, and movements of yellowhammers at four grassland dominated farms in Ayrshire, Scotland. Data were obtained via field surveys and trials, radio-tracking and faecal analysis. Fine scale breeding season foraging habitat requirements were studied by comparing invertebrate and vegetation communities at foraging sites with paired controls across all four farms. A small scale winter supplementary feeding trial was conducted on one farm. Breeding yellowhammers were distributed throughout the study sites; average density was low at 0.11 pairs per hectare (range 0.06 to 0.15), half the densities reported in arable and mixed regions. Yellowhammers preferentially foraged within 10m of field margins. Grassland summer foraging sites contained significantly higher invertebrate diversity and more large invertebrates than control sites. Faecal analysis revealed that adults ate significantly more cereal than nestlings, with both including more invertebrate material than observed in previous studies. Diptera, Coleoptera and Araneae were key orders, with Lepidoptera larvae additionally important for nestlings. In contrast to summer diet, and despite grassland being the dominant habitat, cereal dominated winter diet; grass seeds and invertebrates accounted for <1% of diet in winter. Wintering yellowhammers avoided grassland fields, with numbers observed positively correlated with stubble availability. Radio-tracking found yellowhammers mainly used stubble in early winter and then increasingly used farmyards and garden habitat in late winter. Supplementary feeding attracted and held over 100 yellowhammers at a site where the previous year's winter surveys recorded only 5 birds despite holding a good breeding population. As winter progressed, the use of the grain provided increased. Providing supplementary food represents a cheap and easy solution that could be utilised by agri-environment schemes to tackle late winter farmland bird food shortages. Alternatively, increasing winter stubble in grassland-dominated regions should provide additional biodiversity benefits associated with increased landscape heterogeneity as well as increased winter food availability. This study highlights differences in breeding density, habitat selection, movements and diet of yellowhammers on grassland farms compared to arable and mixed farm populations. Restricted winter stubble habitat limits winter food availability, and hence the likely overall size of the population able to subsist in this habitat.

## THE IMPLICATIONS OF CLIMATE CHANGE FOR THE MANAGEMENT OF THE UK'S SPECIAL PROTECTION AREA (SPA) NETWORK

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Conservation practitioners have to manage protected areas to benefit a range of species, and therefore have to reconcile competing requirements of different species. In a changing climate, this includes assessing the compatibility of measures intended to benefit important species already present at a site, with those intended to benefit important species for which the site might become climatically suitable in the future. We investigated the implications of climate change for the management of the UK's Special Protection Area (SPA) network for breeding populations of Annex I bird species, breeding seabirds and wintering/passage waterbirds (termed SPA features). We first reviewed how climate change is predicted to affect the extent and quality of the main SPA habitats in the UK in the absence of adaptation measures. For each of these habitats, we then identified measures aimed at reducing pressures on SPA features assessed as being at risk of future climate-related population decline in the UK, and measures aimed at providing suitable conditions for SPA features assessed as having a high likelihood of climate-related population increase in the UK. We also assessed the evidence of the likely effectiveness of these measures. Most of the measures identified were predicted to benefit both SPA features at risk of future climate-related population decline, and those at high likelihood of climate-related population increase in the UK. These included: re-creating intertidal habitat to compensate for predicted losses of intertidal habitat; re-creating large freshwater wetlands in areas safe from coastal flooding to compensate for predicted loss of coastal freshwater wetlands; addressing pressures on freshwater supply for wetlands in eastern and southeastern England; reducing the impacts of eutrophication on wetlands; reducing levels of predation by generalist predators; and reducing negative impacts of human disturbance. Other measures predicted to reduce pressures on SPA features assessed as being at risk of future climate-related population decline in the UK included: avoiding locating marine renewable energy installations in important seabird foraging areas; and minimising pressures on the food supply of seabirds from commercial fishing.

## INTEGRATED MODELLING OF BIRD POPULATIONS – THE VALUE OF DIRECT MEASURES OF RECRUITMENT

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Integrated Population Models allow optimal inferences about population processes where there are measurements of abundance and one or more demographic rates for the same population. Most work to-date has combined measures of temporal variation in abundance with annual measures of survival and/or reproductive rates. In many such models one or more demographic components cannot be estimated directly, and must therefore be estimated by inference from other demographic rates. While the integrated modelling framework provides estimates and precision measures for such parameters, there is a danger that these estimates may reflect biases in the data sets included in the model, in addition to information on the parameter of interest. In particular, difficulties may arise with the estimation of pre-breeding survival, since natal dispersal (emigration away from the place of birth) is usually substantial, so mark-recapture estimates of survival based on birds ringed as nestlings or juveniles cannot separate emigration from true mortality. Many of these problems can be addressed by measuring recruitment into the breeding population directly and we explore two approaches to obtaining such estimates for bird populations. First, where all birds born in the previous breeding season can be separated from older birds using plumage characteristics it is possible to obtain a direct measure of recruitment (the inventory method). Second, where breeding season mark-recapture data are available, as in the case of Constant Effort Sites, it is possible to estimate recruitment from an analysis of reverse capture histories (the Pradel method). We use both of these approaches to obtain estimates of annual recruitment for European blackbirds (*Turdus merula*) breeding in Britain, based on general ringing data (the inventory method) and data from a large network of Constant Effort mist-netting Sites (the Pradel method). We construct initial Integrated Population Models for blackbird populations incorporating estimates of relative abundance from large-scale census data (Common Birds Census/Breeding Bird Survey) with data on breeding performance from the Nest Record Scheme and age-specific survival estimates from ring recovery data. Results from these relatively standard models are compared with those from models where recruitment is estimated using either the inventory method or the Pradel method. The models are developed within a state-space framework with parameters and credible intervals being estimated using Bayesian MCMC techniques. Direct recruitment measures are expected to provide improved inferences about population processes and the potential for collecting such data should be taken into account when designing large-scale demographic monitoring schemes.

## RESOURCE FLUCTUATION, DENSITY DEPENDENCE, AND SPECIATION IN CROSSBILLS

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Evidence for sympatric speciation is especially uncommon in birds. However, why even putative cases of sympatric speciation are so rare except in peculiar circumstances (e.g., brood parasitic indigobirds) is unclear. Here I focus on crossbills (*Loxia*) for which sympatric divergence appears rather common, but speciation remains incomplete except in a few cases. In western North America, seven different vocal/ecological types of Red Crossbills (*L. curvirostra* complex) have diverged to exploit alternative conifers. Most if not all of these vocal types have diverged in sympatry, but only one, the South Hills crossbill, has speciated. Unlike the other vocal types and unlike most temperate bird species, South Hills crossbills are strongly limited in a density-dependent manner on the food resource that they rely upon for breeding. This density dependence prevents other vocal types from breeding when South Hills crossbills initiate breeding and may be key to sympatric speciation. Because most bird species including most crossbills exploit large pulses of food resources during reproduction, which reduces the importance of density-dependent food limitation on the occurrence of breeding, sympatric divergence is unlikely to lead to sympatric speciation. I will try to draw parallels to crossbills in Eurasia using our ongoing analyses of Illumina sequencing data.

SESSION: POSTER (5)

## HOW DO AGRI-ENVIRONMENTAL SCHEMES FARE IN STOCHASTIC ECOSYSTEMS? SPRING FLOOD CAUSES DECOUPLING BETWEEN THE TIME SCHEDULES OF BREEDING BIRDS AND CONSERVATION MEASURES

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Agri-environmental schemes (AES) promote friendly biodiversity practices. The area and the time schedule of measures are often based on the distribution and breeding phenology of the target species. However, AES have not been designed to cope with the natural variability of ecosystems so that they may drastically lose efficiency in some years, a potentially critical phenomenon for small populations. We addressed this issue in floodplain grasslands under AES designed for bird conservation and recorded the breeding phenology and settlement of the 4 dominant passerine species during a spring flood event. The reproductive success of grassland birds mainly depends on the mowing date, i.e. the type of measure undertaken. In our area, the more favourable measures cluster in the more frequently flooded sites so that the impact of mowing on bird population may drastically increase during spring floods. We did find that a spring flood shifted the occupancy area towards higher grounds. It also delayed bird settlement, and therefore induced the decoupling between mowing and breeding phenologies. We estimated that brood mortality could have exceeded 80 % if all parcels had been mowed at the date allowed by the AES contract. Our study suggests that the current implementation of AES is inappropriate to cope with ecosystem stochasticity. The aggregation of favourable measures in the lower parcels and the lack of flexibility of actions caused by fixed mowing dates, may challenge effective species conservation in the long term.

## THE WINTERING ECOLOGY OF WHINCHATS *SAXICOLA RUBETRA*

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The wintering ecology of Palearctic migrants is poorly understood, especially finer aspects such as residency, ranging and site fidelity. The Whinchat *Saxicola rubetra* has shown severe declines on its breeding grounds, the cause of which is unclear. This project is exploring the wintering ecology of whinchats through large-scale colour ringing of individuals, in order to better direct conservation efforts for this threatened species. Specifically, we aim to determine the degree at which whinchats are resident throughout the winter, range size and its predictors, and whether these individuals return to the same wintering grounds in subsequent years (site fidelity). The study has also deployed 50 geolocators to study migration routes and the location of breeding grounds. Differences between different age and sex cohorts will be explored with regards to return and survival rates, migration routes and speed, and the location of stopover and breeding sites.

## EXPLOITING AVIAN VISION WITH AIRCRAFT LIGHTING TO REDUCE BIRD STRIKES

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Bird–aircraft collisions (bird strikes) represent a substantial safety concern and financial burden to civil aviation worldwide. Despite an increase in the rate of damaging bird strikes, necessary steps to develop a mitigation method outside of the airport environment have not been empirically tested. We suggest, however, that bird detection and avoidance of approaching aircraft can be enhanced, and present an approach by which this goal can be achieved. Specifically, we assessed experimentally whether use of aircraft lighting might enhance detection of and reaction to the approach of an aircraft in flight by Canada geese *Branta canadensis*, a species responsible for a high rate of damaging bird strikes. We used a novel approach by estimating the visibility to the goose visual system of a large, standard radio-controlled (RC) aircraft (standard aircraft) and another RC aircraft designed to mimic a raptor (predator model). The standard aircraft exhibited either a 2-Hz alternating pulse of two lights, or lights off. We then exposed small groups of wing-clipped Canada geese to the approach of each aircraft and quantified behavioural responses to respective treatments. Estimates of chromatic and achromatic contrasts indicated that the standard aircraft with lights on was more salient to the visual system of the Canada goose than with lights off or the predator model. At individual and group levels, quicker alert responses were observed to the standard aircraft with lights compared to the lights off and predator model. Goose groups showed similar responses to approaches by the standard aircraft and the predator model, suggesting the use of antipredator behaviour to avoid the aircraft. Further, flight-initiation distance has been shown to be positively correlated with alert distance. We suggest that design of aircraft lighting systems to enhance detection and avoidance by birds is contingent upon understanding avian visual ecology and behaviour. Based on spectral sensitivity in Canada geese, aircraft-mounted lights that peak in the ultra-violet/violet range (380–400 nm) are the most likely to produce the maximal behavioural effect.

## INFORMATION TRANSFER EXPLAINS COLONY SPECIFIC HABITAT USE IN A LONG-DISTANCE FORAGER, THE NORTHERN GANNET *MORUS BASSANUS*

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Colonial breeding is a widespread phenomenon in the animal kingdom. In eusocial species, agonistic between-colony competition typically results in discrete colony home ranges. However, there is increasing evidence that colonies of non-related individuals, such as seabirds, also maintain broadly discrete colony home ranges despite an absence of similar agonistic interactions. Mechanisms to explain this phenomenon are poorly developed, but such central-place foraging provides a number of opportunities for individuals to enhance their decision making by gathering information on the feeding success of others. In making such foraging decisions, two key interrelated tradeoffs exist. There is a time-limited tradeoff between the extent to which an individual should actively search and gather private information, versus observing others and gaining public information. However, there is also a tradeoff between increasing the use of public information, for example in unpredictable environments, and a likely increase in levels of con- and hetero- specific competition. These tradeoffs between the use of information types, and their impact on competitive interactions, are predicted to greatly impact on spatial foraging patterns. Here we empirically demonstrate through the use of tracking data from 70 Northern Gannets *Morus bassanus* at 5 colonies that colony specific foraging occurs. We then demonstrate mechanistically that it is only when public information transfer within the vicinity of the colony is combined with local enhancement closer to foraging locations, that the observed pattern of colony separation in foraging areas is approached. Thus both public information transfer at-sea and at-colony is key to the population-level patterns observed. This highlights the key role of the colony in enabling information transfer, and supports the potential for cultural transmission of foraging locations. Similar cultural effects may be an underrated influence on individual decisions and movements in many species, linking these factors to observed population-level processes. Such separation of foraging grounds by colony may occur in many central-place foragers, and has important implications for the ecology and conservation of numerous charismatic species.

## CHANGING PHENOLOGY WHEN PHENOTYPIC PLASTICITY DOES NOT SUFFICE: EVIDENCE FOR EVOLUTION IN ACTION?

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Climate change alters seasonal ecological interactions, and because observed phenotypic responses are often insufficient, evolutionary changes are required. Here we show that *Ficedula* flycatchers are adapting their annual timing through a combined phenotypic flexible and possibly an evolutionary response. Because the individual flexible response was weaker than the mean population response, flycatchers lay at present up to a week earlier with the same temperature than 30 years ago. This effect differed across Europe, being strongest in regions with most spring warming. This possible evolutionary response was predicted by observed heritability and selection on annual timing. We hypothesize that populations in warming regions could evolve because survival selection for early arrival and breeding has weakened as temperatures upon spring arrival have increased and female survival consequently increased over the years. Whereas rapid evolutionary response may allow some species to adapt, our observed rate of adaptation in flycatchers is still less than the advance in timing of a major food source, and as a result major local population declines have been reported.

SESSION: POSTER (6)

## BIRD MONITORING IN NORTHERN FRANCE: A USEFUL TOOL TO BETTER UNDERSTAND SPECIES INTERACTIONS AND DISTRIBUTIONS ACCORDING TO ENVIRONMENTAL CHANGES

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Staging areas and distribution of birds during the breeding and the wintering seasons can be greatly affected by climate change but also by the effect of predation risk. France is a major area for wintering, migratory and breeding birds of most avian species distributed in North Western Europe. To efficiently contribute to the conservation of bird species and their habitats in Europe, nine French regions along the northern coast have engaged a wide census program all year round. This program is focused on the census of about 200 species belonging to farmland birds, raptors and waterfowl species. About 70 wetland and farmland sites are visited monthly by trained professional ornithologists to count all birds seen, using binoculars and cameras (to discard identification doubts). High data quality is requested and the census methods are based on official protocols established by the French Museum of Natural History. Overall about 1 million of birds were counted between October 2012 and January 2013.

A first important result is that among farmland birds, the timing and numbers of birds counted daily during migration can greatly differ for a given species (a difference of up to ten times) between new and traditional counting sites even if those sites are very close (a few kilometers). This may suggest a narrow shift of migration route but it reveals that focusing only on traditional counting sites can result in important biases. Such differences need to be taken into account when estimating long-term trends in population size. There was an apparent association between the number of kestrels (*Falco tinnunculus*), migrating fieldfare (*Turdus pilaris*), blackbird (*Turdus merula*) and sparrowhawk (*Accipiter nisus*). Among birds staging on wetlands we found almost no correlation between the number of raptors and the population size of potential prey species. Only kestrel numbers were highly correlated with pochard (*Aythya ferina*) and tufted duck (*Aythya fuligula*) population sizes ($r_s > 0.77$; $p<0.002$; $n=12$ sites). Our data also show that mallard and gadwall are not associated with the same species. Although gadwall population sizes are significantly correlated with coot, tufted duck and pochard numbers, mallards are not . This suggests that some interactions between waterbird species can not be excluded when examining the use of wintering sites. The ecological significance of those species interactions need to be further investigated according to the quality of wetlands.

SESSION: POSTER (7)

## THE EFFECTS OF GROUND VEGETATION AND LANDSCAPE FRAGMENTATION ON THE HABITAT USE OF WOODLARKS *LULLULA ARBOREA* AND THEIR PREY

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Vineyards in Switzerland are among the most intensively managed crop systems. Of the Valais vineyards in the upper Rhône valley, 95% do not have any ground vegetation cover. However, there has been a considerable reduction in the application of herbicides over the past decades, leading to more vegetation of higher diversity on the ground. These different management types lead to a fragmented mosaic of few parcels with ground vegetation and lots of parcels with bare ground. The woodlark (*Lullula arborea*) is an endangered ground-nesting bird that is likely to benefit from a combination of ground vegetation and bare ground on a small scale. Here we demonstrate the positive effects of ground vegetation on the woodlark. Using the combination of radio-tracking data, field surveys and satellite images, we show that on the level of micro-habitat selection, woodlarks favoured foraging habitats with a proportion of ground vegetation cover around 40-60%. During territory settlement, woodlarks preferred vineyard parcels with enhanced ground vegetation and higher plant and arthropod species richness. Additionally, habitat fragmentation was an important factor determining the habitat use of the woodlark and of its prey. Using these findings, our project aims to give clear recommendations to winegrowers about the amount, distribution and connectivity of parcels with ground vegetation within the vineyards, which should ultimately favour biodiversity in general and woodlarks in particular.

## WHERE ON EARTH CAN ANIMALS USE A GEOMAGNETIC BI-COORDINATE MAP FOR NAVIGATION?

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Many animal taxa have been shown to possess the ability of true navigation. In this study we investigated the possibilities for geomagnetic bi-coordinate map navigation in different regions of the earth by analysing angular differences between isolines of geomagnetic total intensity and inclination. In 'no-grid' zones where isolines were running almost parallel, efficient geomagnetic bi-coordinate navigation would probably not be feasible. These zones formed four distinct areas with a north-south extension in the northern hemisphere, whereas the pattern in the southern hemisphere was more diffuse. On each side of these zones there was often a mirror effect where identical combinations of the geomagnetic parameters appeared. This may potentially cause problems for species migrating long distances east-west across longitudes, since they may pass areas with identical geomagnetic coordinates. Migration routes assumed for four populations of migratory passerine birds were used to illustrate the possibilities of geomagnetic bi-coordinate map navigation along different routes. We conclude that it is unlikely that animal navigation is universally based on a geomagnetic bi-coordinate map mechanism only, and we predict that the relative importance of geomagnetic coordinate information differs between animals, areas and routes, depending on the different conditions for bi-coordinate geomagnetic navigation in different regions of the earth.

SESSION: POSTER (8)

## HOW TO MEASURE STRESS SENSITIVITY IN BIRDS: A META-ANALYSIS

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Stress reactions are a natural event occurring after encountering predators (including humans), food scarcity, social stress and many more. Species vary widely in their response to stressors, i.e. in their stress sensitivity. The question is how stress sensitivity can be measured. Three methods for quantifying stress sensitivity are commonly used: (1) Increase in the plasma concentration of glucocorticoids, in birds corticosterone. (2) Flight initiation distance (FID; also called flush or flushing distance), which is the distance at which an individual moves away from an approaching predator. (3) Change in heart rate. Flight initiation distance is often recommended as a measure of stress sensitivity of a species and used for defining buffer zones against human disturbance. However, there are different behavioural strategies governing how birds react to an approaching predator. The question therefore is whether FID-measures are really related to physiological stress sensitivity as measured via circulating corticosterone or heart rate. We conducted a meta-analysis of published data on FID, plasma concentration of corticosterone and heart rate. Out of 156 species with corticosterone data and 476 species with FID-measures, only 44 had data on both. Heart rate measurements have mostly been measured in a few large bird species, as proper measurements can only be obtained by implantation of electrodes. We found a positive relationship between the increase in corticosterone as a response to an acute stressor (capture and handling) and FID, irrespective of body size. This implies that FID could indeed reflect stress sensitivity in birds on a species level. The analysis on the heart rate data was restricted due to small sample size, but we speculate as to how this physiological measure of stress sensitivity relates to FID.

## HOW CAN SPECIES DISTRIBUTION MODELS PROMOTE BIRD CONSERVATION? NEW APPLICATIONS TO GO BEYOND THE SIMPLE MAPPING OF SUITABLE AREAS

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Species Distribution Models (SDMs) are increasingly used as tools in ecology and conservation. Models provide a measure of the probability of presence, which can be used to define species' spatial occurrence, but also to inform surveys, evaluate impacts of environmental change, predict species' invasions, inform conservation planning, estimate abundance. SDMs assess relationships between distribution data and environmental features to provide a measure of the probability of presence. If the outputs of SDMs accurately represent the relationships between habitat features and species performance, the species-habitat relationships depicted by the models can provide useful information on the effect of specific habitat traits on habitat suitability, thus being relevant to management, and SDM results can be related also to additional key parameters of populations, other than distribution.

Here, we show some examples of how SDMs for bird species may be used for a variety of purposes: 1) to estimate reproductive parameters (on the base of adaptive habitat selection resulting in habitat suitability correlated with habitat quality), thus allowing for an identification of high-quality sites of overriding importance for population persistence and thus of conservation priority; 2) to evaluate the importance of specific habitat factors and relative values for species occurrence (and whenever possible reproductive outputs), allowing for the definition of habitat reference values to be used as conservation target for an appropriate habitat management, e.g. within SPAs; 3) to estimate species richness to identify areas with highest species diversity, to be included within priority areas for conservation at the regional scale, and within possible core areas in ecological networks at the regional scale; 4) in wide-ranging species, to model the effect of the availability of habitats used for different purposes on the distribution, considering it as the result of the combined availability of different kind of habitats. This new approach can enable researchers to identify what (and where) habitats and factors are limiting species distribution, thus providing with relevant management implications, and in particular with detailed and spatially explicit recommendations for habitat management targeted at priority species.

The ever increasing availability of fine-scaled environmental layers will enable even finer SDMs; in turn, the increasing production of high-precision SDMs will provide with a wide range of detailed and spatially explicit information of potentially high relevance for conservation. Such information can include much more knowledge than the simple mapping of suitable areas for a species.

SESSION: POSTER (9)

## COMPARATIVE ANALYSIS OF BIRD DISTRIBUTION IN AGRICULTURAL LANDSCAPES IN THE ZONAL ASPECT (THE CASE OF FOREST AND FOREST STEPPE ZONES IN CENTRAL RUSSIA)

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For a comparative analysis of summer bird assemblages, line transect counts were performed in early summer 2000-2012 in Vladimir and Tula regions (Central Russia). The study area was made up of a southern forest zone and northern forest steppe. The research was carried out in agricultural landscapes: ploughed fields, fields with plant crops (spring crops and winter crops), and fallow. Transect length was 60 km in the forested area and 25 km in the forest steppe. A total of 17 bird species were recorded in the agricultural landscapes. The number of species in different types of agricultural land varied from 4 to 14. The core avifauna of open agricultural landscapes was comprised of 6 species: *Alauda arvensis*, *Saxicola rubetra*, *Sylvia communis*, *Motacilla flava, Crex crex,* and *Coturnix coturnix*. These species are almost always present in such habitats. Along the north – south axis, species diversity declined by almost two-fold, with15 species in the forest area and 8 in the forest steppe. The most common species in both natural zones were *Alauda arvensis* and *Saxicola rubetra*. In the forest steppe, *Motacilla flava* was also common. In the same direction (from forest zone to forest steppe), there was a decrease in the abundance of one of the dominant species: *Saxicola rubetra* declined from 70 to 60 ind. $km^{-2}$. A significant increase in the population density of *Motacilla flava* was also noted (10-12-fold, from 7-8 to 80-100 ind. $km^{-2}$). For *Alauda arvensis,* no evident change in population density was recorded. The total population density of birds in agricultural landscapes in the forest zone and forest steppe was ca. 240-260 ind/$km^{-2}$ (higher in the forest steppe, however this difference was not statistically significant). The decrease in bird species diversity from north to south can probably be explained by differences in farming methods. Southern territories have been intensively used for growing crops for a long time and are more subject to anthropogenic impact. In addition, the agricultural landscapes in the forest steppe are less varied than in the forest zone. It should be noted that at present, there is significant weakening of anthropogenic impact against the background of the global downturn in agricultural production on a national scale. This leads to the expansion of fallow land area and, consequently, to changes in fauna and bird assemblages of these habitats. Thus, during recent years, numbers of some species (*Crex crex*, *Coturnix coturnix, Locustella luscinioides)* have increased, and new species not observed previously in similar habitats (e.g *Hippolais caligata, Locustella naevia*) emerged in the forest steppe zone in the fallow land.

## INDIRECT EFFECTS OF CLIMATE CHANGE ON MEDITERRANEAN BIRDS: THE ROLE OF LAND USE CHANGES AND FIRE

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The current challenge in a context of major environmental changes that will be exacerbated in the future is to allow a meaningful projection of species distribution to future landscape and climate scenarios. Species distribution modelling may play a fundamental role in this challenge but we need to integrate more ecology in model building and develop more coherent model validation before species distribution modelling may be of use in a dynamic ecological context.

Mediterranean landscapes are highly dynamic systems. Climate changes one the most powerful driving forces of these dynamics and in the Mediterranean basin its frequency and impact have markedly increased in recent years. However, climate change impacts on birds are often indirect through changes in disturbance regimes. Fire is a critical factor in the Mediterranean and is likely to drive climate change effects over large areas. The description and analysis of landscape patterns associated to fire dynamics have received some attention, but knowledge about how the temporal and spatial arrangement of habitats, arising from wild fires, affects wild birds is astonishingly poor, with the exception of within habitat succession related recovery of communities after the disturbance event.

In this communication, we present recent advancements in bird species responses to fire in Catalonia (North-east Iberian Peninsula) in which species distribution modelling applications have played a major role. Our study model in dynamic Mediterranean landscapes has stressed the importance of landscape dynamics, population connectivity and model building in the accurate prediction of distribution changes of bird species in response to climate changes, land use changes and fire dynamics during the last 20 years in the region. We argue that a deep insight on the temporal and spatial factors that interact in a complex way to determine current landscape patterns and species responses will be essential if we aim at understanding and managing Mediterranean systems. The generality of these constraints suggest that successful application of species distribution modelling to the prediction of species distribution dynamics in other systems should be developed under a similar integrative, ecological sound framework.

SESSION: POSTER (10)

## VARIATION IN MARSH TIT *POECILE PALUSTRIS* SURVIVAL AND RECRUITMENT CREATES A SEASONAL GENDER IMBALANCE AND REDUCED PRODUCTIVITY

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Annual survival and recruitment are key drivers of avian demographics, but relatively little information exists for seasonal variation in these phenomena and how this may differ between the sexes, even for well-studied species such as the *Paridae* tits and chickadees. Where annual survival rates are similar for males and females, a sedentary, territorial and socially monogamous species may be expected to exhibit a balanced sex ratio in the breeding population. However, if seasonal (within-year) survival or recruitment differs between the sexes, then a gender imbalance may result at key stages of the annual cycle. This imbalance may limit the number of occupied territories in which breeding pairs are present and, consequently, the number of broods produced by the population. We present results from a 10-year population study of Marsh Tits *Poecile palustris* in England, investigating annual and seasonal survival of males and females, and juvenile recruitment. On average, exactly the same proportion of adult males and females (54%) survived between years. Most adult mortality occurred during the spring territorial and breeding period, and this was proportionately greater for females than males. Only a third of locally-fledged juveniles were successful in becoming established in the autumn population, with males outnumbering females overall in this group and also among all locally-settling juveniles, although annual differences were not statistically significant. However, on average, almost two-thirds of settled juveniles disappeared over the autumn and winter period, leaving just 12% of locally-fledged juveniles surviving to enter the breeding population. Again, a majority of surviving juveniles were male, and female-biased immigration during a late winter dispersal phase was not sufficient to make up the deficit. The variation in recruitment and seasonal mortality between age and sex classes resulted in a gender imbalance in every breeding period, with an average of 8% of potential breeding territories being occupied by lone males each spring. The study indicates that even where overall annual survival is balanced between the sexes in the adult breeding population, seasonal variation in mortality and recruitment can produce a gender imbalance at a critical period of the annual cycle, reducing the potential productivity of the population.

SESSION: POSTER (11)

## HABITAT PREFERENCES OF CORNCRAKE *CREX CREX* MALES IN AGRICULTURAL MEADOWS

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A dramatic decline in the Corncrake *Crex crex* population has been observed in Western Europe over the last century. This species is still widespread and occurs at high densities in Eastern and Central Europe. In the present study, we focused on the habitat preferences of Corncrake males in agricultural meadows of Eastern Poland, where large areas are managed by mowing. We counted calling males two times during the same breeding season and noted habitat features within the territory and at the calling location. Our study revealed that Corncrake males may be abundant in agricultural meadows. We recorded 59% of studied population in meadows which were mowed at least once during the breeding season. We also found differences in the habitat preferences of Corncrakes between the first and second parts of the breeding season. In the first part of the season, when territories were established, males preferred abandoned meadows as the primary habitat type within their territory and calling location. The proximity of shrubs or abandoned meadows positively affected the probability of Corncrake occurrence. In the second part of the season, males significantly increased their mean distance from shrubs, ditches and abandoned meadows. Overall, calling places were mainly situated in abandoned or extensively mowed meadows, while extensively mowed meadows was the most common habitat at the larger territory scale. In addition, the distances to the nearest (negatively) and second nearest (positively) neighbours significantly affected the probability of Corncrake occurrence. Regarding the management and protection of Corncrake populations in agricultural meadows, we propose leaving even small uncultivated fragments of meadows around ditches or shrubs as refuges. These uncultivated areas could be sufficient for Corncrakes during the period of territory occupancy. The "Corncrake- friendly" mowing should be done after the first hatch and unmowed meadows areas should be left.

SESSION: POSTER (12)

## NEIGHBOUR–STRANGER CALL DISCRIMINATION IN CORNCRAKES *CREX CREX*

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The acoustic signals of birds are commonly used for individual recognition. Calls or songs allow discrimination between parent and offspring, between mates, and between territorial neighbours and strangers. In this study, we investigated vocal neighbour–stranger discrimination in Corncrakes *Crex crex*, a nocturnally calling species of rail Rallidae. We conducted interactive playback experiments with 43 males. Each male was tested twice on the same night, and their responses to the calls of a familiar neighbour and the calls of an unfamiliar stranger were measured. Corncrake males responded more aggressively to the playback of a stranger's call. They approached the speaker more rapidly, spent more time close to the speaker and physically attacked the speaker more frequently. We found no significant differences between the vocal responses to the playback of neighbours' and strangers' calls. Thus, although calling plays an important role in Corncrake territorial interactions, it is only a first line of defence in which males signal aggression towards intruders by calling, similar to singing in passerines. The lack of differences in vocal responses and the presence of clear differences in other behavioural responses demonstrate that the absence of a differential vocal response does not imply the absence of discrimination. Although the individual nature of Corncrake calls has been mentioned in a few previous studies, this study provides the first experimental evidence that Corncrake males indeed use calls for neighbour–stranger discrimination. Notably, because of Corncrakes' preferred dense wet meadow habitats, and their tendency to call at night, it is probable that acoustic individual discrimination by Corncrakes are crucial for making correct decisions during aggressive encounters between rivals.

## TEMPORAL PATTERNS IN THE ABUNDANCE OF CATERPILLARS AND AERIAL INVERTEBRATES IN BRITISH OAKWOODS IN SPRING AND THE IMPLICATIONS FOR THE BREEDING PERFORMANCE OF RESIDENT AND LONG DISTANCE MIGRANT BIRD SPECIES

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There has been considerable research interest in the relationships between the peak in abundance of food resources in spring and the timing of breeding of resident and migrant forest birds. In particular attention has focussed on the relative timing of the food peak and nesting of the birds and the implications of climate change on any mismatch. In Britain, oak woods show a particularly strong invertebrate resource peak in spring which is exploited by many breeding bird species. In this study we describe the temporal patterns of caterpillar frass and aerial invertebrates in a large sample of oak *Quercus petraea/robur* woods distributed throughout Britain to characterise the pulse of food abundance in spring. We relate this to studies of the breeding parameters of resident (*Cyanistes caeruleus* and *Dendrocopos major*) and long distant migrant (*Phylloscopus sibilatrix* and *Ficedula hypoleuca*) species and explore the evidence for the temporal mismatch hypothesis for this group of species.

SESSION: POSTER (13)

## BASAL METABOLIC RATE IN FREE-LIVING BIRDS OF OLD WORLD TROPICS

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The notable differences between tropical and temperate birds in numerous life-history and other traits lead to a notion that tropical birds have a "slow pace of life". Due to trade-offs, most life-history traits can possess only a limited combination of values. The nature of constraints on the diversification of life histories may be related to limitations in physiological mechanisms. Although basal metabolic rate (BMR) is one of the most examined avian physiological traits, the number of studies on energetics in the tropics is very limited. Using the largest existing data-set of metabolic rates of Old World tropical birds (126 individuals belonging to 34 species from 19 families), we studied the relationship between BMR and body mass (M) in wild-caught birds of South Vietnam. The body mass ranged from 5.7 to 150 g. We found that tropical birds have considerably lower BMR than temperate species. The power in the allometric equation BMR=a*M^b was also lower in tropical birds (b=0.586) and significantly different from 2/3 ("Rubner's law"). No difference in BMR was found between passerine and non-passerine species, as well as between oscines ("advanced" passerines) and suboscines ("primitive" passerines). Birds which forage in the sun had BMR's averaging 15% lower than birds which forage in the shade. The result is discussed within the context of an energetic model, according to which the high BMR was formed in migrant passerines, which then occupied the forest zone of temperate and high latitudes.

## SENSOR NETWORKS TO MONITOR BIRDS IN A CHANGING ENVIRONMENT: THE HORUS PROJECT TO MONITOR A LESSER KESTREL *FALCO NAUMANNI* COLONY

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Recent developments of sensor networks offer the possibility of continuously monitoring environmental parameters in real time. Although this is an area of active research and development with expanding market opportunities, it has received relatively little attention for bird monitoring. The Lesser Kestrel *Falco naumanni* is a small colonial falcon. The species, associated in southern Europe with extensive cultivated areas, suffered a dramatic decline in the 1960's associated with agriculture intensification and the abandonment of marginal agriculture. The Doñana Biological Station started in the 1980's to study the ecology of the species. In 2006 we started a project with the aim of incorporating sensor networks to monitor remotely the reproduction of a Lesser kestrel colony. We have developed a smart nest-box equipped with sensors that collect information on the breeding kestrels. Kestrels have been marked with passive transponders that are read when they enter the nest. The nest box is equipped with a balance to weight the kestrels, temperature and humidity sensors, and IR barriers that record when kestrels enter or leave the nest. Nest-boxes are controlled by an Arduino, an open-source electronics prototyping platform, and they are all connected by an ethernet network. Information is collected in real time to a centralised database that is accessible through the internet. First prototypes were installed in 2009 and were readily accepted by kestrels. The colony is currently equipped with 20 smart nest-boxes. The project aims to use the system to monitor long-term changes of individual behaviour and population parameters in a scenario of climate and agricultural change.

## SOCIALIZING OBSERVATIONS OF THE SKY: REMOTELY SENSING THE AERIAL LIFE OF THE SWIFT *APUS APUS*

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Since the pioneering work of Weitnauer (1952) and the famous book "Swifts in a Tower" of Lack (1956) the Swift (*Apus apus L.)* is widely known as the most aerial bird, even sleeping on the wing. Old Dutch radar observations of social "roosting" over water made the bird even more mysterious. In a conference paper of the International Bird Strike Committee (Buurma, 2000) radar images from 1979, 1996 and 1999 were shown indicating that the birds characteristically aggregate at night over Lake IJssel, in the centre of The Netherlands. They seem to fix certain distances to coastlines, apparently using them as landmarks for orientational purposes while ascending twice up to 2.5 km at twilight i.e. after dusk and before dawn. The then new hypothesis was that the Swifts socially "evaluate" weather dynamics by averaging their individual assessments of the altitudinal wind vector / air pressure gradient. The species specific dawn and dusk ascents (DDA) might serve to calibrate 3D/t against celestial cues. Recently we were able to confirm the horizontal patterns of the DDA phenomenon, collected with a long range surveillance radar, by means of a adapted weather radar that provided a much higher altitudinal resolution as well as wingbeat signatures (focus article in Animal Behaviour by Dokter et al. 2013). We now compare new simultaneous registrations of Swift ascents by means of both radars. Furthermore, we hope to zoom in to the nocturnal Swift swarms by means of the ROBIN avian radar designed to register bird 3D bird movements at and around airports. The social component of ascents above Lake IJssel indicates an intriguing link between orientation and navigation, information sharing for assessment of synoptic weather patterns and feeding opportunities. It might even show the acquisition of social prestige. Besides the discovery of the DDA as a very fundamental biological phenomenon, the comparison of different radar technologies also improved applied radar science. The assessment of spatial and temporal flight patterns of birds came along with better understanding of the dynamics of remote sensing techniques. Together, they will improve aviation safety as well as nature conservation.

SESSION: POSTER (14)

## INDIVIDUAL CONSISTENCY IN MOVEMENT PATTERN IN EAGLE OWL *BUBO BUBO*

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Observed movement patterns are the response of the interaction between environmental variables and individual state but surprisingly even individuals of the same species experiencing similar environmental conditions can exhibit different behavioural responses, and these responses can be highly repeatable within individuals. Here, the variation we focus on is how individuals of a long-lived, territorial species, the nocturnal Eagle owl *Bubo bubo,* move during their daily activity over multiple years. Eagle owls that repeatedly move within fixed home ranges are expected to have an extensive knowledge of their surroundings. As a consequence, they are expected to show to some extent a systematic movement strategy based on available *a priori* information or based on an individual behavioural consistency. If it is so, we can expect that movement patterns to vary much less between repeated daily trajectories than between different individuals. To test our hypothesis, we broke up movement pattern variation into within-individual vs. between-individual components and estimated the repeatability (r) of daily movement parameter frequency distribution (i.e. MPFD of speed, time step, total distance, step length and nest distance) statistics for each owl. The repeatability analysis of MPFDs of breeding owls showed moderate individual consistency in all movement parameters considered (r range = 15-25%). However, because between-individual variation in the movement parameters was relatively low in our population, repeatability of the four statistics selected to describe MPFDs did not indicate a strong individual consistency. Each owl seemed to perform in a consistent way during daily movement activity while maintaining some degree of variation across nights. Accordingly, 95% CI of r estimates for all variables were well above zero, demonstrating that they were statistically significant at $\alpha = 0.05$. When analysing the MPFDs of owls that have been owners of the same territory or mate of the same pair, repeatability estimates were substantially smaller (r range = 1-7%). That is, owls that moved in the same territory during different years did not show similarity in their MPFDs. This could suggest that characteristics of the territory do not affect owls' movement patterns as observed in many others territorial species. We suggest homogeneity in territory quality to be responsible for both the small between-individual variation in movement patterns and the moderate repeatability in movement behaviour.

SESSION: POSTER (15)

## NEIGHBOUR DEAREST: COLONIAL LESSER KESTRELS *FALCO NAUMANNI* BENEFIT FROM NEST ATTENDANCE OF NEIGHBOURING JACKDAWS *CORVUS MONEDULA*

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Colonial species interact not only with conspecifics but often with other species nesting at the same site. The effects of conspecific traits have recently been measured with multilevel social selection analysis, but the effects of hererospecific social traits on individual fitness have yet to be quantified. We recorded nest attendance effort of two species, lesser kestrels *Falco naumanni* and jackdaws *Corvus monedula*, nesting on the Gela Plain (Sicily, Italy). Both species are secondary-cavity nesters breeding in abandoned rural buildings where they form single-species or mixed-species colonies. By correlating reproductive success as a measure of fitness to conspecific and heterospecific nest attendance, our data revealed that despite fitness benefits that would accrue to lesser kestrels associating with highly-vigilant jackdaws, this advantageous assortment rarely occurred. Jackdaws, however, benefited from enhanced vigilance effort at their own nest regardless of the attendance level of neighbouring lesser kestrels. Our results implicate nest site limitation as the ecological factor preventing lesser kestrels from maximizing fitness through assortment with jackdaws.

## MODELLING THE IMPACTS OF CLIMATE CHANGE ON SEABIRDS IN THE UK

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Over the past two to three decades, some UK seabird colonies have shown dramatic declines. For species such as the black-legged kittiwake, the influence of climate has been implicated in declines; high sea surface temperatures impact recruitment and growth of major prey species such as sandeels, in turn leading to poor bird breeding success. Climate change may therefore already be impacting seabird populations, but with further, more dramatic impacts expected as climatic warming continues. However, there is likely to be extensive regional variation in the impacts of climate change due to differences in oceanography and dominant prey species between regions. Whilst the mechanisms that could drive these declines are becoming increasingly well-understood, projections of population-scale impacts have only recently started to be made. We are modelling the possible impacts of climate change on UK seabird populations by combining long-term datasets of seabird population trends with extensive high resolution seabird tracking data from the RSPB's FAME (Future of the Atlantic Marine Environment) project. This allows us to link population performance in particular breeding colonies with the physical and biological oceanographic features of key foraging grounds, such as sea surface temperature, ocean circulation and food availability. Then, by combining the resulting relationships with data derived from climate projections, we can examine how changes to the physical environment under climate change will impact seabird populations. The range of colonies surveyed in the FAME project also allows us to examine regional variation in climate change impacts. This modelling approach therefore provides a contrast with traditional climate envelope models, by implicitly considering the mechanisms driving population trends and how they may vary between regions. As an important indicator species with extensive population data and a well-studied link with environmental variables, initial analyses focus on kittiwakes. Further analyses will, however, examine species with different foraging behaviours, to see how diving species such as guillemots and razorbills, planktivores such as storm petrels, and kleptoparasites such as Arctic skuas could vary in their response to a changing climate.

## IMPACT OF WEATHER ON THE BREEDING PERFORMANCE OF CAVITY NESTERS: ADAPTING CONSERVATION EFFORTS TO FACE CLIMATE CHANGE

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Understanding the underlying mechanisms by which climate change will affect bird populations is vital for adaptive management. In the Mediterranean basin, mean temperatures are predicted to increase and total precipitation to decrease. As a consequence, climate change is predicted to have profound, although scarcely evaluated, ecological effects for many bird species. Mediterranean cereal steppes constitute one of the most valuable habitats in Europe as no other habitat supports so many bird species classified as to be at risk of global extinction. While there is virtually no information on the impacts of climate change on steppe birds, this information is vital to adapt conservation efforts and future planning to account for climate change. In this study, we examine the effects of local weather conditions (temperature and precipitation) on the inter-annual variability of lesser kestrel (*Falco naumanni*) phenology and breeding success in Portuguese cereal steppes. From 2003 to 2012 we monitored more than 3500 pairs in several colonies to assess annual breeding parameters. Data on meteorological variables were collected from the closest weather stations and temperature data loggers were used to assess nest-site microclimate. Lesser kestrels displayed significant plasticity in the onset of breeding, showing earlier laying dates in response to warmer and drier springs. However, warmer and drier springs had a negative linear effect on nestling body condition. Moreover, high temperatures during the chick rearing period caused large juvenile mortality, especially amongst younger individuals, due to chicks' acute dehydration. Within survivors, high temperatures significantly decreased chick growth and body condition at fledging. Nest-site microclimate was influenced by nest-type and nest orientation: wooden nest-boxes attained the highest temperatures, exceeding 55ºC when facing south. Chicks from nests exposed to high temperatures had higher mortality rates, lower growth rates and lower fledging body condition. Future predicted drier and warmer springs may result in an increased selective pressure toward earlier breeding whilst warmer summers may increase chick mortality. We simulated the joint effect of global warming scenarios and the current positive trend in proportion of the population occupying artificial nests. Overall, these models predicted a reduction in population growth rate. In the worst scenario, with 100% of the population occupying nest-boxes, the population would decline on average 7% per year. The impact of weather variability on lesser kestrel breeding success highlights a need for actions to modify and research to adapt conservation efforts and future planning to account for climate change.

SESSION: POSTER (16)

## ASSESSING THE SENSITIVITY OF ALPINE BIRDS TO POTENTIAL FUTURE CHANGES IN HABITAT AND CLIMATE

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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 associated with high altitude habitats have, however, received little attention. Data on breeding bird distributions collected along altitudinal gradients at relatively high altitude (c. 1700-3100 m) in the western Italian Alps were modelled in relation to habitat cover, topography and temperature. These models were then used to assess the sensitivity of species to potential future environmental change by estimating species distributions under a range of scenarios of habitat and climate change for the entire study area. Scenarios consisted of: slow or rapid response of the treeline; whether species responded to habitat change only, or to both habitat change and temperature change directly; and, the presence or absence of constraints on vegetation development at high altitudes (>2800m), which may occur if soil processes are disrupted by reduced winter snow cover. For the majority of forest or shrub nesting species, the amount of suitable habitat is likely to remain stable or increase in the study area in response to climate change as a result of elevational shifts in these habitats. However, open habitat species are facing a potentially severe loss of habitat as alpine grasslands are colonised by forest and shrubs, as much of the area considered is not at an altitude high enough to accommodate further elevational shifts. Furthermore, this loss will be exacerbated if upward shifts in vegetation zones are constrained at high altitudes, 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. 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.

SESSION: POSTER (17)

## DOES BARN OWL *TYTO ALBA* BREEDING VARY BETWEEN EUROPE AND MIDDLE EAST?

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Little is known on whether Barn Owl *Tyto alba* breeding differs across their distributional range. This is mainly because most research has been done in temperate regions of Europe and, to a lesser extent, Mediterranean habitats. In temperate regions Barn Owl breeding success has varied due to variations in rodent populations, weather and in part due to variation in habitat. Because climate fundamentally differs between Mediterranean and semi-arid regions, the relative roles of food supply, weather and habitat may differ in their effects to those observed in temperate regions. Here we studied whether diet, rodent populations, habitat and weather affect the breeding of Barn Owls in the Middle East and compared the results to those already found in temperate regions of Europe. Similar to the temperate regions of Europe, Barn Owls' breeding success in Israel was related to the size of rodent populations. Barn Owls also fledged more young when they consumed a larger proportion of voles in their diet. Even though long-term average winter temperature are much higher at our study sites compared with other parts of Europe, Barn Owls in Israel bred after warmer winters and they produced more fledglings when average temperatures were higher. Rainfall was not correlated with breeding parameters. Similar to some, but not all, studies in Europe, variation in the intensity of agricultural practices is shown to only weakly affect some aspects of the Barn Owl breeding in the Middle East. We conclude that rodent availability, weather, and habitat have similar effects on the breeding biology of Barn Owls in both semi-arid and temperate regions.

SESSION: POSTER (18)

## MIGRATORY REED WARBLERS *ACROCEPHALUS SCIRPACEUS* NEED INTACT TRIGEMINAL NERVES TO CORRECT FOR A 1,000 KM EASTWARD DISPLACEMENT

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Several studies have shown that experienced night-migratory songbirds can determine their position, but it has remained a mystery which cues and sensory mechanisms they use, in particular, those used to determine longitude (east-west position). One theoretical solution involves two clocks, but this does not seem to be used by birds. Another potential solution would be to use a magnetic map or signpost mechanism like the one documented in sea turtles. Night-migratory songbirds have a magnetic compass in their eyes and a second magnetic sense with unknown biological function involving the ophthalmic branches of the trigeminal nerves (V1). Could V1 be involved in determining east-west position? We displaced 57 Eurasian reed warblers *Acrocephalus scirpaceus* with or without sectioned V1. Sham operated birds corrected for the displacement behaved like the untreated controls, whereas V1-sectioned birds did not correct for the displacement. Thus, intact ophthalmic branches of the trigeminal nerves are necessary for detecting the 1,000 km eastward displacement in this night-migratory songbird. Our results suggest that V1 carries map-related information used in a large-scale map or signpost sense that the reed warblers needed to determine their approximate geographical position and/or an east-west coordinate.

This study was supported by Russian Foundation for Basic Research, grant no. 12-04-00296-a.

SESSION: POSTER (19)

## REGULATION OF SPRING MIGRATORY STATE IN LONG-TAILED TITS *AEGITHALOS C. CAUDATUS*

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Long-tailed tits *Aegithalos c. caudatus* in northern Europe are partial migrants, mostly known for their autumn movements. Sometimes the species shows outbreaks of migratory individuals, forming the picture of irruption. This behaviour creates an impression that the species moves in response to external environmental stimuli such as food limitation or overpopulation in the breeding areas. However it was shown recently that the date of the onset of autumn migration in the long-tailed tit, as in many regular migrants, is affected by photoperiodic conditions. Spring movements of the species are less studied, as well as the regulation of spring migratory activity itself. The aim of the study was to understand whether the photoperiod influences the spring migratory state in the long-tailed tit, and in which way. We studied the dynamics of fat reserves and locomotory activity of first-year captive long-tailed tits from mid December up to mid May of the following year. A total of 32 birds were captured for the experiment: 24 individuals were taken from nests and handreared or captured in mist nets just after fledging from the local population in the vicinity of the Ladoga Ornithological Station, NW Russia (60°41'N, 32°57'E), 8 individuals were trapped during autumn passage at the same place. Before the start of the experiment all the birds were kept under similar naturaly changing daylength, reaching its minimum of 9 hours in winter (9L:15D). Then they were distributed randomly among four experimental groups that were kept under different photoperiodic conditions. For the groups 1 and 2 the daylength started to increase at normal time (early January), but in group 2 the rate of increase was higher. Group 3 was kept under 9L:15D until early February with the daylength increase shifted one month ahead; group 4 was kept under winter daylength up to early March, so that the changing of photoperiod was shifted two months ahead. The activity was studied using the videorecording system connected to a computer. It was possible to observe the behaviour of the caged birds and record the amount of activity on-line using the original software. Our results indicated that the timing of increase in the locomotory activity and fat reserves in spring depended on photoperiod. Long-tailed tits kept under shifted light conditions exhibited migratory activity later than birds kept under natural photoperiod. The dynamic of fat reserves was similar to the dynamic of locomotory activity changes. At the same time in groups 3 and 4, kept under shifted light conditions, the maximum fat reserves preceded the maximum of activity. It was also revealed that the rate of locomotory activity increase depended on the rate of daylength increase. The present findings suggest that in the long-tailed tit the photoperiod triggers migratory activity in spring, similarly to regular migrants.

This study was supported by Russian Foundation for Basic Research, grants no. 09-04-01087a and 13-04-01474a.

SESSION: POSTER (20)

## HABITAT COMPOSITION AND HUMAN DISTURBANCE AS FEATURES TO A KNOWLEDGE-BASED MODEL FOR THE LITTLE BUSTARD *TETRAX TETRAX*

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In Italy the Little Bustard is currently present in Sardinia with 1000-1500 individuals, but in the past it was present also in Molise (extinction in 1960), in Apulia (extinction in 1990-2000) and in Sicily (extinction in 1960). A knowledge based evaluation of the habitat suitability of these three regions was computed by means of habitat composition and human disturbance features. The best areas for a future reintroduction project of the species were identified?

SESSION: POSTER (21)

## EFFECT OF SUPPLEMENTAL FOOD ON BREEDING PARAMETERS, DIET COMPOSITION AND WORKING EFFORT OF LITTLE OWLS IN DENMARK

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The Little Owl *Athene noctua*, a top predator once widespread in the rural landscapes of Europe, has shown substantial declines in many European countries and is on the road to extinction in Denmark. The causes of population decline are linked to reduced productivity induced by energetic constraints after egg-laying. Potential reasons for reproductive failure appear to be related to food limitation during the first stages of breeding; therefore food availability for breeding birds is the main target for conservation. Provision of additional food to breeding pairs was applied as a conservation measure to improve survival of broods and increase the reproductive success of Little Owls in Denmark during the period 2006-2012. The consequences of additional feeding have been monitored to analyse the impact of food provision at the population level. Supplemental feeding increased the breeding success measured as the number of fledged young and decreased the working effort of breeding Little Owls. Moreover, the diet of owls provided with supplemental food was more diverse than of control birds, including a higher proportion of large beetles and vertebrate prey. The Minimum Flight Distance of radio tracked individuals provided with supplemental food was shorter than of control birds. The results indicate that supplemental feeding of owls decreased their hunting needs and increased the effectiveness of foraging behaviour. Supplemental food provided in winter months (December – February) had no positive effect on winter survival of adults. The effect of supplemental food was compared with the effect of suitable management of foraging habitats of owls in close proximity to their nests.

## THERE ARE NO LOW-QUALITY GODWITS IN NEW ZEALAND

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Carry-over effects (COEs), in which performance in one life-history stage has fitness consequences in subsequent stages, can reveal bottlenecks in the annual cycle and inter-individual differences in 'quality'. Migratory birds appear particularly prone to COEs, due to time and energy constraints of maintaining fuel stores, feather quality, and optimal scheduling of breeding and migratory journeys. Alaska-breeding Bar-tailed Godwits *Limosa lapponica baueri* undertake three annual non-stop migratory flights of 6,000–12,000 km each, accumulate prodigious pre-migratory fuel loads, conduct a complex molt, and breed during brief high-latitude summers. High inter-individual variation in plumage and migration timing further implies potential bottlenecks and individual quality differences in this system. However, I found no evidence that Bar-tailed Godwits wintering in New Zealand approached the limits of their capabilities. Specifically, (1) most inter-individual variation in plumage and timing was linked with breeding latitude and defied quality-based explanations; (2) intra-individual variation in plumage and migration timing was low and unaffected by COEs from preceding life-history stages; (3) annual survival was high and individuals did not skip migrations; and (4) godwits did not appear to minimize the distance of the two longest non-stop migratory flights yet recorded. I argue that two key aspects of the godwit annual cycle reduce apparent COEs and individual variation in performance: (1) godwits demonstrate a counter-intuitively conservative annual cycle, which features slow fuelling, abundant and predictable resources, reduced predation risk, and ample opportunity to prevent COEs from cascading across life-history stages. Their long life expectancy additionally predicts a low-risk strategy of prioritizing migratory performance (survival) over reproductive success in a particular year. (2) The unforgiving nature of their migrations implies that selection is absolute; i.e., individuals embarking on protracted non-stop flights in poor condition are likely to be removed from the population, thereby reducing measurable COEs and inter-individual quality differences. These aspects encourage us to re-evaluate the nature of expected COEs in long-distance migrants and the view that individuals operate close to their physiological limits. However, it also suggests the potentially fragile nature of the godwits' annual routine, in which significant disruption of current conditions may precipitate rapid collapse, rather than incremental declines.

## CAN CLIMATE CHANGE EXPLAIN THE INCREASING NUMBER OF OVER-WINTERING BIRDS IN IBERIA? A NICHE ANALYSIS APPROACH

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The evidence for climate change impacts across natural systems has rapidly increased over the last few years. Birds are no exception and many changes in their ecological patterns have been attributed to climate change. These include changes in distribution and phenology, population dynamics and migratory patterns. Changes in migratory patterns include evidence for shorter migration distances and even residency in species that used to be wholly migratory. In Iberia several species of wholly migratory birds now have partially migratory populations with increasing numbers of resident birds. These changes have been linked to increased availability of winter food resources due to anthropogenic activities, such as habitat changes, introduced species, and rubbish dumps. In this study we asked whether climate change can also be a driver of the observed changes in migratory behaviour. We addressed this issue by analyzing how the winter climatic niche in Iberia has changed over the last decades, in comparison to the African niche. This comparison was done for ten species that used to be wholly migratory and now have overwintering populations in Iberia. We tested the role of climate on the observed migratory changes of these species by hypothesizing that: (1) the climatic niche of wintering areas in Iberia has become more similar to their African counterpart during the last decades; (2) increased similarity should be mostly driven by an increase in temperatures, and (3) birds are selecting wintering areas in Iberia with a more similar temperature niche to that of their wintering grounds in Africa than expected by chance. The results confirm our predictions for most species and indicate that climate change may also play a part in these recent changes. In light of our results, we discuss the possible mechanisms through which climate change may contribute to drive the observed and future changes in migratory behaviour.

SESSION: Symposium 13 | 29 Aug 2013 | 1030

## THE ECOLOGICAL CONSEQUENCES OF THE RELATIVE IMPORTANCE OF PERSONALITY AND BEHAVIOURAL FLEXIBILITY TO PREDATION RISK MANAGEMENT

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Predation risk has its greatest effect through trait-mediated interactions: where the individual behaviours of prey organisms, as they respond to predation risk, affect fitness, distribution and community dynamics. Individual behaviours are a function of genetic predisposition (personality and phenotypic constraints) and adaptive flexibility (learned and context-dependent responses). Major ecological effects arise therefore from the trade-off between baseline levels of risk-taking (the "shyness-boldness" continuum) and the ability to modify this trait dependent on context and current and past information about predation risk. Redshanks provide an empirical example of where there is variation in individual baseline levels of risk taking as measured by vigilance levels that is effectively swamped by context-dependent flexibility in predation risk management. Nevertheless very small differences in propensity to take risks have very profound differences in terms of individual lethal and non-lethal effects, and consequent population and community effects. Circumstances where differences in propensity to take risk are personality driven need to be identified to understand how selection results in observed base-line levels of risk-taking rather than selection for apparently much more useful context-dependent flexibility in risk management. Key is the degree of information available and the level of behavioural flexibility available. Young and so inexperienced and sub-ordinate animals may therefore show predation risk-management strategies based on personality more than behavioural flexibility and so there may be major differences in selection for personality dependent on life-history stage, and so differences in the types of ecological effects arising from trait-mediated interactions. This may be manifest by avoidance and so distribution effects for initially young and dispersing animals, with predominantly lethal effects selecting for personality types that give the best average solution for that cohort. As animals become older and more experienced, which is associated with continued residency in an area, so behavioural responses become more dominant, with predominantly non-lethal effects selecting for trait-mediated behavioural responses. Thus variation in personality types may be maintained by variable selection on different cohorts due to annual variation in environmental conditions, predator community composition, and conspecific and predator density. Variation in behavioural flexibility may then be maintained through the variable value of local predation risk knowledge and increasing ability to act upon this information, which increases with age and residency. Key avenues for future research are therefore how the effect of baseline risk management and behavioural flexibility changes with different environmental conditions, age and experience.

## MIGRATORY BIRD CONSERVATION AT THE FLYWAY SCALE: APPROACHES TO PRACTICAL IMPLEMENTATION IN AFRICA–EURASIA

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There are many approaches to achieving effective conservation for migratory birds, with the most appropriate tools varying depending on the group of species concerned. For Globally Threatened Birds, implementing internationally approved species action plans through species working groups in the framework of CMS and AEWA is proving successful for some species such as Aquatic Warbler *Acrocephalus paludicola* and Sociable Lapwing *Vanellus gregaruis*. For seabirds, we still have relatively little information about their distribution at sea; less than 1% of the global sea surface has any statutory protection, and even in these areas, the protection of the key resource, usually fish, is woefully lacking. We know that seabirds face many threats, but achieving effective conservation for these, often highly mobile, species is complicated by the fact that many species spend a large proportion of their time on the high seas, using areas outside national jurisdiction. For waterbirds, which tend to form concentrations, identification and conservation of a network of key sites can be especially beneficial. The BirdLife Partnership has identified a global network of over 11 000 Important Bird Areas (IBAs). Some 2000 of these are wetland IBAs in the African–Eurasian flyway where the 'Wings over Wetlands' project developed the Critical Site Network Tool, to present information on key sites in a flyways context. Its modular training kit addresses capacity gaps for migratory waterbird conservation, management and monitoring. The project 'Strengthening networks for the conservation of migratory birds and their habitats along the west coast of Africa' focuses on achieving conservation for all migratory birds (not just waterbirds) in a specific part of the African–Eurasian flyway. For soaring birds that have 'bottleneck' passage points, site-based conservation is very important, but infrastructural development, unsustainable hunting and land degradation pose major threats that are best tackled at the policy level. In northeast Africa and the Middle East, the GEF/UNDP/BirdLife 'Soaring Birds Project' is working to mainstream migratory bird conservation considerations into policy decisions across economic sectors, especially the energy sector, including wind energy developments. Although there is a relatively clear way forward for waterbirds and soaring birds through site-based conservation, this is not the best solution for migrant landbirds. Here we need to address conservation at an entirely different scale and solutions will need to address issues such as drought, loss of natural vegetation, over-grazing and human population pressures. Protection of key sites will help, but engaging with the wider land-use debate to influence the policies behind these threats is likely to offer the best chance of achieving effective conservation for migrant landbirds.

SESSION: POSTER (22)

## ARE MALE PENDULINE TITS *REMIZ PENDULINUS* BETTER PARENTS THAN FEMALES? NESTLING CONDITION IN UNIPARENTAL BIRD SPECIES

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In some species nestling body condition has been found to correlate with fitness components such as future survival or lifetime reproductive success. We investigated nestling condition in the Penduline Tit *Remiz pendulinus,* a small passerine bird that exhibits a unique breeding system. Either a male or a female abandons the clutch before incubation commences and both sexes frequently remate after desertion. Parental care is provided by only a female or a male, and about 30–40% of clutches are deserted by both parents. Apart from nestling body condition, we also investigated parental care behaviour (incubation and feeding) of males and females and thermal conditions inside the nest. Clutch size and brood size were higher in nests with female parental care. Males and females did not differ in the incubation effort, and the temperature inside the nest during incubation was similar in both types of nests. Males were found to feed nestlings more frequently than females. As a consequence, nestlings in broods with male care were in better condition. At the age of 13 days they had higher haemoglobin levels and higher scaled mass index than those reared by females. Post-fledging consequences of this difference remain unknown.

## CONSERVATION OF LONG-DISTANCE MIGRANT LANDBIRDS IN THE AFRICAN-EURASIAN FLYWAY – HOW CAN SCIENCE AND POLICY ALIGN?

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Precise information on the wintering zones, migratory strategies and resource requirements of migrant landbirds within the African-Eurasian flyway remains relatively scarce. Such information is necessary before assessments of the consequences of environmental changes can be made and effective conservation solutions developed. This needs to be underpinned by an understanding of current and likely future land use, the use of habitats by birds, their distributions and the key threats within each major vegetation zone, supported by comprehensive databases and trained personnel to increase the capacity to use such information. There is an urgent need for an overarching perspective of migrant ecology and conservation that incorporates an understanding of the relevant socio-economic factors and policy drivers on the breeding, wintering and staging grounds, and of the interactions across these stages. We need to draw on long-term datasets for birds, land use, policy and climate at national and international scales, conduct detailed autecological studies at local scales, take advantage of the emerging high technology tracking devices, and build basic scientific, policy and advocacy capacity and expertise on the wintering and staging areas of these birds in Africa. There is currently no international framework for research or conservation action on African-Eurasian migratory landbirds, although such initiatives do exist for waterbirds and birds of prey. These provide governments and others along the length of the flyway with internationally agreed priorities for conservation action, funding and cooperation. In November 2011 a landmark resolution was adopted by the CMS Conference of the Parties (COP) that should lead to significant improvements in the conservation status of African-Eurasian migratory landbirds. It delivered a mandate for the establishment of a CMS Working Group to develop a flyway Action Plan with clear goals designed to achieve and maintain a favourable conservation status for these species and their habitats. The Action Plan will urge Parties to the Convention and invite non-Party Range States and other stakeholders to engage in co-operative activities to promote the sustainable management of migratory landbirds of the African-Eurasian flyway. In particular, the Action Plan will outline the primary knowledge gaps that need to be filled through defined research and monitoring activities, and align these with actions which support the development and promotion of sustainable land management policies and practices, eliminate unsustainable harvesting and raise awareness of the conservation status of African-Eurasian migrant landbirds, the threats they face and the measures needed to conserve them.

## BIRD STRIKE PREVENTION BY MUTUAL SEPARATION

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Traditionally, the prevention of collisions between aircraft and birds (bird strikes) on and around airfields is based on the assumption that when no birds are present the risk is negligible. Thus all effort is put in keeping birds out of the way of aircraft operations by reducing bird attractiveness of airfields, complemented by the dispersal of birds.

Military aviation has a double problem: it suffers from the on and around airfield bird strike risk but in addition to civil aviation there also is a significant en-route problem when jet aircraft perform low level missions in generally bird rich altitudes. The prevention of these en-route bird strikes is based on a radical different principle: aircraft operations are adapted to the bird density in the air. Based on radar observations bird warnings are issued for (3D) areas which, depending on the bird situation, ultimately lead to flight restrictions for certain areas and altitude levels.

RNLAF pilots are already for decades used to the fact that the actual bird situation might have influence on their en-route operations. This meant that when in 2000 this principle was also introduced for the prevention of on and around airfield bird strikes pilots quickly accepted that under certain circumstances operations have to be adapted. In fact we introduced a bird status for an airfield parallel to the well-known and accepted meteo status. Up to now observations by bird control units form the - subjective - basis for such a bird status.

Thanks to better and faster calculating powers and data handling techniques, dedicated bird radars arise that enable a dual separation approach in bird strike prevention on airfields, both military and civil. This means that traditional bird strike prevention is complemented by an adaption of aircraft operations. Of course, there will be opposition from the aviation industry since this ultimately means their operations are complicated by birds as a safety issue. But the *fight for airspace in ever more crowded skies* (Dolbeer, this conference) means that separation will be ever more important. In the presentation several examples of radar based observation will be given as well as the complications with the *concept of operations* using the information.

SESSION: POSTER (23)

## INFLUENCES OF OCEAN WINDS ON MIGRATORY PATHS AND THE CHOICE OF WINTERING AREAS IN A HIGHLY PELAGIC SEABIRD, THE CORY'S SHEARWATER *CALONECTRIS BOREALIS*

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A recent study showed remarkable individual flexibility in migratory behaviour of a long-distance trans-oceanic migrant, the Cory's shearwater *Calonectris borealis*, in the Atlantic Ocean. According to their results, some of these shearwaters exhibit high fidelity to wintering grounds year after year, while others shifted among wintering areas several thousands of kilometres apart in subsequent migrations: from the South to the North Atlantic, from the western to the eastern South Atlantic and from the Atlantic to the Indian Ocean. Such great flexibility appears to be linked neither to the productivity of wintering grounds nor to individual traits (i.e. age, sex). On the contrary, it seems to apply to the migratory journey itself, but nothing that could explain this behaviour has yet been explored. In this study, we analysed a dataset composed by 183 migratory GLS tracks of Cory's shearwater recorded during five consecutive migrations, from 2006 to 2011, and belonging to 108 different individuals. In particular, we investigated the relation between seabirds' migratory routes at sea with ocean winds. Because petrels have evolved flight characteristics that allow them to extract energy from prevailing wind over the ocean's surface, the variability in wind speed and direction is of fundamental importance for these seabirds and may be the key element in the understanding of migratory flexibility.

SESSION: POSTER (24)

## EFFECTS OF SALINAS RECONVERSION ON THE GREATER FLAMINGO *PHOENICOPTERUS ROSEUS* IN THE CAMARGUE (SOUTH OF FRANCE)

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Mediterranean salinas provide essential food resources for many waterbirds, including the emblematic Greater flamingo *Phoenicopterus roseus*. Flamingos are filter feeders with a diverse diet including aquatic invertebrates and seeds. In salinas, brine shrimp *Artemia spp*. are their main prey during the breeding period. Flamingos also forage in alternative habitats including freshwater marshes and natural brackish lagoons. In spring, they forage in freshly sown rice fields causing local crop damage. Salt industry is presently declining in Europe and many salinas have been abandoned or transformed. In the Camargue (Southern France), salt production has recently ceased over half of the surface area of what was the largest commercial saltpan in Europe, Salin-de-Giraud. Activity over the remaining production area might also cease in the near future and a project is currently planned for the production of micro algae. This study aims to understand how salinas' transformations will affect foraging decisions and spatial distribution of flamingos.

We used mechanistic and individual-based models, which are increasingly used to predict species' ranges in response to environmental change. These models combine physiological/behavioural traits and environmental characteristics. Here we use MORPH (Stillman, 2008), which uses data on flamingo foraging ecology and environmental parameters. Specifically, MORPH requires three key parameters. (i) the functional response of feeding, i.e. the intake rate or the bird ingestion efficiency as a function of prey density, (ii) the energetic requirements as a function of environmental variables and (iii) prey distribution in salinas. Beyond being a key parameter of mechanistic models, studying the functional response of feeding is essential to assess the profitability of different food items for foragers and to better understand their use of foraging areas. Here, we experimentally measured the functional response for captive flamingos on *Artemia*, chironomid larvae (*Chironomus spp.*) and rice seeds (*Oryza sativa*). Our results showed that, contrary to theoretical predictions for filter feeders, flamingos were more limited in their capacity to ingest large amount of food. Overall, flamingos foraged more efficiently on *Artemia*. However, feeding on rice was energetically more profitable for flamingos than feeding on *Artemia* or chironomids, explaining their attraction for rice fields.

Energetic requirements were calculated using another mechanistic model, NicheMapper™ (Porter & Mitchell 2006). Results showed the importance of key factors influencing flamingo energy requirements such as feather length, plumage depth, body dimensions, flight parameters and climatic parameters such as wind speed, with different sensitivity between sexes. The presentation will discuss these results and first predictions obtained with MORPH.

SESSION: POSTER (25)

## YELLOWHAMMERS.NET: CITIZEN SCIENCE PROJECTS UNCOVERING THE MYSTERIES OF THE DISTRIBUTION OF YELLOWHAMMER *EMBERIZA CITRINELLA* SONG DIALECTS

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We present two citizen science projects focusing on mapping the geographic distribution of song dialects of Yellowhammers *Emberiza citrinella*. This species is a good candidate for such studies: its characteristic song is easy to recognize even for an untrained ear (especially late in the season when other birds tend to be silent) and no specialised equipment is needed to record the song in sufficient quality for identification of dialects (most digital cameras and new mobile phones will do). Thus, even people without extensive ornithological experience or special devices can be involved in the research and with their help large amount of data, necessary for mapping, can be obtained. The Dialects of Czech Yellowhammers (DCY; www.strnadi.cz) project started in 2011, when the species was chosen as the Bird of the Year by the Czech Society for Ornithology. Its aim was to map dialect distribution in the Czech Republic and to find out whether a border between two European macrodialect groups (containing at least seven dialect types distinguished by the final phrase) runs through the Czech territory. During two years of DCY, with the help of over 120 people we obtained more than 1700 recordings covering most of the country, and detected not only all dialect types known so far but also additional local variants. Recording of yellowhammer songs enriched daily walks, bike trips, or family journeys of our volunteers. For some, collecting recordings from different places and seeing them appear on an interactive online map, became a real passion. Thanks to the success of DCY, we decided to expand abroad in 2013. The new Yellowhammer Dialects project (www.yellowhammers.net) aims to compare geographic distribution of dialects in Great Britain and New Zealand, with involvement of the public in both countries. Yellowhammers were introduced to New Zealand by British colonists in the second half of the 19th century and spread so rapidly that by the beginning of the 20th century they were regarded as serious pests. Data about numbers of introduced birds and localities of release are known; their origin can be assumed to be in the vicinity of three principal ports from which ships departed to New Zealand (London, Plymouth and Glasgow). The distribution of Yellowhammer dialects in the newly colonised territory may thus reflect both founder effects (thanks to substantial introduction bottlenecks) and subsequent cultural evolution during the biological invasion.

SESSION: POSTER (26)

## FROM MACRO- TO MICRO-CLIMATE? 3D ANALYSIS OF LESSER KESTREL *FALCO NAUMANNI* NEST ATTENDANCE

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Biparental care, where both parents are involved in egg incubation and chick rearing, occurs in 75–90% of all bird species despite its time and energetic costs. In species adopting this strategy, a trade-off between costs and benefits is expected and parents have to partition their time budget between breeding and other activities. Parental care is easily quantifiable as the amount of time parents spend inside or in close proximity to their nest. Nest attendance is related to incubation, nestling and mate provisioning, and nest vigilance. Efforts in increasing each of these activities promote reproductive success. Nest attendance may, however, be influenced by both intrinsic (e.g., body conditions of parents) and extrinsic (e.g., climate) factors. Efforts allocated to incubation and chick provisioning are affected by local climate, whereas little is known about the effects of microclimate (e.g., air temperature inside the nest) and macroclimate (e.g., North Atlantic Oscillation Index, NAOi) on nest attendance. Accordingly, we studied the largest population of the lesser kestrel (*Falco naumanni*) in Sicily to test whether nest attendance of both parents was affected by climate variables recorded at three spatial scales: globally (N=2), locally (N=3) and on the nest microhabitat level (N=7). The lesser kestrel is a small raptor breeding solitarily as well as in colonies of variable size in a typical pseudo-steppe habitat. It is a secondary-cavity nester that finds its nest holes in cliffs or wall crevices and under roof tiles of rural buildings. To accomplish our aim, we conducted systematic observations (focal sampling method) in five colonies to quantify nest attendance (i.e. percentage of time each parent spent at the nest) for each pair member in 20 nests, from incubation to nestling fledging. We related nest attendance measures to a large-scale climatic indicator such as monthly NAOi, as well as to medium-scale climatic measures with local temperature and humidity obtained from the closest weather station. Microclimate was recorded by dataloggers placed inside nests. Results of a GLMM (Generalized Linear Mixed Model) analysis revealed no significant difference in nest attendance between parents. Monthly NAOi and temperature during focal sampling (FST) showed significant effects on parental nest attendance. At a global level a drier climate seemed to enhance nest attendance but at the colony scale FST was the best predictor of time at the nest. Finally, at the microhabitat level, parents were more likely to spend time at the nest as the minimum daily temperatures decreased. We discuss our findings on environmental conditions in light of an integrated analysis at different spatial scales. Our results show that not only macro- but also micro-habitats may be potential extrinsic factors able to enhance or prevent optimal behavioural activities that would, in turn, allow birds to capitalize on reproduction.

## FROM INDIVIDUAL DECISIONS TO MASS MIGRATION EVENTS: FACTORS SHAPING MIGRATION PATTERNS IN SONGBIRDS CROSSING THE OPEN SEA

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For migrating landbirds, large bodies of water represent significant ecological barriers. Although bird observatories and ringing stations are classically situated on island or on coastal peninsulars, our knowledge of the factors governing flight decisions in offshore environments is still limited. Both, conditional (physiological, psychological) and environmental factors may affect the decision to cross the open sea. Of the latter, wind is of particular importance. As periods of optimal flight conditions are unpredictable for birds, an individual facing a water body needs to make an all-or-nothing migratory decision. Thus, in theory, the majority of individuals may be migrating under suboptimal conditions. This can be crucial for considerations at the population level which are of particular interest when assessing risks for migrating birds through collisions with illuminated offshore constructions (e.g., oil rigs, offshore wind turbines). Furthermore, migration performance is likely to be additionally affected by species-specific morphological traits such as body size which may for example determine the degree of wind drift. At the Swedish South Coast (Falsterbo), we fitted a selection of differently sized night-migrating songbirds with radiotransmitters and recorded their sea-crossings with a receiver station installed on the German offshore research platform Fino 2, situated in a distance of about 45 km to the SSE of Falsterbo. Furthermore, we recorded nocturnal passages of migrants at the platform with an automatic camera system (VARS) and a pencil-beam radar (BirdScan), representing a semi-quantitative and, respectively, a quantitative method for recording bird migration. We compare individual migration events with the occurrence of migration waves and weather conditions. We test the hypothesis that larger species and/or more powerful fliers may migrate under a wider range of weather conditions than do small species and/or weaker fliers. We discuss the relevance of species-specific migration ecology for the risks imposed through the realisation of large-scale offshore wind farm projects. Study funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the Swedish Research Council.

## BIRDS AND AIRCRAFT: FIGHTING FOR AIRSPACE IN EVER MORE CROWDED SKIES

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Bird collisions with aircraft (bird strikes) are an increasing safety and economic concern to civil and military aviation worldwide, costing well over $1 billion each year. Over 225 aircraft have been destroyed by wildlife strikes worldwide since 1988, the most notable of which was the Airbus 320 which landed in the Hudson River in New York in January 2009 after hitting a flock of Canada geese *Branta canadensis*. A basic tenet of programs to mitigate the risks of bird strikes has been to focus management efforts at airports since various historical analyses of bird strike data for civil aviation have indicated the majority of strikes occur in this environment (during take-off and landing at < However, a trend analysis of bird strike data involving commercial air carriers in the USA indicates that this tenet should be revised. I conclude that mitigation efforts incrementally implemented at airports in the USA over the past 20 years have resulted in a reduction of damaging strikes in the airport environment. This reduction in strikes has occurred in spite of increases in populations of many large bird species hazardous to aircraft. However, these successful mitigation efforts, which must be sustained, have done little to reduce strikes outside the airport boundaries, especially during the initial climb phase of flight when modern-turbofan engines are most vulnerable to damage. Increased efforts now are needed to eliminate bird attractants within 8 km of airports, to further develop bird-detecting radar and bird migration forecasting, and to research avian sensory perception to enhance aircraft detection and avoidance by birds. I encourage researchers in traditional ornithological and behavioural sciences to look at this problem from different perspectives to develop novel solutions to this problem. The overall goal is safer skies for all who fly, birds and people!

SESSION: POSTER (27)

## SPATIO-TEMPORAL DISTRIBUTION AND BEHAVIOUR OF THREE COMMON SEABIRD SPECIES IN LAGANAS GULF AND ARGASSI (SE ZAKYNTHOS, IONIAN SEA, WESTERN GREECE)

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The distribution of seabirds in the Eastern Mediterranean is poorly known while species like *Phalacrocorax aristotelis desmarestii,* an endemic Mediterranean subspecies and of conservation priority for the European Union, and *Larus michahellis,* which is considered as a superabundant species and a possible threat for other seabirds, are known to live in this area. This work that was partly funded by the LIFE07 NAT/GR/000285 aimed to establish baseline information about the spatial and temporal distribution of the two pre-mentioned species as well as their associated behaviour in SE Zakynthos (Ionian Sea, Western Greece) which mostly belongs to the National Marine Park of Zakynthos. A third species, *Calonectris diomedea diomedea*, was included since it was abundant at one of the stations were the observations took place. The methodology was based on a combination of coastal counts sessions at 3 determined stations and onboard observations along the whole coastline of Zakynthos Island. Results showed that the location, the seasons and the daytime period had an effect on their distribution and behaviour to different extents. Behaviour was also a factor that influenced the species distribution. Correlations were also attempted between abiotic factors and movement of birds. The total population of *L.michahellis* and *P.a.desmarestii* could be estimated as well as the average number of *C.diomedea* using Zakynthos' eastern offshore. Conservation purposes include further monitoring of the three seabird species ideally thanks to telemetry, the further investigation of possible influences of anthropogenic food resources (e.g. fishery discards and landfills) as well as the maintenance or even reinforcement of the restricted access of the core area of the Marine Park.

SESSION: POSTER (28)

## LACK OF DIFFERENTIATION BETWEEN CUCKOO *CUCULUS CANORUS* EGGS LAID IN NESTS OF TWO SYMPATRIC SPECIES OF GENUS *ACROCEPHALUS*

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Cuckoos are brood parasites that lay their eggs into nests of several Passerine species. Cuckoo females parasitizing different bird species seem to be genetically differentiated forming host-specific "gentes". Cuckoos specialized in parasitizing particular hosts usually lay eggs that phenotypically (colour, spottiness, sometimes also size) match the host's eggs. We studied cuckoo eggs collected in clutches of two sympatric species, great reed warblers *Acrocephalus areundinaceus* and Eurasian reed warblers *A. scirpaceus*. Eggs of these two host species differ in size, egg-shell thickness and colouration. We tested a hypothesis that eggs laid by females parasitizing these two hosts differ significantly with respect to these traits. Contrary to our expectations cuckoos parasitizing great reed warblers and Eurasian reed warblers did not significantly differ in any of measured traits describing the phenotypes of their eggs. We hypothesize that in our study systems cuckoos diverged recently with respect to their host species and thus they have not evolved appropriate adaptations. Further studies - involving examination of the genetic structure of this cuckoo population - are required.

## TURTLE DOVES, TRIAL PLOTS AND TRICHOMONAS: CONSERVING THE UK'S ONLY MIGRANT DOVE

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UK Turtle Dove populations have declined by 93% since 1970, paralleled by a 73% decline across Europe since 1980. In the UK, the number of breeding attempts per pair has halved since 1960, sufficient to explain the population decline, and a dietary switch from arable plant seeds to cereal grains over the same time period suggests food limitation may be responsible. Here we describe ongoing work addressing conservation issues for turtle doves throughout the annual cycle. On breeding grounds, early results of research aimed at reducing food limitation suggest that trial plots now available to farmers through English agri-environment schemes can provide additional seed resources for breeding turtle doves, but key to their success is widespread roll-out and the correct management allowing accessibility to foraging doves. Recently, we found a high prevalence of infection by the protozoan parasite *Trichomonas gallinae* in turtle doves, spread at shared food and water resources, and linked this to mortality in adult and nestling turtle doves. We emphasise the importance of reducing the reliance of turtle doves on small patches of anthropogenic food resources to reduce disease transmission on breeding grounds. Work currently in its early stages aims to examine the epidemiology of parasite infection on African wintering grounds, and across European breeding grounds, in conjunction with work attempting to elucidate population structure, in order to further our understanding of migration and wintering ecology in this rapidly declining bird.

SESSION: POSTER (29)

## ALL EGGS IN TWO BASKETS: LONG-TERM EGG-LOSS RATE IN WHITE STORKS *CICONIA CICONIA* – AN EXAMPLE OF COOPERATIVE STUDYING IN VOLUNTEERS AND SCIENTISTS

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Long-term datasets, especially on reproductive success, provide a fundamental basis for studies on ecological systems and on relationships between biotic and abiotic variables. However it must not be forgotten that the collection of long-term datasets is very labour-intensive and that this effort cannot be appreciated enough. We illustrate how committed volunteer work led to a real wealth of data. Over more than 30 years, the White Stork (*Ciconia ciconia*) nests in the rural district Kalbe (Milde) in Germany (federal state Saxony-Anhalt) were maintained and monitored by a group of volunteers, including the recording of clutch sizes. On average 3.6 eggs (in a range of 0 to 6, standard deviation 1.5) were laid. The mean egg-loss rate was 42%, varying from 19% to 58% (standard deviation 9.6%) between years. This dataset provides highly valuable information on the breeding success of White Storks. Even though this species is studied intensively, very few data are available on the number of eggs laid. The analysis of breeding parameters such as the number of pairs and their fledglings, as well as the yearly variation in the percentage of eggs that do not result in fledglings, enables a more specific quantification of juvenile mortality. Further statistical modelling will reveal the influence of environmental variables such as weather and habitat on the breeding success and especially on the egg-loss rate in White Storks. We would like to emphasise the role of volunteers in nature conservation and monitoring programs and to encourage cooperative reearch between volunteers and scientists because they can complement each other by sharing expertise and resources.

SESSION: POSTER (30)

## EAST AFRICAN *ZOSTEROPS SPP.* IN SPACE AND TIME: COMPARATIVE ANALYSES REVEAL MULTIPLE DRIVERS OF SPECIATION IN A CRYPTIC SPECIES COMPLEX

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The cloud forests of the Eastern Afromontane biodiversity hotspot are restricted to isolated mountain archipelagos, being surrounded by dry and warm lowland savannas and semi-deserts. This situation drives distinct evolutionary processes due to geographic isolation and different environmental conditions. Members of the genus *Zosterops* occur as several distinct highland and lowland taxa and populations over Eastern Africa. By focussing on *Z. poliogaster*, we tested for differentiation processes taking place on these mountain archipelagos. Besides genetic information we used morphometry and species distribution modelling to infer possible effects. Our data indicate (i) a stronger differentiation within *Z. poliogaster* if compared with highland and lowland taxa, (ii) highland populations are sometimes linked with respective lowland taxa, but sometimes strongly differentiated from those and (iii) geographic isolation is not the driving force for local differentiation processes. The multifaceted landscape of East Africa promoted multiple drivers of speciation that generated a rich phylogenetic structure of clades waiting for further, more detailed taxonomic assessments of East African *Zosterops*. However viability of sensitive populations is highly vulnerable due to anthropogenic habitat fragmentation that might threaten even more species than are yet described.

## CHANGES IN THE DISTRIBUTION OF MONTANE AND UPLAND BIRDS IN MONTANE REGIONS OF SCOTLAND DURING A PERIOD OF CLIMATE CHANGE

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Climate change has potentially important consequences for birds characteristic of montane environments. To adapt, these species will need to track suitable bioclimatic space up the mountainside, but where a species already occurs at the altitudinal extremes of a range, there may be relatively few opportunities for vertical migration. In the UK, montane zones are restricted to the Scottish Highlands between 750-1300m. Occurring in such a narrow elevational band, it is possible that birds associated with Scottish montane zones will be highly susceptible to the effects of climate change. In 2011, a national Montane bird survey was undertaken in the UK, repeating earlier surveys in 1987-88 and 1999. Here, we use these datasets to consider whether montane birds, namely Dotterel (*Charadrius morinellus*) and Ptarmigan *(Lagopus mutus*), demonstrate changes in their distribution over 25 years that are consistent with the effects of climate change. Furthermore, we also consider changes in the distribution of another cohort of species, including Golden Plover (*Pluvialis apricaria*) and Dunlin (*Calidris alpina*), that are more characteristic of lower altitudes to evaluate their potential responses to climate change.

SESSION: POSTER (31)

## CHALLENGES IN AVIAN SPECIES DISTRIBUTION MODELLING: HOW TO CONTROL FOR PRESENCE RECORD SAMPLING BIAS? EVALUATION OF METHODS AND APPLICATION TO THE CORNCRAKE *CREX CREX*

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Although species distribution modelling (SDM) has become a common tool to predict potential distributions of birds, several issues have to be addressed to produce reliable outputs. One common and serious challenge is the sampling bias in presence records due to the uneven distribution of the sampling effort across the species' range. This bias may strongly affect the model outputs and may lead to incorrect conclusions or conservation decisions. Although a number of sampling bias correction methods have been proposed, there is currently no consensus on how to account for it. We tested various methods of sampling bias correction on real and artificial datasets and compared the model outputs to assess the correction performance of each method. Performance strongly depended on the species and the type of sampling bias but the simple systematic sampling of records consistently ranked among the best performing correction methods.

As an application, we modelled the distribution range of the Corncrake *Crex crex*. The status on the IUCN Red List of this grassland bird has been downgraded to "Least Concern" in the past decade. However, reclassification was based on a relatively small amount of information which makes the use of SDM relevant as an independent tool to evaluate the expert-based range provided by IUCN. The dataset of records is extremely strongly biased towards western countries. To account for this bias, we partitioned the data into a western and an eastern set to construct two SDMs that were combined afterwards. We also carried out a systematic subsampling of occurrences prior to modelling. The model output largely departed from the IUCN range estimate when sampling bias was left uncorrected, whereas we found a good match when we accounted for the bias. Our study supports the current range estimate for the Corncrake. It also demonstrates that a relevant modelling strategy is likely to produce accurate estimates of the distribution of avian species, even from highly biased datasets.

SESSION: POSTER (32)

## VARIATION IN ABUNDANCE IN HEAVY METALS IN EGGSHELLS OF PORTUGUESE WHITE STORKS *CICONIA CICONIA* AND THEIR PREY, RED SWAMP CRAYFISH *PROCAMBARUS CLARKII* – CONSEQUENCES FOR PRODUCTIVITY

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Milder European winter temperatures and reliance on landfill significantly influence migration strategy and nesting decisions of the White Stork in Iberia. Previously a wholly migratory species, since approximately 1984 increasing numbers of White Storks are choosing to stay in Iberia all year rather than migrate to Africa. In the last winter census in 2008 there were over 10,000 storks wintering in Iberia, more than 75% of them feeding on landfill. Additionally, White Storks have shown a preference for nesting close to landfill. Between 1984 and 1994 the proportion of breeding pairs near dumps increased from 17% to 45% of the total breeding population in Spain with consequences for chick dispersal and population expansion. However, beginning in late 2012, the Portuguese open landfill sites are gradually being replaced by modern facilities where food waste is handled under cover and birds will not be able to gain access. This will likely affect individual migratory decisions and breeding population sizes. Wintering White Storks will increasingly rely on foraging in the agricultural fields (mainly rice fields) where they feed extensively on the invasive Red Swamp Crayfish, a species known to accumulate heavy metals. Heavy metals, particularly cadmium, mercury and lead are known to impact on fecundity and chick development, even in low concentrations. In the rice field region of Sado, Portugal, where crayfish are a main prey source, White Stork productivity was consistently lower than comparable areas between 2004 and 2008. This trend is in terms of number of chicks fledged and percentage of nests to successfully rear at least 1 chick. Analysis of 17 heavy metals in crayfish fragments derived from regurgitated pellets demonstrated toxic levels of lead, cobalt and arsenic in crayfish consumed by storks in this region. Additionally, quantities of heavy metals in eggshells are known to reflect exposure levels experienced by the developing chick. Chicks are especially vulnerable to heavy metals through effects on bone and tissue development. Eggshell samples from Sado reveal lead and selenium were present in significantly harmful levels. It is also known that the combined toxicity of heavy metals is greater than their individual toxicity. Chicks in Sado are exposed to a combination of various heavy metals both during development in the egg and accumulated through diet. This was concluded to be a major factor in the low productivity in Sado. Sado was compared to other estuary systems in Portugal where storks feed in high numbers. Whilst heavy metals were highest in Sado, levels were also high in eggshells from other areas. Heavy metals levels in crayfish from pellets were present in above threshold levels in other estuarine colonies. Increased consumption of contaminated crayfish after the closure of the landfills could result in decreased productivity due to widespread heavy metal toxicity.

## A BRIEF INTRODUCTION TO EUROPEAN ETHNO-ORNITHOLOGY AND CONSERVATION

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Three issues of major strategic concern to conservationists in Europe and North America are: 1) a growing sense of human disconnectedness from nature as populations become increasingly urban; 2) that biodiversity loss globally parallels a loss of human cultural diversity; and 3) the 'Shifting Baseline Syndrome' whereby successive generations fail to recognise the scale of change in biodiversity that had occurred over a significant period greater than that of their own generation's span (e.g. since industrialization). Globally, the extinction of cultures and species share similar causes in globalization, and with the loss of cultural diversity goes a loss of ethnobiological knowledge, which may be uniquely valuable for nature conservation. Consideration of this issue also offers potential for addressing the first issue of human disconnection from nature, which in the West is reflected in a decline in peoples' basic natural history knowledge. Relevant to this complex of issues, is the growing recognition that birds are of unique value in addressing the need to reconnect people with nature, and indeed in many cases with their own cultural roots.

In this paper we present an overview of the recent international revival of interest in the ethnobiological sub-discipline of ethnoornithology. Since the Australasian Ornithological Conference of 2005, which hosted the first day-long session dedicated to ethnoornithology at an international conference, numerous similar sessions and symposia have occurred at national and international conferences in a variety of disciplines. We discuss some aspects of the growing interest in ethnoornithology as an area for study, with particular emphasis on the practical application of ethnoornithological knowledge to indigenous and non-indigenous land management, the relevance of ethnoornithological research to European birds - both migrants and endemic - and its potential value to European bird habitat and conservation projects.

As an example, a recent study is described which demonstrates how the 3,291 English folk names of 78 passerine birds collected by ornithologists in the 19th century demonstrates the intimate knowledge of birds held by lay people in England at that time, and how this provides a stable baseline against which the decline in natural history knowledge of the population since that time might be compared. The conservation potential of this is described in terms of the three specific issues raised above. We shall also consider the opportunities that ethnoornithology can offer students, emergent and mid-career biologists.

## FITNESS CONSEQUENCES OF MERCURY EXPOSURE IN ANTARCTIC TOP PREDATORS

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Mercury (Hg), a ubiquitous toxic element of both natural and anthropogenic sources, is known to alter behavioural, hormonal and immune functions in birds, which in turn may affect major fitness components and demographic traits. Long-lived top predators are subject to the highest exposure - and possibly the most severe toxic effects - of contaminants because of the bio-magnification of Hg along the trophic web. Estimating the effects of Hg on long-term survival and reproduction are rarely achieved because of the need to sample marked individuals from long-term capture-mark-recapture (CMR) studies. In the present study, total mercury levels were measured in blood samples of 2 Antarctic top predators: the brown skua *Catharacta lönnbergi* in Kerguelen Island (2001/2002), and the south polar skua, *Catharacta maccormicki* in Adélie Land (2002/2003 and 2004/2005). Brown skuas showed much higher (around 8.8 ppm) Hg levels than south polar skuas (around 2.3 ppm). The annual presence and reproductive outputs of ringed individuals were monitored until the 2011/2012 breeding season. Using CMR approach taking into account capture probability and temporary absence from the study area (E-surge software), we estimated the effects of mercury on adult survival rate, breeding probability and breeding success. Survival rate and breeding probability the following year were not related to mercury levels, despite very high contamination levels. South polar skuas with the highest mercury levels had the lowest breeding success the following year. Similarly, the most contaminated brown skuas failed to rear two chicks the following year, with a stronger effect for males than for females. This breeding failure may be explained by poor parental care, as chick-rearing skuas bearing higher mercury levels had lower levels of prolactin, the parental cares hormone. We did not detect any effect of mercury on baseline corticosterone levels and nest defence intensity. Another hypothesis is that the most contaminated parents laid eggs with high mercury levels, thereby impairing the development and the survival of embryos and chicks. This study confirms the prediction that life-history traits with the lowest elasticity (e.g. breeding success) are the most sensitive to toxic chemicals. At last, population dynamic models were developed to predict the potential effects of mercury on populations' growth rates of these two Antarctic top predators.

## CULTURAL INTERACTIONS BETWEEN BIRD AND HUMAN POPULATIONS

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Unprecedented levels of urbanization have changed the evolutionary landscape for bird species. Humans shape selection pressures by transforming habitats, modifying the type and distribution of resources, and altering species interactions. Certain species are more able to cope with these changes than others. While no single trait governs the success of birds alongside humans, a tolerance to the physical presence of people, as measured by a reduced flight initiation distance (FID), is often assumed to serve as a helpful adaptation that allows for urban colonization. In theory, a reduced sensitivity to human disturbance would enable birds to expended less energy fleeing people unnecessarily, and allow for foraging on food items in highly trafficked areas. However, the split between human-tolerant and intolerant species may be complicated by the attitude of humans towards specific bird species. Efforts such as culling schemes and garden feeding are often culturally motivated, but have drastic consequences for the success of species in contact with these policies. Species from the family Corvidae occupy an especially polarized place within British culture as some species are categorized as vermin, yet others are found fascinating for their intelligence and problem solving abilities. Whether species distributions respond to areas of intense belief has yet to be investigated thoroughly. I will present the results of one of the first efforts to integrate species distributions with human cultural attitudes, based on a large-scale study of FID measures and questionnaires in urban and rural areas of the UK. Given that separate corvid species are perceived differently by human populations, the skills and traits that favour their survival may differ across human-altered landscapes.

SESSION: POSTER (33)

## DO WOOD WARBLERS TAKE EXPERIMENTAL CONSPECIFIC CUES INTO ACCOUNT DURING SETTLEMENT?

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Conspecific attraction via location cues appears to be important in the settlement process of many bird species and has mostly been investigated using playbacks to mimic the presence of conspecifics. Song is of central importance for territory defence and mate attraction in many birds, while at the same time provides readily available evidence of conspecific presence. Focusing on pre-breeding cues, settling behaviour of wood warblers on experimental plots with playbacks of wood warbler songs will be compared to silent control plots. We expect that more males will set up territories near experimental plots with playbacks of wood warbler songs than near control plots. Settling in places where other wood warblers are already present (simulated by songs) may increase mating opportunities (i.e. social pairing and/or extra-pair parentage). Individuals settling in response to conspecific playbacks will be closely monitored to assess pairing status and reproductive performance. Knowledge of the fitness consequences for individuals attracted by conspecific playbacks is one of the largest knowledge gaps in our understanding of conspecific attraction in songbirds. However, evaluating these fitness consequences is important for deciding whether conspecific attraction via location cues may be suitable in a management and conservation context.

## HOW DO MICROORGANISMS SHAPE LARK EGGS: MATCHING MICROBIAL COMMUNITIES OF EGGSHELLS AND ANTIMICROBIAL PROPERTIES OF ALBUMEN UNDER TEMPERATE AND TROPICAL ENVIRONMENTS

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Whether related to life-history variation, individual quality or other characteristics, immune function of birds is often explained by, or related to, the microbial pressure posed by the environment. Because it is likely that immune system architecture varies between different environmental conditions, it is now time to develop an independent measure of this microbial pressure that can be included in studies of avian ecological immunology. Thereby, eggs provide us with a simplified model system to study the immune protection against microbes. Indeed, microorganisms are key players in hatching success. Because of their potential for egg invasion, they are considered as a major determinant of embryo mortality. Across two different environments (tropical and temperate), we investigated the match between the antimicrobial properties of albumen and the microbial communities on eggshells from lark species. Antimicrobial properties were assessed by measuring three main proteins: lysozyme, avidin and ovotransferrin. Microbial communities were assessed based on independent-culture methodology, including different procedures to characterize their community structure (PCR-DGGE), abundance (qPCR) and composition (16S rRNA tag pyrosequencing). We carried out these measurement on Kenyan lark species, namely Red-capped lark *Calandrella cinerea* and Rufous-naped lark *Mirafra africana*, and on Dutch lark species, namely Skylark *Alauda arvensis* and Woodlark *Lullula arborea*. More generally, we aimed to link microbiota and immune defences, and to understand how these two components co-varied under two different climates. The combination of microbial and immunological tools should help understanding how immune index variations are concomitant with microbial pressure under different environments, and thus can be applied in field studies of wild birds.

## WHINCHATS *SAXICOLA RUBETRA* IMPACTED BY THE INTENSIFICATION OF FARMING PRACTICES: LESSONS FROM SWISS POPULATIONS

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Long-term monitoring and research on Whinchat populations in Swiss Alpine valleys provide excellent insights into the mechanisms of how intensification of grassland management in the breeding grounds is affecting Whinchat population dynamics. Large-scale censuses in 1988 and 2010 of the Engadine valley, one of the hotspots for the species in Switzerland, showed strong declines in both population density (-46%) and distribution (-17 %). In a number of studies we investigated different aspects of grassland intensification affecting Whinchat demography by comparing breeding characteristics in traditionally managed meadows and intensified grassland fields nearby. In intensified fields, mowing dates advanced by a month within the last 20 years, insect availability was lower and parcel size larger compared to traditionally managed fields. Parents in traditionally managed meadows provided 30% more biomass to their chicks compared to those in intensified fields. However, advanced mowing was the main factor affecting Swiss Whinchat populations: compared to traditionally managed meadows, intensified fields showed a reduction of nest survival from 70% to 8.5% and in an increase in female mortality by 12 % reducing effective population size. Re-nesting rate after nest destruction of the first brood was higher than previously assumed (60% of females), but nest success of replacement clutches was low, still due to the frequent mowing threat. Finally, considering adult survival and productivity, fewer individuals left intensified fields in summer than arrived in spring, whereas in traditionally managed fields 3 times more birds left the area after the breeding season. The mowing event had also strong social consequences. Large-scale mowing destroyed the arrangements of the small territories (average size 3-4 ha) and 70% of the pair bonds. 63% of the birds deserted their territory after their nest was destroyed by mowing and left the study area. Thus, mowing is an anthropogenic induced factor that changes a spatially fixed social system to a highly dynamic and unpredictable one with detrimental effects on productivity and demography. Large-scale intensification results in a population extinction within a few years. This dramatic situation leaves urgent questions unsolved. In particular, we are in need of effective large-scale conservation measures within modern agriculture in grasslands.

SESSION: POSTER (34)

## A LANDSCAPE OF PREY IN THE EURASIAN HOOPOE *UPUPA EPOPS*: CONSEQUENCES OF SPATIAL VARIATION OF MOLE CRICKETS *GRYLLOTALPA GRYLLOTALPA*

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In Switzerland, a major part of the population of the endangered hoopoe breeds in intensified orchards in artificial nestboxes. This population increased in the last two centuries and has reached a plateau with around 100 breeding pairs within the last years. Previous studies indicate that mole crickets, *Gryllotalpa gryllotalpa*, are important prey items that can make up 80% of the delivered biomass. Here, we aim to investigate the relationship between the importance of mole crickets as prey and fitness-related traits in hoopoes. We quantified spatial variation in the food allocation pattern of hoopoes over the whole study area and analysed the importance of this prey on past and current reproduction. Our results show considerable spatial variation of mole crickets over the whole study area, which affected the number of breeding attempts in the past (i.e. occupancy rate) and additionally the current reproductive success. Chicks that were fed with a high proportion of mole crickets were in better body condition and showed a higher fledging rate. Interestingly, the importance of mole crickets was most pronounced in male feeding patterns. Males invest more in offspring food provisioning and mainly fed the larger and older offspring with mole crickets, while females compensated a male's feeding pattern and fed smaller prey items to the younger chicks. These sex-specific feeding patterns are expected to be adaptive where the female's compensatory feeding behaviour will largely depend on a male's ability to provide enough food – in our case mole crickets – to the brood. This study highlights the importance of a single prey species on sex-specific food provisioning patterns and ultimately on the reproductive success of a bird species.

## SEX DIFFERENCES IN PARENTAL CARE OF THE LITTLE BITTERN *IXOBRYCHUS MINUTUS* DURING THE NESTING PERIOD

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The breeding biology of the Little Bittern is not well known, because this species is difficult to detect (as it inhabits dense reed beds, has a low range of vocalization, and a short residence time of chicks in nest). The purpose of this study was to determine if the activity of males and females of the dimorphic Little Bittern differs during the nesting period. Lower parental care of males was expected because this sex protects the breeding territory. The egg incubation, nest improvement (building) and feeding chicks of the Little Bittern were studied in fish ponds in 2011 and 2012. The activity of males and females was monitored in 3 nests using trail cameras. Four breeding periods were determined: 5 days before hatching, 1 day before hatching, 5-6 days old chicks, and 10-11 days old chicks. The activity of males and females in each breeding period was analyzed in two periods: 5-10 am, and 15-20 pm. In total, 1048 min. of observation were analyzed. Differences in the period of egg incubation were found; males incubated eggs in the period 5-10 am, and females in the period 15-20 pm. After chicks hatch, females spend more time on the nest than males. No differences in chick-feeding between sexes were found. Nest improvement and building was made undertaken by males. We concluded that the sexes of the Little Bittern vary in parental care.

## THE RELIABILITY OF THE CMIP5 ARCHIVE FOR ASSESSING THE IMPACT OF CLIMATE CHANGE ON BIODIVERSITY

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Following the inception of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), there is a renewed focus on the adaptation of existing biodiversity conservation strategies to climate change, and consequently the validity of General Circulation Models (GCMs) for such applications. Here, we assess the ability of the Coupled Model Inter-Comparison Project 5 (CMIP5) GCM ensemble to simulate historical observations of the bioclimatic variables that are frequently used in biodiversity and ecosystem impacts studies. We analyse the inter-annual variability of 19 bioclimatic variables, mean seasonal cycle and ability to reproduce observed seasonal minima and maxima for 24 GCMs from the CMIP5 ensemble. Our findings show that for most of the world, temperature variables such as mean annual temperature have the highest GCM agreement with observations. Lower agreement is found for temperature and precipitation variables with a seasonal component, especially in arid and semi-arid locations. The seasonality of monthly precipitation was found to have low model agreement in Central and Eastern Europe, East Africa, Southern Australia and parts of Asia. This was found to be due in part to GCMs not simulating the months of either maximum or minimum precipitation reliably. These results show that in general the CMIP5 ensemble reliably simulates bioclimatic variables, but care needs to be taken in its use for certain parts of the world and certain variables. These results will be made available to conservation practitioners via a protected area information system. We propose that conservation scientists may reduce uncertainties in biodiversity projections by selecting a subset of the most reliable models.

## AVIAN UV VISION AND WINDOW MARKINGS

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Millions of birds are killed each year in collisions with windows. Windows may be stained or coated with markings to mitigate this problem but these measures may obscure the view through the glass or be aesthetically unacceptable. Using markings that are transparent in visible light but form contrasts in UV would represent an elegant solution. UVA is invisible to humans while virtually all diurnal birds can detect reflection and absorbance in this wavelength range. There is little evidence to support that UV as a colour is either a deterrent or an attractant. Therefore the main value of UV markings is probably to alert birds to the presence of obstacles in their flight path. We will discuss the ambient light conditions that affect the contrast and detectability of UV markings and how birds may perceive such markings differently depending on whether they use single cone, double cone or rod based mechanisms of visual perception.

SESSION: POSTER (35)

## NEST SITES OF GREAT *DENDROCOPOS MAJOR* AND MIDDLE *D. MEDIUS* SPOTTED WOODPECKERS IN A PRIMEVAL FOREST: DO THEY DIFFER FROM THOSE FROM OTHER LOWLAND EUROPEAN FORESTS?

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Unique features retained in the primeval parts of the Białowieża Forest (E Poland) (a diverse set of tree species, the presence of old large "veteran" trees, diversity of dead and decaying trees) offer woodpeckers a wide array of possible nesting substrates, much wider than is usually the case in managed woods. We use data on the locations of c 1200 breeding holes of the two most numerous species – *Dendrocopos major* and *Dendrocopos medius* - gathered in the Białowieża National Park in three old growth habitats (coniferous, oak-lime-hornbeam, riverine) in 1975-2012 to see: 1) where they excavate holes in such conditions and, 2) if hole location differs between the species. Finally we compare the Białowieża results with those from other European lowland forests.

## WINTERING AT HOME OR WINTERING ABROAD? PARTIAL MIGRATION HAS CARRY-OVER EFFECTS ON IMMUNE FUNCTION, BODY MASS AND RETURN RATES OF SKYLARKS *ALAUDA ARVENSIS*

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Partial migration in birds occurs when some individuals of a breeding population migrate seasonally to non-breeding areas while other individuals of the same population remain resident year-around. Studying partial migrants offers the unique opportunity to investigate the causes and consequences of migration by comparing migrants and residents from the same population. Such studies can reveal if the wintering strategy, either migration or local wintering, has carry-over effects on the fitness of an individual bird. We analysed stable hydrogen isotopes in claw material to determine if individual Skylarks *Alauda arvensis* were migratory or resident the previous winter. We then compared migratory status to several immune parameters, body mass and reproductive performance in the subsequent breeding season as well as future return rates. We demonstrate that the wintering strategy has carry-over effects on immune function, body mass and future return rates. Resident skylarks had higher haptoglobin concentrations in some years, showed a trend of having lower lysis titers, and had lower return rates over the following winter than migrants. Furthermore residents had higher body mass than migrants, but this difference was partly explained by a difference in size. Reproductive parameters, agglutination titers and wing length did not differ between groups. Future return rates showed roughly the reverse pattern of haptoglobin concentrations, which suggests links between immune function and survival. For 20 individuals we could assign a wintering strategy for multiple winters, and 45 % of these birds switched strategies between winters. Thus, the decision to migrate is not genetically determined but flexible. We conclude that migrating or wintering locally has carry-over effects on immune function, which we hypothesise to increase mortality and consequently result in different return rates after the following winter. Differences in carry-over effects between years probably reflect different evolutionary costs and benefits of both strategies in different years, resulting in coexistence. That resident skylarks have lower subsequent return rates could indicate deteriorated local wintering conditions and thus has important implications for conservation measures for this rapidly declining species.

SESSION: POSTER (36)

## THE EFFECT OF AGE AND SEASON ON HAEMATOCRIT AND DIFFERENTIAL LEUCOCYTE COUNT IN FREE LIVING GREYLAG GEESE *ANSER ANSER*

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Physiological information provided by haematological parameters like haematocrit and leucocyte count can be used for intraspecific studies in various areas of biology, for instance when investigating processes of adaptation to exogenous factors such as season, as well as endogenous ones, such as ageing and sex. Haematocrit can be considered an indicator of health, despite its high natural variation associated with sex and age, whereas the differential leucocyte counts provide information on the relative occurrence of different leucocyte types, which can indicate, for instance, physiological stress situations. The present study considers seasonal variation in haematocrit and blood leucocytes as well as their relationship with age and sex in a free living population of the highly social and long-lived Greylag goose *Anser anser*. The studied birds belong to the flock introduced into Upper Austria by K. Lorenz in 1973: geese are unrestrained and subject to natural predation pressure, nevertheless they are habituated to the close presence of humans, which allows catching of individuals by hand. Furthermore they are individually marked and individuals' life histories have been carefully monitored since 1973 (i.e. social relationships within flock-members are well known). Blood samples were collected from a total of 103 geese of different age (age ranging from 0.3 to 23 years, 30 individuals younger and 73 older than one year), sex (58 males, 45 females) and social status (56 paired males and females, 17 unpaired males and females, 30 young of the year). Depending on the possibility, focal birds were caught between up to three times time over three sampling periods, chosen according to the biologically relevant seasons of the Greylag goose: (1) in summer, after moulting; (2) in autumn (winter flock) and (3) during the mating season before the beginning of the laying period (approx. mid-March). To avoid potential bias due to diurnal variation all geese were caught in the morning between 7:30 and 9:30 am. Leucocytes count was obtained by air-dried blood smears, whereas the haematocrit was calculated as red blood cell volume/(red blood cell volume + plasma volume) from centrifuged haematocrit capillaries. As data collection is still ongoing, definitive results will be presented at the conference. Nevertheless, preliminary analysis of the haematocrit values (HC) allow the following remarks: (1) in the young of the year HC is increasing from fledging in summer until autumn; (2) HC-differences between the sexes are evident during the mating season; (3) social status plays a season-dependent role. Our results provide an integrative picture of the interplay between endogenous factors (age, sex) and exogenous ones (social status, season) in a free roaming avian population. Funded by FWF-Project P21489-B17.

## COMBINING LARGE-SCALE PATTERNS OF BREEDING ABUNDANCE WITH SITE BASED ECOLOGICAL STUDIES IN WINTER AND SUMMER TO IDENTIFY DRIVERS OF POPULATION CHANGE IN WHINCHATS *SAXICOLA RUBETRA*

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The plight of long-distance migrant birds is high on the conservation agenda with a need to understand the major ecological and demographic constraints acting on these species. The whinchat is discussed as a model sub-Saharan migrant bird, which breeds in Europe but has suffered major declines in recent years across its breeding range. The whinchat is becoming relatively well studied so allowing valuable comparisons of context to be made across the species' range, to help identify the drivers of population change. In the UK, analysis of new atlas work shows a large-scale range contraction into core habitats for whinchats. Such patterns are a symptom shown by other declining migrant birds subject to large-scale environmental processes, of which low post-breeding survival is chief among suspects. However, as in other parts of Europe, gross patterns of abundance or range change in the UK are not entirely ubiquitous or necessarily predictable. Breeding populations that buck the general trend offer insights into demographic and environmental constraints on population stability, with the potential to impart important information for conservation action. Here we discuss an example of a stable population of whinchats breeding on Salisbury Plain in the light of current work on whinchat ecology and demographics, with reference to factors operating at other life history stages and at a larger scale. The observation that over a Europe-wide scale, many whinchat populations and other migrant species are declining, suggests that declines might also be associated with wintering or migration. However, the limited data available suggest that the whinchat is a flexible generalist user of anthropogenic habitats on both the wintering grounds and during migration. Nevertheless, because non-breeding site selection for juvenile birds is largely stochastic, average reduction in the quality and availability of habitat during the wintering seasons on the Afro-Palaearctic scale will inevitably drive populations downwards, unless the productivity at smaller scale high quality breeding sites can compensate. Whinchats therefore probably provide a good example of how both local site-based and large scale landscape level demographic factors combine to determine overall population trends, and the need for a multi-scale approach for the conservation of migrant species.

SESSION: POSTER (37)

## DIETARY PREFERENCES OF HOUSE SPARROWS *PASSER DOMESTICUS* IN A PERIURBAN POPULATION PROVIDED WITH A CONSTANT SUPPLY OF FOOD BY HUMANS

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Reproduction is a key period in the life of all birds. At this time, birds allocate most of their resources to breeding. To ensure nestling survival birds need to obtain foods with the best nutritional value. Hence birds are often compelled to change their feeding habits in both the quantity and the quality of food. The objective of this study was to confirm whether birds select different types of food according to its nutritional value and assess whether preferences vary during the year in relation to changes in physiological requirements. An experiment was conducted using a natural population of House Sparrows *Passer domesticus* located at the Complutense campus of the University of Madrid. A selection of food was provided for the birds at a regular feeding site. Each feeder was supplied with a particular nutritional group: carbohydrates, proteins, fats and vitamins. Two hours after sunrise, twenty minutes of feeding activity were video-recorded on seven days between February and June. The video was analysed to score the behaviour of single individuals and their selection of food taken from the feeders during the reproduction period. Significant differences based on the stage of reproduction were predicted. The hormonal changes involved in reproduction, nest defence, copulation, nest building, egg laying and incubation and nestling feeding require increased effort making it possible that increased consumption of energy is required during these stages of reproduction. Moreover males and females contribute differentially to each stage so it would be predicted that sexual differences may arise. As for the type of food consumed, it would be expected that birds select those of the highest calorific value. However, during the early stages of development nestlings mainly need protein for proper growth. Hence adults are forced to change their mainly herbivorous diet to one based upon insects. Therefore, it would be predicted that there would be an increase in the consumption of mealworms coinciding with egg hatching. It has also been reported that some species of migratory birds increase intake of antioxidant-rich fruits to offset the production of free radicals that are produced as a result of the increase in metabolic rate produced by flight. Similarly, it would be expected to detect an increase in fruit intake to compensate for the increase in free radicals produced by the increase in energy expenditure involved in reproduction.

## SPRING MIGRATION STRATEGIES OF AFRO-PALAEARCTIC MIGRANTS WINTERING IN CENTRAL AND SOUTHERN AFRICA AND BREEDING IN BRITAIN

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The sub-Saharan sections of the migrations of several species of Afro-Palaearctic migrants breeding in Britain and wintering in central and southern Africa have been very poorly known until recently, due to low numbers of and biases in ringing recoveries, together with incomplete appreciation of the seasonal distribution of several species. The tracking of individual migrants with geolocators and satellite radio-tags has illuminated the movements of several species south of the Sahara, providing new and unexpected insights. The migration strategies used in spring are of particular importance as they have the potential to strongly influence arrival times of the early-breeding British populations. We present results from the tracking of Common Cuckoo, Common Swift and European Nightjar, three species that use a previously unsuspected stop-over in West Africa en route to Europe - at least the cuckoo and the swift were previously considered to have migrated to north of the Sahara direct from central or even southern Africa. The use of this stop-over occurs during a period when recent drought-breaking rains associated with the northward advance of the Inter-tropical Convergence Zone (ITCZ) have created a burst of invertebrate availability. Since the timing of the rainfall associated with the ITCZ is determined by global climatic systems & ultimately by astronomical events, rather than by local or regional conditions, use of this stop-over has the potential to constrain arrival time advancement by early breeding populations needing to respond to local warming on the breeding grounds. This is particularly pertinent given that the two species under discussion for which sufficient data exists, are both declining strongly and are amongst the species which have advanced their spring arrival on the breeding grounds less.

## THE MEANING OF MAGPIES *PICA PICA* – AVIAN CULTURAL HERITAGE AS MOTIVATION FOR AVIAN CONSERVATION

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Within the ecosystem services framework, birds are assigned an explicit monetary value, and an implicit conservation priority, according to the services they are deemed to provide for human beings. That is, what they *do* for people. What about what birds *mean* to people, quite apart from the utility we derive from them? Arguably, the ecosystem services approach emphasises the cultural *services* provided by birds at the expense of any meaningful consideration of the cultural *significance* of birds. There is a rich cultural heritage surrounding birds among virtually all the world's people groups. Much of this exists as folklore and traditional ecological knowledge (TEK). What might be the value of this heritage for inspiring positive attitudes towards avian conservation, and what might be the implications for conservation education? This study addresses the above questions using the magpie (*Pica pica*) as a focal species in the UK context. The magpie is a widely recognised species in both urban and rural contexts, and is steeped in folklore and tradition. Furthermore, with it dividing public opinion, its focus as a driver for conservation is far from assured. We surveyed the attitudes of 450 10 and 11 year-old schoolchildren towards magpies and their conservation. Classes of children were randomly assigned to one of four groups asked about magpies after receiving: (1) scientific information; (2) cultural heritage information; (3) scientific and cultural heritage information; and (4) no information. Groups one to three received the same total amount of information about magpies. Findings from the survey revealed that cultural heritage information had a significant effect on their attitude towards magpies. We consider the implications for conservation action and education, and make recommendations accordingly. We show that ethno-ornithology can be employed within an experimental paradigm. Furthermore, we suggest that our methodology could be applied to other avian species in quantifying how avian cultural heritage might inspire positive attitudes towards conservation.

## BEHAVIOURAL TRAITS AND THEIR CONSEQUENCES FOR SURVIVAL IN RE-INTRODUCED POPULATIONS OF GREY PARTRIDGES *PERDIX PERDIX*

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Behavioural traits are often correlated and are then referred to as personalities or behavioural syndromes; i.e. an animal keen to explore a novel environment also tends to be less shy across different contexts. The existence of correlated behaviours leads to a reduced behavioural plasticity which could ultimately affect fitness. Whereas a strong selection for a reduced behavioural plasticity can be beneficial in a constant environment, such as captivity, it might negatively influence fitness in a changing environment such as the natural habitat of a species. Distinct behavioural types such as proactive or reactive have also been found to correlate with circulating levels of the glucocorticoids in birds and mammals. However, relationships between behaviour, stress physiology and fitness remain elusive. Within a long term re-introduction project of Grey Partridges in Switzerland we conducted well-established behavioural tests to characterise behavioural traits of 177 individual birds in 16 cohorts in captivity. We measured the survival of these birds after release. We found that behaviours were related to corticosterone levels and that these partly explained survival after release. Our findings highlight important behavioural traits correlated with the survival of released Grey Partridges and also shed light on the underlying hormonal mechanisms.

SESSION: POSTER (38)

## DENSITY AND BEHAVIOUR OF WHINCHATS *SAXICOLA RUBETRA* ON AFRICAN FARMLAND – NO EVIDENCE THAT WINTER HABITAT CONDITIONS LIMIT EUROPEAN BREEDING POPULATIONS

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The Whinchat *Saxicola rubetra* is an Afro-Palearctic migrant undergoing widespread population decline. Whinchats winter in West Africa but there are almost no data on their habitat use and behaviour there that may help to explain the cause of this decline. We measured the density of Whinchats, the habitat characteristics associated with their occurrence on farmland and the relationships between behavioural and habitat variation on farmland around Jos, central Nigeria, over three winters. Whinchats occurred in many fields harvested in the dry season, the density at three sites varying from 0.03 to 0.43 birds per hectare, but were absent from a fourth site. Whinchats were less likely to be found in farmland without particular crops (e.g. structural stem crops such as maize and millet) with more trees, lower amounts of short vegetation (grass, weeds, crops and crop stubble less than 10cm in height), and higher amounts of medium vegetation (coverage of vegetation 10-100cm in height) and litter (dead, unburned vegetation on the ground). Whinchat abundance in areas of farmland where they were present was independent of most variables considered, but density was higher where there was more short vegetation cover. Foraging behaviour did not vary significantly between farmland habitats. All predictors were consistent between seasons, years and across sites. The presence/absence model was very poor at predicting presence and there were no strong predictors of abundance or foraging variation. This is consistent with a species well below carrying capacity within its environment so that many suitable areas do not have birds present and there is little aggregation at better sites. Overall, whinchats were abundant and appeared to have plentiful habitat; densities have probably increased alongside the intensification of agriculture (presence of fallow farmland, short vegetation and structural crops). The results suggest that West African farmland in the dry season can support large numbers of Whinchats and that recent population declines in Europe are unlikely to be caused primarily by lack of suitable wintering habitat within the range of farming intensities occurring within our study site.

SESSION: POSTER (39)

## SPATIAL AND TEMPORAL VARIATION IN THE DIET OF THE GREAT CORMORANT *PHALACROCORAX CARBO* IN NW SPAIN. IS IT REALLY A THREAT TO GALICIAN FISHERIES?

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The Great Cormorant *Phalacrocorax carbo* is an aquatic piscivorous bird, which usually over-winters in European estuarine and fresh water habitats. In the last 30 years, its populations have been increasing, causing severe conflicts with angling and fisheries interests in many countries. However, Great Cormorants have been widely considered a generalistic and opportunistic species, feeding on the most abundant and accessible prey. With the aim of casting light on the above, their diet was studied using pellets collected from two nocturnal roosts of Galicia (NW Spain) between January and April 2005. One of the roosts was located more than 20 km from the coast, with members foraging in a strictly freshwater environment, and the other one was located in the final section of a river with a coastal influence.

A total of 219 pellets were collected from the roost located inland, in which 921 prey from at least 6 different *taxa* were found. The most abundant prey was Iberian nase (*Chondrostoma duriense*) (71.6% of total), followed by Brown trout (*Salmo trutta*) (16.4%) and Chub (*Squalius carolitertii*) (10.6%); the remaining *taxa* represented just 1.4 % of the diet.

74 pellets were collected from the roost under coastal influence, in which 180 prey were found and identified, belonging to a minimum of 10 *taxa*. The major prey were specimens of the family Mugilidae, being 38.3% of the diet, followed by the Iberian nase (*Chondrostoma duriense*) (36.1%). The Brown trout represented just 8.3% of the diet, and there was more evidence of the presence of species of coastal influence with an abundance of 13.9%.

The data obtained did not suggest high predation on salmonids which is attributed to this species in Galicia. The Brown trout did not constitute more than 17% of the diet, not even reaching 9% at the roost with a marine influence. The cormorant showed an opportunistic diet, feeding mostly on cyprinids in the roost inland and on mullets in the coastal roost. Consequently, salmonids could be an important part of the cormorant diet, but it seems likely that this only occurs in areas of high salmonid density.

SESSION: POSTER (40)

## GENETICS AND MORPHOLOGY DRIVE INCIPIENT DIFFERENTIATION IN AN ISLAND COLONIZING BIRD IN THE ABSENCE OF SONG FEATURE STRUCTURE

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Understanding the mechanisms operating in the differentiation of populations is one of the most important topics in evolution. Much of the information available on bird speciation has been obtained by measuring either genetic divergence among taxa or in combination with some ecological features such as physiological, phenotypic and acoustic divergence. Oceanic islands are geographically discrete units, and have not been connected to the mainland. They provide tractable study systems to understand evolutionary diversification processes. The spectacled warbler (*Sylvia conspicillata*) is a sexually dimorphic small passerine (~8.5 g) with a patchy distribution around the Mediterranean basin, but with a broad and common distribution throughout the oceanic Atlantic archipelagos of Madeira, Canary Islands and Cape Verde. The species inhabits open and arid habitats with sparse trees and bushes from the coast to the top of mountains. Despite its wide distribution only two subspecies, separated by slightly different feather colouration, are recognized: *Sylvia conspicillata conspicillata* occurs around the Mediterranean Sea and *S. c. orbitalis* is restricted to the north Atlantic archipelagos (Macaronesia). Males sing a complex song with a variable number of syllables (4-69) that seems to be determined by individual innovation. Therefore, the spectacled warbler appears an ideal species in which to investigate colonization patterns and incipient differentiation in morphology, song and genetic structure among island populations across Macaronesia. The goal of this study is to examine the colonization process of the spectacled warbler in the Macaronesian islands in order to quantify population differentiation driving incipient divergence. We use a combination of morphological, acoustic and genetic (mtDNA and microsatellite) data obtained over a latitudinal gradient of 3,580 km both in the Macaronesian islands and the closest continental areas (North Africa and Iberian Peninsula). We predict some incipient differentiation between insular and continental populations on the basis of the two described subspecies, but we also expect some differentiation among island populations due to the sea being an effective barrier to dispersal. Overall we studied 14 populations (12 islands and two mainland populations). Results provided evidence of incipient differentiation in genetic structure (two groups were identified) and morphology (we found a weak but significant effect of latitude on some morphological traits), However, differences were not due to a differentiation between island and mainland groups. Moreover, we did not obtain any evidence of acoustic structure among populations studied. We discuss the evolutionary consequences of these results.

SESSION: POSTER (41)

## FEEDING RATE NEGATIVELY RELATES TO IMMUNE RESPONSE IN PIED FLYCATCHER *FICEDULA HYPOLEUCA* MALES

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Using video recordings of Pied Flycatchers, which reared chicks to the age of 9-13 days, we evaluated their feeding rates (FR) and the number and size of prey items in each delivered food portion. Male colour type was estimated using Drost's 7-step scale. Unlike many other avian species with monocyclic breeding, the majority of pied flycatchers overlap two energy-consuming processes, breeding and moult. FR was negatively related to mean size of food portion. Moulting males visited their broods less often than non-moulting ones. This relationship was more pronounced in pale males (V-VII morphs by Drost's scale) than in conspicuous males (II-III). FR was negatively related to the strength of experimentally induced humoral immune response, and this relationship also tended to be more pronounced in pale males. As we have previously shown, pale males demonstrate a stronger immune response during moult than conspicuous males. Moulting pale males heightened the antibody titer after immunization, while moulting conspicuous males tended to reduce the strength of immune response. Non-moulting males of different colour types showed the same immune responses. The results of feeding behaviour of Pied Flycatchers suggest that pale males mounting immune responses during the moulting period face critical physiological constraints that could be avoided by lowering energy-consuming activity such as FR.

SESSION: POSTER (42)

## FACTORS INFLUENCING POPULATION AND INDIVIDUAL BREEDING SUCCESS OF PIED FLYCATCHERS *FICEDULA HYPOLEUCA* IN THE MOSCOW REGION

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The Pied Flycatcher breeding population was monitored in the Moscow region during 23 years (1988-2010). The abundance of caterpillars, an important food resource of this insectivorous species, was surveyed in canopies of birch trees from 2002-2010. Long term changes in spring weather conditions, the dynamics of Pied Flycatcher breeding numbers and factors influencing both characteristics of the population and individual breeding success were studied. In contrast to western European study areas, the Moscow region was not characterized by warming springs during the last two decades. Warming in the second half of April (the time of arrival of the first portion of flycatchers) was often combined with a fall in temperature in mid May (the time when first eggs were laid in first nests). A combination of weather conditions in the end of April and in May shaped the population curves of breeding dates. These curves changed from year to year but did not perform any stable trend. The start of mass breeding (when first eggs were laid by the first quarter of breeders) was affected both by temperatures in the first half of May and the value of maximal abundance (peak) of caterpillars, the latter index not being directly related to spring weather conditions. Breeding seasons were longer in the years with delayed peaks of caterpillars. In the models where environmental factors (weather and food conditions) and individual quality of breeders (breeding experience) were included as independent variables, breeding success was mainly affected by environmental conditions.

SESSION: POSTER (43)

## DO CAVITY NESTING BIRD SPECIES PREFER SOCIAL INFORMATION FROM CONSPECIFICS OR HETEROSPECIFICS?

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Social information use is a widespread strategy in the animal kingdom, and it has been shown to affect many important behaviors. Cavity nesting birds are excellent model organisms for studying social information use in natural settings. Great tits *Parus major* use conspecific cues in their feeding and nest site choices. Blue tits *Cyanistes caeruleus* avoid competition with the dominant great tits, and use conspecifics' success as social information in their breeding site choices. Early breeding resident tits are excellent social information sources for migratory collared flycatchers *Ficedula albicollis*. Flycatchers use tits as cues in their breeding habitat, nest-site and breeding effort decisions by copying the choices of good quality tit tutors and rejecting those of poor tutors. Furthermore, flycatchers gather intraspecific social information (density and success of conspecifics) during the breeding season, and use it in their breeding habitat decisions in the following year. In all the three species, age and sex affect social information use. While previous studies have ignored the multiple sources of social information, in this study wild birds were faced with conflicting information from the heterospecifics and conspecifics. Thus, we were able to assess the relative importance of intra- and interspecific social information in these three species. We associated artificial nest-site features (geometric symbols) with the nests of tits and flycatchers. Empty nest-boxes with different symbol types were offered in equal numbers for subsequent birds. Our results demonstrate that the use of con- versus heterospecific social information depends on time of nest-site choice and the numbers of tutoring tit and conspecific individuals in flycatchers. In great tits, old males tended to copy the choices of their conspecifics. Blue tit data suggests avoidance of nest-site characteristics of the competitively dominant great tits. Individuals usually live in multi-species communities and amidst a continuous information flow from con- and heterospecific neighbors, thus our results bring social information use research closer to natural conditions. Our study indicates that birds use social information discriminatively, they prefer intra- and interspecific information in different situations when cues provided by both conspecifics and heterospecifics are simultaneously available.

## SHIFTING BENCHMARKS, FOREST MANAGEMENT, AND THE SIGNIFICANCE OF NICHE VARIATION IN WOODPECKERS: LESSONS FROM THE RED-COCKADED *PICOIDES BOREALIS* AND IVORY-BILLED *CAMPEPHILUS PRINCIPALIS* WOODPECKERS

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Differential niche use among and within woodpecker species is often demonstrated or suggested, but rarely incorporated into forest management for woodpecker conservation. Management plans for troubled species may focus more on compatibility of management with forest resource use and on minimum species' needs than on species' optimum ecological needs. They may also lack needed site-specific flexibility. Using data relevant to the endangered Red-cockaded Woodpecker (*Picoides borealis*) and a review of work on other species, I will focus on the conservation significance of persistent variation in sex-related foraging niches and ephemeral variation in age-specific habitat use. These niche dynamics are also geographically variable and influenced by forest management practices such as fire prevention, use of prescribed fire, and different harvest regimes. Using historical records and specimen data I will extrapolate our understanding of woodpecker niche dynamics to the likely extinct Ivory-billed Woodpecker (*Campephilus principalis*). Management efforts for woodpeckers and our understanding of their niche dynamics, including those of the Ivory-billed Woodpecker, have suffered both from a lack of historical perspective and as a result of shifting benchmarks of public and even scientific perception of forest parameters such as areal extent and configuration, species composition, age dynamics, and the roles of dead and dying trees.

SESSION: POSTER (44)

## THE RELATIVE IMPORTANCE OF EARLIER MOWING AND ARTHROPOD AVAILABILITY ON WHINCHAT *SAXICOLA RUBETRA* POPULATION DECLINE

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Over the last few decades farmland birds in most European countries have been declining at an alarming rate. Such changes have been linked to the intensification of agricultural practices in the second part of the 20th century and have made farmland birds the most threatened group of birds and therefore an issue of major conservation concern. Agricultural intensification has led to changes in grasslands such as an earlier onset of the mowing period and more frequent mowing as well as a decrease in arthropod availability. It is widely acknowledged that such changes are the key drivers for the dramatic decline of ground-nesting grassland birds such as the Whinchat (*Saxicola rubetra*). In this study, the conflicts between the whinchat's breeding cycle, the mowing schedule and arthropod availability are quantified in the inneralpine Goms valley where a last stronghold of the remaining whinchat population resides in Switzerland. Identifying the key threat for this population is therefore of utmost importance in order to target conservation measures. Our study demonstrates that an intensification of grasslands increases the conflict between the breeding cycle of the whinchat and the first mowing event, and simultaneously alters the composition of the arthropod community. When comparing the relative importance of both factors on breeding density and reproductive success, our analyses indicate a stronger effect of the earlier onset of mowing compared to the availability of arthropods. These findings suggest that the mechanical nest destruction due to earlier or more frequent mowing is the primary cause for an initial population crash in whinchats while the excessive fertilization of intensively farmed grasslands changes arthropod community in the short-term, and might lead to a dramatic decline in arthropod abundance on a long-term. Both factors will ultimately lead to grasslands that are not suitable to host sustainable populations of ground-nesting grassland bird species.

SESSION: POSTER (45)

## HOME RANGE, HABITAT PREFERENCES AND NESTING SUCCESS OF LITTLE CRAKES *PORZANA PARVA* ON SMALL MIDFIELD WATER BODIES

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The Little Crake *Porzana parva* is one of the most secretive and least studied waterbird species in Europe. Little is known about its distribution, habitat preferences, breeding success, survival rates and threats. During the last two decades changes in land management in north-eastern Poland and actions associated with small-scale water retention contributed to a rise in groundwater levels and to the restoration of midfield water bodies. Currently, colonization of these habitats by the Little Crake is being observed. Last year, a long-term research project studying the breeding population of the Little Crake at 20 small midfield water bodies in the Mazurian Landscape Park was developed. The main objectives of this project are: (1) to assess the nesting success of birds and main nest predators using camera traps, and (2) to collect data about home ranges and habitat use by birds during breeding season using radio-tagging. In 2012 we monitored 26 Little Crake's nests. The nesting success was 73.1% and the nesting predators were small rodents (probably Water Vole *Arvicola amphibius* or Brown Rat *Rattus norvegicus*) and American Mink *Neovison vison*. We also radio-tracked 17 Little Crakes during the egg incubation period. Home range size of males ranged from 300 $m^2$ to 1500 $m^2$, and home range size of females from 100 $m^2$ to 1200 $m^2$, but neighboring territories didn't overlap. Habitat selection analysis showed that the birds preferred more Cattils *Typha* sp. vegetation than Common Reed *Phragmites australis* in their home ranges, and most of the nests were placed in Cattails. Mean water depth at the nesting site was 54 cm.

SESSION: POSTER (46)

## GPS TRACKING OF THE FORAGING STRATEGY OF SCOPOLI'S SHEARWATER *CALONECTRIS DIOMEDEA* IN THE IONIAN SEA

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Nowadays, modern telemetry tools give information of a high level of accuracy regarding seabird foraging movements at sea. Here we report the first data of tracked breeding Scopoli's Shearwaters *Calonectris diomedea* during the early stages of the chick rearing period on one of the Strofades islands (southern Ionian Sea). Global Positioning System (GPS) loggers (20g, <5% of the bird's body mass**)** storing tracking information were used on 18 breeders between 2011 and 2012. A total number of 12 individual foraging trips of varying degrees of completeness were obtained, showing a success rate of up to 67% per deployment. The stored tracks revealed that the majority of Scopoli's Shearwaters made short foraging movements for food provision to their chicks which lasted one day. Spatial analysis of recordings showed that breeders use mainly four to five different foraging areas in western Peloponnese and Zakynthos Island. The study also provides possible explanations of the tracked foraging activity by using data on meteorological factors so as to evaluate the influence of abiotic parameters on the seabird dispersion at sea.

## VISUAL THRESHOLDS IN BIRDS – BEHAVIOURAL TESTS

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To protect birds from crashing into windows we need to understand how birds see these large transparent or mirroring surfaces. We have used budgerigars as model species to study spatial resolution and contrast sensitivity at different light intensities. I will present behavioural data and compare them to data obtained for other birds. We find that budgerigars, similar to other species, have high spatial resolution, but low contrast sensitivity. This indicates that birds need high intensity differences to see and avoid stationary obstacles. Budgerigars can determine very small colour differences, but have very low spatial resolution for colour patterns that do not provide intensity contrast. We have also studied the spectral sensitivity of budgerigars under conditions with and without ultraviolet light in the background. We find that they have high sensitivity to ultraviolet light, and that this depends on the background colour. However, the differences in bird performance with and without ultraviolet in the background are smaller than expected from theory. The presented data on visual performance of the birds will be the basis of a discussion with the aim to better understand how we can make glass panes easier visible for birds.

SESSION: POSTER (47)

## TO SEE OR NOT TO SEE VOLE URINE: OCULAR TRANSMITTANCE AND UV VISION OF RAPTORS

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Bird vision extends into the ultraviolet range, and it was suggested 18 years ago that raptors can use ultraviolet (UV) reflections from vole urine to find good hunting grounds (Viitala *et al.* 1995). However, how far vision extends into short wavelengths depends largely on the transmittance of the ocular media – most importantly the lens – and hitherto, these properties were unknown for birds of prey. We measured ocular media transmittance in four raptor species, determining the wavelength at which 50% of the light is transmitted and the wavelength below which less than 1% is transmitted. We found these values to be 375/331 nm for Common Buzzards *Buteo buteo*, 369/327 nm for Eurasian Sparrowhawks *Accipiter nisus*, 394/371 nm for Red kites *Milvus milvus,* and 375/327 nm for the Common Kestrels *Falco tinnunculus*. We also measured the reflection spectra from white filter paper and from different substrates including fresh green grass, dry grass and sand that were either dry, treated with water or treated with Bank Vole *Myodes glareolus* or Field Vole *Microtus agrestis* urine. We used these measurements together with published data on cone photoreceptor sensitivities of the common buzzard and sparrowhawk, and established colour vision models to estimate whether it is likely that raptors detect vole urine markings and discriminate them from rain water. We found that vole urine reflects very little UV light on all substrates, that the difference between dry and urine-treated substrate is small even after four subsequent treatments, and that urine-treated and water-treated natural substrates cannot be discriminated by the raptor eye (Lind *et al.* 2013). We conclude that it is highly unlikely that raptors can use vole urine markings to allocate hunting activity to areas with high prey density, and suggest that they probably use other cues.

**Reference**

Lind, O., *et al.* 2013 Ultraviolet sensitivity and colour vision in raptor foraging. *J. Exp. Biol. in press.*

SESSION: POSTER (48)

## EBBA2 – THE SECOND EUROPEAN BREEDING BIRD ATLAS

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Knowledge of the distribution and abundance of organisms is a crucial part of targeting conservation action. The first European breeding bird atlas, published by the European Bird Census Council (EBCC) in 1997, was a milestone in European ornithology. It not only provided national governments and NGOs with a basis to target their conservation efforts, the detailed information in the atlas also proved to be an invaluable and enduring source for scientific studies. However, since data collection in the 1980s, many environmental changes, such as those in land use and climate, have impacted on bird populations across Europe. Data collection builds on the vast network of volunteer citizen scientists and professional ornithologists across Europe, under the guidance and coordination of EBCC. Today, new opportunities have arisen and technologies have been developed, improving our ability to incorporate even the most remote parts of eastern Europe, where very few data were available for the first atlas. Several countries have started national atlas projects in order to provide data to the European project for the main data collection period of 2013-2017. Analysis and production of maps will be carried out in collaboration with specialists of EBCC member organisations, including leading experts in spatial modelling and mapping. This ambitious project will require resources at both the national and European levels. The main challenges lie in covering the vast areas in eastern and southeastern Europe where both human and financial resources are very limited.

SESSION: POSTER (49)

## THE INTERACTION BETWEEN A "LONG GRASS-ADAPTED SPECIES" – THE EURASIAN CURLEW *NUMENIUS ARQUATA* – AND THE STARLING *STURNUS VULGARIS* A "SHORT GRASS" SPECIALIST AT AN AIRFIELD

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The Eurasian Curlew (*Numenius arquata*) is a large wading bird (body mass of male and female can exceed 1kg) which outside the breeding season is typically found on estuaries and comparable coastal wetlands. But, it is also known to feed in fields and recently, from 2006 onwards, it has become a regular, and increasingly numerous, visitor to the grasslands at Dublin Airport, Ireland which is situated approximately 8km from the nearest coastline. Over the 2007 to 2012 interval there have been 8 bird strikes involving the Curlew at Dublin Airport, of which 3 (38%) have caused damage to the aircraft involved. Conventional management protocols including the rigorous implementation of a long grass policy have been largely unsuccessful. An unexpected and unwelcome development has been the fact that the Curlew has attracted flocks of Starlings into the long grass sward – from which they were previously completely excluded- and thereby considerably increasing the risk to moving aircraft. This presentation reviews the development of the Curlew and Starling problem and tests different hypotheses concerning the association between the two species.

SESSION: POSTER (50)

## THE COSTS OF HELPING BEHAVIOUR IN COOPERATIVELY BREEDING SEYCHELLES WARBLERS *ACROCEPHALUS SECHELLENSIS*

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In several animal species, subordinate individuals forego independent breeding to assist others in raising offspring that are not their own. Several benefits underlying the evolutionary stability of such seemingly altruistic helping behaviour have been invoked, and assessment of variation in individual investment in response to variation in such benefits is often being used to reveal the adaptive significance of these benefits. In the Seychelles warbler *Acrocephalus sechellensis*, subordinates gain substantial fitness benefits of helping: individuals that start as helpers have higher life time fitness than subordinates that do not help initially. Nonetheless only about half of the subordinates do help. Using a range of physiological measures, we show here that helping carries a substantial cost. Additionally, only individuals in good condition do provide help, because probably only these individuals can overcome the associated costs. This result suggests that, apart from the associated benefits, variation in subordinates' condition explains part of the variation in helping behaviour. This highlights that considering the condition of the (potential) helper and the costs of helping are important to unravel the benefits of helping, and to understand the variation in the expression of helping behaviour within species.

## GENERIC WIND PATTERNS AND THE CROSSING OF A FORMIDABLE BARRIER, THE SAHARA DESERT

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Wind is an important factor for any migrant as the magnitude of wind generally is very similar to the own self-propelled speed (airspeed) of a flying bird. A bird flying into headwinds will easily spend twice as much time and energy to cover a certain distance compared to windstill circumstances, thus birds have a lot to lose by migrating under headwind conditions. Likewise, a bird exploiting tailwinds can travel almost twice as fast, thus birds have much to win by migrating under tailwind conditions. Several studies have pointed out the similarities between migration routes and generic wind patterns, indicating that species adapt to prevailing wind conditions, and thus that generic wind patterns shape migration routes.

Here I focus on the Palaearctic-African migration system, and in particular on wind conditions during the crossing of the Sahara desert, a formidable barrier for migrants. First I describe general wind patterns in this region, both for autumn and spring. Subsequently I look into two major aspects related to wind and the crossing of a barrier (1) how birds respond to winds during the desert crossing, mainly how they negotiate crosswinds (drift versus compensation) and (2) whether species have adapted their routes to prevailing wind conditions. In my evaluation of these aspects I rely on satellite tracking and geolocator studies.

SESSION: POSTER (51)

## HOW TO MEASURE PARENTAL EFFORT DURING INCUBATION? – A CASE STUDY OF THE REED WARBLER *ACROCEPHALUS SCIRPACEUS*

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Biparental care in birds is less common during incubation than in other nesting phases. In species with biparental incubation, male effort is generally estimated to be lower than his female partner. In many avian studies, the most popular and useful indicator of parental investment during breeding season is time. Incubation is the most time consuming and spatially limited phase in the breeding cycle. Birds must balance demands of self-maintenance activities (foraging, resting) with the need to be sitting and maintaining the eggs at the temperature necessary for embryonic development. Generally, in birds it is considered between 32˚C to 38˚C (as optimal incubation temperature). The Reed Warbler is a small, monogamous, insectivorous passerine bird, breeding in reedbeds. Both sexes participate in incubation, but only the female develops a brood patch. Our research was conducted at "Stawy Milickie" nature reserve (western Poland), during two breeding seasons, from May to July 2009-2010. The main goal was to estimate parental incubation behaviour and to determine if there are any differences in incubation temperature between sexes. We observed nests during 2h observation sessions (behavioural observations) and simultaneously recorded incubation temperature by inserting loggers into the nests (temperature recordings). Considering time spent incubating, females devote on average 1722 s/h, but males also participate in incubation despite their lack of a brood patch. From behavioural observations alone, males are involved in incubation like females, but for less time than his partner. But are behavioural observations the correct way to measure parental incubation performance? Is time a proper indicator of parental abilities to incubate? From temperature recordings, we reported that there are no sex differences in heat provided to the incubating eggs. Both parents maintain eggs at the same temperature, for females it is 33.5˚C, for male 33.4˚C. In conclusion, time doesn`t specify abilities of parents to incubate functionally, by maintaining the eggs at a temperature optimal for embryo development. In spite of lower male Reed Warbler nest attentiveness, he is able to keep eggs at the same temperature level like his partner and thus to ensure appropriate thermal conditions for optimal embryonic development.

SESSION: POSTER (52)

## THE ROLE OF FISH IN HABITAT COUPLING BY RED-NECKED GREBES *PODICEPS GRISEGENA*: EVIDENCE FROM COMBINED STABLE-ISOTOPE AND CONVENTIONAL DIETARY APPROACHES

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Animal consumers confined to a single ecosystem can be subsidized by prey with complex life cycles which migrate across ecosystem boundaries during their life history. In waterbirds, the use of food resources often strongly depends on the presence of fish, since fish can be exploited by birds and can suppress their alternative prey, including allochthonous inputs, as well. We compared the trophic relationships of red-necked grebes *Podiceps grisegena* as top predators of fishless ponds and ponds stocked with common carp *Cyprinus carpio*. We combined conventional methods of diet estimation with stable carbon ($\delta^{13}C$), nitrogen ($\delta^{15}N$) and sulphur ($\delta^{34}S$) analyses of egg components and putative prey of grebes. Foraging grebes were observed to take mainly adult amphibians on fishless ponds and fish on stocked ponds. Alimentary tract analyses gave more weight to invertebrate prey, especially to leaf beetles *Donaciinae*, apparently picked off water or emergent plants. The isotopic mixing models roughly supported the gut content findings, but indicated that leaf beetles contributed significantly to materials used for egg formation only on fishless ponds. Overall, our results suggest that the allochthonous resources (mainly leaf beetles and adult amphibians) were more important for pre-laying grebes in the absence of fish than on fish-stocked ponds. Fish replaced allochthonous prey in the diet, presumably due to being more attractive food for grebes; however, invertebrate trapping indicated that taxa which actively shift habitats can be depleted or scared off by fish. Stronger $^{15}N$ enrichment in albumen and yolk of eggs from stocked ponds compared to fishless ponds indicated that fish presence increased food chain length or otherwise affected nitrogen-transfer through the pond food web. However, the interpretation of stable isotope data can be difficult in the case of opportunistic foragers, which exploit allochthonous prey subsidies in freshwater ecosystems, because stable carbon, nitrogen and sulphur isotope signatures of prey did not distinctively discriminate between terrestrial and aquatic sources. Combining different approaches provided trophic information that would not have been apparent if only a single method was used.

SESSION: POSTER (53)

## DETECTING BEHAVIOUR IN CANADA GEESE *BRANTA CANADENSIS* USING HIGH-ACCURACY GPS AND ACCELEROMETERS

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Many ecological studies are based on a quantitative understanding of what an animal is doing when. Their aim is to understand processes as varied as disease detection, migration timing and anthropogenic effects on fitness and evolution. Visual observations in the field are, up to now, still the standard way of classifying behaviour of wild animals. In this study we examine how far behavioural types can be detected remotely from data collected with a novel GPS and accelerometer tag. The tag is developed within the EU FP7 project E-Track (www.etrack-project.eu), records EGNOS corrected positions up to once per second and provides raw acceleration data at very high frequency. It was tested on ten captive Canada geese *Branta canadensis*, with behavioural observations performed at the same time. The very high data resolution was expected to allow for the detection of small scale behavioural types like preening or feeding. Several algorithms were tested for behavioural detection; they were based on track and accelerometer characteristics and methods previously developed for video analysis. A first stage of ground-truthing behavioural types from accelerometer data revealed clear distinctions of, for example, sitting, walking, feeding and flapping the wings. Those first results point out which behavioural types can be remotely classified for Canada geese using beyond state-of-the-art tracking techniques. A follow-up study of tagging geese in the wild can then use the developed behavioural classifiers to explore time budgets during different times of the birds' annual cycle. This can include migration and stopover in remote areas, leading to new insights of migration timing, energetics and behaviour.

## BREEDING BIRD ASSEMBLAGE DYNAMICS IN THE PRIMEVAL TEMPERATE BEECH-FIR FOREST IN THE WESTERN CARPATHIANS (SLOVAKIA)

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The structure and dynamics of breeding bird assemblages of primeval beech-fir forest in the Šrámková National Nature Reserve, the Malá Fatra Mts., Slovakia were studied during ten consecutive years of 1997−2006. Bird abundances were estimated by the combined version of the mapping method in the 27.5 ha forest interior study plot. Determination of foraging guild structure used an *a posteriori* approach with a numerical analysis of random point observations of foraging birds. In total, 53 bird species were recorded as breeders in the census plot reaching a total assemblage density of 59.45 ± 5.26 SD pairs/10 ha (CV = 8.85%) across all years of the study. One species was characterised as eudominant ($x \geq 10\%$): Chaffinch *Fringilla coelebs*; and six species as dominant ($5\% \leq x \leq 10\%$): European Robin *Erithacus rubecula,* Blackcap *Sylvia atricapilla,* Coal Tit *Parus ater,* Goldcrest *Regulus regulus,* Common Chiffchaff *Phylloscopus collybita*, and Dunnock *Prunella modularis*. A bootstrapped cluster analysis (algorithm UPGMA) of chord distances classified seven groups of species with significantly different group partitions at $\alpha = 0.1$. These groups corresponded to six foraging guild types: litter foragers, herb layer foragers, stream foragers, flycatchers, trunk foragers, foliage foragers and one single species dendrogram branch represented by Willow Warbler *Phylloscopus trochilus*. The mean value of population variability coefficient (PV) of density of the 22 most numerous species was 0.33 ± 0.14 SD (CV = 42.05%), indicating a mean difference in density among years of 33%. The highest fluctuations were detected in plant eaters (PV = 0.47, N = 3) followed by flycatchers (PV = 0.44, N = 3), herb layer foragers (PV = 0.33, N = 2), trunk foragers (PV = 0.33, N = 2), foliage gleaners (PV = 0.29, N = 8) and litter foragers (PV = 0.21, N = 4). Population trends were estimated for the 22 most numerous species by simple linear regression models. Based on criteria of trend classifications, 17 species (77.27 %) showed uncertain trends (confidence interval encloses 1.00 but lower limit < 0.95 and/or upper limit > 1.05) indicating high population fluctuations. Cluster analysis of Pearson's correlation coefficients of species densities showed no consistent grouping according to wintering areas or guild membership. Only seven of 26 simulations by binary null models (9 algorithms, 3 indices) on assemblage level indicated negative associations. None of 9 null model simulations of density assemblage matrix (3 algorithms, 3 indices) showed negative species associations. Similarly, the analysis of species associations (27 simulations, 3 algorithms, 3 indices) in three foraging guilds (flycatchers, foliage foragers, and litter foragers) provided no evidence of negative associations. The results provide no evidence for competition in the structuring of this bird assemblage, but instead support a pluralistic model of community functioning.

SESSION: POSTER (54)

## WHERE DO THE EUROPEAN ROBINS GO?

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The European Robin *Erithacus rubecula* is a partial migrant. All individuals of the Scandinavian population migrate southward whereas only parts of the central-European population leave the breeding area during winter, and British populations are known to be sedentary. The winter range includes northern Africa, the Mediterranean, Great Britain and central Europe as far north as Denmark. However, even after more than 100 years of bird ringing, we still know only vaguely what proportion of which population winters where. The main cause of this lack of knowledge is the low and spatially heterogeneous ring re-encounter probability. We developed a stochastic model that allows for quantification of the continental-wide distribution of different bird populations along the year based on ring re-encounter data while taking into account spatial heterogeneity of ring re-encounter probability. The model quantifies the winter distribution of the different populations.

## LAND-USE EFFECTS ON SPATIAL BEHAVIOUR AND POPULATION DENSITY OF PALEARCTIC MIGRANTS WINTERING IN WEST AFRICA

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Many species of Palaearctic long-distance migrants are declining over much of their breeding range. This may be caused by habitat change in the non-breeding range, either related to climate change or land-use change. Nevertheless, very little information is available on the non-breeding ecology of these species preventing an appropriate assessment of causes. We have radio tracked three species of common Palaearctic passerines in winter in Damongo, northern Ghana in West Africa: willow warbler *Phylloscopus trochilus*, pied flycatcher *Ficedula hypoleuca* and melodious warbler *Hippolais polyglotta*. We provide data on basic spatial behaviour as home-range sizes, home-range overlap and habitat selection (measured as tree species) in a highly disturbed, agricultural site and in a less disturbed, Forest reserve site. We find differences in home-range size and overlap between sites, with considerable variation among species. Willow warblers had larger home-ranges than the two other species and all species had a larger home-range in the disturbed site. Interestingly, density of willow warblers was higher in the more disturbed and open habitat, whereas for pied flycatcher it was higher in the undisturbed site and melodious warbler showed similar density. We relate the patterns to territoriality and habitat selection and discuss inferences on habitat quality of the two different sites.

SESSION: POSTER (55)

## REPRODUCTIVE BEHAVIOUR OF MOUNTAIN CHIFFCHAFFS *PHYLLOSCOPUS SINDIANUS* IN TAJIKISTAN

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We studied the biology and behaviour of Mountain Chiffchaffs *Phylloscopus sindianus* in 2011 and 2012 in the Panj and Ghund river valleys in the Pamir Mountains, where these warblers inhabit riverside thickets from 2300 up to 3500 m.a.s.l. Seventeen nests were placed in sea-buckthorn, wild rose and tamarisk bushes between 13 and 111 cm above the ground. Full clutches comprised 4-5 eggs. The birds are principally monogamous. Each male continues singing in close vicinity to his nest after pair formation, but not above the nest. Nest construction and incubation is by the female only. When females leave the nest during the incubation period, she usually flies directly to her singing partner and forages in his presence. On the day of hatching each female shows nestlings to the male and he starts feeding as intensively as his mate. One male fed nestlings two days after his mate's death. We recorded one case of polygyny when a female became a secondary mate of the neighbour male after her nest was depredated, while the first mate of the polygynous male was incubating a replaced clutch. Polygynous males started singing on two territories, near the nests of his two mates. This case shows that male singing during incubation in Mountain Chiffchaffs is initially addressed mainly to his mate, not to other females. Later this male was seen feeding his fledglings from one nest and nestlings from another nest in the same time. Biology of the *Phylloscopus sindianus sindianus* is unique among other forms of the Chiffchaff complex. Similar to *Phylloscopus sindianus lorenzii* they inhabit thickets in the alpine zone, but tend to breed in river valleys (not on watersheds), they prefer thorny shrubs and have significant male care of the young (which is also a common feature in Canary Islands Chiffchaffs *Phylloscopus canariensis*). The study was supported by the Russian Fund for Basic Research and the Rufford Small Grants Foundation.

## WHERE TO ARRIVE AND WHERE TO GO FROM THERE: DISPERSAL BEHAVIOUR AT SETTLEMENT

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Dispersal is a key life history trait that links individual behaviour to population dynamics. Empirical studies have focused mainly on departure and settlement of dispersal but not on the actual search. Where does, for example, a migratory individual first arrive and how does it begin to search for nest site and partner? Does it sample potential breeding sites and partners until it encounters one that exceeds a set quality threshold, or does it compare between potential sites or partners before selecting the one of the highest quality? Does it use previous information in these behaviours, to prioritise sites that had higher breeding success in the previous season? How extensive is sampling and what is the sampling strategy: does it resemble a threshold quality, best-of-*n* or comparative Bayes strategy? We studied these questions in migratory pied flycatchers, *Ficedula hypoleuca*. By using individually coded RFID tags (microtransponders), we tracked the pattern of nest site and mate search of individuals when they arrive back to the breeding area from the wintering area. This study should provide insights into the links between dispersal and habitat/mate choice.

## TRACKING ADULT NORTHERN GANNETS *MORUS BASSANUS* AT SEA TO INVESTIGATE FORAGING RANGES DURING AND POST-BREEDING IN RELATION TO OFFSHORE WIND FARM PROPOSAL AREAS

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In 2010, 2011 and 2012, 43 adult northern gannets, *Morus bassanus* (hereafter gannet), at the breeding colony on Bempton Cliffs, in northeast England, were fitted with platform terminal transmitters, PTTs, to investigate their distributions at sea, in particular in relation to proposed offshore wind energy development zones, during chick-rearing and the early post-breeding period. The foraging areas used by gannets from Bempton Cliffs were unknown prior to this study. Tracking has revealed a maximum foraging range for Bempton gannets of approximately 300 km, considerably shorter than that exhibited by gannets from the Bass Rock. The 95% kernel density estimates, representing the area of active use, overlapped with wind energy development zones in the North Sea, in all three years. The 50% kernel density estimates, representing the core of the range, extended into the zone closest to Bempton, especially in 2012. Early post-breeding dispersal coincided with several zones. Gannets may be vulnerable to collision with offshore wind turbines because of their generally poor manoeuvrability - they are adapted to use the wind to aid fast flight – and their foraging strategy of plunge-diving from elevations within rotor swept height. Recent studies indicate that gannets may show high levels of flight avoidance around clusters of wind turbines. Nonetheless, it is unclear to what extent gannets may interact with large scale deployment of wind turbines planned in UK and European waters. The UK is host to over 50% of the world population of northern gannets so has a special responsibility to ensure responsible development of offshore wind energy. This study was funded by the UK Department of Energy and Climate Change, as part of its Offshore Energy Strategic Environmental Assessment programme.

## EVOLUTION AND ECOLOGICAL CORRELATES OF FACIAL BRISTLES IN THE CAPRIMULGIFORMES WITH EMPHASIS ON THE NIGHTJARS (CAPRIMULGIDAE)

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Foraging methods and diet choice are major components defining an animal's niche. Within an ecological context, the divergence of foraging methods across environmental gradients may promote or reinforce local adaptation of behavioural, morphological and physiological traits and may ultimately lead to reproductive divergence and speciation. A comparative phylogenetic approach examining the occurrence and functionality of such foraging-associated traits, along ecological gradients, provides an opportunity to test their evolution and function as specific trophic adaptations. Using museum specimens we conducted a morphological investigation of rictal and other facial bristles of 80 species and 13 races from the five Caprimulgiform families with a range of ecologies including insectivorous hawkers, insectivorous sally feeders, ground and foliage feeders, fruit eaters, cavity nesters, cave nesters, tree nesters and ground nesters. We compared various traits including bristle number, length and stiffness and related these to their feeding and nesting ecology. There was a significant phylogenetic effect for many of the variables under consideration, however, after correcting for phylogeny, many remained significant. The traits under investigation varied with general habitat and foraging habitat in different ways but most significantly with foraging habitat density. We found that dense foraging habitats may require facial bristles to be longer and more numerous for mechanical protection of delicate head structures from hard surfaces. Birds foraging in dense habitats were more likely to use sallying, a combination of sallying and hawking, and sallying to the ground and foliage feeding as a mixed-foraging method and this correlated with bristle length and number. Birds which fed more on the ground in dense habitats had a greater range of bristles. Conversely, species feeding in open habitats or at high levels lacked bristles of any kind. Bristles were less stiff in dense general and foraging habitats and therefore stiffness may be related to mechanoreception. Finally, species nesting in cavities had the largest range of facial and head bristles again suggesting a sensory function. We also found that birds feeding on the ground and at various heights possessed relatively large mouths perhaps allowing them to exploit the range of prey they are likely to encounter and species with relatively small mouth areas possessed stiffer rictal bristles but this may be the result of isometric scaling. Global cooling and drying during the paleogene caused forests to retract and grasslands to spread allowing species to colonise more open habitats, adjusting their foraging behaviour from omnivory and sallying to insectivory and sally-hawking resulting in ecological character displacement of facial bristles and speciation within the order.

SESSION: POSTER (56)

## CLASSIFICATION TREES: A PROMISING STATISTICAL TOOL TO ASSESS SITE MANAGEMENT PRIORITIES FOR VULNERABLE SPECIES: THE CASE OF THE EURASIAN BITTERN IN FRANCE

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A major goal of the first National Action Plan for Bitterns in France (2008-2012) was to prioritize reedbeds in need of restoration to improve quality and quantity of breeding sites for Eurasian bitterns. A standardized methodology to characterize reedbeds was developed and applied to 87 sites throughout France, of which 24% had bitterns. Ten criteria were considered for this environmental diagnosis, partially based on field work: (1) site ownership; (2) protection status; (3) reedbed size and landscape structure; (4) reedbed surroundings; (5) management structure; (6) hydrological functioning; (7) water quality; (8) reedbed health state; (9) human uses; and (10) presence of bittern. Dichotomous classification trees (recursive partitioning) were used to improve our knowledge of bittern requirements using field data analyzed according to regions. This non-parametric method is robust for small, unbalanced samples and does not require pre-selection of explaining variables. This analysis allowed us to identify the main management objectives that should be encouraged in order to maintain/increase bittern population. For instance, a reedbed size of 100 ha in densely urbanized/industrialized areas, and of 25 ha in residential areas were identified as threshold values for explaining bittern presence. Each of the ten criteria was further attributed a note varying from 0 to 4 using specific guidelines elaborated based on expert knowledge and scientific literature. For example, reedbed health state was estimated based on homogeneity of reed cover, presence of terrestrial plant species, size of reed stems and the ratio of dry to green stems. Classification trees were again used to evaluate the relative importance of each criteria (from 1 to 9) and of their score (from 0 to 4) to explain bittern presence. The score of each criteria was further transformed into a value of 0 or 1, whether it was associated with bittern absence(0) or presence (1), and then multiplied by the proportion of variance explained by this criteria according to the classification tree analysis. Sites were ranked according to the sum of these new scores to set priority for restoration. This original approach allowed us to give more weight to the criteria that matter the most for bitterns and to correct for the subjectively defined scores that were actually poor predictors of bittern occurrence. The most relevant criteria to predict bittern presence differed according to region and were reedbed area (85%), marsh hydrology (71%) and reed structure (68%). Overall, the two main recommendations arising from this study were to improve carrying capacity of large reedbed sites having a relatively low bittern density (< 1 bittern/10 ha), and to better control water levels (with 10-15 cm from late March to July) to provide suitable breeding conditions at small reedbed sites.

SESSION: POSTER (57)

## MIGRATORY PATTERNS OF THE MONTAGU'S HARRIERS *CIRCUS PYGARGUS* BREEDING IN DENMARK

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Montagu's Harrier *Circus pygargus* populations have been declining in Denmark as well as other places in Europe. The Montagu's Harrier is a long distance migrant that spends most of its life away from its breeding grounds. European breeding populations have been tracked to improve the understanding of migration and space-use in the winter (nonbreeding) area and hereby point out conservation concerns, yet little is known about the population breeding in Denmark. In this study we tracked the migration of nine Montagu's Harriers breeding in Denmark using satellite telemetry. The birds spent the non-breeding season in West Africa from 10.9 N to 17.6 N and 16.3 E to 5.3 W. Most of the tracked individuals chose the western migration route via Spain and used the same route in autumn and spring. They left the breeding area in late August and arrived in the winter area in late September after migrating 5195±93 km. In spring they departed in the end of March and arrived on the breeding ground in mid May after migrating a distance of 5796±204 km, which was significantly longer than in autumn. Each individual had between two and four home ranges in the wintering area and the home ranges established later in the season were located more southwest of the earlier ones. Individuals tracked in multiple years showed high route and winter site fidelity. These findings are similar to those from other North West European breeding birds and we are convinced that the Danish breeders will benefit from the same international conservation actions.

## ENVIRONMENTAL FACTORS INFLUENCE BOTH ABUNDANCE AND GENETIC DIVERSITY IN A WIDESPREAD BIRD SPECIES

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An evolutionary key variable that correlates with population size is genetic diversity, which is of importance for population resilience and ecological processes at the population, community and ecosystem level. Thus, it is crucial to understand how ecological factors influence genetic diversity, but this relationship so far has only been investigated in a small number of studies. Here, we used data from a field study of a common bird species, the house sparrow (*Passer domesticus)*, to investigate the link between ecological factors, local population size and allelic diversity. We studied sparrows outside the breeding season in a narrow and confined, 6 km long valley in southern France, where the landscape is dominated by dispersed farms and small-scale agriculture. Population surveys at 36 locations revealed that sparrows were more abundant in locations with high food availability. We genotyped 891 individuals at 12 microsatellite loci in 12 of these locations. Population genetic analyses revealed a fine-scale genetic structure between locations within the valley, where each locality represented distinct substructure within the study area. Moreover, food availability explained about 30% of the genetic variation found between locations. Thus, our study provides evidence that ecological factors can affect both a population size *per se* and genetic diversity. These findings suggest that the fine-scale pattern of genetic diversity in house sparrows is a consequence of both environmental factors and population ecology. Given the importance of genetic diversity for population resilience, our results may provide a fruitful approach to identify key factors limiting population size and also the conservation potential of populations.

SESSION: POSTER (59)

## IGF-1 AND DEVELOPMENTAL SPEED IN GREAT TIT *PARUS MAJOR* NESTLINGS: A BROOD SIZE MANIPULATION

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In the postnatal period all animals attempt to achieve the best nutritional status possible, which dictates developmental speed and overall condition in the transition to independence. In the laboratory, insulin-like growth factor 1 (IGF-1) and its downstream signalling has been shown to regulate the growth rate of maturing vertebrates by stimulating cell proliferation, differentiation and survival in most tissues. However, very few studies have investigated the functioning of IGF-1 in free-living animals. In this study we used brood size manipulation to investigate how IGF-1 levels, in free-living great tit *Parus major* fledglings, change with age and in different environmental conditions, and how these changes are related to developmental speed. We found that plasma IGF-1 levels were elevated in the middle of the nestling period, when the growth rate is assumed to be most rapid, and declined significantly during the pre-fledging stage. Nestlings in reduced broods gained more weight, had better body condition and also higher IGF-1 levels prior to fledging than those in control and enlarged broods. Our results suggest that IGF-1 varies with different environmental conditions and potentially plays an important role in regulating the growth and development of wild passerines.

SESSION: POSTER (60)

## LOW NEUTRAL GENETIC DIVERSITY IN SMALL ISOLATED INSULAR SPECIES: THE CASE OF THE AZORES BULLFINCH *PYRRHULA MURINA*

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The long-term viability of small populations is generally assumed to be correlated to neutral levels of genetic diversity, although evidence shows viability of several populations with low levels of neutral genetic diversity. Here we test this hypothesis with an extreme case, the Azores Bullfinch *Pyrrhula murina*, one of the most threatened passerine species in islands, confined to the largest island of the Azores archipelago (North Atlantic Ocean) with a small population size for the last century. We found very low nucleotide diversity using several mitochondrial and nuclear genetic markers, consistent with the historical bottlenecks and small population size. The comparison of a set of microsatellites with the sister species shows that despite the very recent increase in population size, genetic diversity remains at the same level of other endangered species. However it was not possible to ascertain whether this low neutral genetic diversity is the result of the bottleneck over the last century or if it is previous to this time scale. These findings are important for the analysis of small isolated species future viability, in the context of current exposure to factors, such as habitat degradation. This also stresses the importance of on-going genomic approaches for assessing functional genetic diversity in populations subject to persistent small population size.

SESSION: Symposium 4 | 28 Aug 2013 | 1150

## RISKS OF IMIDACLOPRID-TREATED SEEDS FOR RED-LEGGED PARTRIDGES *ALECTORIS RUFA*

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The use of pesticide-coated seeds is a very widespread practice that could pose a risk on granivorous farmland birds. The neonicotinoid insecticide imidacloprid is the most used insecticide for seed coating, and constitutes the main risk of poisoning for wildlife species feeding on seeds. Since 2010, we have developed an assessment of the risk of coated seed ingestion on an important game species in Spain, the red-legged partridge *Alectoris rufa*. In order to characterize the direct effects of ingestion of imidacloprid-treated seeds, we conducted two experiments with different doses and exposure times and recorded survival, body condition, and physiological and reproductive effects. Partridges feeding exclusively on seeds treated with the recommended dose of imidacloprid in the first experiment carried out in spring (10 days of exposure) showed a loss of body weight, altered biochemical parameters, increased oxidative stress and reduced carotenoid-based coloration. In the second one performed in autumn, such exposure was lethal for all partridges (n=32) after 21 days (with the first casualty recorded the third day of exposure). Imidacloprid exposure also reduced the fertile eggs rate (55% vs. 85% in controls) and increased chick mortality at day 32 post-hatching (70% vs. 34.6% in controls). On the other hand, we have studied the risk of exposure through a feeding trial with four experimental groups (n=4 pairs/group): untreated seeds only, treated seeds only, treated and untreated seeds without shifting the position of feeders between days, and treated and untreated seeds shifting the position. Partridges offered both kinds of diet clearly rejected imidacloprid-treated seeds, although their consumption tended to increase when the location of the feeders was shifted (14.77±6.32 vs. 7.3±4.2 % of total consumption). In another feeding trial, we have seen lower food consumption when treated:untreated grain was offered *ad libitum* in an increasing number of feeders (1:1 to 8:8), which may respond to the refusal of food under an unpredictable scenario of toxic grain availability. When offered only treated seeds, average daily consumption was 7.77±1.72 g / partridge, which is about the half of the $LD_{50}$. Actually, one of the partridges ate 18 g in the first day of experiment and was found dead the next day. In conclusion, although partridges reject imidacloprid when they have an easily accessible untreated alternative, they may feed on small amounts that can exert severe toxic effects. In order to minimize risks posed for imidacloprid-treated seeds on farmland birds, it is essential to preserve margins and patches with natural vegetation to provide a clean food source for animals. Furthermore, given the high toxicity of the insecticide for wild birds, it seems recommendable, if possible, to replace it by less toxic alternatives.

SESSION: POSTER (61)

## BREEDING SUCCESS OF SKYLARKS *ALAUDA ARVENSIS* NESTING IN PESTICIDE-TREATED CROP FIELDS COMPARED TO THOSE NESTING IN NON-TREATED AGRICULTURAL LAND

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Over the period 2007 – 2012, the nests of 83 skylarks breeding in either pesticide-treated arable crop fields (winter wheat, spring cereals or oilseed rape) or non-treated grassland habitats (organic, conventional or alfalfa) were located and observed. In each case, the development of the brood was documented and various brood parameters recorded until the nest was either lost or the chicks had fledged and breeding success could be confirmed. The use of pesticides (pesticide type, active ingredient, concentration and number of applications) was recorded for each of the treated fields harbouring skylark nests. Up to eight pesticide applications were made to the treated fields. Predation was found to be the main cause of nest failure in the treated crop fields. In the grassland habitats, the majority of nest losses were due to mowing activities carried out on these areas.

## PHYSIOLOGICAL CONDITIONS INFLUENCE STOPOVER DECISION DURING MIGRATION IN BLACK REDSTART *PHOENICURUS OCHRUROS,* EUROPEAN ROBIN *ERITHACUS RUBECULA* AND WHINCHAT *SAXICOLA TORQUATA*

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During migrations, birds spend a considerable amount of time at stopover sites to refuel and recover from the fatigue of long flights. However, stopover in itself is expensive in terms of energy and time loss, therefore birds are thought to minimize the stopover duration, which depends on environmental factors, endogenous programmes and physiological conditions of birds. In previous studies on garden warblers *Sylvia borin*, which are long-distance migrants, we found that birds that are in good conditions minimize stopover duration whilst birds in poor conditions extend the duration of the stopover. This set of data based on telemetry and recording of nocturnal restlessness confirmed a number of previous studies that had reported a strong correlation between condition indicators such as subcutaneous fat and estimated stopover duration. As the role of physiological conditions on stopover decision in short-distance migrants is less known, we asked what relationship exists between condition and migratory behaviour in birds that migrate for shorter distances overall. We focused on three short-distance migratory passerines: black redstart *Phoenicurus ochruros,* robin *Erithacus rubecula* and stonechat *Saxicola torquata*. The study was conducted on the island of Ponza in the Tyrrhenian Sea during spring migration. In nocturnal migrants, the extent of migratory disposition is reflected in captivity by the intensity of nocturnal restlessness (Zugunruhe). Thus, we estimated the migratory disposition and the duration of stopover by measuring the intensity of Zugunruhe of birds that had been caught in the morning of the same day. We calculated an index of physiological conditions by applying principal component analysis (PCA) to body mass, fat score and muscle score as recorded at capture. Our results reveal that the physiological conditions predict the intensity of Zugunruhe: birds in poor conditions show low Zugunruhe, whereas birds in good conditions show the opposite pattern. Therefore, our results provide evidence in support of the hypothesis that the amount of energy reserves plays a major role in determining the stopover duration in short-distance migrants, in a manner similar to that described for long-distance migrants.

SESSION: POSTER (62)

## MANIPULATION OF PARENTAL EFFORT AFFECTS PLUMAGE BACTERIAL ASSEMBLAGES IN PIED FLYCATCHERS *FICEDULA HYPOLEUCA*

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Recent work has suggested that plumage microorganisms play an important role in shaping the life histories of wild birds. Intensive parental care in birds can result in a reduction of self-maintenance and preening behaviour and therefore might affect the dynamics of microorganisms living on feathers. However, experimental proof for this is almost entirely lacking. We manipulated the parental effort of wild breeding Pied Flycatchers *Ficedula hypoleuca* females by modifying their brood size or temporarily removing male partners. The density and species composition of bacterial assemblages was estimated using flow cytometry and pyrosequencing techniques. We expected that experimentally decreasing or increasing parental effort would affect the feather sanitation behaviour of females and therefore also the bacterial assemblages on their plumage. In accordance with this expectation, manipulation affected the density of free-living bacteria: females with reduced broods had the lowest number of free-living bacteria on their feathers, while females without male partners had the highest. However, manipulation had no significant effect on densities of attached bacteria. Manipulation also affected the species composition of plumage bacteria. Besides the effect of parental effort, we found a significant effect of breeding habitat: bacterial densities were higher in females breeding in deciduous than in coniferous habitat. Our results confirm that a trade-off between self-maintenance and parental effort affects plumage bacterial assemblages in birds. Such a trade-off may have significant effects for avian life-history, as some bacteria may act as pathogens and thereby reduce individual fitness.

SESSION: Symposium 5 | 29 Aug 2013 | 1150

## DIFFERENTIATING STOPOVER AND STAGING SITES FOR LONG-DISTANCE MIGRATORY SHOREBIRDS: LENGTH OF STAY AND FUEL DEPOSITION OF GREAT KNOTS *CALIDRIS TENUIROSTRIS* IN THE YELLOW SEA

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Migratory birds require stopover sites for resting and staging sites for refuelling along their migration. Length of stay and fuel deposition are two indices for differentiating between stopover and staging sites. Using the great knots *Calidris tenuirostris* as a model species, we compared the length of stay and fuel deposition of long-distance shorebird migrants at two sites in the Yellow Sea: the Chongming Dongtan Nature Reserve (CMDT) in the south and the Yalujiang Nature Reserve (YLJ) in the north. Radio-tracking and bird capture confirmed that great knots stay a short period (mean stay of 2.2 days) and their mean body mass did not increase at CMDT, while birds stay for 1 month (mean stay of 31.0 days) and their mean body mass nearly doubled at YLJ. Fuel consumption models suggested that great knots departing from YLJ but not from CMDT can make a nonstop migratory flight to the breeding grounds, i.e., birds departing from CMDT must refuel in the north Yellow Sea. The results indicate that both the north and south Yellow Sea are areas of conservation priority: the north serves as the critical refuelling site while the south serves as temporary stopover site that enables birds with low fuel stores to arrive at the refuelling site. The short length of stay of individuals relative to the long migration periods indicates that the turnover rate at CMDT is rapid and that many more birds use CMDT and similar stopover sites than are indicated by peak number counts. The study shows that even long-distance migratory birds that accumulate large fuel stores at particular staging sites require the integrity of multiple stopover sites.

SESSION: POSTER (63)

## WHEN A MALE CHANGES HIS WAYS: SEX DIFFERENCES IN FEEDING BEHAVIOUR IN PIED FLYCATCHERS *FICEDULA HYPOLEUCA*

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Although sexual dimorphism is a well-known phenomenon, several aspects of it remain unresolved. For example, it is not clear how environmental conditions influence sexual dimorphism, especially in behavioural traits. In a study of Pied Flycatchers *Ficedula hypoleuca* we tested whether there are differences in the composition of food brought to young by the different parents, and whether such sex differences are dependent on the hunger level of nestlings. We found that in normal feeding conditions, female parents provisioned nestlings with relatively more food collected from the tree canopy (caterpillars), while males brought more food caught in flight (adult Lepidoptera). To imitate a temporary worsening of environmental conditions, we experimentally increased the hunger level of nestlings. Male parents responded to this manipulation by changing their foraging behaviour such that the sex difference in provisioning behaviour diminished. Possible explanations for the observed sex differences are discussed. This result is in accordance with the general pattern previously found for sex differences in animal size and certain other traits – namely that sex differences tend to diminish in harsh environmental conditions. It is possible that a decrease in sex differences in harsh conditions represents a more general pattern than previously assumed.

## FLYWAY-SCALE RESEARCH TO IDENTIFY CAUSES OF POPULATION DECLINE IN THE WOOD WARBLER *PHYLLOSCOPUS SIBILATRIX*

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The Wood Warbler *Phylloscopus sibilatrix* is an Afro-Palaearctic migrant that breeds throughout northern and temperate Europe, while the entire population spends the non-breeding season in tropical Africa. It has seen population declines of 33% during 1980-2009 (PECBMS 2011), categorising it as a Species of European Conservation Concern. The declines could be caused by factors in either the breeding or non breeding areas, so a coordinated flyway-scale approach has been adopted, combining research in both. In the UK, although there have been concomitant changes in habitat and bird numbers since the 1980s, there is little evidence to suggest that such changes in habitat have driven the Wood Warbler's decline. Despite variation in invertebrate abundance, historically, between sites and seasonally, this appears to have little impact on chick weights or fledging success, with birds able to adjust timing of breeding to coincide with peak caterpillar abundance. In one region of the UK, nest mortality rates were shown not to have changed since the 1980s; however, comparison of nest mortality in different regions with differing population trends suggests that low nest success, mainly through predation, may be having a local effect. At the same time, research has been underway in the non breeding areas. Survey data collected during 2009-2012 have been used to construct Maximum entropy (Maxent) models of potentially occupied areas in Ghana. Although work is still ongoing, preliminary results indicate that they may possibly be restricted to a relatively narrow band of suitable habitat stretching across the Guinea savannah/forest transition zone. Extensive searches have been conducted within these areas to identify sites and habitats that appear to be important for the species, with focussed autecological research now established at one of these. Retrodictive models have been built to investigate potential changes in the extent of suitable habitat in Ghana. Maxent model predictions may offer a reasonably fair reflection of the probable over-winter distribution of the species in Ghana, particularly given the species observed habitat preferences. The latest results of this ongoing research programme are presented here.

SESSION: POSTER (64)

## THE ATTRACTION OF GREAT TITS *PARUS MAJOR* AND BLUE TITS *CYANISTES CAERULEUS* TO HERBIVORE-DAMAGED PINES

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Recently, it has been shown that herbivore-damaged birches (*Betula* spp.) may "cry-for-help" from vertebrate predators such as birds, either through visual or olfactory cues. But is that tritrophic interaction true only for deciduous trees or can coniferous trees also communicate with insectivorous birds? With the laboratory experiments in our study, we show for the first time that great tits *Parus major* and blue tits *Cyanistes caeruleus* (N=94) can respond to herbivore-induced changes in coniferous trees when foraging for prey. In an experimental set-up inside a study booth (1.0 × 1.0 × 1.7 m), a naive bird caught in the wild had 15 minutes to visit two branches (ca. 70 cm tall) of Scots pine *Pinus sylvestris*. One branch previously had larvae of pine sawfly *Diprion pini* on a lower part of the branch, but that part was cut off before the experiment. The other branch had never had any larvae but as a control we also cut off a similar size of the lower part of the branch. Thus, the bird experienced two branches of which one (the "herbivore branch") showed systemic induction of larval herbivory. All experiments were video-taped and analysed with regard to the following response measures: first choice (on which branch the bird went first after calming down), number of visits and time spent on either branches. The results show that birds were significantly more attracted to the herbivore branches than to the control branches. In addition to vision, birds can recognize the herbivore-damaged branches also by olfactory cues. We collected herbivore-induced plant volatiles (HIPVs) from the pine branches with and without larvae. The collections were done both from the herbivore-damaged part and from a systemically induced part of the branch. The HIPVs emitted by the systemically induced parts of the herbivore branches were (*E*)-β-farnesene and α-farnesene. Thus, these could possibly be the cues that the bird uses to recognise herbivore-damaged pines.

## HYBRIDIZATION ZONE BETWEEN EASTERN EUROPEAN CHIFFCHAFF *PHYLLOSCOPUS COLLYBITA ABIETINUS* AND SIBERIAN CHIFFCHAFF *PHYLLOSCOPUS (COLLYBITA) TRISTIS*

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The presence of gene flow between Siberian and Eastern European chiffchaffs has been debated for decades and still attracts the attention of researchers. In our earlier works, we obtained evidence for the gene flow and hybridization between subspecies based on comparative analysis. Here we present an extensive analysis of our data collected in two parts of the hybrid zone: southern (the Southern Urals) and northern (Arkhangelsk region) areas. We considered data on phenotypic (plumage colouration), acoustic (territorial song) and genetic (mtDNA, cytochrome b) traits. We discovered *tristis* haplotype dominance and we hypothesize its active introgression into the population. Classifying the hybrid zone population based on plumage colouration, we found an equal percentage of Siberian (34%), European (37%) and hybrid (28%) individuals. Here we define hybrids as birds with very little amounts of yellow on the ventral side of the body in comparison with plenty of yellow in *abietinus* and absolutely no yellow in *tristis*. In contrast, the *tristis* haplotype dominates in the hybrid population: 41% of individuals classified as hybrids or *abietinus* by colouration have mtDNA of the Siberian chiffchaff. Thus, we hypothesize that *tristis* mtDNA tends to replace *abietinus* in the hybrid zone, while phenotypic traits of *abietinus* are kept intact in the population. A similar tendency was found for acoustic traits: Siberian song clearly dominates in the population. In the hybrid population, besides *tristis* itself, phenotypic hybrids mostly sing the Siberian song and even 21% of *abietinus* perform it. On the contrary, the European-type song was not encountered among pure *tristis* individuals. Moreover, vocal repertoire analysis revealed that mixed singers incorporate into their song most of vocal elements typical for *tristis*, but use only a fraction of the vocal repertoire of European chiffchaffs. Studies of the subspecies distribution within local populations in the southern part of hybrid zone revealed a sharp geographical boundary in the distribution of Siberian chiffchaffs. Geographically, this boundary coincides with the Zilmerdak mountain ridge, and *abietinus* prevalence changes into mixed population over only 15 km. In contrast, no such boundary can be identified for at the Northern part of the studied region. It remains an open question whether the same boundary exists in the north or whether it is unique to the Ural population. There are some facts supporting the latter. The Zilmerdak ridge takes most of the precipitation and as a consequence splits different forests types, creating an ecological boundary. Finally, our new data on subspecies distribution from the Northern Russia can be used to refine the boundaries of the contact zone. The most intensive hybridization occurs in central and eastern parts of Arkhangelsk region. Slightly to the south the contact zone includes southern parts of Komi republic, which is mainly inhabited by Siberian chiffchaffs.

## HUMAN ARTEFACTS THROUGH BIRDS' EYES

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The introduction of human artefacts into natural environments has presented many problems for birds. Many of these problems seem to arise from the ways in which birds extract information from their environments. Although all animals share the same planet they clearly inhabit different worlds. These worlds may differ both fundamentally and subtly between species, and especially between birds and other taxa, including humans. However, there is now sufficient information to combine insights into the visual worlds of birds, and knowledge of the behaviour of birds in their natural environments, in order to understand and ameliorate the problems that are faced by birds due to the introduction of human artefacts. These include glass panes, artificial lights and objects that intrude into the open air space. The need for caution in finding simple, or all embracing, answers to these problems is made clear by understanding the many subtle differences in visual capacities between birds. These differences arise due to the complex evolutionary history of birds and the subtle levels at which retinal structures, visual optics and visual fields, appear to have been the subject of natural selection in response to the many varied perceptual challenges faced by birds in their natural environments.

SESSION: POSTER (65)

## DIFFERENTIAL SPATIAL USE AND SPATIAL FIDELITY BY BREEDING BONELLI´S EAGLE

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Bonelli's eagles *Aquila fasciata* have suffered an intense decline throughout Europe in recent years. Spain holds 65 percent of the European population but high mortality rates due to electrocution and poisoning are found for this species. The decline of Spanish populations may have an intense effect on European populations so it is very important to understand spatial ecology of populations, in order to manage this species correctly. Our study population is located in Aragón, Northeast Spain. To asses the movements of this population, 17 breeding birds were equipped with GPS and tracked over 7 years. GIS was used to calculate home ranges and other spatial parameters (kernels at different levels), for example, core area or nesting area. Three periods over the annual cycle were established in order to assess differential spatial use over the year. The aim of this study is to determine the differences between the size of the home range and other parameters among individuals throughout the years and determine if individual use of space is mediated by sex or period of the annual cycle. In addition the degree of overlapping of home ranges and other parameters has been calculated to define the fidelity of individuals to a particular territory. In this population, there are individual variations in size and use of the home ranges, but no interannual variations for the same individual were found. In addition high fidelity rates to home ranges have been found in consecutive years (around 70 percent). This type of study provides useful information about spatial use which can be applicable to the conservation of the species and is important in improving the status of populations. Ultimately, these results can be applied to improve management of this species in Aragon, where a Conservation Plan is being carried out.

SESSION: Symposium 13 | 29 Aug 2013 | 1130

## INDIVIDUAL DIFFERENCES IN METABOLIC RATE PREDICT THE WILLINGNESS TO FORAGE UNDER INCREASED PERCEIVED PREDATION DANGER IN GREAT TITS *PARUS MAJOR*

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Individuals from the same population often differ consistently in their behaviour, a phenomenon known as animal personality. One behaviour that is commonly studied in an animal personality framework is boldness, or an animal's willingness to expose itself to 'risky' situations, such as those involving an increased exposure to predators. It has been suggested that variation in boldness is maintained via a fitness trade-off, with bolder individuals having higher annual reproductive output but lower survival. However, the underlying cause of individual variation in boldness remains unclear. Here, we test the hypothesis that boldness in a foraging context is a function of an individual's energetic needs. We used basal metabolic rate as a measure of individual energetic requirements because basal metabolic rate differs several-fold among individuals from the same population, is repeatable, and represents a substantial portion of an individual's daily energy budget. We predicted that individuals with higher metabolic rates should be consistently more willing to expose themselves to increased predation risk while foraging compared to individuals with lower metabolic rates. We tested this prediction in a population of wild great tits (*Parus major*). We screened individuals for basal metabolic rate and performed manipulations of perceived predation risk at fixed feeder locations. The latency to return to a feeder after a simulated encounter with a model predator (sparrowhawk, *Accipiter nisus*) was used as our measure of risk-taking, with shorter latencies representing greater risk-taking. Consistent with our prediction, we found that higher metabolic rates were associated with shorter latencies to return to feeders following predator encounters. This result suggests that individual differences in risk-taking behaviour are at least partially underpinned by individual differences in energetic requirements. We will also use 4 years of breeding and winter re-capture data to evaluate whether variation in boldness is maintained in our study population via a trade-off between reproduction and survival.

SESSION: POSTER (66)

## INCUBATION PATTERN IN RELATION TO NEST CHARACTERISTICS IN THE PIED FLYCATCHER *FICEDULA HYPOLEUCA*

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Avian nests show considerable variation at the intra-specific level. It is hypothesized that differences in nest characteristics such as its size may translate into differences of its thermoregulatory properties. Larger nests are expected to provide better insulation for incubating parent(s), eggs and nestlings than smaller nests. To date, the consequences of nest size with respect to its thermoregulatory properties have been primarily studied in relation to incubation length and hatching success. If size of the nest is associated with the magnitude of egg temperature fluctuations, it may also affect the behaviour of incubating parent(s). Larger nests should better buffer such fluctuations, and consequently allow incubating parent(s) to take longer off-bouts. This should be especially important in species with uniparental incubation. We examined the patterns of incubation in relation to nest size in the small migratory passerine with female-only incubation – the Pied Flycatcher. Nest mass and its volume measured at the beginning of the incubation period were used as an estimate of nest size. Incubation behaviour was monitored with temperature data loggers placed beneath the eggs in the centre of the nest cup. The logger records of on- and off-bouts were validated with video recordings. The results are discussed in the light of thermoregulatory properties of the nest and the consequences of female incubation patterns for subsequent stages of the nesting cycle.

SESSION: POSTER (67)

## DOES LOW ILLUMINANCE LIMIT HOLE USE BY COLLARED FLYCATCHERS *FICEDULA ALBICOLLIS*?

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The pattern of tree hole use differs among non-excavators. Though holes with narrow openings appear to be safer, they are not equally often used by all the bird species, even in primeval conditions where the birds have access to a wide spectrum of superabundant holes. Long-term observations on tits and flycatchers carried out in primeval Białowieża Forest (E Poland), show that Collared Flycatchers *Ficedula albicollis* usually occupy holes with entrances larger than the tits and larger than their body size would allow. They also lose more broods due to predation than the tits.

One of possible factors which could hinder usage of holes with small openings by Collared Flycatchers could be insufficient cavity illuminance (creating problems with seeing and feeding nestlings). Presumably the flycatchers are less well adapted to operate at low light levels than the tits.

We test this hypothesis using data on light intensity measured at the nest level in Collared Flycatchers' cavities, and comparing them with those observed in Marsh *Poecile palustris* and Great Tits' *Parus major* cavities. We expect that Collared Flycatchers 1) control the amount of light reaching the nest by adjusting the nest distance from the entrance (by building nests of appropriate size) to the opening size, and 2) start feeding young at higher internal light conditions than the tits. To best of our knowledge these are the first data on light intensity in cavities of Collared Flycatchers ever made.

SESSION: POSTER (68)

## EAGLE MIGRATION AND WIND FARMS IN EGYPT – A STUDY USING GPS SATELLITE TELEMETRY

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Many of the world's migratory bird species are in decline, their populations eroded by a great variety of environmental and other pressures. Their conservation is going to necessitate a coordinated political response on a global scale. One framework potentially capable of shaping and steering this response, at the same time elucidating the strategic needs of migratory soaring birds, is their system of migration routes (flyways). The Rift Valley/Red Sea flyway is the second most important flyway for migratory soaring birds in the world and the most important route of the Africa - Eurasia flyway system. Each year over 1.2 million birds of prey and 300,000 storks migrate along this corridor between their breeding grounds in Europe and West Asia and their wintering areas in Africa. In total, 37 species of soaring birds, 5 of which are globally threatened, regularly use the flyway. Despite the fact that several sections of the flyway are undergoing a period of rapid development the level of conservation attention they receive during their migration approaches zero. Migrating birds become especially concentrated - creating a 'bottleneck'-, wherever the flyways are compelled to cross seas or mountain ranges. This concentration makes soaring migrants highly vulnerable at these points. This study focuses on the eastern sector of the African-Eurasia Flyway (Red Sea Flyway) in Egypt, which is possibly the most significant corridor for bird migration in the world. Egypt has emerged during the past few years as a regional leader in the field of wind power exploitation in electricity generation in the Middle East and Africa. Several areas are eligible for hosting the establishment of large-scale wind energy projects. More than 8000 square kilometers of desert lands have been allocated for implementing future projects. Satellite telemetry and GPS/GSM data loggers are ideal tools for tracking migrating birds. In the course of long term projects conducted since 1992 we have marked over 100 Lesser and Greater Spotted Eagles (*Aquila pomarina*, *A. clanga*) as well as Steppe Eagles (*A. nipalensis*) with satellite transmitters. Most of these birds use the Red Sea flyway on their migrations between Eurasia and Africa. The interaction between birds and wind turbines is an important factor to consider when a wind farm is projected, planned and constructed. Whereas counts of migrant raptors have been carried out at various localities the migration routes of eagles and other raptors along the Red Sea have not yet been investigated in any depth. In this study, mainly on the basis of GPS fixes of these migrating eagles, we describe the routes taken by these eagles and try to assess the collision risk they run with both existing wind power plants and those planned or under construction along the Gulf of Suez where migrants concentrate in high densities.

SESSION: POSTER (69)

## DO SATELLITE-TRACKED EUROPEAN HOBBIES *FALCO SUBBUTEO* FOLLOW THEIR PREY SPECIES DURING MIGRATION?

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The Hobby breeds across Europe and Asia and is a long-distance, trans-equatorial migrant. European birds winter in central and southern Africa. Only a small number of birds are observed at the well-known bottlenecks. A total of 5,720 Hobbies were ringed in ten European countries between 1909 and 1998 of which 203 (3.5%) were subsequently recovered, although none south of the Sahara Desert. We are aware of just two ring recoveries after 1998 for this falcon species south of the Sahara. In 2008-2012 we fitted 17 German adult Hobbies with 5 g satellite transmitters. For the first time in a study a number of small falcons were also fitted with satellite transmitters for spring migration. In 2009 the first such bird, an adult female, spent 49.3% of the year in its wintering area, 7.2% on spring migration, 32.3% in the breeding area and 11.2% on autumn migration. In this year the bird spent 65% of the year in Africa and only 35% in Europe. In most cases the Mediterranean was not crossed non-stop. On autumn migration in particular the birds stopped over on islands, presumably to catch other small migrant birds. In autumn the Sahara and Sahel regions were crossed on a broad front some 2,800 km wide. The winter was spent in the less-densely wooded areas of southern Angola and Zambia north of the Kalahari, but also in the north of Namibia, Botswana and Zimbabwe. In several cases four complete annual migrations were recorded by satellite telemetry. The migration routes in spring were often well to the west of the autumn routes. The reason for this is unclear. One contributory factor to the routes chosen by the falcons could be the migration tracks of Barn Swallows, House Martins, Common Swifts and other important prey species. The African equatorial rainforest appears to be a significant ecological barrier. Migration was noticeably rapid there with distances of up to 580 km flown per day – also in part at night. Migration at night was recorded repeatedly while crossing the Sahara and rainforest areas, but also in the Mediterranean. In one case a pair of Hobbies was fitted with transmitters. In 2011 the pair produced three young that did not however fledge. In 2012 both falcons occupied the same nest and reared one young bird that subsequently fledged. The migration routes of the two birds were completely separate. The female left on migration before the male and, regardless of the breeding success, departed at almost the same time as the year before. In the previously unsuccessful breeding season however it remained several days in the wider area of the nest. After fledging the male alone provided for the young bird for some length of time. The previous unsuccessful season it departed on migration considerably earlier. At the present time (February 2013) five falcons still have their transmitters, including a female that has carried it for 2 ¾ years.

SESSION: POSTER (70)

## SATELLITE TRACKING OF ADULT GERMAN OSPREYS *PANDION HALIAETUS*

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Central European Ospreys are long-distance migrants. With respect to Ospreys breeding in Central European Germany, practically nothing is known about their migration, in particular the exact migration process, speed, resting areas and wintering habitats. We fitted 28 adult Ospreys in North Germany with satellite transmitters (PTTs) during 1995 to 2001, as part of an on-going study. Since 2007, 17 transmitters with GPS location devices were used, which also provide information on flight height, direction and speed. Only these latter data are evaluated here. The transmitters on the Ospreys were active for up to five years. The birds with GPS transmitters provided precise data on their home range size etc. Individual female Ospreys travelled up to 60 km from their nests, and after the reproduction period they also visited nests of other Ospreys, but eventually always returned to their own nests. A female in the state of Brandenburg resettled and bred 40 km from the previous year's nest site. A female in Mecklenburg, which has bred for many years on a mast, paired with a different male on a tree nest site after its male companion failed to return in spring. The females always leave the breeding area in August several weeks before the male, whereby in many cases – in contrast to the male – make rest stops for longer periods in Central Europe. The males provide the young with food until they leave for migration. Three males with GPS transmitters wintered in Portugal and Spain, all other birds in West Africa. The wintering areas of the male and female of individual pairs, except in one case in West Africa, were widely separated. The males always migrated somewhat further to the west than the females. The migration route was mainly via France and Spain. A large number of Ospreys did not fly via the Strait of Gibraltar, but crossed the Mediterranean from Cape Gata east of Almeria (Andalusia, Spain) to Cape Viejo (Morocco), a route unknown until now. Some birds also migrated across the Alps and the Mediterranean. During the Mediterranean crossing most Ospreys spent the night on one of the islands. In autumn, a female crossed this ecological obstacle non-stop in three consecutive years, from the South of France to Algeria, in two cases by night. The longest non-stop flight began in Bavaria (1,582 km in 28 hours, average speed 56.5 kph). In spring the non-stop crossing of the Mediterranean by this bird was recorded, from Tunisia to Central Italy. One of these non-stop flights, in 2008, covered 1,434 km in 31 hours (an average speed of 46.3 kph).

SESSION: POSTER (71)

## MIGRATION AND WINTERING STRATEGIES OF ADULT HONEY BUZZARDS *PERNIS APIVORUS* FROM GERMANY REVEALED BY SATELLITE TELEMETRY

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European Honey Buzzards are long distance migrants. Little is known about the migration and wintering patterns of German breeding birds. Other open questions include habitat use, home range size in summer and winter, flight height and speed etc. In the years 2001 to 2011 we fitted 12 adult German Honey Buzzards (seven males and five females), with solar powered satellite transmitters (PTTs), of various types and producers, weighing 18-22 g. We were able to record up to six complete autumn and spring migration routes of individual birds. In the relevant literature there is no previous account of pre-nuptial migration of European Honey Buzzards fitted with satellite transmitters. It was possible to study both partners of a pair for two of the project years. They migrated separately and wintered far away from each other. All birds migrated to West and Central Africa. Male No. 52033 wintered furthest south in Congo (Brazzaville: 2°22'S/ 12°42'E). In autumn 2010 it covered a distance of 8,560 km in 61 days, 140 km/day on average. In spring 2011, performing a loop migration, passing through Sicily, it flew 7,526 km in 29 days (259.5 km/day on average). The bird did not avoid crossing mountains. In autumn it spent one night on 10/11 September in the Pyrenees at an altitude of 1,725 m ASL. In spring it crossed the Austrian Alps at about 2,000 m ASL. The attempt to cross the Adriatic Sea was abandoned after four hours. The second longest migration route was taken by a male with transmitter No. 57029, which flew 7,612 km as far as Gabon in autumn. It covered on average 167 km daily. With the exception of male No. 52033, it is the only Honey Buzzard known to date that has been tracked crossing the Equator. Data on flight height and speed became available for the first time on autumn migration 2010 (for male No. 52033). It reached its highest flight altitude over the Sahara at 1,703 m ASL at a flight speed of 60 kph. The fastest flight speeds (72 und 76 kph) were also recorded here. Speeds of between 60 and 70 kph were recorded on seven occasions. Two birds perished on migration while crossing the Sahara and Mediterranean respectively. Three more birds vanished in the wintering area and another two in the breeding region. Of the birds tracked long enough to reveal their winter area, four Honey Buzzards spent the winter in Nigeria and one each in Gabon, Guinea, Cameroon, the Republic of the Congo and Liberia. Of the birds that were tracked more than one year as far as their winter quarters, it was established that they returned to the same areas. The home range size in the wintering area was determined for the first time with the assistance of GPS telemetry.

SESSION: POSTER (72)

## SATELLITE TRACKING OF EUROPEAN HONEY BUZZARDS *PERNIS APIVORUS* – HOME RANGE USE IN FRAGMENTED LANDSCAPES AS REVEALED BY GPS TELEMETRY

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European Honey Buzzards are long distance migrants. They spend less than four months (May - August) in the breeding area. Little is known about home range and habitat use of breeders in Germany. Four males and two females were fitted with GPS-Argos transmitters in Northern Germany. Here we present data of the four males. Before GPS tags became available, a number of birds were fitted with Argos transmitters using the Doppler phenomenon to locate tags. The Doppler fixes obtained were too imprecise to enable the study of short-distance movement and habitat use etc. in the summer home ranges. Signals were transmitted over a period of up to three years by some of the birds. With the exception of the last six transmitters fitted with GPS location and solar arrays in three layers, data was transmitted almost only during migration. Outside the migration periods the birds spent most of the time in vegetation too dense to permit adequate recharging of the earlier transmitters. As 2D GPS transmitters require less power than 3D models, the former devices allowed many more fixes from the breeding area in bad weather than the latter. There were very few fixes from females fitted with 3D transmitters as they spent more time at the eyrie (brooding and protecting their young) than the males, so that their solar arrays received too little direct sunlight. Breeding home range size in Northern Germany was determined for four males: Male 95771: 17.4 km² (MCP 95%) in 2009, Male 95770: 12.3 km (MCP 95%) in 2009, Male 52033: 14 km² (MCP 95%) in 2010, Male 52033: 6.32 km² (MCP 95%), Male 68561: 6.4 km² (MCP 95%) in 2011. All fixes for these birds show a clear concentration on woodland. The birds' main diet is larvae of ground-dwelling wasps. They build their nests above all in woodland, but also in peripheral countryside structures (hedges, woodland fringes, waysides etc.), and to a lesser extent in open areas. The GPS fixes were accurate enough to enable the dug-out wasps' nests to be found in some cases. The core foraging area can change during the breeding season. Male No. 95770, for instance, visited a plot of woodland 17 ha in size daily from 12 to 25 August but did not visit it at all in the preceding period from 19 July to 11 August. We found three exploited wasps' nests in this location. The birds sometimes spent the night in their foraging areas in close proximity to wasps nests, which probably had not yet been completely exploited. The home ranges of neighbouring pairs overlap to a great extent and aerial territorial conflicts are common. The latter assist patient observers to establish home range distribution.

SESSION: POSTER (73)

## SPATIAL DISTRIBUTION OF LITTLE OWLS *ATHENE NOCTUA* IN RELATION TO THE PRESENCE OF TAWNY OWLS *STRIX ALUCO*

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The decline of little owl *Athene noctua* populations within the last decades across central Europe calls for ecological research and enhanced conservation measures. However, many factors related to habitat occupancy, spatial distribution and potential of recolonisation remain unclear. Radio-tracking data from southern Germany indicate that predation by common buzzards *Buteo buteo* and tawny owls *Strix aluco* is an important cause of mortality in little owls. Accordingly, we hypothesised that the presence of these predators affects the spatial distribution of little owls. We conducted censuses of little owls and tawny owls across the county of Ludwigsburg, Southern Germany (c. 690 km$^2$). During February and March of the years 2012 and 2013 we used sound luring to assess the presence of the two species in a two-by-two kilometre grid. We analysed the effect of tawny owl presence on little owl presence by modelling the co-occurrence of the two species. We included environmental factors associated with the presence of the two species and factors affecting the detection probability. Our results suggest that the presence of tawny owls has a negative effect on the occurrence of little owls. In addition, the probability of little owl presence was highest at points close to orchards and was positively correlated with the distance to the nearest forest patch. In contrast, the probability of tawny owl presence was negatively correlated with the distance to forest, confirming a strong association of tawny owls with woody areas. These results indicate a marked segregation of the two species at a small scale. This pattern likely results from a behavioural response of the prey species, the little owl, in response to tawny owl presence. Furthermore, little owl mortality might be increased near forest patches occupied by tawny owls. Thus, it seems that the distribution and land use of little owls in Central Europe is shaped by a predator-induced avoidance of forest patches.

SESSION: Symposium 4 | 28 Aug 2013 | 1100

## BIRDS AND INSECTICIDES – FROM ORGANOPHOSPHATES TO THE NEONICOTINOIDS. ARE WE JUMPING FROM THE FRYING PAN INTO THE FIRE?

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Since the Second World War, the bulk of our struggle against insect pests in agriculture has been waged with organophosphorous and carbamate insecticides. Since that time, in North America and many other parts of the world, insecticides of extreme acute toxicity to birds have been used in farm fields despite the knowledge that bird kills were frequent and largely unavoidable. Through early interventions to limit the use of the most toxic products, insecticides' primary impact on birds in the UK is thought to be the loss of insect food. In contrast, current evidence from North America suggests that pesticide acute toxicity contributed significantly to the decline of grassland/farmland bird species. My analysis of breeding bird survey trends from 1980 to 2003 on a State by State basis in the US revealed that lethal impacts (inferred from a field-based risk model) were more likely to be associated with grassland bird declines (4 times more plausible based on evidence ratios) than agricultural intensification and habitat loss, the oft-cited culprits based on European research.

In light of new pesticide use patterns, the situation may be changing but not necessarily getting better. The bulk of insecticide use has now switched over to the neonicotinoid class of insecticides – compounds such as imidacloprid, thiacloprid, acetamiprid, clothianidin and thiamethoxam. These insecticides are of lower acute toxicity to vertebrates although their use as seed treatments is of concern for birds because of the potential for both acute and reproductive effects. More importantly, however, these insecticides are systemic, persistent in soils to the point of being prone to accumulation from year to year, susceptible to runoff and groundwater infiltration, and exquisitely toxic to a broad range of aquatic invertebrates in the 10-30 ng/L range. Additionally, they appear to have a cumulative effect on invertebrates meaning that recovery from intoxication is unlikely; they are also suspected of subtle behavioural and immune effects at levels that cannot even be measured by many laboratories. From the point of view of terrestrial and aquatic invertebrates, they appear to be game changers. There are many concerns with respect to their impact on honeybees and wild pollinators and some have started talking of a 'disaster in the making' because of their mode of action, physico-chemical characteristics and ability to affect entire food chains.

For the first time since DDT and the other organochlorine insecticides, our ongoing pest control efforts appear to be poised to affect all insect-eating bird species, not merely those that frequent agricultural fields. We therefore need to cast our net much more broadly in our future investigations of declining bird species.

## TRENDS OF BIRD POPULATIONS IN CENTRAL RUSSIAN FLOOD PLAINS UNDER CHANGING LAND-USE AND CLIMATE

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Flood plains of Central Russia play a very important role for sustainable existence of bird populations, with rich species diversity and high breeding densities of waders, ducks, meadow passerines and others. Till the end of the 1980s, these areas supported extensive farming: late haymaking once a year, low grazing charge in pastures and an absence of forage grass rotation. The deep depression of farming began in the late 1980s – early 1990s and is continuing. It has led to abandonment of floodplain meadows, overgrowth of tall weeds and bushes, and strong spring fires. The dry and warm climatic phase in the 1990-2000s resulted in a reduction in the frequency and duration of spring floods, and reductions in water levels in small lakes. The influence of these changes on bird populations, both in land-use and spring floods, was studied in the first half of 1980s and in 2002-2012 in the pilot area of Vinogradovo Flood Plain, located in the Moscow Region. This flood plain is typical for the forest zone of European Russia and trends in local bird populations are characteristic of this vast area as a whole. The total number of duck broods has declined by ca. 3.5 times during the period from the beginning of 1980s till mid-2000s, and the ratio of different species has changed significantly. *Anas querquedula* and *Anas clypeata* retained their dominant and subdominant status, but the numbers of *Anas acuta* and *Aythya fuligula* have declined dramatically, and have disappeared in dry years. At the same time *Anas strepera* and *Anas platyrhynchos* increased their numbers. *Fulica atra* has shown an increase in comparison with the early 1980s, the numbers of *Vanellus vanellus* in Vinogradovo Flood Plain dropped nearly 10-fold, and numbers of *Limosa limosa* ca. 6-fold. The most dramatic declines on abandoned pastures and hay meadows were recorded for two species: *Philomachus pugnax* (from ca. 100 breeding females to 2-5 females breeding occasionally in wet years) and *Emberiza aureola* (from 60-80 pairs at the early 1980s down to nil in 2010). Trends of p*asserines* varying with the progressive succession of vegetation were observed on abandoned arable lands in 2003-2011. *Saxicola rubetra*, *Acrocephalus palustris* and *Sylvia communis* became common by 2011, with the densities 161, 158 and 84 individuals km$^{-2}$, respectively. Our surveys have revealed an abatement of the influence of the farming changes on birds from very high and prolonged spring floods in some years. The results of these studies have become the basis for habitat management for sustainable bird populations in flood plains of Central Russia.

SESSION: POSTER (74)

## VISUAL ACUITY IN LEACH'S STORM PETRELS *OCEANODROMA LEUCORHOA*

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Leach's Storm Petrels *Oceanodroma leucorhoa* are strongly attracted to dimethyl sulfide and can track prey rich areas by scent cues alone. Both prey capture style and prey size suggest that Storm Petrels do not need high visual acuity (spatial resolution) for seizing prey. However, the ability to distinguish faint contrasts (high contrast sensitivity) and to see well in the dark (high absolute sensitivity) are advantageous for detecting prey items on or just below the surface of the sea. We investigated spatial resolution and contrast sensitivity of adult Leach's Storm Petrels using a non-invasive behavioural test. Birds were positioned in front of computer monitors and presented with moving patterns of white and black gratings of different spatial frequencies, contrasts and intensities. At light levels corresponding to late afternoon (1.6 log cd/m$^2$), storm-petrels had a spatial resolution of only 1.5 cycles/degree, which is the lowest value that has been reported for any avian species. By comparison this is similar to spatial resolution reported in rats, but 40 times lower than in humans and ~100 times lower than in Wedge-tailed Eagles *Aquila audax*. However, Storm Petrels detected contrast levels of ~10%, which is comparable to most other birds. At light levels corresponding to a starlit night (-4.4 log cd/m$^2$), Storm Petrels had maximum visual acuity of 0.125 cycles/degree. Taken together, our results suggest that Leach's Storm Petrels cannot rely solely on vision to recruit to foraging flocks, however their visual capabilities are sufficient for seizing prey at night, providing there is some moonlight.

## LINKING INDIVIDUAL SURVIVAL TO DISPERSAL ALONG HABITAT SUITABILITY GRADIENT: A CASE STUDY OF THE NORTH AFRICAN HOUBARA BUSTARD

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Habitat suitability models are useful tools for predicting potential current or future species distribution. It is important to understand how individuals survive, disperse or reproduce across these predicted ranges? To date, few studies have linked the gradient of habitat suitability to demographic parameters, probably because of the lack of appropriate data. However, such an approach could not only improve the reliability of habitat suitability models, but also provide a better knowledge about the response of species to spatial variations in habitat suitability and better predict the response of species to changes in habitat suitability over time, such as land-use or climate changes. Within the study case of the reinforcement of population of North African Houbara bustard (*Chlamydotis undulata,* Gruiformes: Otididae), we tested if the spatial variations in habitat suitability along the dispersal of released bustards have an effect on their individual survival using data about the historical wild population of Houbara bustard and from intensive monitoring of released individuals. Independently, we modelled the habitat suitability of wild Houbara bustards using the BIOMOD platform which provides a consensus method across several modelling techniques. Then we analysed the survival of released bustards according to a multi-event capture-recapture modelling. Originally, our study thus highlights a link between dispersal through habitat suitability and individual survival.

SESSION: POSTER (75)

## NEW INSIGHTS IN THE MEDITERRANEAN OSPREY *PANDION HALIAETUS*: UPDATES AND PRELIMINARY RESULTS

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In the Mediterranean, the osprey *Pandion haliaetus* is currently present with <60 breeding pairs after having suffered demographic decreases and local extinctions during the last decades, as result of the strong persecution. Even though direct management actions have allowed partial recoveries, the Mediterranean population is still exposed to local extinction risks. Furthermore, some aspects of the biology and spatial ecology of the osprey in the Mediterranean are far from being comprehensive preventing the possibility to detect key conservation-related measures to be applied at the whole scale of the basin. Thus, a new project recently started with the aim to investigate such topics in the Mediterranean area. Here we present preliminary results of this study and report an updated situation of the osprey status. In particular, we reveal new insights for the osprey population of the Al Hoceima National Park (Morocco) which is actually affected by rising threats and propose urgent measures to be adopted for putting into effect local management actions. Finally, we report the first outcomes from a new phylogeographic study of osprey, in order to strengthen the taxonomic knowledge of the species in Eurasia and in the world (via genetic tools) in the light of a sound conservation strategy.

SESSION: POSTER (76)

## PREDATION RISK AFFECTS THE LEVELS OF MATERNAL IMMUNE FACTORS IN PIED FLYCATCHER *FICEDULA HYPOLEUCA* EGGS

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Predation risk is an environmental stressor that can induce changes in prey behaviour and physiology. Perception of predation risk may indirectly affect offspring traits and future fitness prospects via impacts on the condition of parents. Females may influence the survival of their offspring via maternal effects, especially when breeding in stressful conditions. We investigated the effects of continuous predation risk perceived by mothers on the maternal allocation of immune factors and carotenoids in eggs of pied flycatchers *Ficedula hypoleuca*. We collected eggs from wild pied flycatchers that bred in the vicinity of a predator nest (pygmy owl, *Glaucidium passerinum*), were exposed to cues of a mammalian nest predator (urine of least weasel, *Mustela nivalis*), or received appropriate controls for these two groups. Pied flycatchers transferred more immunoglobulin in eggs when breeding in site with high continuous predation risk, both in owl and mammalian predator treatments. The presence of owl nests also lowered the level of lysozyme transferred in the eggs in one of the two study years. Predation risk did not modify egg size or overall carotenoid levels. Our results show that continuous predation risk perceived by females during egg-laying affects egg composition. This different allocation of maternal immune factors may be an adaptive response evolved to increase the probability of offspring survival.

## LOSING BUGS AND BIRDS: INVESTIGATING THE IMPACT OF NEONICOTINOID INSECTICIDES ON AGRICULTURAL WETLANDS OF PRAIRIE CANADA

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Carson was the first to address the problems associated with the agriculture industry's "war on insects" and the potential problems for bird populations associated with insecticides. In the last 50 years, the development and use of insecticides have continued to rapidly expand concomitant with equally rapid pest resistance. Neonicotinoids, a newer class of insecticides with lower acute vertebrate toxicity than many older products, are controversial because of their persistence and high leaching potential. Evidence from Europe and North America shows that they are highly toxic to a wide range of non-target aquatic insects and other arthropods. Applications also directly overlap with seasonal invertebrate production and the avian breeding season for a range of species and evidence suggests populations of farmland and aerial insectivorous birds are declining rapidly throughout North America and Europe. We hypothesize that insectivorous birds are potentially susceptible to neonicotinoids indirectly through loss of insect prey. In the Canadian Prairie Pothole region, intensive and widespread use of neonicotinoids particularly for canola seed treatments prompted us to investigate the fate and effects of these chemicals in agricultural wetlands which may be contaminated. Neonicotinoid concentrations (imidicloprid, thiamethoxam, clothianidin and acetamiprid) were measured 3 times from April to September in water and sediment in approximately 140 wetlands surrounded by a range of land uses and crop types. We detected peak water concentrations during June in canola fields with neonicotinoids (dominantly clothianidin) being detected in 62% of the wetlands at concentrations up to 2280 ng/L. A wetland habitat assessment was used to evaluate the landscape and ecological variables that are contributing to wetland contamination and showed that the recognized important temporary and seasonal wetland classes, as well as those situated in canola fields were the most susceptible. Seasonal averages in insect abundance in a subset of sites with high and low agricultural intensification were correlated with observed changes in growth and body condition of local insectivorous tree swallow populations. Adult female swallows weighed 9% lighter and nestlings were significantly smaller and in poorer body condition in the intensive agriculture sites relative to the natural areas. The outcomes of the full study will lead to better informed risk assessment practices of neonicotinoids in addition to addressing the biological integrity of aquatic ecosystems in one of Canada's most ecologically productive agricultural environments.

SESSION: POSTER (77)

## SEX-BIASED SURVIVAL IN A DECLINING MIGRANT: IMPLICATIONS FOR POPULATION DYNAMICS

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Over the past 40 years there have been rapid declines in the abundance of many migratory bird species which breed in Europe and winter in Africa. In many declining bird species, higher rates of mortality among females than males have led to biased population sex ratios, which may have feedback effects on population abundance. Quantifying the impact of sex-biased mortality on population sex ratios and productivity may therefore be critical in understanding the processes driving the population dynamics of Afro-Palaearctic migrants. Since the mid-1990s, the abundance and productivity of one of Britain's most abundant passerine migrants, the willow warbler, *Phylloscopus trochilus*, has declined in the south-east of the country while slightly increasing in the north-west. We use national-scale bird ringing data to investigate variation in the survival rates of adult male and females willow warblers breeding in these two regions of the UK. We then explore the consequences of survival rates for adult sex ratios and trends in productivity and abundance, in order to identify processes potentially limiting population recovery.

## ECOLOGICAL DETERMINANTS OF POST-FLEDGING SURVIVAL. A FRAMEWORK FOR REVIEW

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Age- and stage-specific survival rates and their modification by ecological mechanisms are a central issue in understanding demographic processes and evolutionary forces forming life history traits. Fledging is perhaps the most dramatic stage transition in the life of altricial birds. Numerous studies have demonstrated a sharp drop in survival rates in the post-fledging period compared to the nestling period and later life-history stages. The 'timing' of this bottleneck varies with species and ecological circumstances. The trophic webs appear to be the major determinant of post-fledging survival in many species. Two main mechanisms emerge: On one hand, food supply, as it results from food availability and parental performance, is crucial for physical development during the nestling period. Thereupon, ecological conditions during nestling growth and parental traits may strongly carry over to influence offspring prospects of surviving the post-fledging period and recruiting into the population. On the other hand, the fledglings face new challenges, for example, in that they become a prey to other inhabitants of the habitat. Differential post-fledging survival can cause immediate and strikingly efficient selection for life-history traits such as timing of breeding, selection of breeding habitat or clutch size. This allows for a quick and efficient feed-back cycle between (heritable) life-history traits and differential survival that adapts reproductive traits to the opportunities and pressures of the trophic web. The brief review summarizes the most important advances in the field since 2000 and emphasises that, in order to better understand the evolution of optimal life histories, research on differential survival patterns over all stages of life is essential.

## SEABIRD COLONY SITES: A HABITAT ENGINEERED BY SEABIRDS

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Seabirds come to land to breed, forming at times spectacularly dense breeding colonies. Through attendance at these colony sites, seabirds may transport and concentrate a substantial amount of marine nutrients to their terrestrial breeding habitat. This may result in significant physical and chemical alteration of the habitat at the colony site and thus may have a profound influence upon the terrestrial community. Understanding the network of trophic links which make up a community is a central topic of ecology. Marine nutrients are mainly deposited in the form of guano. Uric acid, the main nitrogen compound in bird guano, can be rapidly converted to ammonia which volatilises depending on ambient temperatures and therefore will be lost from the terrestrial ecosystem. Ammonia can also be nitrified and then leached out of the system, which will be increased under high precipitation and wet conditions. So the import of marine nutrients may vary with climatic conditions. However, despite considerably larger populations of seabirds at higher latitudes, there is little work on seabird-derived nutrient input at higher latitude where colder and wetter weather could differently impact on nutrient accumulation in the terrestrial ecosystem than in warmer and dryer areas. Here we show that there are seabird-derived nutrients in the local plant communities of three islands in North-west Scotland (St Kilda, Fair Isle and Mingulay) through increase in $d^{15}N$ values of the stable nitrogen isotopes. We will also look at variation in $d^{15}N$ values of plant communities between different sites, seabird species (Atlantic puffin *Fratercula arctica* and great skua *Stercorarius skua*) and between years. We will further address the question whether ornithogenic enrichment of the grass also shows up in mammalian herbivores grazing in that habitat. Understanding the influence of seabirds on the trophic links within island communities will allow a better comprehension of the processes which drive nutrient and energy transfer and provide valuable information for effective conservation and management of island biodiversity.

SESSION: POSTER (78)

## SIBERIA IN EUROPE – MORE THAN 100 YEARS LATER

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The first survey of avifauna of the lower Pechora River was carried out in 1875 by British ornithologists. They registered 113 species of birds from 10 orders. These results were published (Seebhom, Brown, 1876) and they called this area "Siberia in Europe" (Seebhom, 1880). In the 1930s, just 98 species of 10 orders were found (Dmohovsky, 1935). Investigations were only resumed in the 1970-90s by researchers from the Kandalaksha reserve (Bianchi, Krasnov 1987, Bianchi, Sterpeninov 1991) and Kochanov (1989). They registered 100 species of 11 orders. In the beginning of the 21st century ornithologists of the Institute of Biology in Syktyvkar started a research project on avifauna of the lower Pechora. In 2000-2009, expeditions were organized to the Pechora River delta, the Korovinskaya Bay and the lower current of the first-order tributary of Pechora River (Rivers Sozva, Ersa and Charyaga). As a result of these studies, 167 species of 14 orders were recorded. Thus, in more than 150 years, just 175 species of birds from 14 orders have been recorded.

Analysis of bird fauna in the 19th century showed the prevalence of widespread (34%), Siberian (31%), Arctic (22%) and European species (8%) of birds (after Stegmann, 1938). At the beginning of the 21st century, the ratio of faunal groups changed: the number of European species had increased to 15%. Thus, since 1875 the status of 31 species has changed (about 20% of the total number of recorded species). From 1875 to 2010, there were marked increases in numbers of 20 species: nine widespread (Mallard, Tufted duck, Osprey, Woodcock, Curlew, Little gull, Black-headed gull, Common gull, and Stonechat), five European (Wood pigeon, Garden warbler, Whitethroat, Pied flycatcher and Whinchat), four Siberian (Common scoter, Buzzard, Green warbler, Arctic warbler), one Arctic (Rough-legged buzzard) and one Mediterranean species (Turtle dove). Decreases in numbers were reported for nine species: five Siberian (Wigeon, Merlin, Cuckoo, Lesser spotted woodpecker, Three-toed woodpecker), three widespread (Oystercatcher, Common tern and House sparrow) and one Arctic species (Snowy owl).

These changes are related to the natural fluctuations of the border areas. Trends in faunal changes in association with climate conditions (average annual temperature of the territory) were not observed. The most common species (Wigeon, Pintail, Long-tailed Duck, Black Scoter and others) at the end of 19th century retained their importance in the structure of the avifauna of the Lower Pechora River.

## INTERMEDIATE MIGRATORY PROGRAMMES IN HYBRIDS BETWEEN TWO SPECIES OF LARGE GULLS

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Migratory traits in birds, such as inclination, timing and direction of migration, have been supposed to be genetically determined. It was only recently demonstrated, with the use of experiments, that migratory traits have a genetic basis. So far, hardly any study has dealt with migratory programmes of avian hybrids in nature, which is most likely due to difficulties with obtaining sufficient data. Stable hybrid zones are infrequent, hybrid individuals are typically in the minority even there and tracking or recapturing them outside breeding season is difficult. With the analysis of resightings of colour rings, we attempted to assess migratory patterns of two large gull species and their hybrids. The mixed colony where gull chicks were colour-ringed for over 7 years is located in the centre of a hybrid zone between Herring and Caspian Gulls (*Larus argentatus* and *L. cachinnans*) in Poland. Allopatric populations of either species from outside the zone are used as the reference. Herring and Caspian Gulls migrate mostly in westerly directions for winter, but possess divergent, species-specific migratory traits. Caspian Gulls travel twice as far as Herring Gulls to reach their wintering grounds in Europe. In practice, Herring Gulls are rarely resighted further west than Germany, while Caspian Gulls spread across Europe and reach Spain and Ireland. Our results showed that the difference in migration pattern is maintained by parental species in the hybrid zone, while interspecific $F_1$ hybrids migrate distances intermediate between parental species. Backcrosses to either species are in between parental species and $F_1$ hybrids in respect to migratory traits. The maintenance of divergent migratory traits by parental species in the hybrid zone, the intermediacy of hybrids and the similarity of backcrosses to the species they backcross to imply a genetic basis for migratory traits. This has never been demonstrated in nature before, although it is predicted for most if not all bird species.

SESSION: POSTER (79)

## WHEN BODY TEMPERATURE IS INCREASING; POTENTIAL CONSTRAINTS TO WORK RATE

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Birds inhabiting hot and dry environments are faced with a problem of getting rid of excess heat produced during work. This is further aggravated when water is in short supply, which puts limits on evaporative cooling. It will be reported that birds in such situations are not defending strict homoeothermy but allow their body temperature to increase in pace with ambient temperature. However, birds in much less extreme environments also invoke above normal body temperatures. By manipulating brood size in marsh tits *Poecile palustris*, breeding at temperate latitudes, we aimed to study the extent to which parental effort might affect their possibility to stay homoeothermic. We found pronounced hyperthermia in response to increased parental effort, thus in our case work rate when feeding nestlings. The extent of hyperthermia was also, as in hot environments, modulated by ambient temperatures. Thus, it seems that when the gradient between body and environment is decreasing and lots of heat is produced in the muscles, these birds have trouble getting rid of this excess heat. We speculate to what degree this accumulating heat may put constraints to the work rate of birds. Both of these examples highlight the plasticity in the regulation of avian body temperature, in both cases making it possible to retain heat during periods when the dissipation of excess heat in the body is slow.

## EARLY CONDITION, OXIDATIVE STRESS AND TELOMERE DYNAMICS IN NESTLING STARLINGS *STURNUS VULGARIS ZETLANDICUS*

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Reactive oxygen species (ROS) are highly reactive molecules, mainly produced during the normal cellular metabolism. These molecules can cause considerable damage to the cell by attacking important biomolecules, such as DNA, protein and lipids. Under most circumstances, the negative effects of ROS are balanced by an array of antioxidant systems. Should however the antioxidants fail to neutralize all the produced ROS, the individual will be exposed to oxidative damage. It has been hypothesized that the protective end-sequences of the chromosomes, the telomeres, should be especially susceptible to oxidative stress. Telomeres have also been shown to be linked to individual lifespan and the potential link between oxidative stress and telomere dynamics is therefore of key importance for the whole field of biology. In this study, we show that variation in early growth and condition affects individual susceptibility to oxidative stress in wild starlings *Sturnus vulgaris zetlandicus*. By using data from both first and second broods, from two consecutive years, we show that chicks hatched later in the year suffer from considerable higher oxidative stress than chicks hatched earlier. This difference is especially pronounced between first and second broods, where second broods show several times higher oxidative damage than first broods, but only for the year with low food availability. We also explore how oxidative stress affects the telomere dynamics of the individual and how this could be a potential link between oxidative stress and life history trade-offs. These results do not only give us new insights in how seasonality can affect the physiology of the individual, but does also shed new light on how oxidative stress can act as a mediator of life history trade-offs.

SESSION: POSTER (80)

## CHANGES IN MIGRATION PATTERNS OF NORDIC GREYLAG GEESE *ANSER ANSER*

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The population of Greylag Geese *Anser anser* has increased almost exponentially in Sweden as in other parts of Europe during recent decades. Thus September totals in Sweden were less than 20000 in 1984 increasing to about 250000 in 2009. To deal with the situation of increasing goose populations a Nordic study of Greylags was established in 1984 including neck-banding (still ongoing in Sweden and Norway). In Scania, south-western Sweden, about 3500 Greylags were neck-banded, yielding about 115000 readings. When the project started the majority of Nordic Greylags migrated to winter quarters in the Donana national park in southern Spain via staging areas in the Netherlands. In 1986, about 80% of neck-banded Greylags from Scania wintered here, this proportion decreasing to less than 20% in the early 2000s. New wintering traditions were established in northern Spain and a larger proportion was also found to winter in the Netherlands. During the most recent decade a wintering tradition was also established in south Sweden (close to the breeding areas) with up to 50000 Greylags (20% of the autumn total) in 2009 compared to very few ten years earlier. The timing of the migration was also changed, Greylags left south Sweden much later and arrived back earlier. These changes in migration pattern might be related to warmer winters but competition in the old winter areas and changes in agriculture might also have been important. The changes in the migration pattern may also have influenced other population processes. Geese wintering in Spain were found to have lower winter survival and breeding result that geese wintering in the Netherlands. Moreover Greylags arriving early had a significantly higher reproductive success than late arrivals.

SESSION: POSTER (81)

## DYNAMICS OF A SUMMER BIRD POPULATION AFTER A FOREST FIRE: A STUDY IN THE CENTRE OF THE EAST EUROPEAN PLAIN (KERZHENSKIY STATE NATURE RESERVE, NIZHNY NOVGOROD REGION, RUSSIA)

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Many regions of the center of the East European Plain suffered from forest fires in the hot summer of 2010. In summers 2011 and 2012, bird populations were surveyed in one of these areas during the nesting season using line transect counts with a total length of 670 km. The Kerzhenskiy reserve and its vicinity were investigated, where the extensive fires caused considerable damage to about 210 km² of the landscape. These wetlands are of international importance and a part of a UNESCO biosphere reserve, Nizhegorodskoye Zavolzhye. During the research seven main types of habitats, as well as similar undamaged areas, were investigated. The investigation covered different vegetation types and degrees of damage (forests, meadows and mosaic habitats; damaged by crown or ground fire or on the boundary). The abundance characteristics of 98 bird species (ca. 68% of all bird species on the reserve), including 7 rare species, were determined for the last two years. The territorial and interannual variability of the bird populations in Kerzhenskiy reserve were analyzed and compared with earlier data on bird populations in the burnt-out forests of other regions of Russia. In the first year after the crown fires, the number of species and cumulative abundance of the bird populations decreased. However, during the second year the intensive Willowherb *Epilobium spp.* regeneration in these areas contributed to the appearance of dry valleys bird species in the nesting season and as a result the number of bird species doubled. At the same time, locally specific bird populations changed in the damaged areas. The local species acting as indicators of these areas (*Sylvia borin*, *Motacilla alba*, *Lanius collurio*, *Acrocephalus dumetorum*) were identified; at the same time, the abundance of periperhal species did not increase sharply, so the forest species still formed major components of the bird populations. During the first year after the fires birds frequently used the burnt-out areas during migration, and this trend increased during the second year. Water reservoirs formed in the burnt-out hollows contributed to the temporary increase of wildfowl (Anatidae; including some rare species); on the other hand, the Black Grouse *Lyrurus tetrix* population in the damaged areas did not increase. The trees that had fallen after the fires made the whole habitat more of a mosaic. This contributed to the increased number of bird species in the forests damaged by the ground fire in the first year, as well as to the growth of cumulative abundance of bird populations in almost all habitats in the second year. This research was supported by the Russian Foundation for Basic Research. The results of the investigation were entered into the databank of the Zoomonitoring Laboratory of the Institute of Animal Systematics and Ecology RAS.

## TAU-THEORY AND THE AVOIDANCE BEHAVIOUR SHOWN BY BIRDS TO MOVING AIRCRAFT

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Although collisions regularly occur, birds are known to actively avoid moving aircraft. However, the cue or cues that enable birds to initiate and perform elaborate avoidance movements are poorly understood. Over the 2000 to 2012 interval, avoidance manoeuvres to aircraft performed by birds at Dublin Airport, Ireland have been investigated. It has been suggested that birds use the 'looming' image of an approaching aircraft to estimate the "Time to Collision" or ttc, and thus commence the avoidance manoeuvre in time to avoid being fatally injured. In this presentation we test the hypothesis that the optical expansion parameter tau ($\tau$) explains spatio-temporal avoidance responses of birds to moving aircraft. By identifying the positions of the bird and aircraft it is possible to estimate a) the distance to the probable point of collision (i.e. centreline of the active runway) at which the bird commences its avoidance manoeuvre and b) the simultaneous location of the approaching aircraft. The results are discussed by reference to simple mathematical models and in the context of what is now referred to as tau-theory.

## VISUAL TEMPORAL RESOLUTION IN BIRDS

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High temporal resolution may be of particular importance to birds, which need to perceive fast moving stimuli in order to detect prey, avoid obstacles and maintain formation when flying in flocks. Temporal resolution can be expected to depend on lifestyle, being particularly high in fast-moving, diurnal species. Measures of flicker fusion frequency (FFF), below which a flickering light can just be resolved, are useful for comparing temporal resolution capabilities between animals. FFF varies with light intensity (I), with the highest visible frequency at any light intensity being the critical flicker fusion frequency (CFF). We have performed dual-choice behavioural trials to test FFF as a function of I in birds, using UV-visual, LED based stimuli. For a slow-moving, dim-light adapted species we chose domestic chickens *Gallus gallus domesticus*. We tested both a White leghorn Bovan genotype and Gammalsvensk dvärghöna – an old game breed, morphologically and behaviourally similar to the wild type ancestor, the red jungle fowl *G. gallus*. To represent a fast and airborne diurnal species, we used wild blue tits *Cyanistes caeruleus*. Average CFF values differed considerably among the birds tested, with 74 Hz at 800 cd.m$^{-2}$ in White leghorn and 87 Hz at 1375 cd.m$^{-2}$ in Gammalsvensk dvärghöna. For the blue tits CFF was 130 Hz on average, at ca. 1500 cd m$^{-2}$, which is twice the temporal resolution of humans. It hence appears that birds, at least under particular circumstances, may perceive flicker rates that are invisible to humans, e.g. the 100 Hz or 120 Hz of common fluorescent lighting. Gammalsvensk dvärghöna was tested for a wide range of light intensities and it's I/FFF curve had two branches, most likely reflecting the response curves of rods and cones. In the White leghorn removal of UV wavelengths in the stimuli lowered temporal FFF, which suggests that UV vision is important to avian temporal resolution.

SESSION: POSTER (82)

## IDENTIFICATION OF MAMMALIAN HAIRS IN BIRD NESTS

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Nest material used by cavity nesting birds for construction of their nests is still a much neglected subject of research. Especially in titmice nests, frequent occurrence of mammal hairs has been observed, however the significance of the material for the nesting biology of birds is quite unclear. For this reason we examined titmice and flycatcher nests in order to identify from which mammal species the hair material originated. We evaluated the diversity of mammal species used for nest construction in five bird species. We used our own reference collection of mammal hairs, scientific literature and common microscopical techniques for mammal hairs analysis. In the total number of 91 nests we discovered 22 mammal species used for the nest construction. The highest values in species diversity and frequency were in titmice' nests, especially Great Tit *Parus major*, while the nests of flycatchers were poor in mammal species and hair quantities. The most frequent and the most numerous mammal species found in bird nests was Roe Deer *Capreolus capreolus*. This may indicate that the availability at the locality plays an essential role for birds in search for hair material.

SESSION: POSTER (83)

## THE HABITAT PREFERENCE OF THE GREAT SPOTTED WOODPECKER *DENDROCOUS MAJOR* IN A RIPARIAN FOREST, IN THE PRESENCE OF TWO INVASIVE TREE SPECIES

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This study is based on research which took place in Hungary in 2012. Our study area was an 80 year-old unmanaged riparian poplar-willow forest (ca. 25 ha; 47°04' N 20°11' E) situated in the Central-Tisza Landscape Protection Area, in the flooded area by the river Tisza. The following native tree species can be found: White poplar, Black poplar, White willow, Crack willow. There are numerous introduced tree species in the area, which is a common and increasing problem in almost every riparian forest in Hungary. The invasive species are Red ash and Boxelder maple. These two species reproduce faster and are much more common than the native species in the studied area; they influence the chemical traits of the soil and develop a second canopy layer under the native species' canopy, and thus increasingly shade the ground, preventing the saplings of the autochthonous trees from growing properly. As a result there are very few saplings of the native species in the study area. In the study area, four of the nine Hungarian woodpecker species breed: the Great-spotted, the Lesser-spotted, the Green and the Black woodpecker. Our studied species was the Great-spotted woodpecker. This species is the most common woodpecker, with twelve breeding pairs. The other species have respectively two, one and one breeding pairs. The questions of our study were: which tree species are preferred by the foraging-resting and territorial-vocalising birds? How are the birds distributed spatially between microhabitats based on their foraging-resting or territorial-vocalising behaviour? To reveal the preferences of birds towards particular tree species, we measured the number of each tree species in 1 ha units along the narrow, striated study area. To determine the spatial distribution of birds, we conducted a weekly standard 2.5 km long transect, with 5 min observation time per bird (n = 581). Based on our findings we determined that despite the much lower number of native trees, they turned out to be the more preferred species for foraging and resting. This preference may be caused by the wood quality and the bark structure of the different tree species. The vocalizing birds showed no preference for tree species in the observed habitats. On the microhabitat scale the foraging-resting specimens mostly preferred the lower half of the upper part of the trees, and they moved mainly on the trunk. The vocalising birds preferred the upper half of the highest trees, but mainly stayed under the canopy. As a conclusion we feel safe to predict that the decrease of the autochthonous tree species may lead to a suboptimal habitat compared to the current situation. Under these conditions the size of the woodpecker territories will extend, lowering their density. As the major cavity excavator, the Great-spotted woodpecker plays a key role in alluvial forest communities, and the above mentioned changes will have a significant effect on the population dynamics of numerous cavity dependent species.

SESSION: POSTER (84)

## VOCALIZATION OF LITTLE TERNS *STERNULA ALBIFRONS* AND THE VALIDITY OF THE GENUS *STERNULA*

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According to molecular phylogenies, the Little Tern (together with closely related species) is considered a distinct genus *Sternula*. This study concerns vocalizations of the Little Tern during aerial courtship. These data were compared to similar data from Common Terns *Sterna hirundo* and Sandwich Terns *Thalasseus sandvicensis*. The comparative study of these three species could help to assess the validity of the genus *Sternula*.

The acoustic behaviour of the three species of Terns was studied on the coast of Azov Sea (SE Ukraine, Donetsk region, regional landscape park 'Meotida') in May 2012. Aerial courtship is very characteristic of terns, and includes mutual pursuits of pair members. Males often carry a small fish in the beak, and other individuals can join them. Loud vocalization is very characteristic for every aerial courtship display.

The aerial courtship behaviours of the Common Tern and the Sandwich Tern are essentially similar. In both species, homotypic series of identical notes are the most frequent calls during courtship. In some cases these series contain signals that are similar, but not identical, with differences occurring in time-and-frequency parameters of consecutive signals. The "Fish call" (lasting about 200–500 ms) is the most frequent type of signal, but other types can also be emitted.

The acoustic component of the aerial courtship in Little Terns is much different. Little Terns emit a sequence of short, heterotypical notes. The duration of each series is 310 ± 90 ms (median 300 ms), and the duration of pauses between consecutive series is 270 ± 200 ms (median 210 ms). Each series consists of 5–8 notes (mainly different ones). Consecutive heterotypical series are similar, but some variability is present. This variability consists of (1) reduction in duration of a series, due to the loss of final notes and (2) variability in structure (time-and-frequency parameters) of notes of the same type in consecutive series. Sometimes other types of signals can be a component of aerial courtship of this species.

Thus, the features of vocalization during aerial display in the Common Tern and the Sandwich Tern are essentially similar, whereas the Little Tern is different from the former two. According to the current point of view, the first two species belong to different genera – *Sterna* and *Thalasseus* respectively. The data obtained in this study support the legitimacy of the separation of the Little Tern in the genus *Sternula*.

The study was supported by the Russian Foundation of Basic Research (project 11-04-01302-a).

SESSION: POSTER (85)

## RETURN OF AN URBAN RAPTOR: RED KITES *MILVUS MILVUS* IN A LARGE UK URBAN AREA

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The recent series of reintroductions of the red kite *Milvus milvus* across the UK is arguably one of the most successful of such programmes worldwide. The population reintroduced to the Chiltern Hills, in the southern UK, has risen so greatly since the late 1980s that monitors can no longer provide accurate estimates (but thought to be well over 500 breeding pairs). Although red kites were common in Middle Ages London, foraging on sanitary waste and food scraps, it was thought unlikely that reintroduced birds would recolonize urban areas to any great extent given modern sanitation. Recently, however, the species has become very common above Greater Reading, a large, highly urbanized area (population: 230000) ~20 km south of the release site. In a series of studies, we investigated kite distribution patterns in this region. Central point counts revealed an overall tendency to enter from the northwest after dawn and leave to the northeast before dusk, implying roosts remain outside the urban area. Driven transects further revealed a nonrandom, 'doughnut'-shape distribution, with peaks centred on suburban areas and lower numbers in the centre and urban fringes. Further analysis indicated a positive association with residential housing vs. other habitat types. Intrigued, we investigated potential foraging opportunities. Surveys of discarded human food and roadkill revealed that these had the potential to support 0.2-0.5 kites/km/day (based on 80-180 g food required/day), or ~10-25 across Greater Reading/day. However, this assumes daily replenishment and that all such food is taken by kites and is thus an overestimate. Following anecdotal reports of householders feeding kites, large-scale questionnaires (~1% population) were conducted. 4.5% respondents fed kites, equivalent to ~3500 Greater Reading households with gardens. A detailed national survey of red kite feeders estimated the median mass of food provided at 6 kg/yr, equivalent to 0.08-0.2 kites potentially supported/day/feeding garden. In the context of our local data, this equates to a potential to fully support 81-182 kites/day in Greater Reading by garden feeding. While it is inappropriate to estimate absolute numbers from our point count or transect data, some broad indications can be gleaned, with a minimum point count of 60 and an estimated relative density for our transects of 5 kites/km$^2$ (equivalent to 433 in Greater Reading but the observed association with housing suggests also an association with roads, on which transects necessarily centred). Thus, even without a local population estimate, it is clear that a considerable proportion of Greater Reading's red kites could be fully provisioned by domestic households, even more if not feeding on this resource alone. Our findings are relevant to a range of parties, from those involved in reintroductions to those who may seek to influence distributions of human-associated species either positively or negatively.

## BIRD PHOTORECEPTORS AND THE PERCEPTION OF COLOUR, FORM AND MOTION

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Birds have five types of cone photoreceptors, which are arranged in a more or less order retinal array. About 40% of these are the double cones, whose spectral sensitivity is very close to the combined human red and green cones. The remainder are four types of single cone which are comparatively sharply tuned to wavelength with sensitivity maxima at about 365nm or 405nm, 480nm, 530nm and 600nm. I will outline the evidence that the single cones are used for colour vision, while the double cones are used for seeing form and motion. It is likely that double cones are important of control of flight and collision avoidance. Thus understanding double cone based mechanisms is relevant to preventing collisions with glass. However there are important open questions about the role of colour vision and UV or other single-cone signals.

SESSION: POSTER (86)

## DOES ONTOGENY AFFECT ANNUAL SCHEDULES, AND THEREBY ALLOW PIED FLYCATCHERS *FICEDULA HYPOLEUCA* TO RAPIDLY ADAPT TO CLIMATE CHANGE?

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Long-distance migrants have insufficiently adapted their timing of arrival and laying to the advanced food phenology in their seasonal breeding habitats. One of the major hypotheses to explain this apparent inadequate response to changed climatic conditions is the rather inflexible mechanism controlling timing of migration. However, migrants have survived turbulent natural environmental shifts in their evolutionary history. Together with numerous trends towards earlier arrival time this contradicts the lack of plasticity. Although there is strong support for endogenous control of timing of bird migration, it is still unclear whether additional environmental factors are important in the wild. We will present the results of a large-scale field experiment in which we tested the relative importance of genetic vs ontogenetic factors in the timing of the migratory schedule. Over three years (2009-2011), we delayed hatching dates of 200 Pied Flycatcher nests by a week. To test for early-environmental effects on timing of migration, we monitored arrival dates of recruits from delayed and control clutches. To distinguish between ontogenetic effects caused by food availability and other conditions experienced in early life (e.g. photoperiod), we food supplemented half of the nests in each group. We will discuss why ontogenetic effects in long-distance migrants may allow for rapid adaptation to climate change.

SESSION: Symposium 17 | 31 Aug 2013 | 0900

## SIMILAR OR DIFFERENT MIGRATION STRATEGY IN TWO SISTER SPECIES WINTERING IN THE EASTERN PART OF THE SUB-SAHARAN AFRICA

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The Garden Warbler *Sylvia borin* and the Blackcap *Sylvia atricapilla* are sister species, similar in size and sharing several common features, while being different in e.g. habitat preferences. When analysing migratory behaviour, the Garden Warbler is a typical trans-Saharan migrant, similar to the northern populations of the Blackcap. The aim of the study was to compare migration strategy, including the fattening process, of these two species along the SE flyway, followed by the birds heading towards wintering grounds in the eastern Africa. This study included data from several SEEN ringing stations in Poland, Ukraine, Turkey, Jordan, Palestine, Israel and Egypt. Standard methods of the SEEN network were applied, including constant mist-netting and a standard set of biometric measurements (full-grown individuals: wing and tail length, wing formula; weight - accuracy 0.1 g; fat score; Busse 1995, 2000). The results showed clear differences in migration pattern of both species in the north-central Europe, south-eastern Mediterranean and north-eastern Africa, including the Middle East. The Garden Warbler showed significantly higher fat reserves already in northern Europe compared to the Blackcap. The comparison of the Baltic, Black Sea and Mediterranean regions clearly highlights the Middle East and North Africa as very important areas for migrating birds, prior to the Sahara crossing.

SESSION: POSTER (87)

## PROBLEM-SOLVING SUCCESS IN URBAN AND RURAL HOUSE SPARROWS *PASSER DOMESTICUS*

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Behavioral flexibility is an important component of adaptation as it can help animals to exploit new or diverse habitats. Due to the abundance of novel objects and resources provided by humans, urban environments may select for better problem-solving skills in wild animals. To test this idea, we captured 104 house sparrows from 8 urban and 7 rural habitats and observed their behaviour in four novel problem-solving tasks during which they had to acquire food from different feeders. Individual performance was moderately repeatable over the four tasks. Birds that attempted to access food more frequently solved the problem faster in all tasks, but urban and rural birds did not differ in frequency of attempts. Out of the four tasks, one was solved by a significantly smaller proportion (23%) of individuals than the other three tasks (72-83%). In this difficult task, females were faster than males, and there was a significant interaction between urbanization and body mass: urban birds with large body mass were faster than the rest of the birds. In the three easier tasks, urban and rural birds were similarly successful. Additionally, individuals with lower body condition solved task 3 faster. In sum, we found that problem-solving success shows both individual consistency and context dependency, varying with individual traits such as sex and body condition that may affect motivation. Our results suggest that urban birds may be better at solving challenging tasks, but only when their performance is not hindered by other factors such as small body mass.

SESSION: POSTER (88)

## BIRD COLLISIONS WITH TRANSPARENT NOISE BARRIERS AT HEUNREUNG-RO, GANGNAM, SEOUL, KOREA

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As human population and traffic volumes increase, there is also an increase in the complaints of people about noise. Since it is hard to separate residential areas from roads, noise barriers are often built. In Korea, by 2008, noise barriers were set up at 4,480 locations with a total length of 1,136 km. There are many types of noise barriers and recently people have expressed a preference for Transparent Noise Barriers (TNBs) because of light penetration and the ability to see beyond the barrier. For example, in Seoul, Korea, there were no TNBs in the 1980s, but between 2001 and 2010, TNBs were set up at 27 locations with a total length of 4.6 km. This was 24.7% of the total barriers (18.6 km) of all types. However, TNBs consisting of long window walls may result in "window collisions" by birds. Although there are a few publications of bird-window collisions, to the best of my knowledge there are no reports of bird collisions with TNBs. Therefore, the purposes of this study were to obtain preliminary data and to investigate potential factors affecting bird collisions with TNBs. Bird collisions were surveyed along six TNBs along the road of Heunreung-Ro, Gangnam, Seoul, Korea from October 2012 to February 2013. The road of Heunreung-Ro is 20-25 m wide with 8-10 lanes. The TNBs were 87-181 m long sections with height varying between 6.5 and 12.5 m. The total length of the six TNBs was 872 m, and 2 x 1 m glass panels made up the noise barriers with metal frames mounted on 0.5-1 m high concrete base wall. Three TNBs were adjacent to buffer regions of vegetation screening apartment complexes, while another three were adjacent to bare ground or a stream without vegetation. Bird collision surveys were conducted once per day on for between 17 and 23 days per month. The adjacent bird communities were surveyed once a month to identify dominant species along 1.2 km of the Heunreung-Ro road. A total 58 bird collisions of 19 species were confirmed. Fourteen individuals were not identified primarily due to scavenger activities. Each month, 8-15 individuals of 4-9 species collided with the six TNBs. Bird collisions along TNBs with buffer regions of vegetation screening (12-19 collisions) were much higher than those along TNBs without vegetation (2-4 collisions). The top 5 dominant bird species (80% of 128 observed individuals) were Black-billed Magpies *Pica hudsonia* (41), Marsh Tits *Poecile palustris* (21), Great Tits *Parus major* (15), Brown-eared Bulbul *Hypsipetes amaurotis* (15) and Yellow-throated Bunting *Emberiza elegans* (11). No bird strikes of Black-billed Magpies and Brown-eared Bulbuls were confirmed. We conclude that the number of bird collisions was related to the presence of green vegetation along TNBs. Therefore, to minimize bird collisions, building of TNBs besides buffer regions of vegetation should be restricted. There are also species-specific bird collisions, indicating that a species-specific approach is required to minimize bird collisions. Based on my data, I estimate that 31,200 – 58,620 bird collisions with TNBs occur annually in Korea. My results were from only six TNBs and there is the potential for pseudo-replication. To clarify the factors and the numbers of bird collisions on TNBs, surveys with more samples and wider areas need to be conducted.

SESSION: POSTER (89)

## OCCUPANCIES AND BREEDING PERFORMANCES BETWEEN DIFFERENT DEPTHS OF NEST-BOXES IN GREAT TITS AND VARIED TITS IN KOREA

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It is presumed that cavity-nesting birds prefer deep cavities to shallow cavities for breeding to reduce predation pressure. Here we investigated occupancies and breeding performances between different depth of nest boxes in great tits and varied tits. 149 deep nest boxes (15 cm depth from entrance hole to bottom of nest boxes) and 152 shallow nest boxes (10 cm depth) were set up at forests in Deajeon, Korea. We checked nest boxes weekly from 7 April 2012 (Week=1) until 4 July 2012 (Week=13); species and number of eggs, broods, and fledglings were recorded. Chi-square tests were used for nest box occupancies, predation rates and breeding failure between species and nest box types of different depth. Mann-Whitney tests and t-tests were used for breeding times and breeding performance analysis (number of eggs, broods & fledglings, hatching & fledgling ratios, and breeding success) between two tit species and between two nest box types. In total, 78 nest boxes were used among which 47 were used by great tits and 23 were used by varied tits. Great tits preferred deep boxes (n = 36) to shallow boxes (n=11, Chi-square=10.92, df=1, $p<0.001$), but varied tits showed no preference (deep boxes n=11, shallow boxes n=12, Chi-square=0.004, df=1, $p=0.95$). In early breeding, great tits used more deep boxes (n = 24) than shallow boxes (n=3, Chi-square=13.88, df=1, $p<0.001$), but there was no preference in late breeding (deep boxes n=12, shallow boxes n=8, df=1, Chi-square=0.46, df=1, $p=0.50$). In late breeding, breeding performances were not different between great tits using deep boxes and using shallow boxes ($p>0.11$). Varied tits used deep boxes and shallow boxes similarly in early breeding (deep boxes n=8, shallow boxes n=9, Chi-square=0.003, df=1, $p=0.96$) and in late breeding (n=3 for both box types, Chi-square=0.15, df=1, $p=0.70$). In early breeding, varied tits using deep boxes bred earlier than varied tits using shallow boxes ($T=50.5$, $p=0.03$), but there were no differences in breeding performances between varied tits using deep boxes and using shallow boxes in early breeding ($p>0.33$). Predation rates and breeding failure of all used nest boxes were not different between deep boxes and shallow boxes (Chi-square=0.13, df=1, $p=0.72$ for predation rates, Chi-square=0.44, df=1, $p=0.51$ for breeding failure). There were different preferences for next box depths between two tit species (great tits and varied tits) and breeding times. In early breeding, great tits bred earlier than varied tits (n=27 for great tits, n=17 for varied tits, $T=551.5$, $p<0.001$) and also great tits used deep boxes more than varied tits. Great tits, also, used deep boxes more in earlier breeding than in late breeding. It seems that tits used deep boxes first for breeding. Although there were no differences of breeding performances of two types of nest boxes, preference for deep boxes of earlier breeding tits may relate to post-fledging survival.

SESSION: Symposium 15 | 28 Aug 2013 | 1150

## COMBINING STABLE ISOTOPE ANALYSIS AND GEOLOCATOR DATA TO INVESTIGATE LINKS BETWEEN WINTERING AND BREEDING GROUNDS OF A LONG-DISTANCE EURASIAN-AFRICAN MIGRANT, THE RED-BACKED SHRIKE *LANIUS COLLURIO*

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Until recently, studies focusing on conservation of declining bird populations in Europe have primarily taken place at the European breeding grounds. Yet, this approach may prove inadequate for migratory birds that spend the year in widely different geographical locations with great variations in habitat. In fact, there is a paucity of knowledge about the biology of long-distance migratory birds in the African non-breeding areas and how the wintering grounds may affect the timing of spring migration as well as the reproductive success at the breeding grounds. To target conservation efforts, we need to understand how factors during one period of the year can carry over to affect subsequent periods. Year-round tracking of red-backed shrikes *Lanius collurio* breeding in Denmark by light-level geolocators has shown that these birds winter along a moisture gradient in sub-Saharan Africa during which time a full body moult occurs. Here, we use stable-isotope analysis of carbon, nitrogen and hydrogen in bird feathers to assess the quality of the wintering habitats of 49 red-backed shrikes breeding in Denmark. Stable isotopes are widely used for this purpose, especially in Nearctic-Neotropical migrants; however, data validation has been limited because moult locations are often thousands of kilometres away or are unknown. By determining specific wintering locations from geolocator data we are able to validate the data from stable-isotope analysis and make more robust inferences regarding winter habitat quality. In this talk, we focus on the comparability of the two methods and how we can combine them to investigate the quality of wintering habitats. Furthermore, we investigate how habitat quality in the non-breeding area may carry over to affect timing of spring migration and breeding success at the high latitude breeding grounds.

SESSION: POSTER (90)

## SOME KNOWLEDGE OF THE ORIGIN OF GREYLAG GOOSE *ANSER ANSER* STAGING IN FRANCE

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The Greylag Goose *Anser anser* is a widespread species over the Palaearctic. Most geese in Europe pertain to the subspecies *anser*, while in the eastern part of the continent breeders appear to be intermediate with the *rubrirostris* subspecies of Asia. Greylag geese populations are steadily increasing in North Western Europe. Although individuals staging in the Netherlands are considered sedentary birds, those from Scandinavia or Germany fly longer distances, especially over France and down to Spain. Neck-banding and ringing methods give some indication about the origin of birds flying or staging in France, but those data depend on marking and observation effort, which can differ greatly between countries. Genetic markers have become a useful tool for the study of migration patterns. Here we aimed to determine the origin of geese and how they mix using individuals from French hunting bags.

We used mitochondrial DNA (mtDNA) to study the characteristics of the Greylag Goose in Europe. Data from 151 individuals distributed over the western flyway (Norway, Netherlands, N France, SW France) were used to assess the geographical distribution of European Greylag Geese. DNA was extracted from feathers and amplified by PCR. On the basis of the sequences of a mtDNA marker (CR1 D-Loop 288 bp), we found 24 haplotypes. About half the individuals were grouped together with a reference sequence pertaining to the *anser* subspecies, while the remaining were grouped with a sequence pertaining to the *rubrirostris* subspecies or differed clearly from both subspecies. The highest levels of genetic distance were found between pairwise comparisons involving sites from South West France (ranges 0.016-0.017). The genetic distances among geese from Norway, Northern France and Netherlands were lower (range 0.012-0.013). A neighbour-joining tree showed that individuals from each site are present in different branches, with no single clades grouping all individuals from the same geographic areas. Except for the individuals from breeding sites in Norway, which are genetically very close, results reveal the presence of a highly mixed population of geese over the French western flyway. Thus, despite the fact that Greylag Geese in Western Europe have tended to winter further north for a decade, and that geese breeding in the Netherlands are considered as rather resident birds, our data suggest that geese migrating over western France have a relatively high diversity of origins.

## NATAL DISPERSAL IN LITTLE OWLS *ATHENE NOCTUA* – SHORT BUT EFFECTIVE

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In many species the spatial patterns of natal dispersal and their importance as a link between populations are unclear. The little owl *Athene noctua* is often considered a highly philopatric species. This disagrees with new evidence suggesting that the Central European population is genetically strikingly homogeneous. Here, we show that dispersal is a highly dynamic phase in the life history of little owls. Using radio-tracking, 238 little owls were followed from fledging to first reproduction. The timing and trajectories of natal dispersal were determined. Before departure, juvenile little owls left their small (c. 3 ha) natal home range for short explorations. During the subsequent dispersal phase, individual ranges increased to 2-23 km² (25% - 75% range). This turbulent phase of dispersal caused an intensive exchange of individuals over the population. However, these important movements occurred over a surprisingly short period. Individual dispersal phases were rarely longer than three weeks. Post-dispersal home ranges did not differ in size from adult breeding home ranges (c. 9 ha). Occasionally, secondary movements were observed in early spring, possibly by unmated individuals. Our results give a behavioural explanation for the high genetic homogeneity of Central European populations. We conclude that dispersal in little owls is a short but effective mechanism causing substantial movement of individuals within and between populations. Accordingly, the colonisation potential of this species is considerable. While the timing of dispersal is probably ontogenetically determined, the performance during dispersal is likely modulated by factors such as body condition or personality.

SESSION: POSTER (91)

## FORTY YEARS OF MONITORING OF EUROPEAN JACKDAWS *CORVUS MONEDULA* AT THE SAALE VALLEY BRIDGE IN JENA (THURINGIA)

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The highway bridge in Jena-Goeschwitz has been used since the 1950s by European Jackdaws (*Corvus monedula* L.) and Kestrels (*Falco tunninculus* L.) as a regionally significant breeding site. The birds occupied rain gargoyles which were rendered defective after the war. When the gargoyles were repaired in 1972, we installed nesting boxes behind the light slits in the interior of the bridge. Since 1973 the number of breeding pairs and breeding success has been recorded. From 1981 to 2007 a large number of breeding female Jackdaws have been caught and (colour-)ringed in order to provide information about breeding-site fidelity. Meanwhile, this colony represents an insular population in the region as many Jackdaw populations have gone extinct. As a result of these declines the Jackdaw was classified in the category 3 (endangered species) in the "Red Lists of selected plant and animal species". In 2003 the construction of a new, southerly adjacent bridge containing the west-east highway lane began. To avoid disturbance caused by the construction activities, the nesting boxes in the southern part of the old bridge had to be removed, so that only nesting boxes in the northern part were usable for the birds. As a temporary replacement, nesting boxes were installed in the roof structures of the apartment blocks in the adjacent Lobeda-West as well as on the building of the Thuringian Administration of Environment and Geology, in which birds first brought in nesting material in 1999, and the first successful breeding attempt took place in 2003. Additionally, nesting boxes were mounted in the Goeschwitz water tower, which was used initially, but later abandoned because of road construction activities in the close proximity. Hence, measures were proposed to partly allow the use of the old bridge as a breeding site for Jackdaws and Kestrels during the reconstruction, without a major impact or retraction of the construction work. The reconstruction was carried out in a way so that at least six bridge pillars were not affected by the construction activities during the breeding period (March – July) in 2008 and 2009. These measures were successful, proving that the effort to get involved with ecological construction consultancy is worth it. The number of breeding pairs of Jackdaws initially decreased from more than 60 to 25 breeding pairs because of reduced nesting sites, but has now finally recovered (as of 2012), when 50 breeding pairs were observed. On the other hand, the breeding success of the colony does not cause great optimism, as only 0.3-3.0 juveniles per breeding pair fledge each year. The mean breeding success decreased from 2.2 in the 1970s and 1980s to 1.5 in the last 20 years. So, the preservation of the colony can only be enabled by immigration from other regions.

SESSION: POSTER (92)

## URBAN MODELS AND THEIR EFFECTS ON IMMUNE SYSTEM OF HOUSE SPARROW *PASSER DOMESTICUS* POPULATIONS IN CENTRAL SPAIN

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The house sparrow *Passer domesticus* is a species that has been well adapted to humans for centuries and its occurrence is mainly restricted to humanized areas. However in the last decades their populations in the big cities, structures in constant expansion due to the increase in human population, are undergoing a marked decline. This phenomenon has been detected worldwide, especially in Europe, and could reveal that the conditions of urban environments are changing in the wrong direction for this species, and maybe for other bird species inhabiting these areas. The evaluation of immune systems is gaining much interest nowadays to evaluate the status of an animal population. Immunological studies in wildlife provide information not only about their health status, but also about their interaction with the environment, because this system is greatly influenced by different stressors. Therefore it can be a powerful tool to understand how the area in which a particular species inhabits affects individuals. Blood samples were obtained from five different populations located over an urbanization gradient from a small town to a big city. This gradient was established based on information about land uses and the presence of different pollutants in the air of each study area. A stress level as well as nutritional status of each animal was evaluated along with the immune system. A high value of heterophil/lymphocyte ratio, a chronic stress indicator, was detected in individuals of more urbanized areas, indicating either that these birds are more exposed to stressors than rural ones or have lower tolerances. They also showed worse nutritional status, reflected in lower values of hemoglobin, hematocrit and cholesterol than rural populations. Populations in urbanized areas display worse immune status than rural ones. On the one hand, a lower proportion of lymphocytes was found; this result agrees with the smaller amount of total immunoglobulins found since lymphocytes are responsible of its production. In the same direction, the complement, one of the main elements of innate immunity, was decreased in these populations too. The results obtained support the idea that urbanized areas populations of house sparrow are affected by greater stressors. This phenomenon alters their nutritional status and immune capacity which in the long term could affect their ability to adapt to the environment.

SESSION: POSTER (93)

## EFFECTS OF EXTREME METEOROLOGICAL EVENTS ON REPRODUCTIVE SUCCESS IN TEMPERATE-BREEDING HOUSE SPARROWS *PASSER DOMESTICUS*

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With the ongoing change of Earth's climate, the frequency of extreme meteorological events such as heat waves and rainstorms is predicted to increase. The effects of climatic changes are well documented for the phenology and range shifts of many species, but there is still little information about how extreme weather influences reproduction in birds. Extreme weather may not only affect breeding success but might also alter sex ratio if males and females are differentially sensitive to meteorological conditions during ontogeny. In this study we investigated the relationship between overall and extreme meteorological conditions and breeding success in a House Sparrow population occupying a suburban nestbox colony in Hungary, between 2005 and 2010. Sex of nestlings was identified by molecular sexing methods in a subset of broods. We found that hatching success increased when there were more extremely hot days and fewer extremely cold days during incubation, but the latter effect held only for relatively short incubation periods. Fledging success showed no notable relationship with weather variables. However, fledgling body mass and tarsus length were greater when average temperature during nestling development was higher but extremely hot days were less frequent. Additionally, the longer the period without rainfall before fledging, the greater the fledglings' body mass. Fledgling sex ratio did not differ from 1:1 and was unrelated to weather variables. Warm temperature may allow both nestlings and parents to invest less into nestlings' thermoregulation and more into development and foraging, respectively. Additionally, availability of insect prey may be greater in dry periods. While hot weather may promote incubation, it may constrain nestling growth through heat shock. These results indicate that weather has complex effects on hatching success and nestling development of House Sparrows, as the effects of extreme weather can differ between different aspects of reproduction and from the effects of overall meteorological conditions.

## WINTER SUPPLEMENTARY FEEDING ALTERS THE PHENOTYPIC STRUCTURE OF BLUE TIT *CYANISTES CAERULEUS* POPULATIONS

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Provisioning of food to garden birds is a multi-million dollar industry in the Western World, and is increasingly promoted as a method to engage people with the environment whilst conserving declining wild bird populations. It is surprising, therefore, that relatively little is known about the impacts of this enormous resource on wild birds. Recent research has begun to address this, reporting detrimental impacts of winter supplementary feeding on future breeding performance at the population level. But the mechanisms driving these apparent negative effects remain uncertain. It is hypothesised that they may reflect a change in breeding population structure following winter feeding, such that individuals of relatively poor phenotypic quality are able to survive and breed. Here we present the findings of a landscape-scale study of blue tits *Cyanistes caeruleus*, where we test this hypothesis. We examined the effects of feeding energy (fat) and antioxidant-rich (fat-plus-vitamin E) supplements during winter on the phenotypic variation of breeding birds the following spring. Blue tits complete annual moult in autumn and exhibit carotenoid-based yellow breast plumage, a reliable signal of individual quality at the time of feather growth. Using feather carotenoid concentration as an indicator of 'pre-feeding condition', we show that vitamin E-supplemented birds were in significantly poorer phenotypic condition than fat-fed and unfed birds before the onset of winter feeding. These findings suggest that birds of inherently lower quality had recruited into breeding populations as a result of enhanced winter antioxidant availability. We discuss the impacts of this change in blue tit population structure caused by winter feeding on events occurring in the breeding season.

SESSION: POSTER (94)

## THE INFLUENCE OF ROAD TRAFFIC ON A BREEDING COMMUNITY OF FOREST BIRDS

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A sudden development of road infrastructure can negatively influence the natural environment. One group of organisms exposed to these adverse impacts are birds. The main effects of this process are primarily: loss and fragmentation of habitats, mortality of animals due to collisions with road vehicles, andwithdrawal of birds as a result of disturbance and excessive noise in the neighbourhood of roads. In this study we attempted to define the influence of a busy road on a breeding community of woodland birds. Individuals were counted using the point method at 54 observation points located at three distances from a busy road in Eastern Poland (Janów Forest). At each point we determined a range of habitat parameters and the intensity of noise. In total, 995 individuals of 39 species were recorded on the study plot. This study showed that the area was homogeneous with respect to habitat. The number of birds per point increased with distance from the road. Species diversity was lower near the road. The number and species diversity of birds were correlated with the pattern of sound propagation across our study area. These results are generally consistent with predictions of the traffic noise hypothesis, because the number and species diversity of birds were correlated with the pattern of sound propagation across our study area. The density of nine common species increased with distance from the road. Only the great tit *Parus major* and song thrush *Turdus philomelos* preferred areas close to the road. Our investigation is in agreement with a range of studies demonstrating the decline in numbers and species in the vicinity of roads carrying heavy traffic. We found that the species particularly sensitive to road traffic were those with low-frequency calls. An important observation from our study is that with increasing distance from the road, the number of birds nesting on or close to the ground also rose.

## INDIRECT EFFECTS OF BTI MOSQUITO CONTROL ON BIRDS IN THE CAMARGUE, FRANCE

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Following its high selectivity and low toxicity to nontarget organisms, *Bacillus thuringiensis var. israelensis (Bti)* has become the most commonly used microbial agent to control mosquitoes worldwide. *Bti* is considered non-toxic to mammals, birds, fish, plants and most aquatic organisms, at the exception of non-biting-midges (chironomids), which are considered as a major prey item in wetland food webs. Yet, very few studies have addressed the indirect effects of *Bti* on birds through trophic interactions. This topic was addressed within the frame of a control programme encompassing 2500 of the 25,000 ha of mosquito biotopes in the Camargue. Since 2006, *Bti* spraying (aqueous solution of VectoBac 12AS at 2.5 L/ha) occurs whenever *Aedes* larvae appear in water bodies, resulting in 30-60 aerial treatments annually. House martins, reed passerines and waterbirds were used as biological models among birds to assess the indirect effects of *Bti* based on the comparison of treated and control areas over a 6-yr period. Results from the house martin colonies (n = 6) reveal significant changes in the chick diet with less nematocerans (mosquitoes and midges), spiders and dragonflies taken in treated areas (n = 3), partially compensated by a higher intake of flying ants. This diet modification translated into a 33% decrease in breeding success at treated sites. The study on reed passerines relies on a food availability index (sweep-netted invertebrates weighted by their frequency in the bird's diet), which is positively correlated with bird abundance and with the length of the hydroperiod in the preceding year. When food availability is modeled based on hydrology, treated sites (n= 5) exhibit a significant 37% food decrease relative to control sites (n = 10), including a 58% decrease in spider abundance. These two studies reveal *Bti* effects at two trophic levels, since spiders and dragonflies extensively depend upon *Bti*-sensitive dipterans. The study on waterbird abundance covers the period 2000-2011 at three sites, including one sprayed with *Bti* from 2006 through 2011. A significant decrease attributable to mosquito control is observed in seven species among the most common (European coot -70%, mallard -37%, and wigeon -56%), with overall mean monthly abundance decreasing from 3809 to 2370 birds before and during mosquito control. These declines are presumably related to the combination of three factors: disturbance caused by aerial spraying, food resource decrease, and modified hydrological functioning to reduce mosquito production. These studies provide the first compelling evidence of an insecticide affecting vertebrate populations, putting into question the environmental-friendly character of *Bti*. Although highly selective, *Bti* toxicity can persist over several months, reducing the abundance of benthic organisms such as chironomids, with severe consequences on birds.

## DOES PERSONALITY EXPLAIN PREDATION AND PREDATION RISK MANAGEMENT? A REVIEW OF THE EMPIRICAL EVIDENCE

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Animal personality, or the concept of behavioural syndromes, refers to consistent behavioural differences between individuals in populations, and can involve single or multiple traits across time or space. Theory suggests that this consistency may reflect alternative life history strategies, the coexistence of which can be explained by uncertainty, environmental variation, and differences in state. How individuals manage the risk of predation is an important part of their life histories, and personality is widely expected to influence predation because the tendency to take risks has been linked to different axes of personality variation in a variety of animals. The reactive–proactive axis, for example, is thought to reflect whether individuals prioritize productivity or survival, mutually exclusive options that can be caused by conflicts between foraging and anti-predation behaviour. First we review existing formal and verbal theory. Second we examine the evidence for the idea that predation risk, and anti-predation behaviours, might be influenced by personality traits, or form behavioural syndromes with one another or with other kinds of behavioural traits. Third we ask how much evidence there is from the wild versus captive studies, and how much of this is experimental versus observational. Fourth we review whether there is any direct evidence for the expectation that the links between personality and anti-predation behaviour have any implications for population level processes, including natural selection, population regulation and conservation. Finally we argue that the role of predation risk in driving personalities and behavioural syndromes is likely to be pivotal, since predation is a major driver of survival fitness, and we highlight future avenues of research.

SESSION: Symposium 11 | 29 Aug 2013 | 1530

## HYBRIDIZATION IN BIRDS

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Avian hybridization has been under research for centuries, and has been an important aspect of the biological species concept in that reproductive isolation was one factor of assigning species status. However, nearly one tenth of all species have produced at least one hybrid, and this phenomenon still interests researchers. Most works have investigated pre-zygotic isolation barriers (mating mechanisms), such as plumage traits and vocal signals, but also more generally hybrid zones have been under study based on concepts of assortative mating. Nevertheless, hybridisation is still ongoing despite the fact that assortative mating keeps these zones narrow. This talk gives an overview over current knowledge and highlights how some interesting aspects, namely that of post-zygotic isolation mechanisms, have not been studied in detail - most researchers focus on sexual selection. Predation may also act as a post-zygotic isolation mechanism but such issues have only rarely been studied. In addition to some meta-analyses, examples of post-zygotic studies are presented.

SESSION: POSTER (95)

## EFFECTS OF LEAD EXPOSURE ON OXIDATIVE STATUS IN GREAT TIT *PARUS MAJOR* NESTLINGS

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Lead is a highly poisonous metal, distributing throughout the body in the blood and accumulating primarily in bones and kidney. Depending on the level of exposure, lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems of animals. Lead exposure can also affect the oxygen carrying capacity of the blood. Lead is persistent in the environment and can accumulate in soils and sediments, for example through deposition from air sources or via mining activities. Ecosystems near point sources of lead have shown a wide range of adverse effects including changes in community composition and decreased growth and reproductive rates in plants and animals. We aimed to study the effects of lead exposure in nestlings of great tits *Parus major* by manipulating their dietary lead levels. Birds were divided into three treatment groups; high concentration, low concentration and control group. In addition, we included in our experimental setup a great tit population breeding in the vicinity of a metal smelter to be able to compare the effects of dietary lead levels to those caused by exposure to mixture of metals and other pollutants. Our experimental exposure levels (high 4 μg/g, low 1 μg/g) were based on information found in literature of dietary and fecal lead levels reported for this species at some smelter sites. Lead was given by dosing water with lead acetate (treatment) or distilled water (control) orally every day for eleven days (from day 3 to day 13). The group close to the smelter was dosed with distilled water. Blood samples were taken from 7 day-old nestlings and oxidative status biomarkers glutathione peroxidase (GP), glutathione-S-transferase (GST), superoxide-dismutase (SOD), catalase (CAT), glutathione (GSH) and GSH:GSSG ratio were measured to see whether lead exposure increases oxidative stress in the great tits nestling. Lead concentrations were measured from faecal samples. Close to fledging time, the nestlings were transported to the aviary so we could monitor their condition and behaviour after the nestling phase. Oxidative status measurements were repeated when the nestlings were 30 days old to see whether oxidative status varies between 7 and 30 day-old nestlings. The preliminary results showed a negative association between nestling growth and GP activity, with smaller nestlings having higher GP activity. Interestingly, the highest GP activity was found in the group close to the metal smelter, which may be due to poorer nutritional conditions in nestlings close to the smelter site, rather than direct pollution effects.

SESSION: POSTER (96)

## SPATIAL HETEROGENEITY OF BIRD ASSEMBLAGES OF THE EASTERN EUROPEAN AND WEST SIBERIAN PLAINS

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In this study, the results of complex line transect counts were used for the analysis of territorial differences between bird assemblages. These counts were carried out in Eastern European and West Siberian plains, in all natural zones, from May 15th to July 15th, from the end of the 19th century to the end of the 20th century. Birds were counted in habitats ranked by landscape tracts. The classification was made by means of a cluster analysis, based on a matrix of similarity coefficients. For each distinct taxon of classification (groups of similar bird assemblages of different ranks), average total population density, species richness, biomass, transformed energy, and faunal composition were calculated. All calculations were carried out using the database and software provided by the Zoomonitoring laboratory of the Institute of Animal Systematics and Ecology SB RAS. The classification showed that there are three bird assemblage systems in Eastern European and West Siberian plains: 1) the natural field assemblages, 2) the residential, industrial and ruderal assemblages and 3) the aquatic and wetland assemblages. Each system includes assemblage types that correspond to their zone. Population density and species richness of birds are known to increase from the poles to the equator, due to the increase in temperature and corresponding productivity of ecosystems. However, in Eastern European plains, population density and species richness decrease to the south of the middle taiga and increase to the north of it. The increase in these parameters to the north is caused by the warm influence of the Atlantic. The decrease to the south of the middle taiga is associated with anthropogenic degradation of bird habitats, mostly due to extensively tilled land. The anthropogenic transformation on West Siberian plains is much more limited, so population density and species richness of bird populations mainly increase from north to south. In the steppe zone, which is characterized by large cultivated (and consequently lean) areas, these parameters are lower than in the forest steppe. The boundary between the tundra and forest types of bird assemblages in Europe has been shifted to the north as a result of the warm influence of the Atlantic. In the western part of Eastern Europe, the northern boundary of the tundra forest assemblage has been shifted almost to the shores of the Arctic Ocean, whereas in the eastern part it passes through the northern taiga. In Western Siberia the climate is more continental, with a considerable proportion covered by bogs and floodplain areas. The northern taiga forests have been thinned, and therefore the boundary between the tundra and forest types bird assemblages have been significantly shifted to the south, up to the boundary between the northern and middle taiga.

SESSION: Symposium 5 | 29 Aug 2013 | 1210

## INCIDENCE OF EMBEDDED SHOTGUN PELLETS IN BEWICK'S SWANS *CYGNUS COLUMBIANUS BEWICKII* AND WHOOPER SWANS *CYGNUS CYGNUS* WINTERING IN THE UK

REES E: Presenting Author

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Migratory whooper swans (*Cygnus cygnus*) and Bewick's swans (*Cygnus columbianus bewickii*) have been protected by national and international legislation throughout their migratory ranges since the mid 20th century, yet illegal shooting of both species still occurs. X-rays taken of wild caught swans at several sites in the UK were inspected to determine: (1) the incidence of embedded pellets in live birds, (2) inter-specific differences in the level of illegal shooting, and (3) trends in the prevalence of shot-in pellets between the 1970s and the 2000s. A significantly higher proportion of Bewick's swans (31.2%) contained shot-in pellets than whooper swans (13.6%). The likelihood of a bird having been shot increased with its age for both species. The proportion of Bewick's swans with embedded shot was higher during the 1970s and 1980s than in the 1990s and 2000s but the incidence remains high, with 22.7% of Bewick's swans X-rayed in the 21st century containing shot. The prevalence of whooper swans with embedded shot did not change significantly over time (14.9% with pellets in the 1980s compared with 13.2% with pellets in the 2000s). Illegal shooting is of particular conservation concern for the Bewick's swan population because its numbers declined by 27% between 1995 and 2005 and national trends indicate that numbers have continued to decline since then. International collaboration is required for the successful reduction of poaching of migratory swans, as demonstrated for other hunted species, particularly as adherence to national and international legislation is likely to vary between countries. Information gathered on perception of the levels of illegal shooting along the flyway is also described, together with an initiative to address the issue.

SESSION: POSTER (97)

## TEMPORAL SHIFTS IN A BIRD COMMUNITY OF AN ABANDONED MOUNTAIN LANDSCAPE (NW SPAIN) AT CENSUS PLOT SCALE

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Land use changes and their effects on biodiversity are currently a major challenge for ecologists and conservationists. Rewilding abandoned landscapes in Europe may impact biodiversity and ecosystem services, particularly those associated with open habitats. Over a 10 year period we studied the land use/land cover changes (LULCC) in an abandoned mountain landscape (Galicia, NW Spain) and their effects on breeding bird occurrence and distribution. We combined a land use change analysis from remotely sensed data-derived maps with an analysis of bird censuses from 2000 and 2010 at the census plot scale through co-inertia analysis. The bird community was surveyed in 2000 and 2010 by 5-min point counts (n=179) with a max observation distance of 100 m. Censuses took place during the breeding season (March–June) in days without marked rainfall or wind and during the 4 hours after sunrise. Land cover composition was obtained from 2 LULCC maps derived from 5 Landsat TM and ETM+images acquired at the same time as fieldwork. Considering the main cover types of the study area (open shrublands, close shrublands, deciduous forests, evergreen forests, human-influenced areas and bare ground) we performed the classification of images using a hybrid classifier that combines an unsupervised classification approach with training areas. We validated Landsat-derived maps using test areas and the kappa coefficient. To study temporal shifts in land cover composition and breeding bird community we used a co-inertia analysis. The bird data consisted of presence/absence of 31 bird species in 358 census plots (179 plots x 2 years). The environment data consisted of the proportion (%) of pixel classes in a radius of 100 m of the 358 census plots. A monte-Carlo test was run to assess the significance of the co-structure of the data. The overall accuracy of Landsat-derived maps remained constant over years (kappa coefficients = 0.90 and 0.91 for 2000 and 2010, respectively). The co-inertia analysis ($p < 0.005$) first axis showed a gradient from open shrublands and associated species to forested lands (deciduous and evergreen forests). The second axis defined a gradient from bare ground, human-influenced areas and associated species to closed shrublands. Eight species, mainly dependent on open spaces, which were negatively affected by these land abandonment and successional processes (eg *Alauda arvensis*, *Lullula arborea*, *Anthus trivialis* or *Lanius collurio*), highlighting the need to maintain open spaces for the biodiversity associated with these habitats. However, 21 species, mainly associated with shrublands and forests, have been favoured. We conclude that rewilding also has potential benefits for biodiversity.

SESSION: POSTER (98)

## HOW DO GROWTH CONDITIONS INFLUENCE AGING PARAMETERS? EFFECTS OF BROOD SIZE MANIPULATION ON TELOMERE DYNAMICS AND OXIDATIVE STRESS IN THE ZEBRA FINCH *TAENIOPYGIA GUTTATA*

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Growth is a critical period of life in most organisms. For example, growth trajectories in early life have been shown to affect the adult phenotype by affecting the organism's development or the programming of a suite of physiological processes modulating subsequent adult performances and, ultimately, lifespan. Therefore, growth rate is a key life history trait and may incur costs over different time scales. Nonetheless, the underlying mechanisms of the growth / longevity trade-off are not clear and one emerging hypothesis is that growth impacts longevity through an aging mechanism: accelerated telomere erosion.

In this study, we examined the effects of modified growth conditions on telomere dynamics by measuring telomere length within individuals from nestling to adulthood in zebra finches. We modified growth conditions by manipulating brood size, creating three experimental groups: enlarged broods, control broods, reduced broods. We found that birds raised in enlarged broods grew slower, displayed more oxidative damage and had shorter telomeres at the end of the growth period, suggesting a link to the highest nestling competition in enlarged nests. This effect carried on a year after growth ceased.

These results indicate that a modification of growth conditions by manipulation of brood size is associated with short and long term effects on telomere dynamics, suggesting that telomeres may underlie the growth-lifespan trade-off.

SESSION: Symposium 16 | 29 Aug 2013 | 1710

## WHEN WILDLIFE NEEDS HUMAN DISTURBANCE: THE ROLE OF EARLY SUCCESSIONAL HABITATS FOR SPECIALIZED AND THREATENED BIRD SPECIES

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The long history of human influence on northern temperate landscapes has created a mosaic of successional stages, from closed forest to open grassland. Various species thus adapted to different habitats and it is interesting to explore how these differences in species composition among particular successional stages translate into differences in bird communities. Our detailed habitat-specific mapping of bird occurrence in abandoned military training sites revealed that late successional habitats (dense scrubland and forest) were the most species rich, whereas early successional stages hosted bird communities with the highest habitat specialization and threat level. It is possible that this pattern originates from evolution of habitat selection in northern Eurasian birds. Forests would cover the majority of the European continent in the absence of human intervention, whereas open habitats would be confined to small refuges. Forest has thus a considerably larger bird species pool than early successional habitats, and this could result in the higher bird species richness of forest habitat patches observed in our study. Moreover, the fact that forests were widely distributed during the bird faunal history could have enabled the evolution of large geographic ranges for forest bird species and, as a consequence, their ecological generalism. In contrast, the limited distribution of suitable habitats could have selected for the increased specialization of open-habitat bird species. Recently, the land use changes lead to a continental-wide population decline of open-habitat species. Using long-term bird monitoring data from the Czech Republic, we showed that their rate of decline was highest in lowlands before 1990, most likely due to intensive agriculture under communist government. After fall of communism in 1989, vast areas of arable land were converted into grasslands or left abandoned in higher altitudes. These land use changes mirrored in more favourable population status of open-habitat species on these sites. However, such positive trends should be interpreted with caution given transitional state of the early successional habitats. Our previous results suggest that the forest encroachment on open habitats would lead to loss of the specialized species of high conservation concern. Since the land abandonment is now widespread in many Eastern European regions, we urge more attention to be given to maintenance of open habitats due to their crucial role for such species.

SESSION: POSTER (99)

## MECHANISMS OF SPECIATION IN TWO CLOSELY RELATED PASSERINE SPECIES: COMMON NIGHTINGALES *LUSCINIA MEGARHYNCHOS* AND THRUSH NIGHTINGALES *L. LUSCINIA*

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Understanding the mechanisms causing reproductive isolation between incipient bird species can provide important insights into the process of speciation in birds. We study these mechanisms in the Common Nightingale and the Thrush Nightingale within a multidisciplinary project focusing simultaneously on morphological traits, vocalization, genetics, and interspecific interactions. We found that populations of these two species recently came into secondary contact after divergence approximately 1.8 Mya. Both species have similar ecological requirements but we observed divergence in relative bill size in sympatry, which most likely evolved to reduce interspecific competition for food resources. This divergence was asymmetric and was caused mainly by increased bill size in *L. megarhynchos*. This finding, together with the larger body mass of *L. luscinia,* suggests that *L. megarhynchos* is the competitively inferior species. However, results of simulated territorial intrusions (by playbacks) challenge this conclusion since *L. megarhynchos* showed higher levels of both interspecific and intraspecifc aggression. This might be caused by its earlier arrival on the breeding grounds, resulting in higher defence intensities of already established territories. Both species occasionally hybridize and we found strong evidence of gene flow in both directions, but more introgression occurred from *L. megarhynchos* into *L. luscinia*. We estimate the frequency of hybrids as 3-5 % in sympatric populations. The interspecific hybrids appear to have reduced fitness in comparison to their parental species, particularly due to sterility of F1 females, according to Haldane's rule. Most hybrids detected in sympatry originated from mating of a male *L. megarhynchos* with a female *L. luscinia*. This result contrasts with the observed convergence of male songs, a trait particularly important for mate choice, in the sympatric zone. Heterospecific copying of songs is very common in sympatric *L. luscinia*; males of this species include *L. megarhynchos* song types to enrich their own repertoire. As *L. megarhynchos* has more elaborate songs, its males might be more attractive for some heterospecific females. If that is so, the observed heterospecific copying could be an adaptive process increasing attractiveness of *L. luscinia* males. However, this hypothesis remains to be tested by female preference experiments that will be subject of our further studies. Taken together, results of our research convincingly demonstrate that European nightingale species are an excellent model for studying ecological, evolutionary and behavioural consequences of secondary contact and hybridisation of closely related bird species.

SESSION: Symposium 17 | 31 Aug 2013 | 1040

## PRIMARY MOULT PATTERNS OF GREENSHANKS *TRINGA NEBULARIA* ALONG THE WESTERN AND EASTERN MIGRATION ROUTES TO AFRICA

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Greenshanks migrate from their Eurasian breeding grounds to western Europe and West Africa along a western route, and to East and southern Africa along an eastern route. Migrants avoid an overlap of migration and primary moult, with each population having a strategy to accommodate these life cycle activities. We relate the geographical patterns of primary moult of adult Greenshanks to migration distance, and compare the moult patterns of western Greenshanks (Dutch Wadden Sea and Morocco) with eastern Greenshanks (Kenya and southern Africa). At a finer scale, we relate the timing of arrival of Greenshanks with the starting date of primary moult in Zimbabwe, and on the east coast and west coast of South Africa. We used the Underhill-Zucchini moult models to do the analyses. At the Wadden Sea, a stopover site 800–2300 km from the breeding grounds, those adult Greenshanks which arrived in July had an advanced but suspended primary moult; they resumed moult at the site. Later migrants commenced their moult at the Wadden Sea and either completed or suspended it there; others did not moult any primaries and continued migration. At a stopover and final staging site in Morocco, adult Greenshanks arriving in July showed two patterns: a minority arrived with suspended moult and then resumed it; the majority commenced moult and replaced all primaries after arrival in Morocco. Moult duration (estimated by linear regression) was between 75 days, between July and late September. In Kenya (5500–8000 km from the breeding grounds) most adults arrived with primary moult suspended, and resumed it there between September and January. In southern Africa (9000–12500 km from the breeding grounds), adults commenced moult of all primaries after arrival, and moult duration was 105–122 days, between September and January (estimated by Underhill-Zucchini model). Moult started 16–19 days earlier in Zimbabwe and the east coast of South Africa than on the west coast (4, 7 and 23 September, respectively). This corresponds with the timing of arrival of Greenshanks; arrival in Zimbabwe and the east coast is about three weeks earlier than on the west coast. Some Greenshanks which migrate medium-distances start primary moult at early an stage of migration, suspend it and resume it at later stopover sites and the final non-breeding site. This strategy occurred along both flyways. In contrast, the longest-distance migrants commenced primary moult after completing their migration to southern Africa.

SESSION: POSTER (100)

## SEPARATION OF FORAGING AREAS AND PREY SELECTION WITHIN A GUILD OF SYMPATRICALLY BREEDING TERN (*STERNA*) SPECIES

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Seabird species breeding sympatrically in large colonies are subject to interspecific competition. Morphologically similar species should partition resources by varying prey preferences or by foraging in different areas. We examined the foraging behaviour of Arctic (*Sterna paradisaea*), common (*Sterna hirundo*) and roseate terns (*Sterna dougallii*) breeding on Coquet Island, north-east England. We used colony-based observations and coincident at-sea visual tracking of foraging birds to quantify the interspecific overlap in prey selection and foraging areas. Prey profile and chick provisioning rates were significantly different among all three tern species. Arctic terns had the highest provisioning rates and fed chicks a large proportion of small prey items; their provisioning rate increased with brood age. Common and roseate terns had lower provisioning rates than Arctic terns and delivered mainly large prey items at a rate that did not vary with brood age. Roseate terns foraged exclusively in a restricted area close to the shore, while Arctic and common terns foraged over a wider area, with Arctic terns staying closer to the colony than common terns. Core foraging areas of both Arctic and common terns shifted closer to the colony during late chick-rearing. Our study shows that whilst the foraging activity ranges of these three species showed a high degree of commonality, there were sufficient differences in foraging behaviour and in core foraging areas to minimise interspecific competition for food resources.

## RECONCILING FORESTRY AND CONSERVATION: THE CASE OF THE MIDDLE SPOTTED WOODPECKER *DENDROCOPOS MEDIUS* IN TRADITIONAL FOREST LANDSCAPES

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Widespread intensive forestry, through the destruction of key forest structures, poses a major threat for biodiversity conservation. A central unsolved question in conservation biology is, therefore, how to reconcile forestry and conservation. Because many woodpecker species require forests with particular habitat attributes that are shared by numerous organisms, woodpeckers have been shown to be excellent indicators of forest health and biodiversity. By using a long-term ecological study on the middle spotted woodpecker (2000-2013), we show that, contrary to intensive forestry, traditional silvopastoral management practices are compatible with conservation. In NW Spain, middle spotted woodpeckers breed in Pyrenean oak dehesas and mature forests, two types of traditional forests subjected to sparse firewood extraction by selective cutting and moderate livestock production. Traditional management promotes the development of large oaks and decayed trees, which are used by woodpeckers for foraging and nesting, respectively. Moreover, dehesas and mature forests do not differ significantly in territory density, reproductive performance, male pairing success or survival rates of woodpeckers, suggesting that both forest types are suitable habitats. Conversely, intensively-managed forests subjected to clear-cutting and fires are composed of small diameter oaks unsuitable for woodpeckers. Larger dehesas and mature forest patches are more likely to be occupied by woodpeckers, indicating that conservation-oriented traditional management should be performed in extensive areas. In addition, traditionally-managed forests with higher density of oaks>37 cm DBH are more likely to be occupied and colonized by woodpeckers, showing that management actions aimed to increase forest maturity will impact positively on population persistence. Dehesas and mature forests also hold high abundances and species richness of secondary cavity-nesting birds as well as particular assemblages of carabids that deserve to be protected, further highlighting the value of traditional management in allowing the reconciliation of forestry and conservation. Furthermore, the maintenance of traditional management practices in Pyrenean oak forests preserves a cultural heritage exclusive to Iberia. However, the social-ecological system associated with these traditional management practices is not sustainable nowadays, partly due to the intensification of livestock production systems promoted by the EU Community Agrarian Policy in recent decades. The payment of subsidies may preserve traditional management systems in the short-term, but we argue that the long-term sustainability of social-ecological systems requires the development of policies that encourage new direct links between local communities and ecosystems to prevent rural abandonment and to preserve forest biodiversity.

## SAVING BIRDS BY MARKING GLASS

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Although glass continuously plays a major role in current architecture, public and architects are becoming more and more aware about the disadvantages and dangers of glass. These include functional issues (energy efficiency, sun control, additional costs in frequent cases of breakage etc.), aesthetic issues of bare, dark, reflecting facades, and, not to forget, bird strike risks. Current printing techniques are generating new ideas of glass design and bird deterring patterns may get the chance of becoming fashionable. "Bird protection glass" as a market niche is not unambiguous as intended solutions often do not deliver what they promise. Standardised comparable tests have to be done to classify efficacy.

I will present experimental research done in our flight tunnel, main results and surprising findings on diverse deterring effects of prints, coatings and decals. To benefit from the unique opportunity of this symposium that gathers specialised researchers to avian vision, I would like to critically consider some of our findings, which are contrary to widespread accepted views. (1) Neuroanatomical data suggest that colour vision might not be useful for obstacle avoidance, but our experiments showed orange stripes with high chromatic and low achromatic contrast to the background to rank among the most effective markings. (2) Several transparent UV coatings, thought to be effective as bird deterrent while invisible to human, rank at the far end (ineffective) of the scale of tested markings. (3) Fine, dense grids and lattices, similar to mosquito screens, were recognized as being worse than expected. This possibly has to be discussed in the light of spatio-temporal tuning of retinal receptors and neurons in the accessory optic system. These and other findings and resulting questions may contribute to fruitful discussion in the Avion Vision – Glass Collision Symposium.

SESSION: POSTER (101)

## THE USE OF RINGING DATA BASES FOR POWER LINES BLACK POINTS DETERMINATION

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Implementation of measures for bird safety on power lines requires the use of predictive tools to identify black points (danger areas). The use of ringing databases containing specific fields recording death circumstances and geographical situation is a very valuable tool to identify such points. They also allow modeling of potential hotspots for bird safety on power lines.

An investigation of the Spanish ringing database was conducted for the category "dead birds on power lines" to identify danger areas for mortality on power lines and to elucidate if differential death patterns differ with age class, distance to the nest and time since ringing. A total number of 1867 entries for individuals ringed as nestlings of 22 different species were used for the analyses.

The results are promising as they allow the identification of black spots in power lines that need to be adapted for bird safety. The use of ringing databases should provide clearly proactive management tools and prevent fund investment in non-priority areas. In addition, the performance of combined risk maps for different species will prioritize certain areas over others in adopting conservation solutions and adaptation.

## REPRODUCTIVE ISOLATION AND SPECIES DEFINITION IN BIRDS

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Biological diversity is continual as a result of evolutionary process, whereas our language of its description is symbolic and therefore discrete. So, the main question of the "species problem" is that: do the species really exists in nature or not? The answer of this question depends on the "system of coordinates" in which we are describing the species. The species inhabiting the same territory ("one-dimension species") are usually discrete. But when we start to describe the closely related species in their distribution areas ("two-dimension species"), the drawing of the species limits becomes problematic. So, we can define speciation as the process of establishing the sympatry between the diverging taxa and the species as the morphologically distinguished groups of organisms that can coexist at the same territory for a long time. There are more then 20 of the modern species concept, but their diversity can be reduced to the two main kinds: "biological species concept" and "phylogenetic species concept". The later has the disadvantage in compare with former because it is not deal with the question of species reality. Moreover, our ability to describe "phylogenetic species" depends on the method of investigation: using of morphological, acoustic or different molecular markers lead to the different results. From the other hand, using just one criteria of reproductive isolation for description of the "biological species" may lead us to entanglement in the interpretation of speciation process. For example, North American red crossbill (*Loxia curvirostra*) is comprised of nine morphologically and acoustically differentiated forms. They are reproductively isolated and specialize on different conifer resources and therefore must be described as separate species. These forms do not differ by mtDNA, but show slight differences in AFLP markers. In this case we deal with ongoing adaptive radiation that seems do not lead to speciation because of periodically coalescence of diverging forms. In another example, Yellowhammer (*Emberiza citrinella)* and Pine Bunting (*E. leucocephala*) formally cannot be described as separate species because of they are fluently hybridizing in nature. These bunting do not differ by mtDNA too (that seems to be the result of hybridization), but show the obvious differences by nuclear gene and AFLP markers. In cladistic analysis conducted on acoustical and morphological characters Yellowhammer was joined with the Cirl Bunting (*E. cirlus*) and the Pine Bunting with the Chestnut-breasted Bunting (*E. stewarti*). On this example we can conclude that hybridization do not lead to the fusion of divergent forms on the final stage of speciation. The "problem of species" described above can be solved by synthesis of "biological" and "phylogenetic" species concepts and by using of several taxa of under-species level (ecological races, subspecies, semispecies) represented the different stages of speciation process.

SESSION: POSTER (102)

## PATERNAL CARE IN A FACULTATIVE POLYGYNOUS SPECIES, *STURNUS UNICOLOR* IS ASSOCIATED WITH HIGHER FEMALE AND NESTLING CONDITION

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Reproduction is costly for organisms in terms of energetic demands and resources. Because of this cost, it may lead to compromises with other vital activities such as moult or growth. One of the most demanding systems inside an organism is the immune system. In species with biparental-care, it is expected that both parents share the offspring care in an equitable manner. This way, the costs of reproduction are divided among the parents. However in those species in which the assistance of one parent is variable, the costs will relapse over the other member of the couple depending on the received help. In the present study, body condition in female spotless starlings was analyzed according to male assistance received during reproduction. It is expected that females which received help fromn a minor male might suffer a decrease in their physiological status (immune capacity and body condition). This reduction could also affect individual survival and future reproduction. Nestlings from nests with minor male assistance are also expected to be in worse condition. The study was performed in May-July 2012 in a nest box population in Soto del Real (Madrid, Spain). Parental care was recorded by means of subcutaneous transponders over approximately 48h. Females were trapped before their eggs hatched and when the nestlings were 14 days old. Weight and a blood sample for immune measures were obtained from each female as well as from each chick. *In vitro* T- lymphocyte proliferation and level of IL-6 (a proinflammatory and antimflamatory cytokine) were assessed as immune condition measures. Results obtained from this study indicate that female contribution to each clutch was higher than that of males over the whole reproductive season. Male assistance decreased during second clutches. An explanation for this behaviour could be a trade-off between moult and reproduction (this species suffers a complete post-breeding moult). In regard to female condition, no significant differences were found in immune capacity according to male assistance. However females with less help in first clutches suffered a greater decrease in body mass. In second clutches we found a positive relationship between male assistance and nestling condition. In this species, it seems that male help has no effect on the immune condition of the female. Therefore in this species differences in male assistance could have an effect not only on female condition, but also on the offspring.

SESSION: POSTER (103)

## BLUNT-WINGED WARBLERS *ACROCEPHALUS CONCINENS* IN HUNAN HUPINGSHAN NATIONAL NATURE RESERVE (CENTRAL CHINA)

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The genus *Acrocephalus* is an extraordinary diverse group of birds which has been the object of many studies. However, there are still many unanswered questions left and several species remain almost unstudied. Blunt-winged Warblers are particularly poorly studied and there is a lack of data about its range, habitat, behaviour and breeding biology. In May 2012 we studied the population that breeds in Hunan Hupingshan National Nature Reserve, Central China. The first recording of this species in Hupingshan was made in 2010 but the management of the reserve has never included provisions for Blunt-winged Warblers and no research on this population has been done until the present study. The population size of Blunt-winged Warblers was small; the largest in one meadow was three pairs. Such low densities may be because some birds are still on migration at the end of May. All the birds we found were singing in dry thickets of Reeds (*Phragmites spp.*) or Wormwood (*Artemesia spp.)* which were >1.5 m high (elevation around 1500 m above sea level). The males advertised their territories,.by singing from near the top of a stem, sometimes flying into adjacent territories. Females arrived soon after the males and began to build nests straightaway. The song is very similar to that of Paddyfield Warblers *Acrocephalus agricola*, but male Blunt-winged Warblers did not react to playback of this song, they only reacted to song playback of their own species by singing and moving close to the speaker.

SESSION: POSTER (104)

## LOCAL BREEDING FAILURES AT DOÑANA AS A MOTOR FOR THE SPREAD OF GLOSSY IBIS *PLEGADIS FALCINELLUS* THROUGH WESTERN EUROPE

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In 1996 seven breeding pairs of glossy ibises *Plegadis falcinellus* settled at Doñana. Since then there has been a stunning increase of this population with more than 5,000 breeding pairs in 2011. Over this period more than 15,000 chicks have been marked with darvic rings and almost 10,000 Doñana-born individuals have been resighted. At Doñana, a great number of individuals have been resighted over the autumn-winter seasons when they are easily observed feeding in large flocks in marshes and flooded ricefields. We used a multi-event capture-recapture approach (an extension of the multi-state capture-recapture) to estimate the individual dispersal probability of this population over the study period. We also tested the relationship between dispersal and different factors acting at the individual (i.e. sex and age) and environmental level (population size, breeding failures, breeding success, and habitat quality). This analytical approach allowed us to (*i*) use a powerful approach to test for potential differences in dispersal between sexes, and (*ii*) estimate the local sex ratio of the population in autumn-winter. During this time individuals born at Doñana have been observed in several countries like Portugal, United Kingdom, France, Germany, Ukraine, Italy, Tunisia, Algeria and Morocco. Our results suggest that local breeding failures strongly enhanced the dispersal of individuals born at Doñana. In particular, since the 2005 local drought, a high number of locally-born individuals were observed outside of their natal site expanding across Western Europe and Mediterranean basin. Some impressive records of long-distance dispersers have been reported of individuals flying more than 6000 km and crossing the Atlantic. Based on philopatry, we identified two groups of individuals: residents (that are highly philopatric to Doñana) and non-residents (transients). On non-drought years, when glossy ibis bred in Doñana, breeding success was negatively associated with the non-residents dispersal whereas the dispersal probability of residents gradually decreased since the establishment of the colony in 1997. We found no clear differences in dispersal probability between juveniles and adults nor males and females. There was a temporal trend towards a female-skewed sex ratio during the autumn-winter, possibly suggesting the secondary sex ratio or the dispersal behaviour of females and/or males changed over the study period. Our findings suggest that multiple causes affect the decision individuals face to stay or to leave, highlighting the importance of the breeding outcome as a main causal factor and at the same time underlining the complex spatiotemporal dynamic of the dispersal process. It is clear that while droughts are a common phenomenon in Southern Spain, Glossy Ibis will continue periodically spreading out through Western Europe, and maybe establishing new breeding territories.

SESSION: POSTER (105)

## NUMBERS AND DISTRIBUTION OF BIRDS IN IRTYSH FOREST-STEPPE AND STEPPE IN WINTER

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In winter in the Irtysh forest-steppe and steppe, the greatest density of bird populations occurs in human settlements, in contrast to summer. In the towns of southwestern Siberia (Omsk, Biysk, Gorno-Altaisk), the density of birds during winter does not decrease, but rather increases in comparison with summer [Soloviev, 2005; Malmov, Haidarov, 2005; Belikova, 2006]. Far fewer birds than in urban settlements are recorded in forests and fields. The lowest total abundance of birds occurs in the second half of the summer (from 16 July to 31 August), and in the habitat of meadow-field type. This emphasizes the limited food resources and shelter in the habitats in the winter in the Western Siberia and Northern Kazakhstan. When considering the classification units of groups of bird species in Irtysh forest-steppe and steppe, those that dominate in winter are very similar to the summer list, with some differences in the dominant species. Changes in the composition of dominants are visible, especially the appearance in the list of tundra and taiga wintering species. The emergence of new dominants can be traced mainly to the forest-steppe and meadow-field ornithocomplexes with decreased total abundance of birds, where the proportion of dominant species in the population increases due to wandering wintering birds. So, in the meadows, fields and steppes the dominant species consist of Eurasian goldfinch, Northern bullfinch, Snow bunting, Black and White-winged Larks, Snowy owl, Jackdaw, Black grouse, Waxwing and Fieldfare. The spatial-typological structure of bird ornithocomplexes of Western Siberia and Northern Kazakhstan is distinct in winter. This structure is determined primarily by anthropogenic habitat changes, combined with the presence of forestry, parks and reed beds. On the built-up part of the forest-steppe and steppe, variability in winter populations is determined by anthropogenic food resources in residential habitats. The greatest impact on the heterogeneity of avian population in Irtysh forest-steppe and steppe of Western Siberia and Northern Kazakhstan is from human-related factors. Another difference between population structure in the winter is the presence of reed communities, and original steppe landscapes. As a result, the territorial heterogeneity of avian population in Irtysh forest-steppe and steppe is determined by the influence of forestry, wetlands, urbanization area, ruderal and human food resources.

SESSION: POSTER (106)

## CHALLENGES IN AVIAN SPECIES DISTRIBUTION MODELLING II. IMPLEMENTATION OF BIOTIC INTERACTIONS: THE CASE OF PARASITIC INDIGOBIRDS AND THEIR HOSTS

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Species distribution modelling (SDM) has become one of the most important tools covering many aspects of avian biogeography. Despite the benefits achieved by the application of SDMs, there are several challenges that have to be met to obtain biologically meaningful results. In this study we focus on the incorporation of biotic interactions into SDMs, which is one of the major methodological challenges in avian biogeography. This is particularly demanding when dealing with predictions on possible future range shifts. Interacting taxa, whose ranges are influenced by each other, could be affected by changing climatic conditions, particularly if they react in different ways to climate change. Studies on insects and their host plants suggest that the former should be more affected by climate change than their forage plant. These findings can be extended onto parasite-host relationships in birds. In African savannahs south of the Sahara, indigobirds (Viduidae) are obligate brood parasites of estrildid finches (Estrildidae). Due to a highly specific brood parasitism, each indigobird species strongly depends on the presence of a single estrildid finch species. Thus, the parasites' ranges are in any case located within the range limits of their respective hosts or have an even smaller extent. In this study, we analyse the extent to which host and parasite ranges will possibly shift spatially in the near future. For this purpose, we project the potential ranges of parasite-host pairs onto different climate change scenarios based on SDM. We infer predictions about possible future discrepancies in the respective potential ranges and discuss similarities in the climatic niches of the species pairs in ecological space.

## CONSUMER PULSES, AVIAN BREEDING HABITAT SELECTION, AND POPULATION DYNAMICS: DO PULSES CONSTRAIN INFORMATION USE?

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Mast-producing tree species are a major driver of the ecological dynamics of avian communities. Our long-term studies from the temperate forest in the eastern USA have documented relationships between spring rodent (*Tamias striatus* and *Peromyscus leucopus*) abundance and the density of red oak acorns produced the prior fall. In turn, rodents are major predators on the nests of ground-nesting birds. Annual nest predation, the principal cause of nest failure in veeries (*Catharus fuscescens*) is highly variable from year to year and an increasing function of rodent density. Moreover, this interaction influences regional veery population trends. Thus, the bottom-up effect initiating with acorn masting events is critically important for some forest songbird populations. Spatial heterogeneity in nest survival is also present at our site. Individuals, therefore, can use either their prior breeding success or prospect on conspecific success as performance-based cues to direct the choice of where to breed in the future. Using experimental playbacks of fledgling calls, we have demonstrated that veeries do prospect on conspecific success and bias breeding settlement at sites perceived to be productive in the past. At first glance, consumer pulses should short-circuit these mechanisms of breeding habitat choice. That is, for past success to be informative requires temporal correlation in territory quality. However, temporal variability can manifest in multiple ways to influence variation in the distribution of site quality. By modelling avian population dynamics with informed habitat choice and under different types of temporal variability I show that temporal variability in site quality is not necessarily an anathema to population growth and persistence; in fact, it may actually be beneficial by altering spatial heterogeneity over time. Under an information-based framework, we need to be very specific in how we quantify temporal variability in nature and, in theory, how we predict the ultimate effects of resource-consumer pulses in ecological systems.

## IDENTIFYING AREAS RESILIENT TO CLIMATE CHANGE: A CASE STUDY WITH THE LITTLE BUSTARD *TETRAX TETRAX*

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The length of the breeding season of Mediterranean Grassland Birds is constrained by the beginning of the dry hot season, due to the reduction of trophic resources. This temporal constraint is likely to become more important in the future, because of on-going climate change. The Mediterranean climate is expected to suffer reductions in rainfall and increases in maximum temperatures and drought episodes. Adult Little Bustard *Tetrax tetrax* feed almost exclusively on green plants and are thus likely to be affected by the expected increase in dryness within their Iberian range. With this work we aim to understand which areas are more resilient to climate change, by identifying locations where suitable habitat for Little Bustards persists for longer. We specifically aimed to i) identify the level of vegetation greenness suitable for breeding, using Normalized Difference Vegetation Index (NDVI) derived from MODIS satellite imagery; ii) understand what physical and climatic variables influence the duration of the period with adequate breeding conditions; iii) compare the extent of suitable breeding habitat in two contrasting climatic years.

We were able to identify the threshold NDVI associated with breeding areas based on the breeding home range of 27 birds. The birds were tracked using ARGOS/GPS for up to four breeding seasons. The duration of the period with levels of greenness adequate for breeding was strongly influenced by the initial NDVI (at the beginning of the breeding season), soil fertility, and also by mean maximum temperature and accumulated precipitation. The latter indicate a high vulnerability to climate change. In addition, we found that the area with suitable greenness levels for breeding varied substantially between 2005 (severe drought) and 2010 (average precipitation year). The results indicate that the SPAs located in southern parts of the country (which hold more than half of the Portuguese breeding population of Little Bustards) are areas where the vegetation dries fast and therefore are less resilient to climate change. During the drought year these areas had low NDVI values even at the beginning of the breeding season, indicating an overall inadequacy for breeding during these extreme events. In conclusion, these results indicate that for the long term conservation of the Little Bustard it is important to maintain a favourable conservation status in the whole SPA network, including sites which currently may harbour smaller populations but show greater resilience to climate change.

## COMPENSATION FOR WIND DRIFT BY THRUSHES DURING AUTUMN NOCTURNAL MIGRATORY FLIGHT

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Wind is a component of the track direction and bird's ground speed vector. Nocturnal migrants can minimize the deflective effect of lateral winds by selecting nights or altitudes with the most favourable wind conditions. A particular form of compensation for wind drift aloft could be observed in the areas with extent landmarks stretching out along the main direction of seasonal migrations. The data collected on the Courish Spit of the Baltic Sea by the Electronic-optical system helped us to estimate the mechanism of wind drift compensation in the Trushes during their autumn migration. The group of *Turdus* spp. can be reliably identified by this method, and from September to the beginning of October it was by 90% represented by the Song Thrush. The Electronic system allows to receive clear images of flying birds in darkness at the altitude up to 800m and to estimate track and heading direction, ground speed and wing-beat pattern. Wind profiling data has been used to calculate air speed. During 3 autumn seasons there were about 1000 clear images of thrushes with characteristics of their flight in a wide range of winds received. The results clearly showed that during autumn migration, even when the bird flux consists mainly of young navigationally naïve birds, the thrushes partially or completely compensate for lateral wind drift along the guideline of the Courish Spite. The compensation is achieved by combination of air speed and heading adjustment. Increasing side wind component causes an increase of both air speed and angle between track and heading (up to 60-70°). To estimate the contribution of wind selection and wind drift compensation along the guideline we used 3 dynamic models which imitate the migratory flux of thrushes from SE Baltic region to their winter quarters in SW Europe. The first model describes flight with neither wind selection nor drift compensation, the second – only with wind selection, the third – with both wind selection and drift compensation. The data based on real birds observed every night at the Courish Spit and real winds within Europe (Re-analysis2) has been used to enter input parameters for our models. For model parameterization all available data on migration of thrushes collected by various methods was used. The models showed that even if the birds did not select nights with favourable winds at least 50% of them could reach their habitual winter quarters but their distribution would be highly depended on wind condition of the particular year. When the thrushes selected following winds over 80% were distributed within their winter quarters according to ringing recoveries. If they used both wind selection and drift compensation their final distribution most closely corresponded to ringing recovery data. The last model implies that the role of wind drift compensation by using landmark guidelines is not as essential as wind selection but enables birds to mitigate deviation from the route and avoid offshore drift.

## LANDSCAPE-SCALE SETTLEMENT PATTERNS AND SPACE USE OF COLONIAL GULLS

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Birds are very mobile organisms and it is generally believed that the landscape structure does not obscure space use and colonization of habitat patches by individuals. Colonial birds are excellent object to study landscape-scale processes because each individual colony may be regarded as a local population. Therefore, colonial birds, such as gulls may help to understand metapopulation processes, geographical range spread and the behavioural response of individuals to different landscape structures at different spatial scales. In this talk we show that that even such mobile birds as gulls strongly respond to different landscape features during movements, foraging and selecting breeding ground. There is a clear gradient of environmental factors that leads to the emergence of colonial behaviour. For example, colony size is positively related to habitat patch size, with small patches often occupied by singular pairs. The larger the habitat patch, the higher the occupancy rate and lower probability of the extinction of local colony. Also, habitat isolation may negatively affect occupancy and colonization rates of breeding habitat patches. These clearly indicate that colonial birds undergo metapopulation dynamics. The case study on Caspian Gull showed that metapopulation dynamics may be also found during range expansion where the equilibrium between local colonizations and extinctions, assumed by the classical metapopulation models, is violated. Moreover, the colonization rate was positively related to human-related food resources spread in the landscape. The colonial gulls are also useful in understanding the effect of habitat fragmentation on metapopulation processes. A study on Black-headed Gulls indicated that different factors affect occurrence of breeding colonies and their abundance in fragmented landscapes than in more continuous ones. Moreover, occupancy rate and colony size were different between fragmented and more continuous landscapes.

Landscape structure may affect also behaviour of individuals. Study on Caspian Gull showed that extensive forests may impede movements of birds and utilization of foraging patches. It seems that many gull species use rivers as movement corridors. Also, foraging patches located close to rivers are utilized by foraging gulls more often than more distant patches. Rivers are also the most important factor enabling gulls to use the resources in an urban environment.

An interesting topic is also how birds perceive the landscape structure and how they learn to utilize the resources spread in space. Some first studies indicate, for example, that young gulls respond to landscape features in a different way and at different spatial scales than adults. All above show that colonial gulls are very sensitive to landscape features at different spatial scales. Thus, studies on colonial birds in this perspective may greatly add to the development of landscape ecology.

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## LONG TERM STUDIES OF DEAD WOOD RESOURCES AND A GENERALIST WOODPECKER, GREAT SPOTTED WOODPECKER *DENDROCOPOS MAJOR,* IN MANAGED AND UNMANAGED WOODLANDS IN SOUTHERN ENGLAND

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Over a period of 30 years Great Spotted Woodpeckers *Dendrocopos major* and dead wood resources have been studied in managed and unmanaged oak *Quercus petraea/robur* woodlands in southern England. Dead wood provides nesting and roosting sites for the woodpeckers and supports a key group of invertebrates on which woodpeckers feed. In this paper we will consider the dynamic processes which determine the evolution of the quantities and quality of dead wood in its three key forms (standing dead trees, dead wood on living trees and dead wood on the ground) and relate these to the preferences of the woodpeckers. By comparing the trends in the dead wood and the woodpeckers in managed and unmanaged woodlands we will draw lessons for future woodland management and the impact of management on the dynamics of dead wood resources.

## WHY DON'T ANIMALS GROW AS FAST AS THEY CAN? THE LINK BETWEEN OXIDATIVE STRESS AND GROWTH IN WILD BLUE TITS *CYANISTES CAERULEUS*

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It is well documented in nature that animals don't grow as fast as they can and a growing body of literature suggests an involvement of oxidative stress. Oxidative stress results from an imbalance between reactive species (RS) that can damage biomolecules and an organism's antioxidant system that counteracts these RS. Theory suggests faster growth may result in increased RS production that may overwhelm the antioxidant system, so potentially increasing oxidative damage to tissues. To investigate whether there is a link between growth rate and oxidative stress in wild animals, we used a brood manipulation regime to obtain variation in growth rates in blue tit *Cyanistes caeruleus* nestlings. This involved enlarging experimental broods by 2 chicks for the first half of the nestling period so as to reduce nestling growth. During the second half of the nestling period, the extra chicks were taken away and the constraints on growth thus removed in order to allow compensatory (catch-up) growth. Blood samples were taken at day 13, towards the end of the expected period of catch-up growth; these were used to measure a range of oxidative stress biomarkers including those of damage (hydroperoxides from protein, lipid and nucleic acid oxidation; and protein carbonyls from protein damage) as well as antioxidants (total antioxidant capacity, thiols and the enzyme glutathione peroxidase). In order to test whether the link between growth rate and oxidative stress was habitat-dependent, we compared broods in territories within the same woodland that differed in vegetation type and distance to the woodland edge. The study protocol did not result in significantly different growth rates between enlarged and control broods, suggesting parents were able to maintain provisioning rates at control levels. There were, however, growth differences between habitat types. Additionally growth rates were positively correlated with nestling protein carbonyl levels, suggesting damage from oxidative stress may indeed be a limiting factor for growth. The results indicate that there may be links between growth rate and oxidative balance in wild birds, and that growth may be associated with habitat types even on a very local scale.

## SPATIAL ORGANIZATION OF THE BIRDS IN TOBOL-IRTYSH FOREST-STEPPE AND STEPPE (SOUTH-WESTERN SIBERIA AND NORTHERN KAZAKSTAN)

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In order to distinguish the number and distribution of the types of birds in forest-steppe and steppe of Western Siberia and Northern Kazakhstan (Soloviev, 2012), the spatial-typological structure of the bird communities for the first half of the summer (from May 16 to July 15) is represented in the form of three related systems: undeveloped land, urbanization and settlements areas and water and wetland communities. The first of them form a community floodplain: meadow-steppe, field and floodplain meadow types. The second - the population of birds in lowland marsh, lake and river: Irtysh and Tobolsk types, the third - synanthropic ornithocomplexes. Major trends of changes in territorial abundance and distribution of birds in the forest-steppe and steppe in the first half of the summer are influenced by forestry ploughing, humidification, wetlands, water content and flow of water bodies, as well as built-up areas, ruderal and anthropogenic habitats of cities and towns. Increases in urbanization and settlements and the appearance of landfills increase the density of bird populations. Territorial heterogeneity of bird populations studied in the forest-steppe and steppe in the second half of the summer (from July 16 to August 31) is influenced by forestation, building, water area, wetlands, higher human food resources, ploughing, ruderal and valuable areas of cities. Seasonal differences between the structures of bird communities related to the post-breeding dispersion of species and late season migrations. Thus, for the natural landscape, ploughing is still important, while for urbanization and settlements habitats, food resources and other factors are important. Forestry and the presence of different types of rivers and wetlands are important. This emphasizes the dominant influence of agriculture, urbanization and settlements on the forest-steppe and steppe landscapes, reducing landscape-geographical boundaries between the nature zones. It is defined by a large, and in some places almost "total" ploughing and urbanization of landscapes around major regional and federal centres, as well as over-grazing of meadows by cattle near all settlements. Thus, in the summer the main territorial changes of bird populations in forest-steppe and steppe of South-western Siberia and Northern Kazakhstan are related to higher human food resources in the urbanization and settlements areas, and to forestry, bush and water conditions in the natural habitats.

## GREAT REED WARBLERS *ACROCEPHALUS ARUNDINACEUS* IN WINTER: SONG, TERRITORIALITY, AND INDIVIDUAL SUCCESS OF A TRANS-SAHARAN MIGRATORY BIRD

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Trans-Saharan migratory birds spend over 60% of the annual cycle in Africa thousands of kilometres away from their European breeding grounds, but little is known about their winter ecology or the factors that affect individual over-winter success. In particular, many Palearctic-breeding species sing vigorously in Africa, but the function of this behaviour is entirely unknown. Do migrants use song in territorial defence and does song reflect individual quality as on the breeding grounds? I investigated these questions in Great Reed Warblers *Acrocephalus arundinaceus* overwintering in Zambia, using a combination of playback experiments, physiological indices of body condition, and radio telemetry to determine space-use patterns. I asked whether the incidence and complexity of song was related to territorial vs transient movement strategies at the individual level, and whether each of these was related to body condition as reflected by scaled mass indices and blood plasma metabolites. I found that individuals held extensively overlapping home ranges rather than defended territories and that only 45% of males sang. Singing males were in better condition and left earlier for spring migration than their non-singing counterparts. This suggests an adaptive function of winter song apart from territorial defence. I will also report on results from comparisons of summer and winter song complexity and the role of testosterone in winter singing. A better understanding of the non-breeding ecology of Palaearctic-African migrants at the individual level may have significant implications for the conservation of long distance Palaearctic-African migrants, which are currently in a state of precipitous decline.

SESSION: POSTER (107)

## NATURAL? NOT NECESSARILY - THE IMPORTANCE OF STAND STRUCTURE AND NATURALNESS FOR THE ABUNDANCE AND DISTRIBUTION OF MIDDLE SPOTTED WOODPECKERS *DENDROCOPOS MEDIUS* IN DIFFERENT FOREST LANDSCAPES

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Middle spotted woodpecker *Dendrocopos medius* is considered to be a 'relict of European virgin forests', an indicator species of forests with natural properties, but also an oak specialist. Here we examine how the presence and population density of *D. medius* is associated with the forest naturalness in various habitats. Woodpecker surveys were performed on 1 km$^2$ sample plots in three NATURA 2000 forests differing with regard to type (broadleaf-dominated, conifer-dominated), size (small or large), fragmentation (from small isolated patches to large complexes), availability of suitable habitats for *D. medius* (abundant or scarce) and history of use. To assess forest naturalness on sample plots, we measured several parameters related to the amount of decaying wood of different types, living microhabitat trees, the harvesting intensity and the complexity of stand structure. We performed the Principal Component Analysis to identify main factors describing the naturalness of forests to use as variables in density-based generalized linear models.In all study areas neither the total amount of decaying wood nor the number of decaying elements did correspond with the uneven structure and tree species richness, except for the area (1) where the complex structure was positively correlated with the number of deciduous snags. In all study areas, woodpeckers preferred stands with high number of large trees (mainly large oaks), uneven structure and rich species composition. The total amount of decaying wood was not significant in all cases. Only in the area where suitable *D. medius* habitats were common and abundant, the number of deciduous snags was positively correlated with woodpeckers' population density. The results suggest that *D. medius* would benefit from the presence of stands with large rough-barked tress and uneven age structure – properties that characterize natural stands but can be found in many managed forests as well. Concluding, *D. medius* might be considered an indicator species of 'good forest management', focusing on the maintenance of diverse stand structure, even if its presence does not always correspond with the actual naturalness of forest.

SESSION: POSTER (108)

## CHALLENGES IN AVIAN SPECIES DISTRIBUTION MODELLING I. BETTER DISTRIBUTIONS OR BETTER NICHES? ACCOUNTING FOR SEASONALITY IN BREEDING RANGES OF MIGRATORY BIRDS

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Species distribution modelling (SDM) has become one of the major tools in many aspects of avian biogeography. However, there are several challenges that have to be met to achieve biologically meaningful results. In this series of contributions we want to quantify some of these challenges which are particularly important for ornithological applications. This study deals with the right choice of environmental predictors for SDMs in bird studies. In contrast to most other organisms, migratory behaviour in birds is a common phenomenon which makes standard procedures of modelling less transferable. Very often, modelling uses predictor variables which are based on year-round climate data although the target species is confronted with this climate only for a small part of the year, e.g. during the breeding or the wintering season. Herein, we test the effects of year-round variables versus seasonally constricted variables on modelling the breeding range of pairs of migratory sister species occurring in parapatry. We focus on Holarctic systems choosing species pairs either from the Nearctic or from the Palaearctic. Given climate niche conservatism as a premise, we assume that seasonal breeding niches of species pairs should be more similar to each other than niches derived from year-round predictor sets. We discuss our results within the growing framework on the theory of recent modelling approaches as well as under practical application-oriented approaches.

SESSION: POSTER (109)

## STARTING WITH A HANDICAP: THE IMPACT OF ASYNCHRONOUS HATCHING ON GROWTH AND SELF-MAINTENANCE (OXIDATIVE STRESS AND TELOMERE DYNAMICS) IN GREAT TIT *PARUS MAJOR* CHICKS

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Phenotypic plasticity should allow individuals to compensate for a bad start early in life, for example by increasing their growth rate if favourable conditions are restored after an initial period of restriction. However, such compensation has often been associated with immediate but also long-term costs. In recent years, oxidative stress (i.e. the imbalance between the production of reactive oxygen species (ROS) during normal energy processing and the level of antioxidant defences) has been suggested as a potential underlying mechanism for these costs. Oxidative stress is thought to contribute to senescence, notably because it could accelerate the erosion of telomeres, which are protective repetitive DNA sequences at the end of chromosomes.

In many altricial birds hatching occurs asynchronously, creating a hierarchy within the brood in which first-hatched ('core') chicks can enjoy substantial advantages compared to last-hatched ('marginal') chicks. Such a strategy allows parents to optimize the actual brood size according to the immediate environmental conditions during provisioning. However, the handicap incurred by last-hatched chicks must be reversible if environmental conditions are favourable. Therefore, we could expect that successful 'marginal' chicks could present an accelerated growth pattern, but with potential hidden costs such as decreased self-maintenance processes.

Here, we examined the physiological impact of being a handicapped 'marginal' chick in great tits *Parus major*. To do so, we compared the two first-hatched chicks to the two (successful) last-hatched chicks within a brood, in terms of growth, resting metabolism, antioxidant defences, oxidative damage and telomere dynamics.

We found that despite similar body mass and size at fledging, 'marginal' chicks presented lower growth rate in terms of body mass, but not in terms of body size. Interestingly, 'marginal' chicks presented higher resting metabolism, but also higher level of oxidative damage despite similar antioxidant defences. Finally, 'marginal' chicks exhibited an accelerated telomere erosion rate.

This study illustrates that the handicap incurred by asynchronous chicks could be at least partially reversible (similar mass and size at fledging), even without growth acceleration. However, overcoming such a starting handicap was associated with impaired self-maintenance processes, which could potentially lead to premature ageing and decreased adult performances.

## A HISTORY OF BIRD NAMES IN LATVIA: FROM FOLK SONGS TO COMPANY LOGOS AND PRESS-RELEASES; DO THEY REFLECT ATTITUDES TO THE ENVIRONMENT?

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Birds have been important in the lives of Latvian people: predominantly sedentary farmers who had limited contact with their neighbours. About 70% of more than 250 single-word bird names (of 262 analysed) representing 163 species recognisable today are used as site names. The majority of these are names of homesteads from which most of the family names originated, and about 100 persist as family names today. Homestead names reflect knowledge of bird species, and indicate past distribution or presence of certain species, such as Capercaillie and Willow grouse.

Latvian folklore incorporates much information about all aspects of human life (in the 19th century and earlier). By 1945 there were 2,308,348 collected folklore units of all sorts - folk songs, fairy-tales etc., but most of these are folk songs. We have analysed the prime source of folk songs – an initial collection by K. Barons, consisting of 268,815 records, which are now digitalised. More than 3000 songs mention one or more bird species. In total at least 76 species are mentioned. In some songs, birds are used as guides (e.g. indicating when to start some agricultural activities), while others reflect the use of the birds themselves (e.g. as food) etc. In most instances however, birds are used for "talking through birds" - different bird species and their relations were used to describe human relationships, both in work and particularly in peoples' personal lives, such as when evaluating or selecting a partner etc.

Of particular interest is why the use of various bird species differs strikingly between folk songs and elsewhere - e.g. in site names. The analysed folk songs show very high accuracy in terms of mentioned species, their respective features (if visual), voice quality or behaviour in general. For example, more than 80% of statements made in the songs analysed so far were correct. In a further 10% the chain of logic was not comprehensible, probably because the background of the peoples' lives is unfamiliar to us, although, the observations described were correct. Without understanding such background, the entire meaning of songs (as well as other means of communication "through birds") is entirely lost.

However, the tradition to use birds as "comparisons" persists today in Latvian culture, but it exists within a culture that has lost much of its connection with nature; a fact which gives rise to various curiosities. Of particular note is that fact that currently selected random examples (logos of companies, public statements using birds, news messages about them etc.) contain numerous errors of species, use, names, etc. We discuss how important these differences are and whether the overall ignorance of society towards nature (and birds in particular) is related to level of understanding and knowledge of birds.

SESSION: POSTER (110)

## CLIMATIC SUITABILITY AND UNDEREXPLOITED RESOURCES DRIVE PATTERNS OF NON-NATIVE SPECIES RICHNESS IN THE IBERIAN PENINSULA

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The ability of non-native species to colonise new areas has been related to both the abiotic suitability of the area and the propensity of native communities to be invaded. We investigated the influence of abiotic (e.g. climatic suitability), biotic (functional similarity of native bird communities to non-native species) and historical (proximity to introduction sites) factors in influencing the distribution of non-native granivorous passerines in the Iberian Peninsula. Non-native passerines showed strong associations with rice fields, where they comprised a high proportion (20.8%) of granivorous bird species richness. Compared to other habitats, climatic conditions in rice fields were more similar to conditions in non-native species' native range, and rice fields also tended to be closer to potential introduction sites. While these help explain coarse scale patterns in non-native species richness, they do not explain fine scale patterns. Non-native species used similar feeding habitat to native species, but differed in their choice of shelter habitat. This allowed non-native species to exploit food resources in rice fields, which may be underexploited by native species.

## THE UNEXPECTED COSTS OF CITY LIFE: ARE BUILDINGS ECOLOGICAL TRAPS FOR URBAN BREEDING EURASIAN KESTRELS *FALCO TINNUNCULUS*?

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Urbanisation is a global phenomenon, encroaching on natural habitats and decreasing biodiversity, but creating new anthropogenic habitats for some adaptable species. How different degrees of urbanisation affect the distribution of raptors is of particular research interest, since top predators are well suited for indicating consequences of environmental change. The Eurasian kestrel *Falco tinnunculus* is hereby used as a model species for an urban raptor, as it is positively associated with urbanised landscapes. With 88.5 - 122.2 breeding pairs/100 km², the kestrel is the most abundant aerial predator in urbanized areas of Vienna, Austria (415 km², 1.7 million inhabitants) and present only during the breeding period. The aim of this study was to evaluate whether urban environments represent ecological traps for the species: a seemingly attractive habitat that is, however, low in quality regarding reproduction. Specifically, the following research questions were answered: (1) Does the high breeding density result mainly from anthropogenic habitat features or is it also linked to urban-related prey availability? (2) Is the selection of these urban habitats associated with reduced reproduction? A distinction was made between extrinsic (environmental) and intrinsic (demographic) factors influencing breeding success over a three year study period (2010-2012, between 215 and 297 breeding pairs each year) along the urban gradient. As environmental factors, 251 occupied nest-sites were investigated to compare selected habitat to random-areas ($n$ = 338) and random-buildings ($n$ = 240). Field surveys determined the abundance of potential prey (birds and mammals), compared to diet choice through pellet-analysis. As demographic factors, clutch size, hatching and fledging rate and sex-ratio in offspring ($n$ = nest-sites) were used. The majority of kestrels (68.5%) breed in seminatural cavities on historical buildings in the city centre. No urban-related higher prey abundance was found (passerines and rodents), but a significant shift from mammals as main prey in the periphery to passerines as an alternative prey in the centre. Furthermore, the selection of urban habitats was associated with a significantly lower clutch size and a tendency towards lower fledging rates. Many of the smaller male chicks died of starvation, leading to a surplus of female fledglings. We detected trade-offs between the availability of nest-sites and sufficient food supply in the city centre, accentuating the lower habitat quality. Additionally, a lower reproduction rate was shown, indicating that urban kestrels are stuck in an ecological trap.

SESSION: POSTER (111)

## THE RELATION BETWEEN THE WING LENGTH AND MIGRATION DISTANCE IN CONTINENTAL AND INSULAR SPECIES OF ACROCEPHALIDAE AND LOCUSTELLIDAE

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The biometry of the flight apparatus of birds is connected with the flight characteristics of the species: especially their manoeuverability, energetics and speed. The evolutionary pressures under which these features formed vary among the species and can be influenced by various environmental and behavioural factors. For example, the influence of migration distance on wing length has been researched, but the results are inconclusive. Using published literature (Kennerley & Pearson. Reed and Bush Warblers. Christopher Helm. London), we analyse the influence of migration distance, insularity (species range restricted to islands vs continents) and taxonomic affiliation (which reflects the history of the species) on the wing length of species within the families Acrocephalidae and Locustellidae, which are similar in morphology, habitat and food type. Using mGLMs, we revealed a linear relation between wing length and migration distance. The further the species migrated, the longer wing they had. The regression lines for each family were parallel, but Acrocephalidae had relatively longer wings. Insularity did not have a significant effect on the wing length of the species within each family.

## FACTORS MODULATING BIRD RESPONSE TO DISTURBANCE AT MULTIPLE SCALES: A REVIEW

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Outdoor recreation is increasing in intensity and space. Habitats and areas that previously were economically or logistically inaccessible to most people are now being visited and used by an ever growing number of human beings. Human-bird encounters are, accordingly, increasing throughout areas and taxa, which raise the concern among researchers and conservations about the fate of bird populations. This is due to the fact that even in non-aggressive encounters, birds are likely to perceive humans as predators, and thus, mount a physiological and behavioural stress response, which in turn has important negative consequences for birds. However, despite the large amount of research performed about this topic, no many clear and generalized patterns have been found. Sometimes results appear contradictory among studies, which is likely to be due, at least in part, to the partial unawareness about the factors modulating the relationship between human presence and human-induced stress effects. Thus, our aim was to perform a literature review, as comprehensive as possible, about the potential modulating factors. We found that many are the factors affecting bird responses. Some depend on the source of disturbance, with differences in quality (type of activity, presence of pets), intensity (number of people visiting an area and frequency) and distribution (e.g. on-trail vs. off-trail, clustered according to countries or cities). Other are internal properties of the focus of the disturbance, that is, intra-individual (such as ultradian, circadian or annual cycles), intraspecific (i.e. differences in age, sex, body condition, stress phenotype, previous exposure to humans, population density dependence) and species specific (e.g. sensory abilities, antipredatory or breeding strategy, and cognitive level). Finally, the environmental context will also influence bird response, such as for example, spatio-temporal variability in habitat quality and climate. We offer an overview of the different scales at which factors modify expected bird responses (from immediate physiological responses to demographic or evolutionary changes in species) in an attempt to better understand the variables that should be considered when designing or interpreting a specific study.

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## COMPARING VARIATION IN HABITAT USE AND PRODUCTIVITY WITH ESTIMATES OF SURVIVAL AND RECRUITMENT IN A DECLINING MIGRANT BIRD: THE WHINCHAT *SAXICOLA RUBETRA* ON SALISBURY PLAIN, ENGLAND

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The Whinchat, a sub-Saharan migrant bird that breeds in Europe, is an example of a species that was once common across lowland Britain but has suffered major declines in abundance and range in recent years: 55% since 1995. We report on one lowland population, on Salisbury Plain in southern England, which bucks the trend. This site presented an opportunity to investigate which aspects of the species' breeding ecology, habitat use and demography allow the population to persist, against a background of large-scale decline. We test hypotheses comparing variation in territory density, habitat condition and resource availability, with accurate measures of productivity and parental effort. With historical survey data from 2000 and 2005 and a colour-ringed population available since 2010, we analyse data on ecology, 'survival' and recruitment, in the context of concurrent atlas data showing large-scale patterns of change. New data provide first estimates for age-related turnover rates, to help isolate local limiting factors from those operating at other life history stages.

## HOW DOES CLIMATE LIMIT BIRD POPULATIONS? LESSONS FROM THE CZECH REPUBLIC AND CATALONIA

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Climate change affects various aspects of bird ecology. These include population dynamics and numerous studies have provided examples of these effects. However, how climate poses limits on bird populations is still not fully understood. Specifically, there is a need to elucidate the links between climatic effects on particular phases of a species' annual life cycle and their abundance, as well as how the relative importance of particular mechanisms varies in relation to altitude and geography. Here we relate climatic conditions on breeding grounds (snow cover, icy days, temperature, GDD5 and evapotranspiration) and wintering grounds (precipitation and NDVI for long-distance migrants), to yearly variations in population size, productivity and survival of common birds. We use data from two biogeographic regions, Continental Europe (represented by the Czech Republic) and Mediterranean Europe (represented by Catalonia), comparing the strength of the respective climatic factors in both regions. The main hypothesis is that the temperature-related variables will play a more important role in Continental Europe, while precipitation will be more important in Mediterranean Europe. To ensure maximum strength of inference and to address the spatial variability, population models were carried out to the level of monitoring plots. We tested whether breeding productivity is negatively affected by spring/summer droughts and if harsh winters handicap resident birds; whether advanced spring favours resident bird and short distance migrant birds and handicaps long-distance migrant birds due to mismatch of timing the arrival and of food peaks. We also tested if this effect is more important than climatic conditions in Africa for long-distance migrants. Our study will hopefully increase our understanding of the mechanisms on how climate change affects bird populations.

SESSION: POSTER (112)

## DIET COMPOSITION OF MEDITERRANEAN EUROPEAN SHAGS *PHALACROCORAX ARISTOTELIS DESMARESTII*: COMPARISON BETWEEN TWO REMOTE AEGEAN SEA COLONIES

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The Mediterranean shag *Phalacrocorax aristotelis desmarestii* is considered an endemic subspecies of the Mediterranean and the Black Seas. The subspecies' biology and ecology are poorly studied, especially in the eastern part of its distribution, despite the fact that North Aegean Sea (Greece) is considered one of the most important regions for its reproduction. This study presents the first results regarding the feeding habits of the subspecies in two remote Greek colonies: one in the north Aegean (Xironisi islet, Kavala Bay) and one in central Aegean (Alatzonisi islet, Fournoi). Regurgitated food pellets (n=112) were collected during the reproductive periods of 2010 from the north Aegean colony and 2011 from both colonies. A total of 6010 prey items (mainly fish otoliths) were recognized at the lowest possible taxonomic level, using the AFORO Database (Anàlisi de FORmes d'Otòlits - www.cmima.csic.es/aforo/startDB_en.jsp) and a personal otoliths' collection of most fish species from the Aegean Sea. Each prey type in the diet was estimated as numerical frequency and frequency of occurrence (number of samples containing each prey type). The mean diet diversity of each colony per year, expressed by the Shannon-Wienner Index (H), was determined. The frequency of different prey families was compared between the two colonies and the yearly differences were determined for the north Aegean colony. 22 families and more than 45 different species of fish were found within the total number of pellets studied. Sixteen families (e.g. Gobiidae, Sparidae, Atherinidae, Carangidae, Ammodytidae, Labridae, Centracanthidae, Pomacentridae, Serranidae, Solleidae etc.) were the most common in both colonies, yet the diet composition differed. In the north Aegean, the diet diversity was high in both years (2010: H=1.96±0.10 and 2011: H=1.70±0.11), although the most abundant prey items belonged to the Gobiidae family. In the central Aegean colony the diversity was lower (0.96±0.33) and the most abundant prey was *Atherina boyeri*. Diet composition differences between the two areas were statistically significant and the correspondence analysis grouped samples from each colony according to the main prey item and irrespectively of month and year. Differences in the shag's diet probably correspond to different feeding habits in each Aegean colony due to the different sea-bottom depth profiles of these two areas. Thus, in the central Aegean colony, shags mainly feed on surface pelagic fishes, while in the north Aegean they feed on bottom-dwellers and fishes living in sea grass meadows. This study was partly supported by the Hellenic Ornithological Society through the LIFE07NAT/GR/000285 project.

SESSION: POSTER (113)

## ANALYSIS OF MTDNA VARIATION IN THE EUROPEAN SHAGS *PHALACROCORAX ARISTOTELIS* OF THE EASTERN MEDITERRANEAN

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The European Shag *Phalacrocorax aristotelis* is currently divided in three subspecies based on plumage differences, non-overlapping distributions and phenology. The nominate subspecies, *P. a. aristotelis*, has a breeding distribution from northern Russia to the Atlantic coast of Iberia, *P. a. desmarestii* breeds within the Mediterranean and *P. a. riggenbachi*is found along the northern African coasts. Neither of the subspecies is thought to move outside their recognized range thus a relatively high degree of genetic structure across populations might be expected. This issue was addressed for the first time in a recent molecular study. Mitochodrial (ND2) and microsatellite markers were used to estimate the genetic diversity among several Atlantic populations, representing most of *P. a. aristotelis* range, as well as one population from Corsica, representing *P. a. desmarestii*. Analysis revealed an overall weak genetic structure between populations and the Corsican population of *P. a. desmarestii* clustered together with Atlantic Spanish populations of *P. a. aristotelis*, in contrast to current taxonomy. Yet, the Corsican population showed a unique mitochodrial haplotype and 50% of all private microsatellite alleles and may represent the extreme end of a cline in variation between *P. a. aristotelis* in the west and populations of *P. a. desmarestii* to the east. In order to test this hypothesis, we herein perform genetic analyses of 75 specimens from several Aegean (Greece) colonies, representing the eastern Mediterranean range of *P. a. desmarestii*. Approximately 1200 bps from two mitochondrial markers (ND2 and CR1) are used in haplotype network and demographic analyses. Previously published ND2 haplotypes are also included to investigate the genetic relationships between eastern Mediterranean and other shag populations. In contrast to most Atlantic and western Mediterranean populations, our results demonstrate a high genetic variation within the Aegean, comprising of eight distinct CR1 haplotypes and three ND2 ones. Nevertheless, genetic variation shows no apparent geographical structure within the Aegean region, rejecting the hypothesis of genetic isolation between shag populations, as far as mitochondrial genome is concerned. As for the ND2 haplotypes found in the Aegean, two are unique while the third is also found in the Corsican population. The phylogeographic relationships, as revealed in this and previous studies are not concordant with the subspecific designations within the European shag, at least for the two subspecies, *P. a. aristotelis* and *P. a. desmarestii*. However, the higher genetic variation reported from the eastern Mediterranean part of the species' range, which seems to reduce towards the western and northern parts, might suggest that Eastern Mediterranean populations could have acted as source populations for postglacial colonization during a post-Pleistocene range expansion, as several studies in seabirds have shown. This study was partly supported by the Hellenic Ornithological Society through the LIFE07NAT/GR/000285 project.

## TEMPORAL PEAKS IN SOCIAL INFORMATION: PROSPECTORS INVESTIGATE CONSPECIFIC NESTS AFTER A SIMULATED PREDATOR VISIT

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Individuals of many taxa gather social information in order to make informed decisions under lower environmental unpredictability. Social information may show temporal periods of higher information value during certain events, with the value of information expected to decrease with time since the event. Therefore, individuals accessing this information are expected to do so quickly, but this has yet to be empirically shown. In birds, prospectors visit the nests of other individuals to gather information about reproductive decisions and breeding success. Predators are a crucial determinant of breeding success in birds, with nest predation events the leading cause of reproductive failure. Information on predation risk is therefore valuable, but this information might be temporally patchy. We investigated prospecting behaviour of pied flycatchers (*Ficedula hypoleuca*) at conspecific nests within a short time period following a simulated predator visit. We performed predator and control presentations at flycatcher nests, and recorded all prospectors (foreign conspecific individuals) visiting these nests within 45 minute periods before and after the presentations. We found a significant increase in conspecific prospectors visiting focal nests after a simulated predator event at that nest. The prospectors in our data comprised mainly pied flycatchers actively breeding in the neighbourhood of the focal nest. We also found that the increase in prospecting at these nests is of short-duration, and that prospecting rates decreased back to background prospecting levels relatively quickly. Our results find support for the prediction that individuals may respond to temporally peaking value of information after certain observable events. This result suggests that prospecting may be especially aimed at specific periods of high information value. More generally, crucial indicators of ambient predator risk are likely targeted by individuals as sources of social information.

## TRACKING SEASONAL CHANGES IN RESOURCES ACROSS CONTINENTS: MOVEMENTS OF TRANS-EQUATORIAL AFRO-PALAEARCTIC MIGRANTS

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Using fast and long-distance movements, birds can ultimately track seasonal resource changes in regional climate due to variation in sun radiation and rains across continents. It has, however, only recently become possible to identify individual spatio-temporal migration schedules of small, long-distance migrants throughout the year. We investigate the tuning of movement to vegetation peaks for three smaller land bird species, common cuckoo, red-backed shrike and thrush nightingale migrating between the Palaearctic and Southern Africa. Fine-tuning necessitates a complex inherent spatio-temporal travel programme that has probably evolved over centuries. Thus, the considerable local and regional differences expected from global changes present these migratory species with considerable risk of mismatching their migration programme to local climate in the future.

SESSION: POSTER (114)

## EVOLUTION OF TRAITS IN THE SONG OF LEAF-WARBLERS (AVES: PHYLLOSCOPIDAE)

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A comparative phylogenetic approach is applied to identify mechanisms shaping the evolution of bird song in 80 taxa of leaf-warblers (Phylloscopidae). The effects of body size, horizontal and elevational distribution, habitat and migratory behavior on 20 song parameters were tested via simple and multiple regressions. A multi-locus phylogeny was compiled to assess the phylogenetic signal in song features and to account for the confounding effect of phylogenetic history on the regression analyses. High levels of evolutionary lability were corroborated for most song features, while element time parameters were found to be rather neutrally evolved. This pattern is attributed to the impact of adaptations: Most song features were driven by various selective forces leading to fast and irregular trait evolution across the tree. Conversely, high levels of genetic inheritance (proven by previous isolation experiments) and its role in species-specific recognition may have contributed to a slow evolutionary rate in element time parameters in leaf-warblers. In accordance with previous studies, body size had a large effect on overall frequency parameters, being higher pitched in smaller birds due to morphological constraints of the vocal apparatus. Surprisingly, no adaptations to the acoustic properties of the habitat were detected. Similarly, effects of migratory behaviour were small. In contrast, numerous relationships with measures of horizontal and vertical distribution were indicated, many of which remain difficult to link to a specific underlying causation. Overall, the results suggest that the evolution of song features in leaf-warblers is shaped by a complex network of environmental effects and morphological constraints, as well as history.

## THE WHINCHAT *SAXICOLA RUBETRA* – A CAUSE FOR CONCERN, AT LEAST FROM THE SLOVENIAN POINT OF VIEW

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The Whinchat used to be a pretty common bird of open grasslands in Slovenian lowlands. In Atlas of breeding birds, summarizing the data about abundance and distribution of populations in Slovenia in last two decades of previous millennium it was estimated to about 10.000 breeding pairs, with local densities exceeding 50 pairs per km$^2$. After 20 years less than half of that population remained, with no signs that decline will stop in a near future. Majority of the population is confined to a single stronghold – Ljubljansko barje, which is also the study site, where we performed our studies on different aspects of breeding ecology of the Whinchat. Part of our study was to found out more about the period when Whinchats are the most susceptible to different environmental impacts in particular to mowing. It was already known from literature that the sensitivity of individual nest lasts for about 35 days. The period include three breeding phases: egg laying period, incubation period and nestlings period until fledging. A human activity during this period, such as mowing, destroys the nest, with slim chances for the pair to renest. But the period is even longer. We found out, that fledglings do not escape from approaching danger for at least 10 days after fledging, what makes them similarly vulnerable during this time, as they were during their nesting time. We were also interested to found out the period when the population as a whole is at the most sensitive phase, which we defined as a period when all breeding pairs on a location are in one of the breeding phases. Any large scale intervention during this period has the potential to reduce the population's nest survival to zero. We found this period to last (depending on a year) for one to two weeks. On Ljubljansko bare it coincide with the last week in May and the first week in June, when two thirds or more of grasslands are already mown. When adding to this another problem, turning of unimproved meadows into fields and pastures, and the fact, that all this is not happening on just any, but on Natura 2000 site, yes the Whinchat is a cause for concern in Slovenia.

## UNRAVELING POPULATION-SPECIFIC VARIATION IN SPATIO-TEMPORAL MIGRATION PATTERNS IN A LONG-DISTANCE MIGRATORY PASSERINE, THE RED-BACKED SHRIKE *LANIUS COLLURIO*

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The degree of connectivity between breeding and non-breeding populations has long been unknown for most long-distance migrants. This lack of knowledge limits our general understanding of the ecology and evolution of migratory systems as well as our ability to study seasonal interactions in bird species that spend most of the year away from their breeding grounds. Tracking birds throughout the annual cycle now makes it possible to investigate these questions. The Scandinavian and Spanish breeding populations of red-backed shrike *Lanius collurio* comprise the north-western and south-western edges of the species' breeding range, respectively. In this study, we present a direct comparison of the spatio-temporal migration patterns for these two distinct populations tracked by miniaturized light-level loggers (geolocators). Our findings indicate surprisingly similar patterns in timing of migration as well as locations of staging areas en route. However, birds from the two populations spend the non-breeding period in population specific areas separated by thousands of kilometres. These population-specific migration patterns may prove important for your understanding and direct further research within evolution of migration systems, as well as the cost of detours vs. optimal migration routes. By unravelling these population specific migration systems, we demonstrate fundamental similarities and differences, essential for identifying threats throughout the annual cycle and which may form guiding tools for much needed conservation initiatives for Eurasian–African migratory birds.

SESSION: POSTER (115)

## BREEDING BIOLOGY OF GREAT REED WARBLERS *ACROCEPHALUS ARUNDINACEUS* AT LAKE PORYAZLAR, TURKEY

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In this study, the breeding ecology of the Great Reed Warbler *Acrocephalus arundinaceus* was studied at Lake Poyrazlar, Turkey. The breeding period started in the first week of May. The incubation period lasted for 14 days. The female lays every morning at around 5:23 ± 3 min. Even though the clutch size in the nests varied from 3 to 5, the incubation period started on laying of the third egg. The nestlings left the nest when they were 8-9 days old. They were fed and protected completely by the female. The diameter of the nests got longer with increasing the clutch size ($r = 0.65$), however, nest height did not change ($r = 0.24$). With increasing distance from the water's edge, clutch size and egg weight increased ($r=0.59$, $r=0.73$), because the adults built their nests on the reeds in deeper areas. On the other hand, the young ignored the choice of nest site. The number of nests showed a positive correlation with the height of reed vegetation ($r=0.80$). Around 80% of the nests were found on the stems of Sea Club-rush *Scirpus maritumus* and the rest were found on the stems of Common Spike-rush *Eleocharis palustris*. In all nests, four different behaviours (Nest Empty, Sitting, Edge of Nest Waiting, Feeding, Nestling) were observed from the first egg until the female left the nest. The female spent on average 38% of her time away from the nest, 52% in incubation, 1% around the nest, and 9% feeding her nestlings.

SESSION: POSTER (116)

## THE EFFECT OF VEGETATION AND WATER DEPTH ON NEST PATTERNS OF EURASIAN COOTS *FULICA ATRA*

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In this study, the effect of distance from the vegetation edge and water depth on nest size of the Eurasian coot was investigated. A Eurasian coot breeding population in Lake Poyrazlar in northwest Turkey was studied from March to August, 2008. Eurasian coots built their nests on aquatic vegetation, including the following species: sea club-rush (*Scirpus maritimus*, 45%), common spike-rush (*Eleocharis palustris*, 30%) and reeds (*Phragmites australis*, 25%). All Eurasian coot nests studied were located in clumps of sea club-rush vegetation. Eurasian coots build a new nest every year, and worn-out sedge from the previous vegetation season is the primary nesting material. However, some artificial materials that were thrown in to the lake, such as nylon fishing wire, were also used to construct the submerged outer layer of these nests. Nests were constructed by adding nest materials successively, beginning under the water among the sedge. The nests were protected from the destructive effects of strong wind and waves. The nest roofs were domed and covered with the green sedge found around the nests. These roofs provided some protection against predators, such as magpies (*Pica pica*), crows (*Corvus cornix*) and marsh harriers (*Circus aeruginosus*). All nests (n=23) were located 6-24 m from the bank, depending on the presence of emergent vegetation and water depth, and were well hidden. The water depth for nesting sites varied from 40 to 72 cm. There was no correlation between water depth and internal nest diameter, despite the increase in the internal nest diameter towards the inner part of the lake (r=-0.19). However, there was a strong correlation between water depth and both nest height and external nest diameter (r=-0.91). Nest became lower and smaller as the water depth increased. In addition, there was no correlation between internal nest diameter and distance from the edge of the vegetation, whereas the external diameter (r=-0.64) and height (r=-0.92) decreased with the distance from the edge of vegetation (r=-0.39). As expected, two environmental factors (distance from the edge of the vegetation and water depth) played major roles in nest site selection and nest size for Eurasian coot. According to this study, water depth appeared to be more important than vegetation. The fact that there were no nests among the sedge in deeper water supports this hypothesis, although the sedge was close to the vegetation edge. The distance between the nest and the vegetation edge depended directly on sedge density and indirectly on water depth. Nests were built in areas of appropriate water depth based on the existence and density of the sedge in the water and as water depth increased, the quantity of nesting material also increased.

SESSION: POSTER (117)

## BREEDING SUCCESS AND HABITAT CHARACTERISTICS OF MARSH HARRIERS *CIRCUS AERUGINOSUS* IN INTENSIVELY CULTIVATED LANDSCAPES

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The Marsh Harrier *Circus aeruginosus* is listed on Annex I of the EU Birds Directive and thus requires appropriate conservation, in particular of its most suitable breeding areas. Moreover, this species is an interesting study object as it seems to have found a way to cope with agricultural intensification. In some regions, a varying part of the population has shifted its breeding habitat from reed *Phragmites australis* to cereal fields.

We studied the relationship between breeding success and habitat characteristics in 2011 and 2012 at three spatial scales for reed-breeding birds (N=82), and at two scales for cereal field breeders (N=30) in their breeding area in northwest Belgium and the adjacent southwestern part of The Netherlands. This area consists mainly of intensively cultivated land. The first and smallest scale includes variables regarding nest site quality. We measured nest height, reed density and age near the nest, reed height, and shape of the breeding polygon. The second scale we look at comprises the breeding area. Here, we calculated the relative percentage of the broad vegetation types present e.g. pure reed, mixed reed, shrub and trees. For cereal breeders, we note the type of crop. The third spatial scale is the landscape. Here, we consider a circular area within a radius of 3 km around the nestsite. Area of agricultural crops (possible foraging area) and their spatial distribution relative to each other are important variables. As a possible proxy for anthropogenic influences we calculated the proximity to the nearest road and village, and the amount of urban area. Also other habitats like water surfaces and forests were incorporated in these analyses. A second theme of this study is an analysis of the long time use of the different breeding areas. We used data regarding nesting locations ranging from 1994 up to 2012. We examined whether a shift in breeding area/biotope could be induced by a (recent) change in the environment, in terms of agricultural crops.

Our study is part of a more general project on the ecology of the Marsh Harrier in the area, the results of which could provide important guidelines for conservation management.

SESSION: POSTER (118)

## ENVIRONMENTAL CONDITIONS EXPLAIN VARIATION IN TRAVEL SPEEDS OF HONEY-BUZZARDS AND MONTAGU'S HARRIERS

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Substantial regional and seasonal variability in travel speeds has been reported for many long-distance migrating bird species. Such variability has been attributed partly to birds changing their flight behaviour in response to the dominant selection pressures across different regions and seasons. However, environmental conditions may also account for this observed variability by directly affecting flight speeds of migrating birds. This is especially true for large birds which rely heavily on soaring flight and therefore on the atmospheric conditions that support it. Our study aims to explain the influence of weather and other environmental factors on travel speeds of two raptor species migrating along the western Afro-Palaearctic flyway: the European Honey Buzzard (*Pernis apivorus*) and the Montagu's Harrier (*Circus pygargus*). We used the high-resolution UvA-Bird Tracking System (www.UvA-BiTS.nl) to track 10 Honey Buzzards and 8 Montagu's Harriers over 2 – 6 migratory journeys each and our data revealed strong differences in travel speeds. The fastest journeys took place in spring and over the Sahara, and the slowest flights occurred over sub-Saharan Africa. We studied the influence of weather conditions, obtained from the ECMWF deterministic atmospheric model, on the hourly speed, daily travel duration and daily travel distance of the birds. Subsequently the response to weather conditions was compared across seasons and the biomes each species encountered. Our results show that hourly travel speeds of both species increased with increasing tailwinds and thermal depth and these weather effects accounted for differences in hourly speeds measured between biomes and seasons. However, time budgets of Montagu's Harriers include mid-day resting periods as well as travel activity during twilight hours. Consequently, the daily distance between roosts was mainly dependent on travel time for Montagu's Harriers, which travelled the longest daily distances above the Sahara where foraging was impossible. Although both species occasionally interrupted migration to potentially forage in sub-Saharan biomes, honey buzzards interrupted their migratory flights due to weather more frequently than Montagu's harriers. In conclusion, our findings stress the importance of studying the role of environmental conditions in shaping spatiotemporal patterns of flight speed in long-distance migrants.

SESSION: Symposium 13 | 29 Aug 2013 | 1150

## CRYPTIC INTERFERENCE EXPLAINS DANGER-PRONE BEHAVIOUR IN A GREGARIOUS SHOREBIRD

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Among many bird species, juvenile foragers are found segregated from adults, often facing higher predation costs. We observed this phenomenon at Banc d'Arguin, Mauritania, among wintering Red Knots *C. c. canutus*. Not only did juveniles feed apart, they also fed at places where they were much more vulnerable to predation by falcons. We examine two mutually exclusive hypotheses that may explain these patterns.

First, assuming that foragers trade-off safety against energy, we may expect a forager that faces a low energy state to prefer the richest feeding sites even if these are more dangerous, while conversely, well-fed animals can feed in safer places that are less rewarding (the 'asset protection hypothesis'). An alternative version of this hypothesis would be that juveniles, due to lower reproductive value, accept more risk in favour of more energy. Either way, the 'asset protection hypothesis' would predict higher reward at more dangerous areas.

Alternatively, we hypothesize that cryptic competition between age classes is the main determinant of juveniles to forage risk-prone. The 'cryptic competition hypothesis' would lead to the prediction that juveniles at the more dangerous areas have similar or lower intake rates than those at safer areas, while lower intake rates would force them to compensate by feeding longer.

We evaluate our predictions through the examination of age-related foraging patterns in the context of food and predator landscapes. Furthermore, we investigate the occurrence of age-related competition by studying adults and juveniles, when they forage together at high densities due to incoming tide. We show that cryptic competition best explains the distribution between juvenile and adult foragers. Finally, we digress to the idea of personalities, and present arguments in favour of the idea that juvenile foragers operate mainly in a 'trial and error' fashion guided by their personality and phenotypic constraints, while adult foragers rely more on their experience with regard to food and predation danger.

## MEASURING THE SELECTION AGAINST INBREEDING IN ISLAND POPULATIONS OF BLUE TITS *CYANISTES CAERULEUS* AND GREAT TITS *PARUS MAJOR*

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Since 1955, all great and blue tits breeding on the island of Vlieland have been followed through the ringing of nestlings and identifying the parents. In both species, over 80% of the breeding birds were ringed as nestlings and pedigree information is relatively complete. In both species, common ancestors are known in over half the pairs where both female and male are local birds. In both species mating is random with respect to relatedness. In blue tits, average detected inbreeding levels have dropped from F = 0.07 in the first decade to F = 0.03 at present together with the growth of the population to about 60 pairs. In great tits, average detected inbreeding levels have dropped from F = 0.03 in the first decade to F = 0.01 at present. These data allow a calculation of selection differentials on F over several stages in the reproductive cycle. The selection differentials on F are proportional to mean F, which is expected if inbreeding depression is due to rare recessives. Although there is consistent selection at the egg hatching stage (about 7 % reduction of F in blue tits and 8 % in great tits), the main reduction in F (about 35 % in blue tits, 17 % in great tits over the last 30 years but not in the first 20 years) is achieved in the recruitment phase, that is between fledging and recruitment into the population as breeding birds. Data on selection against inbreeding and thus slower increase of realized inbreeding are rare and can only be measured in natural populations.

SESSION: Symposium 8 | 29 Aug 2013 | 1130

## ONE MILLION RAPTORS OVER A GEORGIAN VILLAGE

VANSTEELANT, W.M.G: Presenting Author

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During migration, raptors conserve as much energy as possible by soaring on atmospheric updrafts. Consequently, raptor flyways have evolved to circumvent water bodies above which atmospheric updrafts do not form, or to follow geographical leading lines where suitable soaring conditions are regularly available. In some areas, barriers and leading lines may converge into a geographical bottleneck for migrating raptors, and large proportions of regional populations can seasonally aggregate there. Bottleneck raptor migration sites west of the Black Sea and around the Mediterranean basin are often well studied. However, migration east of the Black Sea has remained largely unexplored, despite the global importance of raptor populations breeding in Eastern Europe and Central Asia and the important potential of bottleneck sites for monitoring those populations. However, since 2008, Batumi Raptor Count (BRC) has been studying one of the largest bottlenecks for raptor migration in the world: the Turkish – Georgian eastern Black Sea coast. Up to a million buzzards, harriers, eagles and falcons can be seen during a single season. Unfortunately, (illegal) hunting is a widespread and intensively practiced tradition in the area which may have a far-reaching impact on regional raptor populations considering the extent to which these populations converge in the bottleneck.

In order to reduce this problem, BRC has developed a unique approach, which studies the reasons why hunters engage in their harmful activities and which works with these individuals, rather than against them, to secure sustainable conservation attitudes. This approach involves local communities through a combination of education, capacity-building and ecotourism development which simultaneously improves the intrinsic and economic valuation local community members place on to migratory birds. In this presentation we show that this community-based conservation approach has already proven effective in diminishing hunting pressure. We further present a recently developed project through which BRC will conduct long-term monitoring of our conservation impact by studying how different types of community-based incentives affect the local valuation of migrating birds as well as the receptiveness and sense of responsibility of local communities towards nature protection.

More information about the project can be found on: www.batumiraptorcount.org.

## LESSONS FROM HUGE VARIATION IN MIGRATION PATTERNS IN HOOPOES *UPUPA EPOPS* AND ITS POTENTIAL CONSEQUENCES FOR GENERAL CONCEPTS IN BIRD MIGRATION

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Migration and non-breeding strategies are often considered as fixed traits within an individual and/or within a local population resulting in only minor variation in individuals and stable patterns of migratory connectivity within populations. Also it is assumed that individuals within one given population show similar migration patterns.

Using individual tracking data on the migration of hoopoes (*Upupa epops*) we actually show that there is a huge variation in the main migration routes, the duration of spring and autumn migration, location of wintering areas, both within and between populations and individuals.

In the light of these findings we would like to stress that it is very important to discuss our present understanding of migration. Embedding our findings into the current knowledge on passerine migration, we scrutinise some current themes:

- Uniformity/diversity of genetic background of migration within a population
- Migratory connectivity
- Individual site fidelity and assumed origin

SESSION: POSTER (119)

## HABITAT CHARACTERISTICS DETERMINING NEST SITE SELECTION OF WILLOW TITS *POECILE MONTANUS*

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Anthropogenic habitat loss and fragmentation affect populations worldwide. For example, many bird populations of boreal forests have declined due to intensive forestry. For targeting conservation actions, information of the key habitat characteristics is essential. Individuals are thought to select habitats that maximize their fitness. Therefore, understanding habitat selection enables identification of the important habitat elements for the species. We studied the nest site selection of a primary hole-nesting passerine, the Willow Tit *Poecile montanus*, in a managed forest landscape. Using reliable presence-absence data from two population densities, we determined the most important habitat characteristics of the nest sites for three spatial scales by generalized linear models. In the process, we test the feasibility of remote sensing data in habitat selection analysis. Our results highlight the importance of the availability of nesting sites – standing decaying deciduous trees – in habitat selection. The Willow Tit seems to prefer moist habitats with high densities of deciduous trees, but it does not require mature or intact habitats for breeding. Most of the habitat selection seems to occur at small scales. Our analysis did not reveal major differences in habitat selection at different population densities. Remote sensing data alone were insufficient for producing reliable models, but adding information about nest site availability from direct field surveys greatly improved model performances. For the conservation and maintenance of saproxylic species, changes in forestry practices are necessary to keep the key characteristics of the habitat. Continuous availability of standing decaying wood should be secured.

SESSION: POSTER (120)

## TRADE-OFFS BETWEEN REPRODUCTIVE EFFORT AND MOULT IN THE PIED FLYCATCHER *FICEDULA HYPOLEUCA*

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A growing number of studies indicate that circumstances and events during one period of the annual cycle affect the subsequent ones in long-distance migrant birds breeding in temperate regions. Before autumn migration, Pied Flycatchers undergo a complete post-breeding moult, including body feathers, tail feathers and wing feathers. The onset of autumn migration can only take place after the moult is completed. Early departure on autumn migration may have several benefits, and birds may thus be under selection to complete moult as soon as possible. Moult starts at the end of the nestling period, while the parents are still feeding chicks. As a consequence, parents may have to trade-off their resources between two rather demanding tasks: feeding the chicks and moulting. We experimentally studied how parental investment in breeding affected timing of moult and sexual conflict in parental investment. We used two separate experiments. In the first one, we delayed the breeding cycle of a group of pairs by delaying the start of incubation by one week. In the second experiment we altered the level of parental investment by enlarging or reducing brood size by one chick. Here, we will present the results on how these manipulations of timing of breeding and reproductive effort affected the timing of moult.

SESSION: Symposium 14 | 29 Aug 2013 | 1630

## AVERTING DISASTROUS TIDAL FLAT LOSS IN THE EAST ASIAN – AUSTRALASIAN FLYWAY

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A recent rise in economic prosperity in Asia, the most densely populated region of the world, has created a shortage of land for industry, housing developments and aquaculture. Consequently, about half of the tidal flat habitat in the Yellow Sea has been lost since 1980, some through sediment inflow reduction, some through reclamation to satisfy demand for land. Throughout the East Asian - Australasian Flyway (EAAF), over 600,000 ha of tidal flats are currently the subject of further proposed land claims; in the Yellow Sea, planned conversions of >300,000 ha would amount to a further loss of 40% of the remaining habitat. Here we articulate five arguments to contribute to convincing governments and other stakeholders in the EAAF that the current rate of loss is a disaster which must be urgently addressed. (1) Global responsibility: the EAAF is a large flyway supporting 176 waterbird species, of which 34 (19%) are globally threatened or Near Threatened. Nine more species are under consideration for such listing. Other flyways have 5-13 threatened species, amounting to 4-12%. (2) Regional responsibility: migratory shorebird species essentially make a single stop, or very few stops, when moving between non-breeding and breeding sites. In the EAAF, most of these critical sites where birds refuel for a few weeks are in the Yellow Sea. (3) Regional effects: shorebird population trends in Japan, and at a single wintering site in Australia showed that shorebirds dependent on the Yellow Sea during migration show the strongest population declines. (4) Local effects: migratory shorebirds that lost their fuelling site due to the largest land claim projects in the Yellow Sea (Saemangeum and Bohai Bay) did not all redistribute to the adjacent tidal flats, resulting in a net population decline. (5) Self-interest: Tidal flats and associated coastal ecosystems provide critical ecosystem services including protection from storm surges and sea level rise. This information was summarized in a recent IUCN report and subsequently EAAF governments have committed via IUCN Resolution 28 to protect the EAAF. But the question remains, how can we ensure the momentum is maintained? We propose a Flyway-wide monitoring system in which stakeholder governments can see the importance of their wetlands to the overall system. Currently, this information is either not available, or scattered and incomplete. While monitoring is not critical to diagnose decline in this instance, we believe there is a strong case to use it to raise awareness. Public awareness in itself is an extremely valuable tool in engaging political willingness to protect sites.

SESSION: POSTER (121)

## LONG-TERM DATA ON GALICIAN BREEDING KENTISH PLOVERS *CHARADRIUS ALEXANDRINUS*: DID PRESTIGE OIL SPILL COMPROMISE REPRODUCTIVE PERFORMANCE?

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Seabirds and coastal species are the fauna most vulnerable to exposure to crude oil released into the marine environment. Oil and its derivates can have lethal effects on birds, through poisoning or hypothermia, or sub-lethal effects, which cannot be ignored because of their potential consequences on reproduction and so at the population level. The Kentish Plover is the only wader nesting on the Atlantic coast beaches from northern Spain. In the stretch of the Spanish coastline between Portugal and France, the nesting population is located exclusively in Galicia. This wader is considered of priority conservation in the European Union (it is included in the Annex 1 of the Birds Directive) and shows signs of decline in several areas of the Spanish coast and throughout Europe. On 13th November 2002 the oil tanker *Prestige*, loaded with 77,000 Tm of heavy fuel oil had an accident near the A Coruña coastline (NW Spain). Of the 863 Galician beaches with breeding Kentish Plover, as many as 503 showed clear signs of pollution. We analyze long-term data (1996-2011) on Galician Kentish Plover breeding success, egg structure, female condition and breeding effort, in order to ascertain the existence or absence of sub-lethal effects of Prestige oil on reproduction. Results showed significant differences in egg structure, female condition and breeding effort (nest abandonment) between pre- and post- spill periods. Eggshell thickness, first egg volume and female condition decreased after the Prestige oil spill, and nest abandonment was higher in this period. Furthermore, we found differences in intraclutch egg size pattern. In the pre-spill period, egg volume varied in relation to position in the laying sequence, increasing from the first to the second egg and decreasing from the second to the third egg. By contrast, in the post-spill period egg volume showed no variation in relation to position in the laying sequence. The Galician Kentish Plover population is characterized by an extremely low hatching success, mainly due to predation. So, absence of significant differences in breeding success between pre- and post- spill periods could thus be a misrepresentation. We can ascertain that Prestige oil spill has compromised Galician Kentish Plover reproductive performance and that its effects have extended over a long time period.

## EFFECTS OF CHANGING ENVIRONMENTAL CONDITIONS ON COLONIAL BEHAVIOUR AND FORAGING DYNAMICS OF SEABIRDS IN THE NORTH SEA

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The majority of seabird species breed colonially. Colonies are sometimes huge containing tens of thousands of pairs and some species breed at very high densities exceeding 1 pair per $m^2$. Typically individuals defend their breeding site against neighbours and prospecting birds but obtain food within a foraging area that they share with other members of the breeding colony. Current data and future projections indicate physical and chemical changes in coastal waters around the UK as a result of climatic change. These events are occurring in marine systems that are already experiencing intense fishing pressure that can have both positive and negative effects on seabirds. In this talk I will use long-term data on common guillemots *Uria aalge* to highlight how when feeding conditions become extreme, the social structure of the colony breaks down with the result that adult aggression is directed at chicks. I will also use data from other species including northern gannets *Morus bassanus*, to explore how the size of the area of sea used by breeding birds for foraging varies in relation to current feeding conditions and show how various aspects of foraging behaviour are influenced both by the size of the colony where a bird breeds and that of neighbouring colonies. Conspecific density plays a key role in shaping the responses of colonial seabirds to environmental perturbations both at the colony and when birds are at sea.

SESSION: POSTER (122)

## USING TEMPERATURE LOGGERS TO MONITOR EGG NEGLECT IN RELATION TO HUMAN DISTURBANCE IN A CAVITY-NESTING SEABIRD, THE EUROPEAN STORM PETREL *HYDROBATES PELAGICUS*

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Tolerance of the embryo to chilling has evolved to a greater degree in the Procellariiformes than most other orders of birds. Temporary egg neglect is commonly observed and typically results in extension of the incubation period. While tolerance to chilling may be an adaptation to cope with unpredictable environmental conditions, interruptions in incubation increase the risk of hatching failure and chick mortality. There is evidence to suggest that the incidence of egg neglect may increase in response to environmental stress, such as poor foraging conditions or disturbance caused by investigators. Due to long incubation periods and high asynchronicity in timing of breeding, collecting data on incubation behaviour in procellariiforms can be labour-intensive. The aim of this study is to use temperature loggers to remotely monitor egg neglect in the European storm petrel *Hydrobates pelagicus* in relation to visitor pressure at a colony in the Shetland archipelago, UK. We deployed temperature loggers in nests exposed to high and low levels of visitor pressure to record nest attendance and the extent, frequency and timing of egg neglect. The frequency of egg neglect varied between nests. Although human disturbance was associated with a reduction in breeding success, there was no effect on egg neglect or incubation period. Interruptions in incubation were more common in a 'poor' year for overall colony productivity, most likely linked to unfavourable environmental conditions causing birds to terminate incubation shifts before their mates returned. We discuss the suitability of using temperature loggers for collecting data on incubation behaviour in related birds.

SESSION: POSTER (123)

## IDENTIFICATION OF NEST PREDATORS OF OPEN-NESTING PASSERINES ALONG AN URBAN GRADIENT

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An increased abundance of some nest predators in urban areas raised concerns about their impact upon urban bird populations. However, contrary to well-documented variations in bird population densities and breeding performance along urban gradients, accurate data on nest success and species identity of nest predators in urban habitats are either scarce, or lacking (in central Europe). I used continuous video surveillance to determine nest fates and predators in open-nesting passerines along an urban gradient in the city of Olomouc, the Czech Republic, in 2011 and 2012. I documented thefates of 128 nests of 11 species; mainly Blackbird (61), Song Thrush (44) and Blackcap (10). The 64 documented predation events were caused by: Stone Marten (28), Magpie (13), Jay (12), Domestic Cat (7), Red Squirrel (2), Sparrowhawk (1) and Wood Mouse (1). Proportional species composition suggests that magpies and cats – the commonly suspected principal predators in urban areas – were responsible for c. 31% of all predation events. Stone Marten alone accounted for c. 44% of all predation and Martens (Martes spp.) seem to be the most important predators of passerine nests across a variety of urban and non-urban habitats in the Czech Republic. This presentation will include additional data from 2013 breeding season, analysis of habitat effects and discussion of conservation implications. (Funding was provided by Palacky University, grant IGA PrF_2012_021)

SESSION: POSTER (124)

## THE BLACK-FACED BUNTING *EMBERIZA SPODOCEPHALA* – SUBSPECIES COMPLEX: PATTERNS IN MORPHOLOGY AND DNA GIVE NEW INSIGHTS IN TAXONOMY AND PHYLOGEOGRAPHY

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The phylogenetic relationships within the passerine family of Buntings *Emberizidae* are relatively well investigated, but below the species level there are some gaps especially in taxa of the eastern Palearctic. That is the case for the Black-faced Bunting *Emberiza spodocephala.* In recent times there have been very few studies dedicated to this species and most information in the literature on distribution, behavior and taxonomy is dated before 1980. Three subspecies have been described and two of them – *E. s. spodocephala* and *E. s. personata* – are slightly overlapping in their breeding range. These two morphologically distinct taxa are sometimes listed as separate species, but their diagnosability is doubtful at least for females and juveniles. In this study we try to elucidate both the taxonomic relationships and phylogeographic history of this subspecies complex by using an integrative approach, combining morphometric and molecular genetic methods. 138 individuals of *E. spodocephala* were captured with mist-nets during ringing projects in Lazovski Zapovednik and Muraviovka Park in eastern Russia. All birds were measured (wing, longest primary, bill, tarsus) and a DNA-sample (feather) was taken. Additionally, 317 museum specimens were measured and 20 toe-pad samples obtained from the Bird Collection of the Natural History Museum in Tring. Differences in DNA were examined by sequencing the subunit I of the mitochondrial Cytochrome-Oxidase gene and the nuclear sex-linked CHD1Z gene.

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## A MULTI-ISOTOPE APPROACH TO ESTABLISHING MIGRATORY CONNECTIVITY IN PALEARCTIC-AFROTROPICAL MIGRANTS: AN EXAMPLE USING WOOD WARBLERS *PHYLLOSCOPUS SIBILATRIX* FROM THE BIAŁOWIEŻA FOREST, POLAND

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Wood warblers *Phylloscopus sibilatrix* have declined considerably throughout most of their north and western breeding range in Europe but the causes of this decline are unknown. Declines may be related factors on the breeding grounds, stopover sites, wintering grounds, or all or some of these components of the annual cycle. We used multi-isotope ($\delta^{2}$H, $\delta^{13}$C, $\delta^{15}$N) measurements of winter-grown feathers of 314 individuals breeding in the Białowieża Forest of Poland to infer where they wintered in sub Saharan Africa over a 4-year period from 2009-2012. We used both aspatial and spatially specific assignment techniques involving a previously developed clustering algorithm related to long-term patterns of precipitation ($\delta$H) and theoretical plant-based isoscapes ($\delta$C, $\delta^{15}$N). We determined that our breeding population was consistently assigned to the forested region of the Congo basin. Males were more depleted in $^{13}$C and $^{2}$H and more enriched in $^{15}$N than females suggesting potential sexual habitat segregation on the wintering grounds. Our results emphasize the need to match conservation efforts at both ends of the annual cycle and our geospatial assignment model now provides a protocol for testing the hypothesis that declining populations winter more in declining forests of west Africa compared to the Congo basin. We encourage this approach for the investigation of migratory connectivity in other sub Saharan Afrotropical migrants.

## IMPACT OF RESOURCE PULSES ON BREEDING BIRD POPULATIONS IN A PRIMEVAL TEMPERATE FOREST (BIALOWIEZA NATIONAL PARK, POLAND)

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Boreal and temperate forests are classic examples of pulsed ecosystems, in which the massive production of seeds, tree defoliation by folivorous caterpillars, and rodent outbreaks can happen at irregular intervals. Such resource pulses can dramatically alter current and subsequent ecological conditions for a variety of organisms. It remains unclear, though, how bird populations respond to such resource pulses and what are the consequences of their responses, how their ecology and behaviour differs between seasons of resource scarcity and superabundance, and what could be carry-over effects of the resource pulses on birds. In managed woods, forestry interventions (e.g. changes of wood structure, active measures to control "pests") can seriously affect the frequency and dimensions of the pulses. Therefore, to understand the impact of pulses one should have to study them in areas free of direct human influence. Such conditions still exist in primeval, strictly protected, fragments of the Bialowieza National Park, E Poland. The breeding avifauna of this area has been extensively studied for almost forty years. Here I shall present results of the long-term observations carried out in such circumstances, describing birds' reactions to year-to-year variation in tree seed crop, abundance of folivorous caterpillars, and numbers of small rodents. I shall contrast these results with findings from other "pulsed systems" studies.

## DO WOODPECKERS NEED "ROADLESS" AREAS? – SMALL-SCALE AND LARGE-SCALE FACTORS AFFECTING DISTRIBUTION OF RARE WOODPECKER SPECIES IN POLISH CARPATHIAN MOUNTAINS

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Rare, specialized woodpecker species are often regarded as indicators of forest quality and the relationship between their presence and small-scale habitat features have been studied frequently in Europe. However elements shaping distribution of woodpeckers at a wider geographical scale together with factors relating to human pressure have been rarely investigated so far. Here we study the link between the characteristics of the forest habitats at various spatial scales and the occurrence of rare woodpecker species in the Polish part of the Carpathian Mountains, analysing the distribution of Black Woodpecker *Dryocopus martius* - BW, Grey-headed Woodpecker *Picus canus* - GHW, Three-toed Woodpecker*Picoides tridactylus* – TTW and White-backed Woodpecker *Dendrocopos leucotos* – WBW. In particular we explore habitat features acting at a wide-scale like forest patch size, distance from other patches, distance from roads / buildings, and the small-scale factors, like forest stand structure, presence of old trees, dead wood volume. The analyses were based on bird surveys conducted in years 2011-2013 on ca. 250 plots (2x2 km squares) in the Polish Carpathians, using standard fieldwork methods, including playback (used for GHW, TTW and WBW, not for BW). We have found that specific small-scale habitat characteristics, like presence of old-growth stands and unevenly structured stands were important particularly in explaining the presence of highly specialized species, like WBW and TTW. The four species of woodpeckers responded differently to factors like forest patch size. The intensity of habitat disturbance (including logging), estimated directly in the field and inferred from the distance of woodpeckers breeding territories from roads and buildings also influenced differently the probability of occurrence of the woodpecker species. To conclude, our study is one of few studying the habitat requirements of rare woodpecker species in the Carpathian Mountains. It proves that key factors affecting distribution of woodpecker species are acting both at a wide and small geographical scale, creating complex matrix of habitat needs of these species. Besides more intuitive aspects of habitat quality acting at a local scale in place of breeding territory, some factors operate at a larger scale. They might be linked with limited dispersal abilities of woodpeckers, and with preferences for high quality, large and remote patches of habitats. Therefore the "roadless" areas concept, although linked mainly with the conservation of large carnivores in Europe, might also be used for conservation of endangered bird species.

## MATING IN A DENSE COLONY – SEXUAL BEHAVIOUR AND STRESS LEVEL IN A COLONIAL SEABIRD, THE LITTLE AUK *ALLE ALLE*

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Colonial seabirds are particularly interesting in respect of extra-pair fertilization (EPF) because as "slow" life histories organisms they are evolutionary predisposed for genetic monogamy. On the other hand, colonial breeding increase probability of an extra-pair mating thus the risk of sperm competition is expected to be high. Indeed, empirical evidence indicates low frequencies of extra-pair paternity (EPP) but high rate of extra-pair copulations (EPCs) in colonial seabirds. Good behavioural studies on the functional significance of extra-pair mating may throw light on this apparent paradox. Here, we present results of combined study on behaviour (copulations, aggressive interactions and presence in the colony) and stress level (baseline corticosterone concentration) during the prelaying period in a highly colonial, Arctic seabird - the little auk, *Alle alle*. EPCs constituted 10% of the birds' sexual contacts. However, majority of the EPCs (98%) were unsuccessful, mainly due to the female's rejecting behaviour. The frequency of successful EPCs makes a fairly good match with frequency of EPP (2%). Within-pair copulations (WPCs) were frequent (1.15 per hour) and quite successful (every second WPC ended with cloacal contact) but their number was not related to the number of female's EPCs. Also, there were usually no WPCs following the EPC of the female. This indicates that frequent WPCs may serve a pair-bonding rather than reducing probability of EPF. Males initiated intra-specific, aggressive interactions more frequently than females, however, the males' aggressive interactions were related neither to the number of WPCs nor EPCs of females. Given the males spent also more time in the colony than females it seems that males' aggressive behaviour could have been related to the nest site defence. Stress level during the pre-laying period was similar in both sexes and higher compared to the later stages of the breeding season. We conclude that this is the female's rejecting behaviour that plays a primary role in the low frequency of EPP in the little auk. Why the females reject EPC remains an open question.

## WETLANDS AND BIRDS IN A DRIER SAHEL

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Many Palaearctic birds spending the non-breeding season in Africa are in decline. These declines are especially large among birds using wetlands in the northern tropic, where their dependence on the few floodplains in the Sahel (Senegal Delta, Inner Niger Delta, Lake Chad, Hadejia Nguru, Sudd) makes them highly vulnerable to droughts and human actions. The large annual fluctuation of the flood extent is due to the variable flow of the rivers. The river inflow has also declined, however, due to the construction of reservoirs and irrigation works upstream. A further reduction of Sahelian floodplains is to be expected given the expected climate change (less rain in W Africa) and construction of more dams.

For a number of bird species, we found a positive correlation between population size or survival and the extent of Sahelian floodplains (Purple Heron, Black-crowned Night Heron, Squacco Heron, Little Egret, Glossy Ibis, Garganey, Black-tailed Godwit, Ruff, Caspian Tern, Sedge Warbler). We will show why a further reduction of the Sahelian floodplains will inevitably cause a decline of the bird species concerned.

For more information see –
http://www.altwym.nl/uploads/file/267Living%20on%20the%20Edge%20ENG.pdf

## ALTERNATIVE MATING TACTICS IN COLONIAL BIRDS – THE IMPORTANCE OF ECOLOGICAL FACTORS

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In monogamous birds the reasons for partner infidelity are still controversial. Using molecular techniques it was possible to identify three different sources of parental uncertainty: extra-pair copulation, brood parasitism and quasi-parasitism. It has been suggested that females could seek extra-pair copulation as insurance of their breeding success in case of male incompatibility or infertility, while males may increase their lifetime reproductive success via extra-pair copulation. Brood parasitism and quasi-parasitism also could represent adaptive strategies and may increase the breeding success. We expected that ecological determinants, as territory quality and nest density may influence frequency of infidelity in colonial birds. We have examined mating strategies in two closely related species Herring (*Larus argentatus*) and Caspian Gull (*L. cachinnans*) in their mixed colony. These gull species are regarded as almost exclusively sexually monogamous, live in life-long pair bonds and defend their territory together. The colony is situated outside the main range of both species, what creates new conditions and give possibility to hybridize. We used microsatellite markers to compare extra-pair offspring frequency in different part of the colony (central vs. peripheral). Our findings seem to contradict the common view that gulls represent typical example of monogamous colonial birds. Results suggest also that mating strategies in large gulls are probably more complex and may be influenced by ecological factors. We therefore highlight that mating strategies, the fundamental area of behavioural ecology, still require experimental work that would control for some confounding factors.

## TREE SELECTION, COMPETITION AND PREDATION ON BLACK WOODPECKER *DRYOCOPUS MARTIUS* CAVITIES UNDER THE ASPECT OF A CHANGING FOREST MANAGEMENT IN BEECH TREES *FAGUS SYLVATICA*

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Cavities are a crucial factor for biodiversity in temperate forests. The black woodpecker *Dryocopus martius* as the largest builder of woodpecker cavities is a keystone species for a large number (40 species) of forest-dwelling species in the Palaearctic. In Central Europe, the black woodpecker strongly prefers beech *Fagus sylvatica* as a cavity tree, but beech trees have hard wood, comparable to oak. The close association between nest sites of other woodpecker species and the presence of rotten wood has often been noted. However, whether cavity excavation in the strong black woodpecker is also linked to fungal infection has long been debated. We evaluated four hypotheses related to cavity tree selection and cavity excavation behaviour in the black woodpecker. Using Resistograph drills to objectively assess fungal decay, we tested whether black woodpeckers preferred trees with heart rot as sites for cavity starts. Heart rot was significantly more common in beeches with cavity starts than in random reference beeches. At the level of the start of the cavity, fungal decay was more prevalent in the central and outer third of the tree radius. Wood density at fresh cavity starts was significantly higher than at old cavity starts. Collectively, these findings imply that black woodpeckers prefer to excavate cavity starts in beeches with heart rot, which the woodpeckers can detect based on cues unavailable to humans. Future studies need to address the mechanisms underlying the abilities of black woodpeckers in relation to the selection of cavity start locations. Beech management in Germany is under pressure; because of energy changes, fuel wood with small diameters is relatively highly priced while large timber is gaining low prices compared to their age and management effort. The changing of management tradition may cause a problem for the black woodpecker and the forest biodiversity with implications for predation risk in small forest patches.

SESSION: POSTER (125)

## BARNACLE GOOSE *BRANTA LEUCOPSIS* ON KOLGUEV ISLAND – A STORY OF EXPANSION

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Since the 1970s, the numbers of geese wintering in Europe have increased markedly as result of intensive fertilization of agricultural fields and nature conservation efforts. Numbers of Barnacle Geese *Branta leucopsis* have increased dramatically from 30,000 in the 1960s to 1,000,000 nowadays and still continues to grow. Initially Barnacle Geese nested only on the cliffs inaccessible to their main predator Arctic fox *Alopex lagopus*, but, in the 1970s, they started to nest on plain coastal areas. In early 1980s, the first Barnacle Geese appeared on Kolguev Island in the Barents Sea. Initially they occupied fox-free coastal sand spits. In the mid 1990s the colony on the Eastern coast of the island in the delta of Peschanka river, with a total of 5,000 breeding pairs, was found. In the mid 2000s this colony had expanded to 45,000 breeding pairs. Despite the presence of Arctic foxes, gulls and other predators, the nesting success of Barnacle Geese was very high, at 94%, but partial predation was observed. In the vicinity of this colony, White-fronted Geese *Anser albifrons* had significant partial predation pressure. Small colonies appeared at the same time in deltas of other rivers. Mixed colonies of White-fronted Geese and Bean Geese *Anser fabalis* (up to 50 nests) were found on the cliffs near lakes or rivers on the areas under protection of Peregrine falcons *Falco peregrinus*. In the mid 2000s, colonies surrounded 30% of Peregrine nests. In 2011-2012, all Peregrine nests were surrounded by colonies of Barnacle Geese. Such colonies did not depend on water bodies anymore. Colony size has grown to 133 breeding pairs. Other geese species were displaced from these aggregations. Nesting success of Barnacle Geese was very high, up to 91%, but sometimes dropped up to 16% if Peregrines skipped breeding or built nests on the lower part of the cliff and didn't protect territories on the upper part of the slope. At the same time, Barnacle Geese occupied new biotopes – wet sedge moss bogs in the centre of the island with no connection to the coast or waterbodies or protection from Peregrine falcons. Nowadays new colony types of Barnacle Geese do not overlap with White-fronted Geese breeding habitats, as White-fronted Geese don't nest in very wet habitats. But increasing numbers of birds in the island leads to increasing number of predators. During the brood rearing period, active anti-predator tactics of Barnacle geese are more efficient than the passive avoidance of White-fronted and Bean Geese. As a result goslings of "grey" geese suffer from Arctic foxes more often than goslings of Barnacle geese. Barnacle geese comprise 18% of all goslings in the area, but only 7% of all goslings in food remains near Arctic fox dens. All geese during the brood rearing period in the centre of the island feed on similar plant species, often in mixed flocks. Future feeding conflicts for grazing habitats between Barnacle Geese and White-fronted Geese are therefore anticipated.

SESSION: POSTER (126)

## SPECIES-SPECIFIC AND GUILD-DEPENDENT RESPONSES OF FARMLAND BIRD FROM ELECTRONIC-WASTE RECYCLING SITES IN SOUTH CHINA

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Extensive electronic waste (e-waste) has been illegally imported into China during the past decade, and various classes of persistent organic pollutants can be released into farmland due to improper recycling activities of e-waste. Despite multiple toxicological analyses of the effects of e-waste pollutants on surrounding biota, still the indirect effects of these pollutants on bird communities are not well known. To explore how population abundance and species diversity of birds are connected to ambient exposure levels, and which species-specific or habitat-use traits are important in determining the susceptibility to e-waste pollution, we analyzed farmland bird community along a presumed pollution gradient (i.e. e-waste exposed sites, e-waste control sites and natural sites) simultaneously in the Pearl River Delta, southern China. As hypothesized, both per-point population abundance and species diversity of farmland bird decreased within the vicinity of source pollution sites (e-waste exposed < e-waste control < natural). For guild dependence, it should be noted that there were more evenly distributed habitat-use and foraging guilds in natural farmland than those in the e-waste region, and a marked decrease was found in e-waste sites, with lower proportions of habitat-restricted insectivores and open farmland granivores. A cluster analysis indicated that there was not a clear dichotomy between exposed sites and surrounding control sites, reflecting the combined effect of e-waste pollutants on the surrounding farmland bird community. The species-level ordination revealed that the species decreased in the e-waste polluted areas are ecologically rather diverse, mainly including woodland insectivores (e.g. babblers, treepie, white-eye), and grassland specialists (e.g., pheasant, grassbird, and cisticola), while some open farmland generalists also seldom occurred, such as arboreal frugivores (e.g., starlings), and terrestrial granivores (e.g., buntings). Even though e-waste polluted areas supported farmland birds, they were not adequate replacements for loss of natural farmlands, favouring some specialists. Moreover, the different bird communities on the e-waste polluted and natural farmlands reflected their species-specific and guild-level responses to habitat changes and food resources.

## HINDLIMB MORPHOLOGY AS ONE OF KEYS IN UNDERSTANDING OF AVIAN EVOLUTION

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The rather conservative morphology of modern birds is related to their early adaptation to flight. Although hind limbs are not directly involved in flight, they nevertheless have undergone significant modifications over the course of avian evolution. Retaining general traits of bipedal limbs of ancestral archosaurs, they gradually acquired new features, related to the cranial shift of the centre of gravity and development of grasping foot. These features, generally not visible from outside, turned out to be very instructive in reconstruction of avian adaptive evolution. A group of such features, comprising the extended Garrod's muscular formula, give us a key to avian adaptive evolution at the level of families. Interrelationships between terminal tendons of long digital flexors, initially modified according to ancestral anisodactyly, are very helpful in understanding functional evolution of avian feet. They do not only indicate recent locomotor specialization, but also point out possible ancestral stages in evolution of particular taxa. As most of the key morphological features of avian hind limbs leave traces on bones, they play a significant role in revealing locomotor peculiarities of extinct birds.

SESSION: POSTER (127)

## BIRDS LOWERED THEIR PERCHING HEIGHT AFTER AN ICE STORM EVENT IN SOUTHERN CHINA

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In January and February 2008 an ice storm struck southern China damaging nearly 21 million ha of forest. This event provides a unique opportunity to study the impact of extreme weather on forest birds. Bird surveys were conducted in 2007 prior to ice storm event and following the event in 2008 at Chebaling Nature Reserve (300-600m elevation), South China. We found that the mean total abundance of birds recorded for three trials significantly decreased after the ice storm. For single species, the mean abundances of three species significantly decreased in the post-storm period; Blyth's Kingfisher (*Alcedo hercules*), Crested Kingfisher (*Megaceryle lugubris*) and Orange-flanked Bush Robin (*Luscinia cyanurus*), however, the mean abundance of two species significantly increased in the post-storm period; Light-vented Bulbul (*Pycnonotus sinensis*), and Red-whiskered Bulbul (*Pycnonotus jocosus*). Because many trees were felled, vegetation structure was rearranged after the ice storm. Species number and abundance of trees more than 12 m in height, as well as tree height, significantly decreased following the ice storm event. Species richness and abundance of birds found in vegetation more than 12m in height was significantly lower during the post-storm surveys. Canopy species also shifted their perching height according to vegetation height in the post-storm period.

SESSION: POSTER (128)

## NEST AND NEST-BUILDING IN TWO SPECIES OF BROADBILLS FROM SOUTH VIETNAM (EURYLAIMIDES: *CYMBIRHYNCHUS MACRORHYNCHOS, CORYDON SUMATRANUS*)

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Although 4/5 of passerine species inhabit the tropics, the vast majority of avian studies (> 99%) have been conducted in the temperate zone. The Old World Suboscines (Eurylaimides) is a peculiar group of passerines, long ago diverged from Oscines. They have a number of morphological features which are the cause for some researchers to regard them as the most primitive group in the order Passeriformes. In contrast to the New World Suboscines (which number more than 1100 species), there are only about 50 species of the Old World Suboscines. The biology of the most of them, including the broadbills (Eurylaimidae) is still almost unknown. In this work I have studied the nest-building of two species of broadbills from monospecific genera (Dusky Broadbill *Corydon sumatranus* and Black-and-red Broadbill *Cymbirhynchus macrorhynchos*). On the basis of almost 200 nests found in three field seasons, I describe the location and surroundings of nests in both species. The behavioural data set was based on visual observations during nest-building for about 50 hours and over 25 hours of video recordings. 12 nests were untwined in detail. The nest-building behaviour of both species and structural features of their nests were described. Some methods of nest-building were found to be unique among birds. The material used by broadbills and the ways in which it is used were also studied.

SESSION: POSTER (129)

## NUMBER AND DISTRIBUTION OF DISPLAYING BLACK GROUSE *TETRAO TETRIX* AT WIND FARMS IN SCOTLAND

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Black grouse in Scotland have been declining, with the latest survey in 2005 reporting a 29% fall in the number of displaying males compared to 1995-96. A number of reasons have been proposed for these declines, including overgrazing, agricultural changes, predation, commercial forestry, habitat fragmentation and fence strikes. In recent years there has been a rapid expansion of wind farms and there is concern about their potential impacts on birds. We evaluated the distribution of black grouse at seven different areas in Scotland where one or more wind farms have been built. The number of lekking black grouse was counted before and after the wind farms were constructed. The data suggest that black grouse have continued to lek at all sites but one. However, there is some evidence of changes in the position of leks within certain sites. These results will be discussed and the potential factors responsible will be explored.

## WHY EUROPEAN WOODLAND BIRDS SPENDING THE WINTER IN THE SAHEL ARE IN DECLINE

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Of the 500 bird species breeding in Europe, altogether 2 billion breeding pairs, a quarter cross the Sahara. These long-distance migrants fare badly compared with short-distance migrants and residents. Most species migrating to Africa show a – often catastrophic – decline, especially those wintering in the Sahel. The vicissitudes of wetland-inhabiting long-distance migrants depend largely on the meteorological and hydrological conditions in their wintering area. If corrected for that, the apparent long-term decline in these species (nearly) disappears. This is very different in migrants wintering in savanna and wooded savanna. The Wryneck declined with 75% between 1965 and 1990 across Europe. The Common Redstart has declined by 95% between 1940 and 2000; the average decline amounted to 4.7% per year, being largest in dry Sahel years. This shows that, beside Sahel rainfall, other factor(s) may be involved. What has changed in the Sahelian wooded savanna? To answer this question, field work was started in 2011 to describe the tree preference of the different bird species and the zoning of the bird species between the Sahara and the tropical forests.


Map courtesy UEA