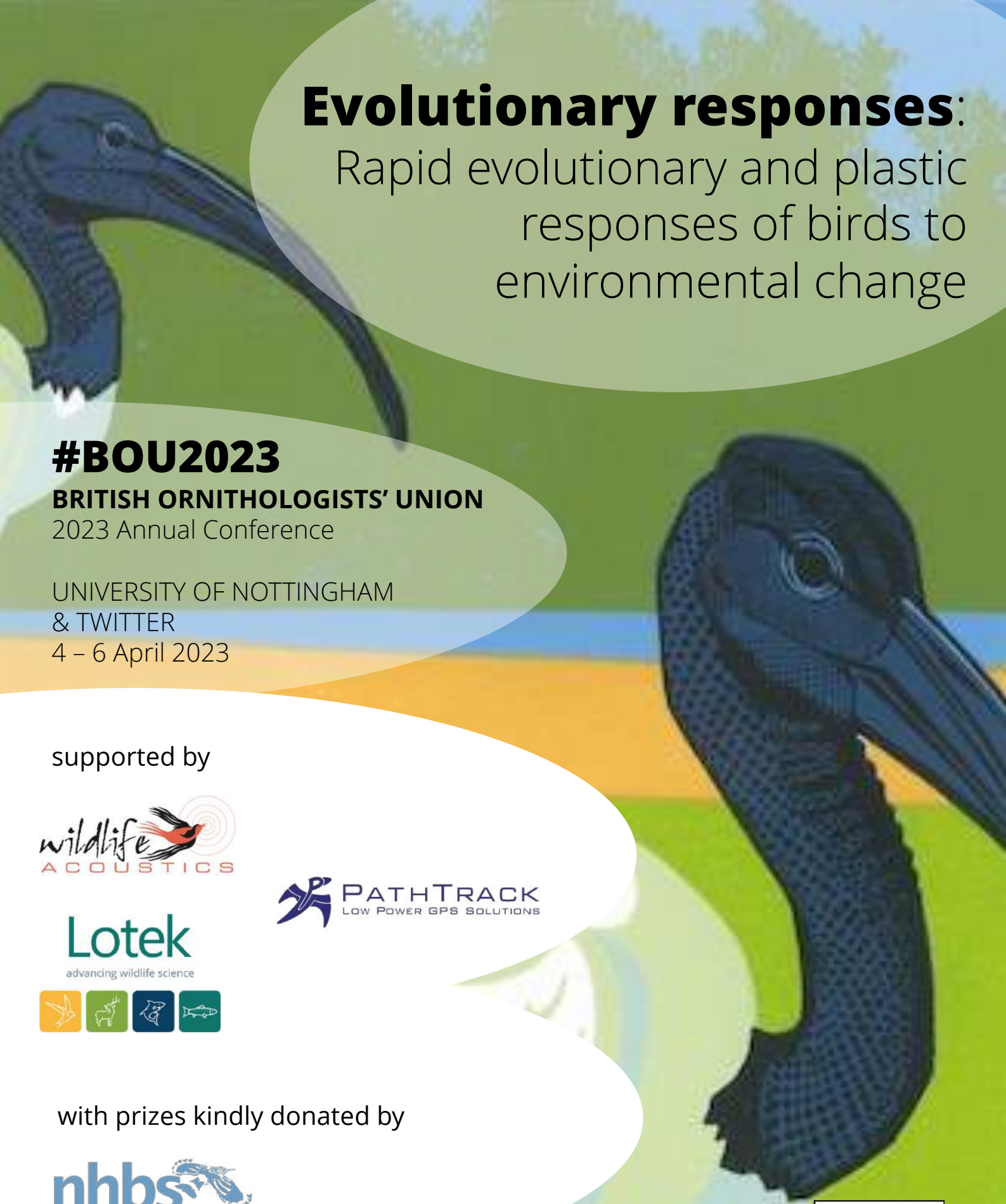
Evolutionary responses: Rapid evolutionary and plastic responses of birds to environmental change



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2023 Annual Conference

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

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

The BOU has been organising conferences and meetings for over 100 years, and they provide an opportunity for people, from widely differing professional backgrounds, to explore and relate to a discrete scientific theme of common interest. Such meetings help to promote understanding of environmental issues and the sharing of knowledge, the presentation of contentious academic theories to critical public debate and the defence of such ideas lie at the heart of healthy science.

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

ACKNOWLEDGEMENTS
Evolutionary responses: rapid evolutionary and plastic responses of birds to environmental change, a conference organised and delivered by Amanda Trask (Institute of Zoology, London), María Moirón (Institute of Avian Research), Ferran Sayol (Centre for Research on Ecology and Forestry Applications), Emily Simmonds (Norwegian University of Science and Technology), Jelmer Samplonius (University of Edinburgh), Michela Corsini (University of Warsaw), Leila Walker (BOU) and Angela Langford (BOU) on behalf of the British Ornithologists' Union. The BOU would like to thank Catriona Morrison (University of East Anglia), Ailidh Barnes (British Trust for Ornithology), María Moirón (Institute of Avian Research), Charlotte Regan (UK Centre for Ecology & Hydrology) and Natalia Zielonka (University of East Anglia) for organising and running the pre-conference early-career researcher (ECR) workshops.

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

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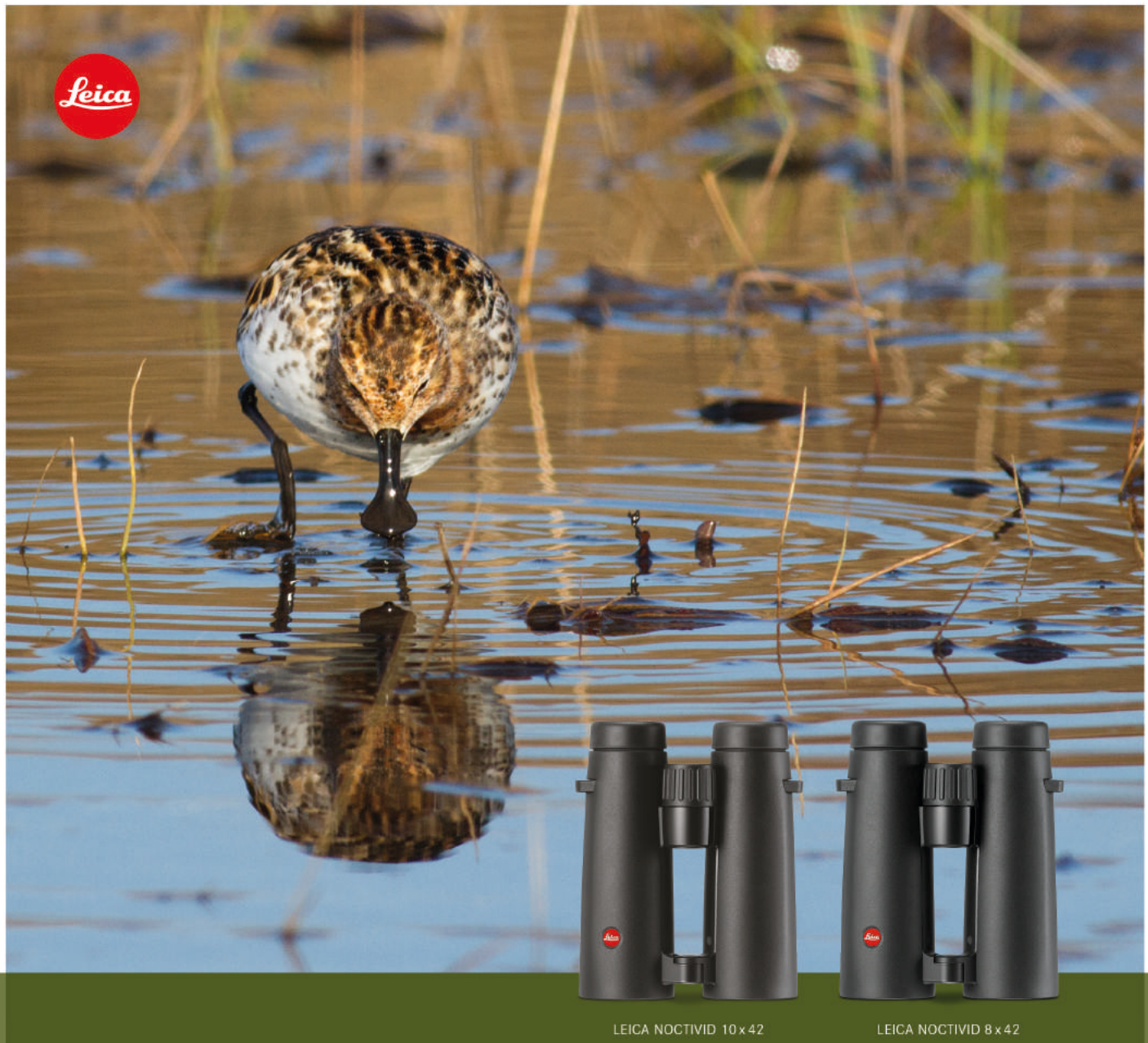

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Welcome to #BOU2023 – the BOU's 2023 Annual Conference

The annual BOU conference for 2023 is themed *Evolutionary responses: rapid evolutionary and plastic responses of birds to environmental change*. A hugely important conference topic, given we are living in a time of rapid environmental change, with pervasive and irreversible consequences on biodiversity. Avian communities respond to human pressures in a variety of ways, modifying aspects such as behaviour, morphology, phenology and movement. Understanding which populations and species may, or may not, be able to adapt fast enough, and under which conditions, is essential for predicting how birds, as well as the ecosystems they inhabit, will respond to future environmental changes.

This conference will bring together researchers, students and conservation practitioners from across the globe to discuss and share high quality research and cutting-edge ideas in how species can and do respond to change. Through an action-packed programme of speakers, posters and Twitter presentations, the conference will showcase work on the diverse ways individuals and populations can respond to a suite of equally diverse environmental threats including changes in land-use, pollution, disease and invasive species.

This is the first face-to-face BOU conference since 2019 and we extend a warm welcome to you all - whether it is your first or you're returning to a (once) 'familiar fixture'. We thank those of you who will be sharing your science and insights. And we invite all of you to engage and interact through questions and discussions as part of the scientific and social programme. The BOU is a great community of active, interesting and interested researchers and ornithologists. We very much hope everyone will genuinely feel they belong in this community and will enjoy being at the heart of it over the next few days.

Prof. Juliet Vickery | BOU President

Code of Conduct

We welcome everyone to BOU events, be these in person at our conferences, meetings and workshops, or online events such as Twitter conferences.

We work hard to engender and promote a welcoming environment that is collaborative, supportive and engaging for everyone involved. Our events provide opportunities to share, develop and broaden viewpoints in a safe and inclusive environment.

We celebrate diversity in all its forms and expect that all our participants are respectful and considerate of each other, that they provide supportive critique, and embrace the multitude of opinions that are on offer.

If you have any concerns, or feel that any participant of an event has breached this code, or have suggestions for how we can make our events more inclusive and productive, please contact any member of the BOU staff, BOU's Meetings Committee or event organisers (named contacts are listed in all event programmes).

During an event, please report any incident as soon as you feel able, to allow us to act upon your concerns. Any reports will be handled in confidence.

Your primary contacts for any issues that may arise during this conference are:

Juliet Vickery
BOU President

Leila Walker
BOU Chief Operations Officer

EVENTS

#BOUsci23
21 – 22 November 2023
Zoom & Twitter
Global flyways

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9 –11 April 2024
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IN-PERSON & TWITTER PROGRAMME

- All times are BST (UTC+1) – please use this time zone convertor for your local time: https://www.timeanddate.com/worldclock/converter.html
- In-person presenters will tweet a summary of their presentation on Twitter during their presentation slot.
- Twitter-only and poster presentations will be tweeted during breaks in the programme.

DAY 1 – TUESDAY, 4 APRIL 2023

1400 -1600 ECR Workshops | The Exchange (C1 / C4 / C34)

1500 - 1800 Accommodation check-in | Jubilee Welcome Point (Newark Hall)

1700 Registration opens | The Exchange

1700 - 2200 Time to view posters and exhibits & enjoy Twitter presentations via #BOU2023 | The Exchange (C3)

TWITTER PRESENTATIONS **#BREAK1**

1730 Poster & Twitter
Microbiome underlying winter adaptations in wild populations of Great Tits (*Parus major*)
Charli Davies (she/her) | University of Jyväskylä, Finland | @CharliSDavies

1740 Poster & Twitter
Actions of microplastic-derived endocrine disrupting chemicals on seabird epigenetics
Christina Biamis | Queen's University Belfast, UK | @CBiamis

1750 Twitter-only
Super birds: The majority of avian blood metabolites are not altered by urban environments
Karen Sweazea | Arizona State University, USA | @CompPSIO

1900 **DINNER** | The Atrium

ALFRED NEWTON LECTURE | THE EXCHANGE (C.LT2) #ALFREDNEWTONLECTURE

2030 **Welcome**
Juliet Vickery (she/her) | BOU President & British Trust for Ornithology, UK | @juliet_vickery

Integrating seasonal movements into evolutionary ecology
Jane Reid | University of Aberdeen, UK & Norwegian University of Science and Technology, Norway | @janemreid1

- 2200 Time to view posters and exhibits

- 2330 **BAR** | Newark Hall

DAY 2 – WEDNESDAY, 5 APRIL 2023

0730 **BREAKFAST** | The Atrium

0830 Registration opens | The Exchange

SESSION 1 – PHENOLOGICAL CHANGES | THE EXCHANGE (C.LT2) #SESH1

0900 **WELCOME TO THE CONFERNCE**
& Chair: Juliet Vickery (she/her) | BOU President & British Trust for Ornithology, UK | @juliet_vickery

0905 **KEYNOTE**
Evolution of phenology in a spatio-temporal context
Ben Sheldon | Edward Grey Institute, University of Oxford, UK | @Ben_Sheldon_EGI

0935 **Consequences of genomic selection for early and late avian lay date in the wild**
Melanie Lindner (she/her) | Netherlands Institute of Ecology (NIOO-KNAW) | @Me_Lindner

0950 **Selection and evolution of phenological plasticity in a fluctuating natural environment**
Suzanne Bonamour (she/her) | CESCO, National Museum of Natural History, France | @SuzanneBonamour

1005 **Separating the contributions of plasticity and local adaptation to spatial variation in Redstarts' breeding phenology**
Ilaria Lonero (she/her) | University of Edinburgh, UK | @LoneroIlaria

1020 **Repeatability of, and environmental effects on, the migratory phenology of a long-distance migratory seabird**
Nathalie Kürten (she/her) | Institute of Avian Research, Germany | @CommonTerns

1035 **Speedy Posters!**
30 second poster elevator pitches | Various presenters

1045 **TEA & COFFEE** | The Exchange (C3)
Time to view posters and exhibits & enjoy Twitter presentations via #BOU2023

TWITTER PRESENTATIONS #BREAK2

1045 Twitter-only **Behavioural responses to anthropogenic noise in an urban-living passerine**
Grace Blackburn (she/her) | University of Western Australia, Australia | @G_Blackburn_

1055 Twitter-only **Interactive effects of rising temperatures and urbanisation on birds: a mechanistic perspective**
Petra Sumasgutner | Konrad Lorenz Research Centre, Austria | @PeSumas

1105 Twitter-only
ALAN as a driver of urban colonization by owls
Airam Rodríguez | National Museum of Natural Sciences, Spain | @Airam_Rguez

SESSION 2 – MOVEMENT AND SPACE USE | THE EXCHANGE (C.LT2) #SESH2

Chair: Simon Evans (he/him) | University of Exeter, UK | @evanssre

1130 **KEYNOTE**

How do migratory mechanisms influence responses to climate changes?
Joe Wynn (he/him) | Institute of Avian Research, Germany & University of Oxford, UK | @joewynn_birds

1200 **Molecular evolution of a potential magnetoreceptor in birds**
Corinna Langebrake (she/her) | Institute of Avian Research, Germany | @c_langebrake

1215 **Eco-evolutionary dynamics in partially migratory metapopulations**
Thomas Haaland (he/him) | Norwegian University of Science and Technology, Norway | @trhaaland

1230 **Beating the bandit: the unexpected consequences of predictor-error in climatic model selection**
Georg Manthey (he/him) | Institute of Avian Research, Germany | @mantheyrochen

1245 **LUNCH** | The Atrium
Time to view posters and exhibits (The Exchange, C3) & enjoy Twitter presentations via #BOU2023

1315 - 1400 **WILDLIFE ACOUSTICS WORKSHOP**
Bioacoustics as a research tool for birds: from data collection to analysis
Paul Howden-Leach | Wildlife Acoustics | The Exchange (C1)

TWITTER PRESENTATIONS #BREAK3

1245 Poster & Twitter
Migration tactics of a nocturnal insectivore in response to ecological barriers
Michiel Lathouwers (he/him) | Hasselt University, Belgium | @MichielLat

1255 Poster & Twitter
From take-off to touch down: how has extreme weather impacted migration timing in a long-distance and long-lived migratory seabird?
Niamh Esmonde (she/her) | Queen's University Belfast, UK | @NiamhEsmonde

1305 Poster & Twitter
Temperature and microclimate refugia influence movement strategy and environmental niche by an endangered grassland bird
Rita Ramos (she/her) | University of East Anglia, UK | @aldinafranco

1315 Poster & Twitter
Additive genetic variance in early-life partial seasonal migration
Rita Fortuna (she/her) | Norwegian University of Science and Technology, Norway | @ritaafortuna

1325 Twitter-only
Biological clocks in the wild: the effects of light pollution in a migratory bird
Sayuri Díaz Palma (she/her) | Jagiellonian University, Poland | @SayuriD5

SESSION 3 – RESPONSES TO ENVIRONMENTAL POLLUTION | THE EXCHANGE (C.LT2) #SESH3

Chair: Sandra Bouwhuis (she/her) | Institute of Avian Research, Germany | @CommonTerns

1415 **KEYNOTE**
The cocktail of urban pollutants and its impacts on birds
Caroline Isaksson | Lund University, Sweden | @CarolineIsak

1445 **The effects of soot on zebra finch (*Taeniopygia guttata*) physiology: an experimental approach**
Susana Garcia Dominguez (she/her) | Lund University, Sweden | @suus_gd

1500 **Mercury uptake across time and space in a long-lived migratory seabird**
Justine Bertram (she/her) | Institute of Avian Research, Germany | @CommonTerns

1515 **Diversity in ornithology: BOU progress and people**
Presentation of Janet Kear Union Medal
Juliet Vickery (she/her) | BOU President & British Trust for Ornithology, UK | @juliet_vickery

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1530 **TEA & COFFEE** | The Exchange (C3)
Time to view posters and exhibits & enjoy Twitter presentations via #BOU2023

TWITTER PRESENTATIONS #BREAK4

1530 Poster & Twitter **Individual level foraging responses to environmental change in a long-lived seabird**
Frederick Mckendrick (he/him) | University of Liverpool, UK | @FreddieMck121

1540 Poster & Twitter **With so much plasticity, how can we reliably demonstrate true evolutionary responses?**
Mark Eddowes (he/him) | Independent researcher | @markeddowes

1550 Twitter-only **Evidence of niche changes and their association with population trends and avian traits**
Pietro Tirozzi (he/him) | University of Milano-Bicocca, Italy | @TirozziPietro

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SESSION 4 – GENETIC AND EPIGENETIC RESPONSES | THE EXCHANGE (C.LT2) #SESH4

Chair: Erik Postma | University of Exeter, UK | @erik_postma

1615 **KEYNOTE**
What role do epigenetic mechanisms play in avian adaptation? A case study of seasonal timing of reproduction
Arild Husby | Uppsala University, Sweden | @arild_husby

1645 **Early-life development of migratory plasticity to environmental change in the European Shag**
Cassandra Ugland | Norwegian University of Science and Technology, Norway | @trhaaland

1700 **An experimental assessment of adaptation to environmental change**
Simon Evans (he/him) | University of Exeter, UK | @evanssre

1715	**Temperature-induced plasticity in nestling growth and physiology in wild nest-box breeding passerines** Bin-Yan Hsu (he/him) | University of Turku, Finland | @binyannhsu
1730	**Multi-generational fitness effects of immigrants indicate strong heterosis and epistatic breakdown that shape gene flow in a natural meta-population** Lisa Dickel (she/her) | Norwegian University of Science and Technology, Norway | @LisaDickel

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1800	**BOU ANNUAL GENERAL MEETING** | The Exchange (C.LT2) All welcome
1830	**BOU ECR EVENT** | The Exchange (C1 / C4 / C34)
1800 - 1945	Time to view posters and exhibits | The Exchange (C3)

2000	**DINNER** | The Atrium

- 2330	**BAR** | Newark Hall

DAY 3 – THURSDAY, 6 APRIL 2023

0730 **BREAKFAST** | The Atrium

0830 Registration opens | The Exchange

SESSION 5 – RAPID RESPONSES TO URBANISATION | THE EXCHANGE (C.LT2) #SESH5

Chair: Emily Simmonds | Norwegian University of Science and Technology, Norway | @EmilySimmonds10

0900 **KEYNOTE**

Great Tits in the city: a tale of (mal)adaptation?
Anne Charmantier | Center for Functional and Evolutionary Ecology, France| @AnneCharmantier

0930 **Colours of evolution: plumage coloration as marker of divergent selection between city and countryside**
Nicolas Bekka (he/him) | Institute of Ecology and Environmental Sciences of Paris, France | @Nicolas_Bekka

0945 **Who eats the junk food? Age-mediated differences in access to landfill resources**
Bruno Herlander Martins | CIBIO-University of Porto, Portugal & University of East Anglia, UK | @BrunoHerlander

1000 **Temporal effects of local tree composition on urban birds**
Johan Kjellberg Jensen (he/him) | Lund University, Sweden | @JohanKJensen1

1015 **Why do birds incorporate anthropogenic materials into their nests?**
Zuzanna Jagiełło (she/her) | Poznań University of Life Sciences, Poland | @JagielloZuzanna

1030 **TEA & COFFEE** | The Exchange (C3)
Time to view posters and exhibits & enjoy Twitter presentations via #BOU2023

TWITTER PRESENTATIONS #BREAK5

1030 Poster & Twitter **Hatching from the pointed end of the egg: a case in whimbrel**
Camilo Carneiro | University of Iceland & University of Aveiro, Portugal | @Camilo_Carneiro

1040 Poster & Twitter **Habitat selection and nest survival in whinchats and stonechats: implications for conservation**
Martin Werner Küblbeck (he/him) | MPI for Biological Intelligence, Germany | @MartinKueblbeck

1050 Poster & Twitter **Eggshell appearance reflects female quality, a meta-analysis in birds**
Norah Alhowiti (she/her) | University of Glasgow, UK | @biologist_ns

SESSION 6 – BEHAVIOURAL AND MORPHOLOGICAL CHANGES IN NOVEL ENVIRONMENTS | THE EXCHANGE (C.LT2) #SESH6

Chair: Ferran Sayol | Centre for Research on Ecology and Forestry Applications, Spain | @FerranSayol

1115 **KEYNOTE**

Behaviour, life history and persistence in novel environments
Daniel Sol | Centre for Ecological Research and Applied Forestries, Spain | @DaniSolRueda

1145 **Great Tit learning abilities variation in an urban world**
Thomas Crouchet (he/him) | Toulouse University, France | @ThomasCrouchet

1200 **Citril Finch wing length changes along >25 years: natural selection under climate change?**
Juan Carlos Senar (he/him) | Museum of Natural Sciences of Barcelona, Spain | @SenarJC

1215 **The dark side of the night**
Ruben Evens (he/him) | Antwerp University, Belgium | @RevNJ

1230 **Biophysical constraints on the morphological diversity of birds**
Ferran Sayol | Centre for Research on Ecology and Forestry Applications, Spain | @FerranSayol

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1245 **LUNCH** | The Atrium
Time to view posters and exhibits (The Exchange, C3) & enjoy Twitter presentations via #BOU2023

1400 Voting for best ECR presentations closes

TWITTER PRESENTATIONS #BREAK6

1300 Twitter-only **Developmental plasticity explains relative bill size according to Allen's rule in a Mediterranean raptor**
Alejandro Corregidor-Castro | University of Padova, Italy | @AlexCoCastro

1310 Twitter-only **Preliminary findings on ecology and genetics of House Sparrow (*Passer domesticus*) in select districts of Gujarat, India**
Anamika Gautam | Salim Ali Centre for Ornithology and Natural History, India | @agsacon343

SESSION 7 – SPECIES INTERACTIONS AND COMMUNITY-LEVEL RESPONSES | THE EXCHANGE (C.LT2) #SESH7

Chair: Maria Moiron | Institute of Avian Research, Germany | @MariaMoironn

1415 **KEYNOTE**

Does social information use help or hinder Reed Warblers vs. Cuckoos coevolving in a geographic mosaic?
Rose Thorogood | University of Helsinki, Finland | @informedbirds

1445 **Trophic interactions and fitness: incorporating the full phenological distribution**
Kirsty Macphie (she/her) | University of Edinburgh, UK | @KMacphie

1500 **Highly pathogenic avian influenza as a novel agent of selection in breeding seabirds**
Sandra Bouwhuis (she/her) | Institute of Avian Research, Germany | @CommonTerns

1515 **Habitat heterogeneity modulates non-linear effects of anthropogenic landscapes on avian biodiversity in a megadiverse tropical forest**
Lisieux Fuzessy (she/her) | Centre for Ecological Research and Applied Forestries, Spain | @LFuzessy

1530 **CONFERENCE CLOSE**
Juliet Vickery (she/her) | BOU President & British Trust for Ornithology, UK | @juliet_vickery

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TEA & COFFEE | The Exchange (C3)
Departure

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ABSTRACTS

Abstracts for the oral programme are in programme order. Poster and Twitter-only abstracts (from page 46) are in alphabetical order on the surname of the presenting author.

TUES, 4 APRIL, 2030 h

Alfred Newton Lecture

Professor Jane Reid
University of Aberdeen, UK & Norwegian University of Science and Technology, Norway | @janemreid1

Integrating seasonal movements into evolutionary ecology

Many wild populations are experiencing rapid environmental changes, including changing seasonality and increasing extreme climatic events. Now, major challenges in ornithology, and in evolutionary ecology more widely, are to predict how populations will respond to such changes over short and longer timeframes. In general, outcomes will depend on combinations of demographic variation, rapid micro-evolution and phenotypic plasticity in key environmentally sensitive traits that affect spatio-seasonal population dynamics. One key trait, exhibited by many birds and other taxa, is seasonal migration. But, seasonal migration has still scarcely been considered in projections of eco-evolutionary dynamics, and new conceptual, analytical and empirical advances are now required to make progress. In my Alfred Newton Lecture I will highlight how combinations of demography, natural selection, genetic variation and intrinsic phenotypic plasticity in expression of seasonal migration versus residence can combine to shape spatio-seasonal population dynamics in the context of dramatic environmental variation. I will illustrate these processes using multi-year full-annual-cycle data from partially migratory European Shags. I will thereby highlight how we can start to predict how eco-evolutionary dynamics involving seasonal migration will shape population responses to rapid spatio-seasonal environmental change.

Professor Jane Reid studied Natural Sciences (Zoology) at the University of Cambridge and did a PhD in Behavioural Ecology at the University of Glasgow. This was followed by a Killam Postdoctoral Fellowship at the University of British Columbia and a Junior Research Fellowship at Jesus College, Cambridge. She joined the University of Aberdeen as a Royal Society University Research Fellow in 2006 and was awarded a personal research Chair in Population & Evolutionary Ecology in 2014. Since 2020, she has worked primarily as an International Chair Professor at the Centre for Biodiversity Dynamics, NTNU, Norway, retaining a part-time position at the University of Aberdeen. Jane aims to provide integrated empirical and theoretical understanding of how ecological and evolutionary processes can combine to shape individual life-histories and drive population dynamics in nature. She is currently particularly interested in understanding how movements, in the form of dispersal and reversible seasonal migration, can link ecological and evolutionary dynamics.

WEDS, 5 APRIL, 0905 h

KEYNOTE

Evolution of phenology in a spatio-temporal context

Ben Sheldon
Edward Grey Institute, University of Oxford, UK | @Ben_Sheldon_EGI

Phenology has become something of a touch-stone for understanding effects and consequences of anthropogenic climate change. However, understanding the evolutionary and demographic consequences of variation in phenology requires that we think about this at the appropriate spatial and temporal scale. In this talk I will summarise work that has addressed the scale-dependence of selection on phenology, and of changes in phenology over time, as exemplified by breeding time in birds, based on analyses at both the scale of individual birds and across populations.

Ben Sheldon is Luc Hoffmann Professor of Field Ornithology in the Edward Grey Institute of the Department of Biology at the University of Oxford. He has long been interested in questions at the interface of ecology, evolution and behaviour, and has found long-term population studies of birds to offer particularly rich opportunities for this kind of work. He directs the Wytham long-term tit study, which celebrated its 75th year of continuous data collection in 2022, and where current work focusses on understanding the spatial scale of phenological synchrony across trophic levels and its wider consequences for ecological and evolutionary processes.

WEDS, 5 APRIL, 0935 h | ECR PRESENTER

Consequences of genomic selection for early and late avian lay date in the wild

Melanie Lindner (she/her)
Netherlands Institute of Ecology (NIOO-KNAW) | @Me_Lindner

Global warming has shifted phenology traits in many species, but not sufficient to track their environment. Despite directional selection, species fail to resynchronize with their environment, indicating that genetic variation for phenology is scarce or fitness doesn't increase with a better-synchronized phenology. To understand this, we used Great Tits (*Parus major*) with extreme early and late genotypes for lay dates, obtained from a genomic selection experiment. We (1) reintroduced females of the fourth-generation into our wild study population to measure lay dates and fitness and (2) housed great tits in climate-controlled aviaries to test whether we introduced genetic, epigenetic or gene expression variation with our genomic selection experiment. Our study constitutes the first application of genomic selection in the wild and led to (1) an asymmetric phenotypic response between genetically early and late females that did not translate into a difference in fitness and (2) differentiation at various molecular levels.

Melanie Lindner did her PhD at the Netherlands Institute of Ecology (NIOO-KNAW) and Groningen University (2018-2022) working on genetics, genomics and epigenetics of adaptation to global warming in Great Tits (*Parus major*). She is now a postdoctoral research associate at the University of Sheffield working on epigenetics of ageing in Soay sheep (*Ovis aries*).

WEDS, 5 APRIL, 0950 h | ECR PRESENTER

Selection and evolution of phenological plasticity in a fluctuating natural environment

Suzanne Bonamour (she/her)
CESCO, National Museum of Natural History, France | @SuzanneBonamour

Organisms live in environments varying in time with different magnitude, speed and predictability. Climate change is altering the patterns of these fluctuations, potentially modifying selective regimes in nature. Selection on phenotypic plasticity is expected to depend on patterns of environmental

fluctuations, notably on the predictability of selection by the environmental cue inducing a plastic response. Despite observed changes in environmental variation and heritable plasticity, there are few evidence of selection on plasticity in wild populations, and even scarcer evidence of fluctuating selection on and response to selection of plasticity. Using a long-term monitoring of wild Blue Tits, we estimated noticeable heritability of laying date plasticity as well as annual selection on and cost of plasticity from individual measurements of fitness and traits combined with environmental time series. We detected fluctuating environment inducing temporally variable natural selection as well as genetic responses of both laying date and its plasticity across years.

Suzanne Bonamour is a postdoctoral researcher at the Centre d'Ecologie et des Sciences de la Conservation (CESCO, at the Museum National d'Histoire Naturelle, MNHN, Paris, France). She is interested in the ecological and evolutionary causes and consequences of phenotypic plasticity of phenology in wild populations in a context of climate change.

WEDS, 5 APRIL, 1005 h | ECR PRESENTER

Separating the contributions of plasticity and local adaptation to spatial variation in Redstarts' breeding phenology

Ilaria Lonero (she/her)
University of Edinburgh, UK | @LoneroIlaria

Warmer springs are expected to see an advance in the optimum breeding time for many forest passerines. Populations may be able to track shifts in optimum timing through phenotypic plasticity and genetic adaptation. Understanding the contributions of these two events may help detect more vulnerable species, like migratory birds, which now face more challenges in shifting their phenology. As quantifying adaptation over time has proven especially challenging, I adopt a space for time approach and estimate the contributions that plasticity and local adaptation make to spatial variation in breeding phenology. I focus on the migratory Common Redstart (*Phoenicurus phoenicurus*) and analyse >4000 observations of nesting stages in UK populations, in combination with daily spring temperature and photoperiods, for the period 1975-2020. This study will improve our understanding of the sensitivity to warming temperatures across space and time of a UK migratory bird.

Ilaria Lonero is a PhD candidate at the University of Edinburgh. She received an MSc in Biological Sciences from the University of Aberdeen. Her PhD project focuses on phenological shifts and range shifts in migratory forest passerines as adaptations to global warming.

WEDS, 5 APRIL, 1020 h | ECR PRESENTER

Repeatability of, and environmental effects on, the migratory phenology of a long-distance migratory seabird

Nathalie Kürten (she/her)
Institute of Avian Research, Germany | @CommonTerns

Climate change has been associated with population declines of many migratory birds, and long-distance migrants in particular. Although the specific mechanisms linking climate change to population trends remain poorly understood, a limited ability of long-distance migrants to adjust their migratory phenology to climate variation may be a contributing factor. To understand whether birds may adjust their migratory phenology to climate change, we first need to quantify this behaviour and identify the environmental cues they use to make their departure decisions. To do so for a long-distance migratory seabird, the Common Tern, we collected data on 138 migratory journeys undertaken by 64 individuals. We calculated the individual repeatability of migratory phenology and applied a spatially and temporally explicit analysis to identify environmental factors that affect it. In my talk, I will present the results of these analyses and discuss how they help provide a better understanding of climate change effects.

Nathalie Kürten is a PhD student investigating effects of climate, as well as climate change, on migratory strategies of a long-distance migratory seabird, the Common Tern.

WEDS, 5 APRIL, 1130 h | ECR PRESENTER

KEYNOTE

How do migratory mechanisms influence responses to climate changes?

Joe Wynn (he/him)
Institute of Avian Research, Germany & University of Oxford, UK
| @joewynn_birds

Understanding how populations of migratory birds respond to a changing climate not only represents a fundamental question in modern bioscience, but is also an increasingly pressing issue in species conservation. The extent to which individual migrants can persist as the climate varies is necessarily a function of their behavioural plasticity, which in turn is partly contingent on the

mechanisms by which they orient and navigate. Conversely, the probability of a novel migratory route evolving in response to anthropic environmental alterations must be linked to a) the probability of a given novel migratory routes occurring and b) the relative fitness payoffs associated with it. A mechanistic understanding of how migratory routes are inherited, refined and executed is, therefore, of interest. Here, using historic ringing records, biologging technology and remotely-sensed environmental data, I present a series of studies aimed at elucidating the relationship between navigational mechanism and ecological change. In doing so I will draw on examples from across the avian phylogenetic tree, and in turn hope to highlight the importance of a mechanistic understanding when considering ultimate questions of selection and evolution.

Joe Wynn did his undergraduate degree at Hertford College, Oxford (2014-17) before moving to Linacre College, Oxford for a D.Phil. (2017-21) studying the mechanism and development of animal navigation with Tim Guilford. Following this he moved to the Institut für Vogelforschung in Wilhelmshaven, Germany for a post-doctoral position under the supervision of Miriam Liedvogel and Sandra Bouhwuis (2021-present).

WEDS, 5 APRIL, 1200 h | ECR PRESENTER

Molecular evolution of a potential magnetoreceptor in birds

Corinna Langebrake (she/her)
Institute of Avian Research, Germany | @c_langebrake

During migration, birds use a magnetic compass to find their species-specific wintering grounds. A cryptochrome based sensor is most likely, especially for night migratory songbirds. Cryptochromes could mediate a magnetoresponse by forming magnetically sensitive radical pairs. With a phylogenetic approach we investigate the evolution of cryptochromes in birds. We hypothesize that a potential sensor protein is characterized by a distinctly different evolutionary history compared to conserved circadian clock cryptochromes. We show that Cry4 is very variable, exhibiting sites under positive selection and sites with an increased fitness in migratory passerines. This contrasts with Cry1 and Cry2 which are highly conserved in all species. A protein modelling approach independently identifies interactions of selected candidate sites across the protein. Our results indicate a distinctly different function of Cry4 compared to other Crys and support the role of Cry4 in a sensory system, shedding light on potential evolutionary mechanisms of migratory traits.

Corinna Langebrake has, since 2019, been a PhD student at the Institute for Avian Research, Germany. She was previously a consultant for bird conservation (2018-2019) at Brunel GmbH and completed an MSc (2016-2018) and a BSc (2012-2015) at the University Greifswald, Germany.

WEDS, 5 APRIL, 1215 h

Eco-evolutionary dynamics in partially migratory metapopulations

Thomas Haaland (he/him)
Norwegian University of Science and Technology, Norway | @trhaaland

Maintaining genetic variation in key phenotypic traits is crucial for natural populations to adaptively respond to rapidly changing conditions. Partially migratory populations, featuring stable coexistence of diverse migrant and resident individuals, are taxonomically widespread, but little is known about how migration strategy variation is maintained in such systems, and in turn how strategies may respond or not as environmental changes alter spatio-seasonal patterns of habitat suitability and population density. Here we extend previous theory on partial migration by modelling spatio-seasonal eco-evolutionary dynamics in metapopulations, such that each subpopulation may contain both residents and visitors from other subpopulations through different parts of the year. We show that such structures, which are commonplace in natural partially migratory systems, can shape the evolution of plastic vs. canalized migration strategies, facilitate maintenance of migratory polymorphisms, and create larger-scale eco-evolutionary impacts of local environmental perturbations.

Thomas Haaland is an evolutionary ecologist who loves bridging the gap between theoretical and empirical work. His work focuses on behavioural and life-history adaptations to variable and unpredictable environments. He is currently a postdoc in Trondheim, Norway; previously in Zurich, Switzerland. He is passionate about climbing, skiing, playing piano, and fighting for climate and social justice.

WEDS, 5 APRIL, 1230 h | ECR PRESENTER

Beating the bandit: the unexpected consequences of predictor-error in climatic model selection

Georg Manthey (he/him)
Institute of Avian Research, Germany | @mantheyrochen

Model selection is a key tool in understanding the effect of climate change on animal movement, allowing for the testing of multiple hypotheses with either a) no specific a priori expectation or b) no a priori expectation at all. However, model selection is necessarily only as good as metrics used to

assess goodness-of-fit, which in turn rely on models that make assumptions about the characteristics of the underlying dataset. It is assumed that error along the x-axis (i.e. error in the predictor) is negligibly small in many commonly applied parametric statistical tests. This is often untrue, however, and deviations from this assumption are often hard (or impossible) to measure. Here, we show that error in the predictor variable has profound and unexpected consequences on goodness-of-fit as measured using likelihood and its derivatives. We find that within-datum predictor error interacts with between-datum predictor variance, sample size and gradient to bias likelihood-based measures of goodness-of-fit in a manner likely to have substantial biological implications. We further find that autocorrelation in predictive power through time and space might lead to the overestimation of goodness-of-fit at points where the true predictive power is questionable. We propose that this problem might be endemic to all likelihood-based measures of fit; suggest that correlations that imply causation should be used with caution; and highlight the importance of adherence to model assumptions during multiple hypothesis testing.

Georg Manthey is a Research Assistant at the Institute for Avian Research, Germany, and an MSc student in Computer Science at the University of Oldenburg, Germany. Previously he was a Research Assistant at the Max Planck Institute for Evolutionary Biology in Plön, and undertook a BSc in Computer Science at RWTH Aachen and Kiel University (2017-2020).

WEDS, 5 APRIL, 1315 h

WILDLIFE ACOUSTICS WORKSHOP
Bioacoustics as a research tool for birds: from data collection to analysis

Paul Howden-Leach
Wildlife Acoustics | @WildlifeAcoust

A workshop looking at bioacoustics as a research tool for the study of birds. The workshop will look at the potential of bioacoustics in general followed by a walk-through of some equipment and potential deployment options to fit in with a variety of standard and non-standard protocols. Case studies will be used, and attendees own specific deployment needs will be addressed to design the most appropriate schedule for their potential study. Following on from this the workshop will move on to data analysis using Kaleidoscope Lite and Kaleidoscope Pro. This element of the workshop will focus on signal extraction, rapid data analysis, and building species classifiers. No previous experience in bioacoustics is needed.

WEDS, 5 APRIL, 1415 h

KEYNOTE

The cocktail of urban pollutants and its impacts on birds

Caroline Isaksson
Lund University, Sweden | @CarolineIsak

Urban habitats and landscapes are markedly different from non-urban "natural" habitats. The major difference is the transformation of the land, from natural green areas to anthropogenic structures and impervious surfaces. In addition, to the fragmented landscapes, urban-dwelling birds are exposed to many novel, sometimes beneficial, but most often challenging conditions. These conditions include for example increased exposure to different kinds of pollutants such as chemical pollution, artificial light at night (ALAN), and noise. These pollutants co-occur in the city and its impact can be difficult to disentangle using field studies of urban and non-urban bird populations. To explore this in more detail we have performed a number of experimental studies of these three anthropogenic pollutants to understand the behavioural, physiological and genetic perturbations in relation to single and multipollutant exposures. These controlled perturbations using Zebra Finches *Taeniopygia guttata*, will be compared and discussed in relation to physiological and genetic changes found in wild urban and non-urban populations of Great Tits *Parus major* to bring some light into the evolutionary responses to pollution.

Caroline Isaksson finished her PhD in 2007 at Gothenburg University, Sweden, under the topic of "Ecology and Physiology of Carotenoid Coloration in Great Tits" from an urban context. After that, she received three independent post doc fellowships to work at Groningen University, the Netherlands, and then at the EGI, Oxford University, UK. In 2012, she began a position at the Department of Biology, Lund University, where she is currently based. The main focus of her research is to understand the impacts of urbanisation on birds using a broad repertoire of approaches and techniques to disentangle the effects and responses caused by different urban factors.

WEDS, 5 APRIL, 1445 h | ECR PRESENTER

The effects of soot on Zebra Finch (*Taeniopygia guttata*) physiology: an experimental approach

Susana Garcia Dominguez (she/her)
Lund University, Sweden | @suus_gd

Urbanization is one of the largest environmental threats to wildlife. Particularly, the high concentrations of traffic-generated air pollutants present in urbanized environments are known to cause premature disease and death in humans. Soot is a major air pollutant that consists of aerosol nanoparticles formed during the incomplete combustion of fossil fuels and biomass. Inhaled soot particles can promote oxidative stress in an organism's internal environment, which can damage important biomolecules, such as lipids, DNA and proteins. Birds may be especially sensitive to soot because of their highly efficient respiratory system and fast metabolic rate. However, knowledge about the impact of soot inhalation on avian physiology is currently lacking. To address this, we will experimentally assess the effects of different forms of soot in the Zebra Finch (*Taeniopygia guttata*), using different health biomarkers. By understanding how soot affects birds' wellbeing, we are better equipped to monitor wildlife responses to anthropogenic disturbances.

Susana Garcia Dominguez has always been interested in how animals interact with their environment, and vice versa, how the environment can affect animals. It is the latter that has become the focus of her PhD studies, in which she explores how air pollution affects the overall wellbeing of birds and insects.

WEDS, 5 APRIL, 1500 h | ECR PRESENTER

Mercury uptake across time and space in a long-lived migratory seabird

Justine Bertram (she/her)
Institute of Avian Research, Germany | @CommonTerns

The environmental presence of mercury has dramatically increased over the past century, leading to its uptake by many organisms, particularly marine top predators, such as seabirds. Understanding the exact sources of contamination requires a year-round individual-level approach, which is especially challenging for species that migrate. We took such an approach and longitudinally, across 6 years, collected feather and blood samples from breeding Common Terns (*Sterna hirundo*) that we also tracked to their wintering areas using geolocators. In my talk, I will present results on the within-

individual repeatability of mercury levels in the two tissues and how factors such as sex, age, phenology and wintering area affect these levels.

Justine Bertram is a PhD student investigating the causes and consequences of mercury contamination in a long-distance migratory seabird, the Common Tern.

WEDS, 5 APRIL, 1615 h

KEYNOTE

What role do epigenetic mechanisms play in avian adaptation? A case study of seasonal timing of reproduction

Arild Husby
Uppsala University, Sweden | @arild_husby

Phenologial traits, such as seasonal timing of reproduction, are among the traits that have responded most rapidly to climate change. It is currently believed that these shifts in seasonal timing are a result of phenotypic plasticity, but we do not yet understand what genetic mechanisms are involved. Some recent works have examined the role epigenetic mechanisms, in particular DNA methylation, might have in seasonal reproduction through their role in gene regulation of key genes in the reproductive cascade. These findings suggests that seasonal changes in DNA methylation patterns can act to regulate expression and thus onset of seasonal timing, although the generality of this finding is still unclear. I this talk I will present an overview of what we currently know about the role of epigenetic mechanism in avian seasonal reproduction and some of the challenges we face to obtain robust functional evidence of the role of epigenetic mechanisms in seasonal timing of reproduction.

Arild Husby is an Associate Professor at Uppsala University and has a deep interest in understanding the genetic basis of phenotypic plasticity, from the quantitative genetic to the molecular level. In his talk he will review our current understanding of how plasticity in seasonal timing of reproduction in birds is regulated at the genetic and epigenetic level. Due to recent technological advances several studies have now examined patterns of DNA methylation in birds, something that has led to renewed insights into how seasonal timing of reproduction in birds is regulated at the molecular level.

WEDS, 5 APRIL, 1645 h | ECR PRESENTER

Early-life development of migratory plasticity to environmental change in the European Shag

Cassandra Ugland
Norwegian University of Science and Technology, Norway | @trhaaland

Environmental change is ubiquitous and is reshaping the context in which avian populations must persist. Core ambitions in evolutionary ecology are therefore to identify how populations can adjust life histories to avoid declines towards extinction. Seasonal migration is one key trait that allows temporal escape from unfavorable conditions, increasing individual survival. However, while phenotypic variation in migration versus residence has been quantified in adults and typically revealed strong individual canalization, no studies have yet quantified early-life (juvenile) migratory plasticity and survival selection. Accordingly, we fitted advanced multi-state capture-mark-recapture models to a 12-year resighting dataset from color-ringed European Shags to quantify early-life movements and associated survival selection on migration and migratory plasticity. We show substantial among- and within-individual variation in early-life migration vs residence, and that selection differs among cohorts. These results highlight how early-life development of phenotypic tactics can shape individual- and population-level responses to environmental change.

Cassandra Ugland is currently undertaking a PhD in Evolutionary Ecology at the Center for Biodiversity Dynamics at the Norwegian University of Science and Technology. Her PhD project focuses on early-life expression and variation of migratory plasticity in a partially migratory population of European Shags.

WEDS, 5 APRIL, 1700 h

An experimental assessment of adaptation to environmental change

Simon Evans (he/him)
University of Exeter, UK | @evanssre

By combining analytical approaches from animal breeding with data from their exceptionally long-term population studies, ornithologists have been at the forefront of efforts to quantify 'evolution-in-action' – adaptive responses of wild populations to ongoing environmental change. Inferred rates of evolutionary change seldom match predictions, raising the possibility that evolutionary change in the wild may be more stochastic than previously appreciated, although these retrospective analyses are inherently correlational. To address this, we make use of a unique selection experiment that

artificially reversed a genetically-based spatial cline of clutch size in an insular population of great tits. After cessation of artificial selection, the two sub-populations exhibited opposing genetic trends, such that the original genetic distinction was rapidly re-established. Our work suggests that even at a local level, evolutionary equilibria are robust to sustained disturbance, such that quantitative genetic analyses reporting little or no evolutionary response to altered environments likely represent valid inferences.

Simon Evans is interested in the evolutionary dynamics shaping populations in the wild, particularly the structure of heritable variation in fitness and how it varies across time and space.

WEDS, 5 APRIL, 1715 h

Temperature-induced plasticity in nestling growth and physiology in wild nest-box breeding passerines

Bin-Yan Hsu (he/him)
University of Turku, Finland | @binyannhsu

Temperature changes induced by anthropogenic activity have been reported to influence populations and communities of wild birds. However, the effects of temperature on early life development, and the potential for mothers to buffer these effects, are less explored. To address this question, we experimentally elevated key mediators of maternal effects, egg thyroid hormones, before incubation and simultaneously increased post-hatching nest-box temperature by ~2 °C in two wild passerines. Our results showed that Pied Flycatcher nestlings reached the highest body mass at an intermediate nest-box temperature, and the heating treatment increased blood mitochondria density in Great Tit nestlings. More importantly, in both species, heating treatment accelerated telomere shortening. The elevated yolk thyroid hormones enhanced growth, but did not clearly modulate the effects of nest-box temperature. Our results suggest that the projected temperature increase will likely induce plasticity in nestling growth and physiology of wild birds, and may even advance senescence.

Bin-Yan Hsu is an Academy of Finland postdoctoral researcher, currently employed as a Senior Research Fellow at University of Turku, Finland. He received his PhD from University of Groningen, the Netherlands, in 2016, studying hormone-mediated maternal effects. Currently, his ongoing project focuses on the relationships between thyroid hormones and life histories.

WEDS, 5 APRIL, 1730 h | ECR PRESENTER

Multi-generational fitness effects of immigrants indicate strong heterosis and epistatic breakdown that shape gene flow in a natural meta-population

Lisa Dickel (she/her)
Norwegian University of Science and Technology, Norway | @LisaDickel

Quantifying and rationalising the fitness of immigrants and their descendants is fundamental to understanding the ultimate evolutionary consequences of immigration into recipient populations. Full genetic outcomes are complex because immigrants can induce contrasting fitness effects across generations, reflecting expression of additive, dominance and epistatic effects. Yet, sex-specific dynamics of fitness emerging across immigrants and descendants in natural meta-populations have rarely been quantified. We used 36 years of life-history and pedigree data from free-living Song Sparrows (*Melospiza melodia*) to quantify fitness of immigrants, natives and their F1, F2 and backcross descendants. F1 offspring of immigrant-native matings had higher fitness than their parents' mean, indicating strong heterosis. Yet, F2 offspring of F1-F1 matings had notably low fitness, indicating strong epistatic breakdown. We thereby demonstrate substantial non-additive genetic fitness effects in a natural meta-population, potentially shaping the net degree and pace of genetic introgression that could shape local adaptation.

Lisa Dickel is currently a PhD student in Evolutionary Ecology at the Centre for Biodiversity Dynamics at the Norwegian University of Science and Technology (NTNU). Her PhD project is focused on genetic impacts of immigration in a natural meta-population.

THURS, 6 APRIL, 0900 h

KEYNOTE

Great Tits in the city: a tale of (mal)adaptation?

Anne Charmantier
Center for Functional and Evolutionary Ecology, France |
@AnneCharmantier

For many decades, the contribution of ornithology to the fields of Ecology and Evolution relied heavily on long-term studies conducted in pristine environments, where we were aiming to study natural selection 'unpolluted' by the strong anthropogenic forces affecting ecosystems. In particular, cities were avoided as their bird communities were very altered compared to natural habitats, and highly

affected by the cocktail of novel and constraining conditions in urban areas. In the past decade, it has however become obvious that we need to learn more about our urban birds in order to protect them, but also that urban environments offer exciting perspectives to investigate processes of rapid adaptation. Results from a project on Great Tits *Parus major* along an urbanisation gradient will illustrate the potential of studies on urban local adaptation. This study revealed phenotypic divergence for a large set of avian morphological, behavioural and life history traits: e.g. birds in the city are smaller, more aggressive, faster explorers with faster breath rates, and breed earlier and have smaller clutches. These phenotypic shifts in cities could be maladaptive since they were never aligned with estimations of natural selection. By exploring the genomic footprints of selection and conducting a common garden experiment we are starting to unravel the interplay between plastic versus genetic responses to urbanisation. Understanding the mechanisms by which populations can rapidly adapt to global change is crucial to predict their viability but often requires multiple complementary approaches and will benefit from collaborative approaches such as meta-analyses in the future.

Anne Charmantier is an evolutionary ecologist holding a senior CNRS position (eq. Prof) in the Center for Functional and Evolutionary Ecology (CEFE, Montpellier, France) where she is head of the Evolutionary Ecology research department. Her main research interests are focused on understanding the mechanisms involved in the evolution of adaptive traits, especially in a context of rapid anthropogenic changes. She is co-coordinating a long-term monitoring program on Blue Tits in Corsica and mainland France, and Great Tits in urban and forest areas of the South of France, which contributes to her research on local adaptation, plasticity, senescence, ecological genomics and sexual selection. She has particularly pioneered quantitative genetic approaches in wild populations, to study adaptive and non-adaptive responses to climate change and urbanisation.

THURS, 6 APRIL, 0930 h | ECR PRESENTER

Colours of evolution: plumage coloration as marker of divergent selection between city and countryside

Nicolas Bekka (he/him)
Institute of Ecology and Environmental Sciences of Paris, France | @Nicolas_Bekka

Deep and rapid environmental changes driven by growing urbanization offers the opportunity to study ongoing eco-evolutionary mechanisms. Urban driven phenotypic differences are increasingly documented, but the potential role of selection in underlying those divergent phenotypes is still poorly understood. Data from 10 years' continuous monitoring of the carotenoid-based breast coloration of Great Tits (*Parus major*) breeding in urban or rural habitat showed divergent selection

gradient consistent with the differences in mean phenotypes observed in the two habitats. In the city, there was evidence of stabilising selection towards lower carotenoid deposition in feathers, but not in the forest. This may partly explain the duller phenotypes observed in the urban as compared to rural habitat, and may reflect an adaptation of the birds' diet to newly available resources, possibly more diverse, but with lower carotenoid content.

Nicolas Bekka is a PhD student at Sorbonne University, Paris, France, where he received a bachelor's degree in life sciences and a master's degree in evolutionary ecology. He is interested in urban ecology and evolution of urban and rural Blue and Great Tit populations.

THURS, 6 APRIL, 0945 h | ECR PRESENTER

Who eats the junk food? Age-mediated differences in access to landfill resources

Bruno Herlander Martins
CIBIO-University of Porto, Portugal & University of East Anglia, UK | @BrunoHerlander

Landfills provide wildlife with valuable and predictable food sources worldwide. Although several species can benefit from these resources, it is still unclear how landfill foraging is developed and which skills are needed to compete for space and food. Here, we investigate the ontogeny of landfill foraging specialization in a long-lived opportunistic bird that now relies on these sites for year-round food. GPS tracking data of more than 100 White Storks (*Ciconia ciconia*) and around 300 behaviour videos were used to understand age-related landfill foraging differences, from fledglings to breeding adults. Access to landfill organic waste and landfill specialization is mediated by foraging skills and experience developed in early life. Older birds use landfills more often and outcompete juveniles by being more successful at feeding. Access to landfill food influences competition and foraging processes, which can shape individual movement decisions and affect population structure and demography.

Bruno Herlander Martins, Biologist and Master in Conservation Biology, is currently a PhD student at the University of East Anglia (UK) and the University of Porto (Portugal), and investigates the ecological and evolutionary implications of human food waste on wildlife.

THURS, 6 APRIL, 1000 h | ECR PRESENTER

Temporal effects of local tree composition on urban birds

Johan Kjellberg Jensen (he/him)
Lund University, Sweden | @JohanKJensen1

Urban environments constitute novel habitats to birds through several factors, including altered vegetation. Here, we investigated this fundamental habitat characteristic, using seven years of breeding data from urban Great Tits (*Parus major*), linking reproductive traits to the local tree composition within 400 territories. We found birds less likely to breed in territories with high numbers of non-native trees, which appears adaptive since nestling weight decreased with higher numbers of non-native trees. Off-spring survival generally increased with early onset of breeding, especially in oak-rich territories, yet oak trees (Quercus robur) were associated with delayed lay-dates. Urban great tits could thus be maladapted in reading phenological cues and timing reproduction to match local food sources. We present results highlighting the importance of urban vegetation but can also show that effects vary within and between years, underscoring the heterogenous nature of urban environments.

Johan Kjellberg Jensen is a PhD student at Lund University researching urban ecology with a focus on trophic interactions and physiological responses.

THURS, 6 APRIL, 1015 h | ECR PRESENTER

Why do birds incorporate anthropogenic materials into their nests?

Zuzanna Jagiełło (she/her)
Poznań University of Life Sciences, Poland | @JagielloZuzanna

Many bird species incorporate anthropogenic materials - including sweet wrappers, cigarette butts, fishing line and plastic string - into their nests and here, we outline the causes and consequences of this increasingly common behaviour. Anthropogenic materials are slow to decay, meaning that they have become widely available as nesting materials in both marine and terrestrial environments globally. The first record of anthropogenic materials being incorporated into birds' nests was in the 1830's, and the abundance of anthropogenic materials in birds' nests has rapidly increased since then. Anthropogenic materials have advantages and disadvantages for birds, and in terms of advantages, it has been proven that plastic serves as a reliable signal to conspecifics and that cigarette butts repel ectoparasites, whilst it has also been suggested that plastic string and artificial plants may strengthen the nest structure, that anthropogenic materials are easy to find, and that

polyester wadding has high insulative properties. In terms of disadvantages, meanwhile, it has been proven that adults and offspring become entangled in plastic string, that rubber bands are ingested by offspring, and that nests containing plastic suffer high levels of predation, whilst it has also been suggested that plastic string and polyester wadding have low insulative properties. We then explore the ultimate mechanisms underlying this behaviour by performing a phylogenetically informed comparative analysis that will examine interspecific variation in the use of anthropogenic materials among species and the ecological and/or life-history traits underlying its usage. Finally, we provide a conceptual framework for the use of anthropogenic materials in bird nests and highlight those areas where further attention is most urgently warranted in this burgeoning research field.

Zuzanna Jagiełło, a PhD Student at Poznań University of Life Sciences, focuses on the impact of the global pollution crisis on birds. She is investigating the mechanisms underlaying the usage of anthropogenic nest materials (like plastic) by birds and its consequences. She has just completed a one-year fellowship at the University of Granada focused on the influence of nest design on nest thermal isolation in response to anthropopression.

THURS, 6 APRIL, 1115 h

KEYNOTE

Behaviour, life history and persistence in novel environments

Daniel Sol
Centre for Ecological Research and Applied Forestries, Spain |
@DaniSolRueda

Novel environments pose many challenges to animals for population persistence because they generate adaptive mismatches and pose difficulties for adaptative rescue. Not surprisingly, most species have difficulties to colonize novel environments. Yet some species seem to be very successful in such environments. In this talk, I will discuss theoretical and empirical evidence for the importance of behavioral responses to persist, proliferate and evolve in novel environments. My thesis is that these responses are part of a slow-lived strategy to cope with environmental changes. Drawing on studies in birds, I will suggest that integrating behavior into life history theory does not only improve our understanding of the invasion process, but it also has important evolutionary implications.

Daniel Sol is a CSIC Professor of Research at the Centre of Ecological Research and Applied Forestries (CREAF). The research of his lab seeks to understand how animals respond to changes and what the consequences are for biodiversity. To this purpose, they combine theoretical models, experiments and comparatives approaches. Their research has contributed to developing: (1) the "cognitive buffer hypothesis" for the evolution of animal intelligence; (2) a more general life history theory for

biological invasions that moves beyond the classical small-population paradigm; and (3) improved global quantitative estimations of the current loss of biodiversity driven by habitat loss and alteration.

THURS, 6 APRIL, 1145 h | ECR PRESENTER

Great Tit learning abilities variation in an urban world

Thomas Crouchet (he/him)
Toulouse University, France | @ThomasCrouchet

Rapid environmental changes such as urbanisation imply challenges for wild animals in order to survive. Although evidence highlighted rapid evolutionary responses explaining differential adaptation of species to anthropogenic alterations, less is known about how birds as individuals react to these fast changes. To develop plastic responses in this changing world, individuals strongly rely on their cognitive abilities. However, the direct impact of short term urbanisation on cognitive abilities still needs exploration. Using associative learning tasks on wild great tits, we analysed the intra-individual variation in cognitive abilities facing urban pollution. We measured learning performance before and during either sound or light pollution mimicking daily urban variations. Both sound and light pollutions impacted birds learning performance, although these two components acted differently on cognitive abilities. We thus provide experimental evidence for short term effect of urban pollution on learning performance, expanding our understanding of birds' responses to environmental changes.

Thomas Crouchet has always been interested in understanding the factors influencing animal behaviour. After undergraduate studies on stress effects on acoustic communication, he started a PhD on behavioural plasticity in Great Tits. He aims to disentangle the link between plasticity and cognition and consequences on birds' fitness in various ecological contexts.

THURS, 6 APRIL, 1200 h

Citril Finch wing length changes along >25 years: natural selection under climate change?

Juan Carlos Senar (he/him)
Museum of Natural Sciences of Barcelona, Spain | @SenarJC

In recent years, rapid changes in the wing length of several bird species, apparently due to climate change, have been reported. However, none of these studies has shown whether the changes detected are due to directional natural selection processes. Here we use an extensive capture-

recapture (CR) database of Citril Finches (*Carduelis citrinella*) sampled from 1991-2017. Survival estimation in relation to wing length showed that wing length was under positive directional selection from 1991 to 2009. From 2009 on, wing length remained constant, and survival analyses showed that wing length was under fluctuating stabilising selection. Results show therefore, for the first time, that changes in wing length under the scenario of climate change are under natural selection processes. However, in birds getting to a stabilization in wing length variation in more recent years, suggests that the change in wing length cannot be explained only by climate change.

Juan Carlos Senar has been in the world of research for more than 30 years. In recent years, he has been working on the topic of Contemporary Evolution in species subject to Global Change, since this change of anthropogenetic origin, mainly climate change, urbanization and invasive species, accelerates the rates of evolution.

THURS, 6 APRIL, 1215 h

The dark side of the night

Ruben Evens (he/him)
Antwerp University, Belgium | @RevNJ

Animal behaviour has evolved under relatively constant cycles of light and darkness. Nowadays, artificial night lighting disrupts predictable, recurring light cycles, such as the lunar cycle. We investigated the potential consequences of a subtle, broad-scale form of ecological light pollution, skyglow, on individual flight and foraging behaviour of European Nightjars (*Caprimulgus europaeus*) in Belgium, Mongolia and Africa. By combining space use and activity data of individual nightjars with local measures of nocturnal light, we observe that, in natural habitats tens of kilometres away from urbanised environments, skyglow mimics a full-moon night in terms of sky brightness. This occurs especially during overcast nights, when the sky should be naturally dark. Nightjars, who are visually-oriented insectivores, respond to such an artificially illuminated sky by increasing nocturnal flight and flycatching activity. This flexibility in light-mediated activity raises the question whether or how individuals and populations adapt to significant changes in their night-time environment.

Ruben Evens is a behavioural ecologist at Antwerp University (Belgium). Supported by an FWO-postdoc grant, he investigates the impact of astronomical light pollution on the behaviour of nocturnal animals, with the European Nightjar (Caprimulgus europaeus) as a model organism. Using activity loggers and local measures of nocturnal lights, he compares individual nocturnal flight, feeding, singing and resting activity under different nocturnal and artificial light conditions.

THURS, 6 APRIL, 1230 h

Biophysical constraints on the morphological diversity of birds

Ferran Sayol (he/him)
Centre for Research on Ecology and Forestry Applications, Spain | @FerranSayol

In spite of the seeming tremendous diversity in shape and function among living things, the observed trait combinations are frequently constrained in comparison to all potential options. Understanding these constraints can help to determine the limits of evolvability of traits and the capacity of populations to adapt to environmental and/or anthropogenic changes. Using quantitative trait measurements and ecological classifications for all birds, we demonstrate that observed variation in both beak and body shape is highly restricted, occupying triangular regions of morphospace with clearly defined edges and vertices. The structure of bird morphospace reflects biophysical trade-offs determined by the physical state of the environment in which birds forage and how resources are captured and processed. We show that species that reside near the vertices of beak and body morphospace are specialised on single biophysical tasks and are more vulnerable to anthropogenic change. Our results reveal how biophysical constraints shape both the evolution of morphological diversity and the resilience of biodiversity to anthropogenic change.

Ferran Sayol is a Beatriu de Pinós Postdoctoral fellow at CREAF. His research aims to understand the role of behaviour in the generation and maintenance of biodiversity. He obtained a PhD in Terrestrial Ecology at the Autonomous University of Barcelona (2018), conducted a postdoc at the University de Göteborg (2018-2020) and held a Marie-Curie Postdoctoral Fellowship at University College London (2020-2022).

THURS, 6 APRIL, 1415 h

KEYNOTE

Does social information use help or hinder Reed Warblers vs. Cuckoos coevolving in a geographic mosaic?

Rose Thorogood
University of Helsinki, Finland | @informedbirds

The Geographic Mosaic theory of coevolution (Thompson, 2005) is often invoked in plants and pathogens to explain how hosts and parasites persist across ecological and evolutionary time without

driving each other to extinction. The Common Cuckoo and its hosts, like the Reed Warbler, were a putative example when the theory was presented. It is therefore surprising that we still have no rigorous tests of whether it explains the geographic patterns we see in their behaviour. This is increasingly important as habitat availability and the populations of hosts and cuckoos continue to change. At the same time, it is becoming clear that the behaviour of others in the local social environment can have important effects on both ecological and evolutionary dynamics, meaning that local densities and identities may need to be considered when investigating range wide patterns. Here I'll present recent work from both classic and new study populations representing the core and range edges of the Reed Warbler to address (i) how their social environment changes across a mosaic of parasitism risk in Europe, (ii) whether this affects their ability to mount defences after over 100 years in allopatry with Cuckoos, and (iii) what this might mean for the future of Cuckoos vs. Reed Warblers.

Rose Thorogood shares Tinbergen's view that 'watching and wondering' is the best method to learn about the natural world. Using field experiments with passerines like Reed Warblers in Europe, or Hihi in New Zealand, I investigate the effects of social environments in decision-making, and test how this shapes both a species' response to selection pressures, and how they exert selection on others. Originally from New Zealand, I was a PhD, postdoc, and NERC fellow at the University of Cambridge before moving to the University of Helsinki, Finland in 2017 – almost exactly the opposite side of the world from where I began.

THURS, 6 APRIL, 1445 h | ECR PRESENTER

Trophic interactions and fitness: incorporating the full phenological distribution

Kirsty Macphie (she/her)
University of Edinburgh, UK | @KMacphie

Hole-nesting passerines and the arboreal caterpillar peak has become a key system for examining impacts of rising spring temperatures on trophic mismatch. Bird breeding success in relation to phenology is most often compared to mean timing of the caterpillar peak, however differences in the shape (height and width) of the phenological distribution of caterpillar abundance will also determine the food available to breeding birds. We hypothesise that the shape of the caterpillar peak will affect the shape of the Blue Tit fitness function relative to their breeding phenology, using data from 44 woodland sites over 9 years in Scotland. We examine whether the timing, height and width of the caterpillar peak have a discernible impact on the phenological fitness function of Blue Tits. This work

provides insight into the effect of the caterpillar peak on strength of stabilising and directional selection and the value of considering the full phenological distribution.

Kirsty Macphie is a 4th year PhD student in Evolutionary Biology at the University of Edinburgh studying variation in the caterpillar resource and the consequences for the phenological fitness function of Blue Tits.

THURS, 6 APRIL, 1500 h

Highly pathogenic avian influenza as a novel agent of selection in breeding seabirds

Sandra Bouwhuis (she/her)
Institute of Avian Research, Germany | @CommonTerns

The anthropogenic influence on wildlife hardly knows any boundary. We cause habitat loss and climate change, deplete natural resources and emit pollutants. In addition, we create ideal environments for the emergence of novel pathogens, such as the highly pathogenic avian influenza virus that originated in poultry farming in the 1990s. Seabirds are among the birds most affected by these changes and during the breeding season of 2022 were introduced to unprecedented avian influenza outbreaks at their breeding sites. In my talk, I will show how at least a quarter of a breeding population of Common Terns was wiped out by avian influenza and how mortality rates varied over time and across birds of different sex, age and phenology. I will also introduce our research plans for investigating the emergence of immunity and further evolutionary consequences of the outbreak.

Sandra Bouwhuis is an evolutionary ecologist with a specific interest in the causes and consequences of within-individual change in life-history traits and between-individual variation in life-history strategies. She mostly conducts analyses on long-term individual-based datasets collected in wild populations.

THURS, 6 APRIL, 1515 h

Habitat heterogeneity modulates non-linear effects of anthropogenic landscapes on avian biodiversity in a megadiverse tropical forest

Lisieux Fuzessy (she/her)
Centre for Ecological Research and Applied Forestries, Spain | @LFuzessy

Evolutionary responses: rapid evolutionary and plastic responses of birds to environmental change

Tropical ecosystems are threatened by over-exploitation, with current and future mass extinctions being expected to occur. Extinctions are unlikely to be driven by stochastic processes alone; they also result from adaptations to tolerate environmental alterations. Here we ask why certain species are better prepared to respond to environmental changes than others, and how variation in responses to anthropogenic landscapes alters the structure of bird communities in terms of functional and phylogenetic diversities in the Brazilian Atlantic Forest ('AF'). The AF is a Biodiversity Hotspot, a global priority for conservation. Local heterogeneity was the main element modulating biodiversity change. The loss of species was accompanied by non-linear shifts in functional diversity (measured as diversity in morphology), and uniqueness of functions. Because species adaptations to cope with changes tend to be conserved, phylogenetic diversity was also affected.

Lisieux Fuzessy is a Brazilian biologist, currently a Marie Curie fellow at CREAF, in Spain. She is concerned about human impacts on biodiversity, and her current research seeks to understand the main consequences of human actions for functional and phylogenetic diversities of birds.

POSTER & TWITTER | WEDS, 6 APRIL, 1050 h | ECR PRESENTER

Eggshell appearance reflects female quality, a meta-analysis in birds

Norah Alhowiti (she/her)
University of Glasgow, UK | @biologist_ns

Avian eggshell colouration varies enormously between and within species, and many hypotheses have been proposed to explain this diversity in egg appearance. A hypothesis that has received much attention is the sexually selected eggshell colouration hypothesis, which assumes that the eggshell colouration acts as a signal of female quality. Despite numerous studies testing the relationship between eggshell appearance and female quality, there is no consistent body of evidence to support this assumption. Here, I performed the first meta-analysis of the relationship between eggshell appearance (biliverdin, porphyrin and maculation) and female quality by extracting 485 effect sizes from 53 studies. Overall, egg appearance was positively related to female quality but porphyrin only in correlational studies and biliverdin only in experimental studies. Thus, eggshell appearance could predict female quality, but there is still a large amount of unexplained variation in responses.

Norah Alhowiti is a PhD student at University of Glasgow. Her research is focused on eggshell pigments. She is particularly interested in the relationship between the eggshell appearance and female quality in birds.

POSTER & TWITTER | TUES, 4 APRIL, 1740 h | ECR PRESENTER

Actions of microplastic-derived endocrine disrupting chemicals on seabird epigenetics

Christina Biamis
Queen's University Belfast, UK | @CBiamis

Plastics and their component endocrine-disrupting chemicals (EDCs) e.g., BPA and phthalates, are a global health and environmental issue. Plastic-derived EDCs produce adverse health outcomes in humans and wildlife populations, often through epigenetic mechanisms. The Northern Fulmar (*Fulmarus glacialis*) seabird is a marine environmental plastic monitoring species, and their varying plastic stomach contents represent natural sentinel populations for the health impacts of plastics. This project aims to elucidate impacts of chronic plastic exposure via epigenetic mechanisms through investigation of transcriptomic signatures, health indicators, and contaminant burdens. Plastic-derived EDCs e.g. phthalates, have been detected in bycaught fulmar feathers. Feather

corticosterone (stress indicator) analyses have revealed sex differences and indicated that foraging location plays a major role in feather corticosterone level and plastic burden. Fulmars with high plastic burdens had increased expression of genes relating to inflammation and epigenetic factors, as confirmed by liver RNA-seq. Epigenetic sequencing will investigate the health effects of long-term exposure patterns.

Christina Biamis is currently undertaking a PhD in the School of Biological Sciences at Queen's University Belfast. Christina previously completed an MSc in Biochemistry and is most interested in the 'big picture' of health and disease, particularly regarding contaminants, the environment, and how organisms adapt to exposures through epigenetic mechanisms.

TWITTER-ONLY | WEDS, 5 APRIL, 1045 h

Behavioural responses to anthropogenic noise in an urban-living passerine

Grace Blackburn (she/her)
University of Western Australia, Australia | @G_Blackburn_

Anthropogenic noise is a widespread pollutant that has increased dramatically in recent decades in both marine and terrestrial ecosystems. Anthropogenic noise can have adverse effects on important behaviours, such as vigilance, foraging and acoustic communication, across a range of taxa. In this study, we conducted multiple focal observations on 75 urban-dwelling, free-living Western Australian Magpies (*Gymnorhina tibicen dorsalis*) to investigate the impact of anthropogenic noise on their behaviour. We found that foraging effort, foraging efficiency, and vocalisation rates were significantly reduced during anthropogenic noise, while vigilance was increased. Through altering these fundamental behaviours of wild animals, anthropogenic noise has the potential to have both short and long-term effects on intraspecific communication, body condition, and reproductive success of species residing in urban areas. As urbanisation and transportation networks continue to expand, these effects are likely to become more apparent and severe in urban individuals and populations.

Grace Blackburn is a PhD candidate from University of Western Australia studying how anthropogenic noise affects Western Australian Magpies. She is fascinated by how anthropogenic change is affecting the animals around us and hopes that by studying this, we will be able to make real change to help wildlife in a human-dominated world.

POSTER & TWITTER | WEDS, 6 APRIL, 1030 h | ECR PRESENTER

Hatching from the pointed end of the egg: a case in whimbrel

Camilo Carneiro
University of Iceland & University of Aveiro, Portugal | @Camilo_Carneiro

Most avian embryos develop with their head at the blunt end of the egg, but non-fatal malformations can occur. One example is embryos malpositioned with the head at the opposite, pointed end of the egg. Such malposition may reduce hatchability, and, to my knowledge, there is no account in the literature of a wild chick hatching from the pointed end of the egg. Here, I report such an event, occurred in a Whimbrel *Numenius phaeopus*, and show how the egg and the chick sizes compared within and among clutches/broods in the study area.

Camilo Carneiro is currently a postdoctoral researcher at the South Iceland Research Centre, where he will investigate how trophic interactions may alleviate environmental change effects in sub-Arctic breeding waders, having the whimbrel as a study species. He is also interested in avian migratory behaviour and movement ecology.

TWITTER-ONLY | WEDS, 6 APRIL, 1300 h

Developmental plasticity explains relative bill size according to Allen's rule in a Mediterranean raptor

Alejandro Corregidor-Castro
University of Padova, Italy | @AlexCoCastro

Endotherms need to respond to temperature changes in their environment to avoid loss of their physiological functions. One mechanism is through dry heat exchange, using little-insulated appendages. Endotherm populations recently exposed to climate change show increased size of their appendages, accordingly to Allen's rule (bigger appendages sizes in warmer latitudes). However, long-term monitoring and museum data do not respond if these changes are evolutionary responses or reflect developmental plasticity. We experimentally reduced maximum internal temperature (MIT) in nestboxes of a wild bird population of Lesser Kestrels *Falco naumanni*, and measured growth rates of different body traits in nestlings. We found a negative correlation between MIT and both body mass and forearm, but not with thermoregulation-related appendages (bill and tarsus), leading to relatively longer appendages. Our results demonstrated for the first time that increasing temperatures due to

climate change can influence bird body shape according to Allen's rule through developmental plasticity.

Alejandro Corregidor-Castro is a PhD student at the University of Padova, focusing on the effect of nest microclimate in the breeding performance of birds, specifically the Lesser Kestrel *Falco naumanni*. In addition, Alejandro works on the implementation of new ways of monitoring wildlife by using drones.

POSTER & TWITTER | TUES, 4 APRIL, 1730 h | ECR PRESENTER

Microbiome underlying winter adaptations in wild populations of Great Tits (*Parus major*)

Charli Davies (she/her)
University of Jyväskylä, Finland | @CharliSDavies

Winter poses a key environmental challenge to survival in endotherms. Combination of reduced temperatures, resources, and day lengths present energetic and thermoregulatory challenges in wild populations living at high latitudes. By increasing metabolic rate through thermogenesis and mitochondrial bioenergetics, endothermic animals can adapt to decreasing temperatures by maintaining a stable body temperature, but this is energetically costly. One promising mechanism for regulating energy acquisition and heat production and thus enabling the host to adapt to rapid environmental perturbations, is the gut microbiome (GM). To see if the GM can act as a mechanism for winter adaptation, we study longitudinal associations between winter conditions and the GM in two wild populations of Great Tits (*Parus major*), which experience varied environmental conditions. Secondly, to assess whether temperature-induced changes in the GM are linked to thermoregulation we associated GM composition with biomarkers of thermal physiology including whole-animal metabolism, and mitochondrial function.

Charli Davies is a postdoc researching winter adaptation and the role the microbiome can play in host adaptation.

TWITTER-ONLY | WEDS, 5 APRIL, 1325 h

Biological clocks in the wild: the effects of light pollution in a migratory bird

Sayuri Díaz Palma (she/her)
Jagiellonian University, Poland | @SayuriD5

The rapid development of cities and the excessive use of Artificial Light at Night (ALAN) has triggered negative consequences for wildlife. Due to its importance for humans' health, most of studies have focused on the effects ALAN on laboratory animals. However, very little is known about the impact of ALAN in wild populations, in an evolutionarily context. In this twitter presentation, I will introduce my PhD research in which we are exploring whether artificial light affects birds' performance. I will emphasise on our experimental set up to introduce artificial light at night in Collared Flycatchers' nest boxes. Our initial results point that ALAN exposure is adjusting early life conditions (i.e., increasing the time spent in the nest before fledging and the number of fledged young). The consistence of these results across two different seasons prompt to explore the effects of ALAN on diverse aspects of early development in birds.

Sayuri Díaz Palma is a biologist interested in understanding the physiological processes shaping life-history traits in free-living birds. She started exploring the effects of avian performance on mitochondrial function. Her current PhD research integrates field and laboratory work to explore how light pollution affects circadian clock gene expression in migratory birds.

POSTER & TWITTER | WEDS, 5 APRIL, 1540 h

With so much plasticity, how can we reliably demonstrate true evolutionary responses?

Mark Eddowes (he/him)
Independent researcher | @markeddowes

Birds have effective plastic responses to between year weather variability, evident in the established dependence of migrant arrival and egg laying dates on spring warmth. Plastic responses to environmental differences are evident over the short term from these interannual variations and also from latitudinal and altitudinal dependences. Whatever evolutionary responses may now be occurring in response to progressive environmental change, practical studies of behavioural responses to putative controlling environmental variables will be dominated by these plastic responses that have evolved over a considerable time. Given the limitations of surrogate variables

like sliding window average temperatures employed in such analyses, reaction norm estimates will be uncertain. Various confounding factors, known and unknown, may further complicate matters, presenting additional challenges for empiricists seeking to distinguish between plastic and evolutionary mechanisms controlling the observed responses. These challenges are illustrated by theoretical considerations and empirical data concerning passerine migrant arrival and laying dates.

Mark Eddowes is an independent researcher currently with a primary interest in passerine migrant phenology, having a life-long wider interest in natural history and a formal scientific training and research experience in chemistry.

POSTER & TWITTER | WEDS, 5 APRIL, 1255 h | ECR PRESENTER

From take-off to touch down: how has extreme weather impacted migration timing in a long-distance and long-lived migratory seabird?

Niamh Esmonde (she/her)
Queen's University Belfast, UK | @NiamhEsmonde

The timing of avian migration plays a key role on survival and recruitment, which depends on synchrony with seasonal peak food availability and optimal weather conditions. Evidence suggests that the changes in climate-driven phenology (the timing of biological events that depend on climate) is rapidly increasing at all trophic levels. However, our current lack of understanding of the many mechanisms controlling bird migration limits our ability to understand and predict the impacts of climatic change for migratory birds. In this study we extract key phenological migration dates from capture-mark-recapture ringing data to examine the scale at which weather impacts timing of migration of an amber-listed seabird species, the Manx Shearwater *Puffinus puffinus*. We show how the timing of migration is influenced by local and large-scale climatic conditions and how it effects the survival and recruitment thereby enhancing our understanding of species' responses to climate change. We highlight the importance of long-term time-series data collection in ecology and the significant effort made by duty officers, volunteers and citizen scientists in maintaining consistent data recording over a remarkable seven decades.

Niamh Esmonde is a final year PhD student at Queen's University Belfast. She has a BSc in Zoology from the University of Glasgow, an MSc in Biodiversity and Conservation from Trinity College Dublin, and has interned with JNCC working on modelling Red-throated Diver distribution in offshore windfarm sites in the UK. Her research interests include demography and climate, ecological speciation, and biologging.

POSTER & TWITTER | WEDS, 5 APRIL, 1315 h | ECR PRESENTER

Additive genetic variance in early-life partial seasonal migration

Rita Fortuna (she/her)
Norwegian University of Science and Technology, Norway | @ritaafortuna

To predict populations' evolutionary potential to respond to rapid environmental change, we need to quantify additive genetic variance in key phenotypic traits that could mediate an 'escape' from harsh conditions. Moreover, potential for micro-evolution may vary across life stages, as selection can be different for juveniles and adults, and genetic variation should thus be estimated at different determining stages of a species' life cycle. Seasonal migration allows temporary spatial escapes from severe conditions, but this trait has rarely been considered in eco-evolutionary studies. Here, we estimated additive genetic and permanent individual effects on the liability to stay resident or migrate during early life. We developed a multistate capture-recapture animal model, combining 9 years of juvenile resighting data with >35 years of pedigree information collected in a partially migratory population of European Shags (*Gulosus aristotelis*). This work will contribute to our understanding of how early-life eco-evolutionary processes shape spatio-seasonal population dynamics.

Rita Fortuna is a behavioural and evolutionary ecologist and has worked with various bird species. She did her PhD at CIBIO (Porto) and CEFE-CNRS (Montpellier) and obtained her degree from the Faculty of Sciences of the University of Porto (Portugal) in 2022. She recently started a postdoc at NTNU (Trondheim, Norway).

TWITTER-ONLY | WEDS, 6 APRIL, 1310 h

Preliminary findings on ecology and genetics of House Sparrow (*Passer domesticus*) in select districts of Gujarat, India

Anamika Gautam
Salim Ali Centre for Ornithology and Natural History, India | @agsacon343

House sparrow (*Passer domesticus*) is a broadly distributed bird species across the planet. The species live in human-commensalism and have been investigated to coexist with human since the ancestral times. During recent decades, the population of the species has been announced to be diminishing at an alarming rate especially in urban settings. The present study aimed to study the abundance and

genetic diversity of House Sparrow in select landscape of India. For the investigation, total 72-point count in three districts for the abundance analysis and biological samples collected from the field are processed for DNA extraction, sequencing and undertaken through bioinformatics pipeline for analysis. Species were abundant in rural region, which is ascribed to the accessibility of nesting sites, for example roof cavities, eaves, walls and nest boxes. The study highlights the effect of anthropogenic land-use-change and urbanization on the genetic population structure of human commensal species and focuses on planning appropriate conservative measures for the protection of species survival at local and regional level.

Anamika Gautam is a junior research biologist (Genetics) at the avian physiology and genetics division, SACON. Anamika joined the institute in a MoEFCC funded project on "Genetic diversity and phylogeographic patterns of *Passer domesticus* from select landscape in India" and is keenly interested in contributing and pursuing a career in conservation biology and the evolutionary pattern of adaptation in birds in the current scenario of the Holocene.

POSTER & TWITTER | WEDS, 6 APRIL, 1040 h | ECR PRESENTER

Habitat selection and nest survival in Whinchats and Stonechats: implications for conservation

Martin Werner Küblbeck (he/him)
MPI for Biological Intelligence, Germany | @MartinKueblbeck

European farmland bird populations have collapsed, mainly due to habitat loss and deterioration in agricultural landscapes. Alarmingly, many species are also disappearing from former strongholds within nature reserves. To focus conservation action, it is vital to understand habitat decisions and their consequences. Combining field data and remotely sensed data, we studied habitat selection at 3 spatial levels in a nature reserve in declining Whinchats (*Saxicola rubetra*), and locally increasing Stonechats (*Saxicola rubicola*). We determined causes of nest failure using wildlife cameras, and used known fate models to estimate daily nest survival. Whinchats strongly selected for extensively used meadows to establish territories, and for nest-sites in fallows with large viewsheds. However, nest-site selection was not congruent with nest survival, likely because the main causes of nest failure (predation and flooding) can be considered stochastic within territories. At landscape-level, habitat selected by whinchat is frequently flooded, while stonechats thrive in flood-proof habitats.

Martin Werner Küblbeck, before starting a PhD in Whinchats, was climbing trees, and studied Arboriculture in Göttingen. He got into birds and studied Evolution, Ecology & Systematics in Munich. The main focus of his work is animal behavior and conservation, and how they relate to each other.

POSTER & TWITTER | WEDS, 5 APRIL, 1245 h | ECR PRESENTER

Migration tactics of a nocturnal insectivore in response to ecological barriers

Michiel Lathouwers (he/him)
Hasselt University, Belgium | @MichielLat

We tracked the autumn migration of 24 European Nightjars using GPS-loggers and multi- sensor data loggers. We quantified crepuscular and nocturnal migration and foraging probabilities, as well as daily travel speed and flight altitude during active migration in response to biomes. Nightjars adopt a rush tactic, reflected in high travel speed, flight altitude and migration probabilities at dusk and at night, when travelling through ecological barriers. Migration is slower in semi-open, hospitable biomes, as reflected in high foraging probabilities at dusk, lower daily travel speed and lower migration probabilities at dusk. Our study shows how nightjars switch migration tactics during migration, and suggest they alternate between feeding and short migratory flight bouts within the same night when travelling through suitable habitats. This flexibility may limit the time they need to spend on stopovers and may act as an insurance against unforeseen negative environmental conditions en route.

Michiel Lathouwers started working with European Nightjars in 2016, as part of his BSc and MSc education in Biology. Currently he is employed as a PhD student at Hasselt University and University of Namur investigating the effects of global change on the migration ecology of European Nightjars.

POSTER & TWITTER | WEDS, 5 APRIL, 1530 h | ECR PRESENTER

Individual level foraging responses to environmental change in a long-lived seabird

Frederick Mckendrick (he/him)
University of Liverpool, UK | @FreddieMck121

For long-lived species, plasticity in foraging behaviour is a key predictor of an individual's capability to respond to environmental change. Although individuals demonstrate differences in behavioural variability, linking movement to specific environmental cues will be crucial in understanding how individuals track changes in resources across time. This study utilises GPS data from 219 Black-legged Kittiwake (*Rissa tridactyla*) across 7 years at 4 colonies in an Arctic fjord currently experiencing rapid environmental change. We highlight individual-level variability in foraging strategy both within-

and between-years with individuals differing in their decision to switch between three foraging habitats. We then quantify plasticity by investigating how changes in foraging strategy between trips is linked to variability in environmental parameters indicative of resource availability. Understanding the sources of individual-level variability is important, as differences in responsiveness to environmental change may expose less-flexible individuals to unfavourable conditions as a result of climate change in the Arctic.

Frederick Mckendrick is currently a second year PhD student at the University of Liverpool studying behavioural and physiological responses to environmental change. He is particularly interested in the causes and consequences of individual-differences in behaviour and what this means for populations at the forefront of human-induced climate change.

POSTER & TWITTER | WEDS, 5 APRIL, 1305 h | ECR PRESENTER

Temperature and microclimate refugia influence movement strategy and environmental niche by an endangered grassland bird

Rita Ramos (she/her)*
University of East Anglia, UK | @aldinafranco
*Aldina Franco (University of East Anglia, UK) will be presenting the poster at the conference

Mediterranean areas are expected to suffer extensive warming and increasing droughts in the next few decades. The Iberian Peninsula is a biodiversity hotspot and a vulnerable site to ongoing climate change. It is also a population stronghold for the Little Bustard (*Tetrax tetrax*), a threatened grassland bird that inhabits agricultural landscapes, especially during breeding. Little Bustards are partially migratory species that performs post-breeding movements to northern or coastal areas in Iberia. By tracking 77 birds with GPS devices over 11 years we were able to investigate their exposure to high temperatures, use of microclimate refugia and environmental niche. Post-breeding migration timing was influenced by food availability, temperature exposure and availability of microclimate refugia. The environmental niche was characterized in a gradient of temperature and microclimate refugia availability. Microclimate refugia was not available in 3 out of 5 populations studied and these birds travelled longer distances to alternative post-breeding areas.

Rita Ramos is a postgraduate student, working on the effects of increasing temperatures in the movement and behaviour of an endangered grassland bird. As an ecologist she is mostly interested in conservation and how to make species, particularly migratory birds, and landscapes more resilient to ongoing global warming and climate change.

TWITTER-ONLY | WEDS, 5 APRIL, 1105 h

ALAN as a driver of urban colonization by owls

Airam Rodríguez
National Museum of Natural Sciences, Spain | @Airam_Rguez

Urbanization and artificial light at night (ALAN) are major drivers of local biodiversity losses, but some species can colonize urban environments. We explore the role of ALAN as a driver of urban colonization by a nocturnal avian predator, the Burrowing Owl *Athene cunicularia*. We studied prey availability, diet, space use, nesting habitat selection and productivity. Streetlights altered the invertebrate availability, attracting them to lit areas. The owl diet was more similar to the invertebrate taxa under streetlights than taxa in control traps. Owl space use was determined by streetlights, spending more time around light sources at night. The most important habitat feature influencing the nesting habitat selection was the distance to streetlight. Owls selected areas close to streetlights for nesting. Finally, productivity was not explained by any of our habitat variables. We demonstrate that ALAN causes a cascade effect that facilitates urban colonization of owls.

Airam Rodríguez is a research biologist widely interested in human-wildlife conflicts. Airam's main research line is the ecological consequences of light pollution, particularly the mortality caused by artificial light on seabirds.

TWITTER-ONLY | WEDS, 5 APRIL, 1055 h

Interactive effects of rising temperatures and urbanisation on birds: a mechanistic perspective

Petra Sumasgutner
Konrad Lorenz Research Centre, Austria | @PeSumas

Climate change and urbanisation are among the most pervasive and rapidly growing threats to biodiversity worldwide. However, their impacts are usually considered in isolation, and interactions rarely examined. The biological impact of rising temperatures in urban and non-urban systems will likely differ in magnitude and direction when interacting with other factors that typically vary between these habitats, such as resource availability (e.g., water, food and microsites) and pollution levels. Furthermore, the nature of such interactions may differ for cities situated in different climate

types, e.g. tropical, arid, temperate, continental and polar. Here, we highlight the potential for interactive effects of climate and urban drivers on the mechanistic responses of birds, identify knowledge gaps and propose promising future research avenues. A deeper understanding of the behavioural and physiological mechanisms mediating species' responses to urbanisation and rising temperatures will provide novel insights into ecology and evolution under global change.

Petra Sumasgutner is an integrative ecologist who combines behaviour and physiology with population biology, to add to a fundamental mechanistic understanding of the impacts of anthropogenic change on wildlife. She was recently promoted to Assistant Professor at the Konrad Lorenz Research Centre, University of Vienna.

TWITTER-ONLY | TUES, 4 APRIL, 1750 h

Super birds: The majority of avian blood metabolites are not altered by urban environments

Karen Sweazea
Arizona State University, USA | @CompPSIO

The North American avian population has decreased by 2.9 billion since 1970. The aim of this systematic review was to identify whether birds in urban environments have altered blood metabolites (e.g., macronutrients, hormones) compared to birds residing in rural environments as this may help explain recent declines. Three scientific databases were searched (PubMed, Web of Science, and SCOPUS) to identify articles that examined at least one blood metabolite concentration in at least one avian species in an urban and rural environment or along an urban-to-rural gradient, yielding 151 unique articles, 48 of which met inclusion criteria, providing 284 datasets (one species and one metabolite). Sixty-six metabolites were identified and inductively grouped into 13 categories. Most datasets included male and female (52%) adult (54%) birds, representing 28 species. Studies were predominantly conducted in the United States (46%) and included 28 unique senior authors with a mean publication year of 2013 ± 6. For 54% of all blood metabolites examined, no differences or clear patterns emerged between urban and rural birds. Of the 13 categories, glucose and oxidative stress/inflammation were higher in urban birds, while the remaining groups were not different, which emphasizes the resilience of birds in an urban environment.

Karen Sweazea is a physiologist who specializes in diabetes and cardiovascular disease. She received her PhD in Physiological Sciences from the University of Arizona where her research focused on understanding glucose homeostasis and natural insulin resistance in birds. Her postdoctoral research was designed to explore how poor dietary habits promote the development of

cardiovascular diseases. She is an Associate Professor in the College of Health Solutions. Professor Sweazea's current research seeks to explore potentially protective mechanisms existing in mammalian and non-mammalian organisms against complications that can arise with being overweight or having high blood sugar levels. One of the main research foci is on understanding the reasons behind the evolution of naturally high blood sugar concentrations in birds in addition to exploring the impact of urbanization and poor dietary choices on avian health. Learning how certain animals thrive under conditions that would result in pathologies for other species may help improve the treatment of diabetes.

TWITTER-ONLY | WEDS, 5 APRIL, 1550 h

Evidence of niche changes and their association with population trends and avian traits

Pietro Tirozzi (he/him)
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Even though the assessment of long-term niche dynamics could provide crucial information for investigating species responses to environmental changes, it is a poorly investigated topic in ecology. Here, we present a case study of a multi-species niche analysis for 71 breeding birds, exploring long-term niche changes from 1992 to 2017 and their relationship with both population trends and species traits. Results supported niche conservatism for 56% of the species, while 10% of the species showed evidence of niche divergence. We detected a general tendency to adjust the niche centroids towards warmer thermal conditions. Increasing populations were positively correlated with niche expansion, while negatively correlated with niche overlap, albeit at the limit of the significance threshold. We found moderate evidence for a non-random association between niche changes and species traits, especially for body size, clutch size, number of broods per year, habitat preferences, and migration strategy.

Pietro Tirozzi is a PhD student at the Department of Earth and Environmental Sciences at the University of Milano-Bicocca. He is interested in animal ecology, zoology and conservation biology and his research focuses on long-term responses of bird populations to environmental and climatic changes, also combining a trait-based approach.

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Evolutionary responses: rapid evolutionary and plastic responses of birds to environmental change

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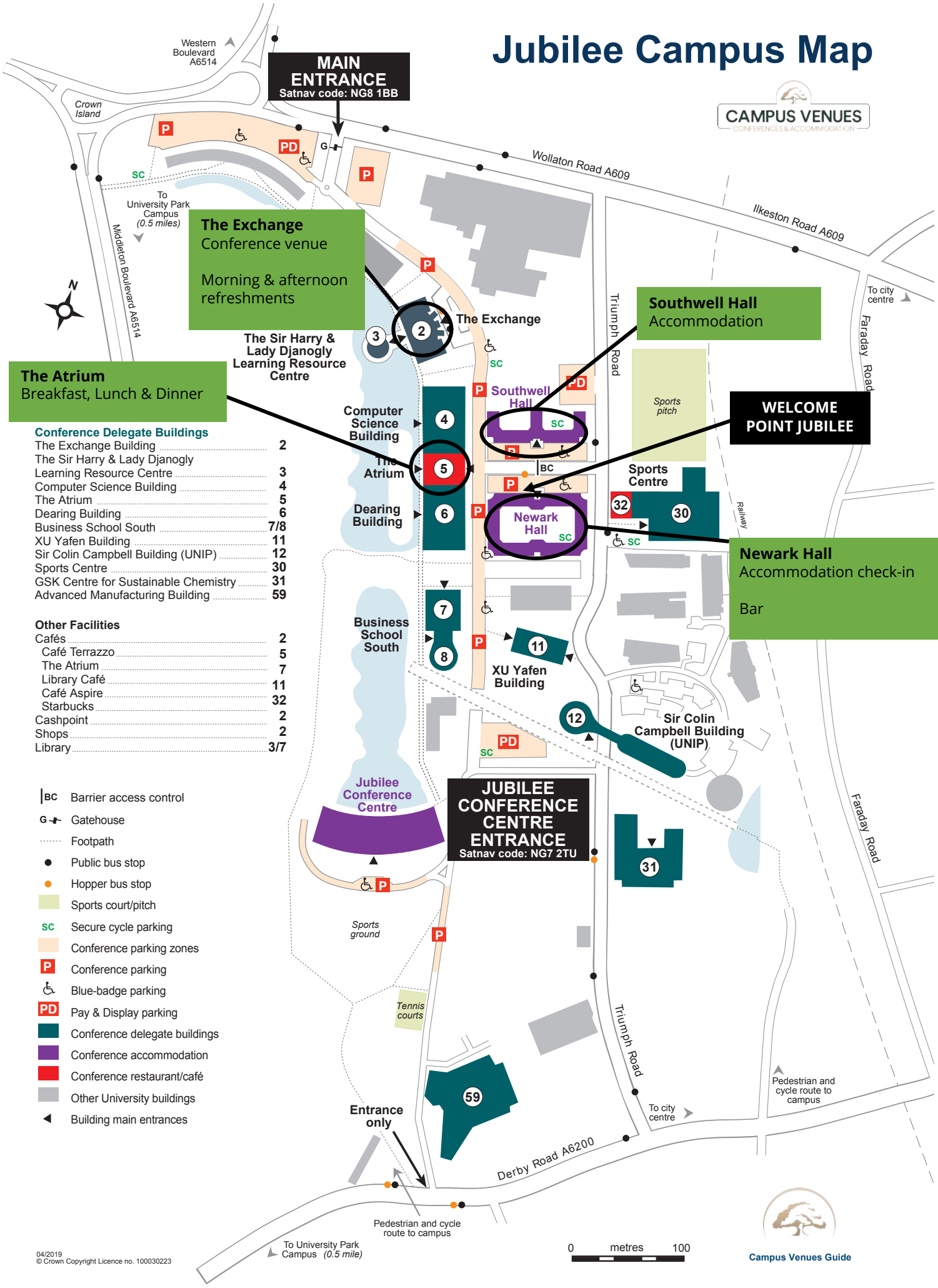
Jubilee Campus Map



Conference Delegate Buildings

The Exchange Building	2
The Sir Harry & Lady Djanogly Learning Resource Centre	3
Computer Science Building	4
The Atrium	5
Dearing Building	6
Business School South	7/8
XU Yafen Building	11
Sir Colin Campbell Building (UNIP)	12
Sports Centre	30
GSK Centre for Sustainable Chemistry	31
Advanced Manufacturing Building	59

Other Facilities

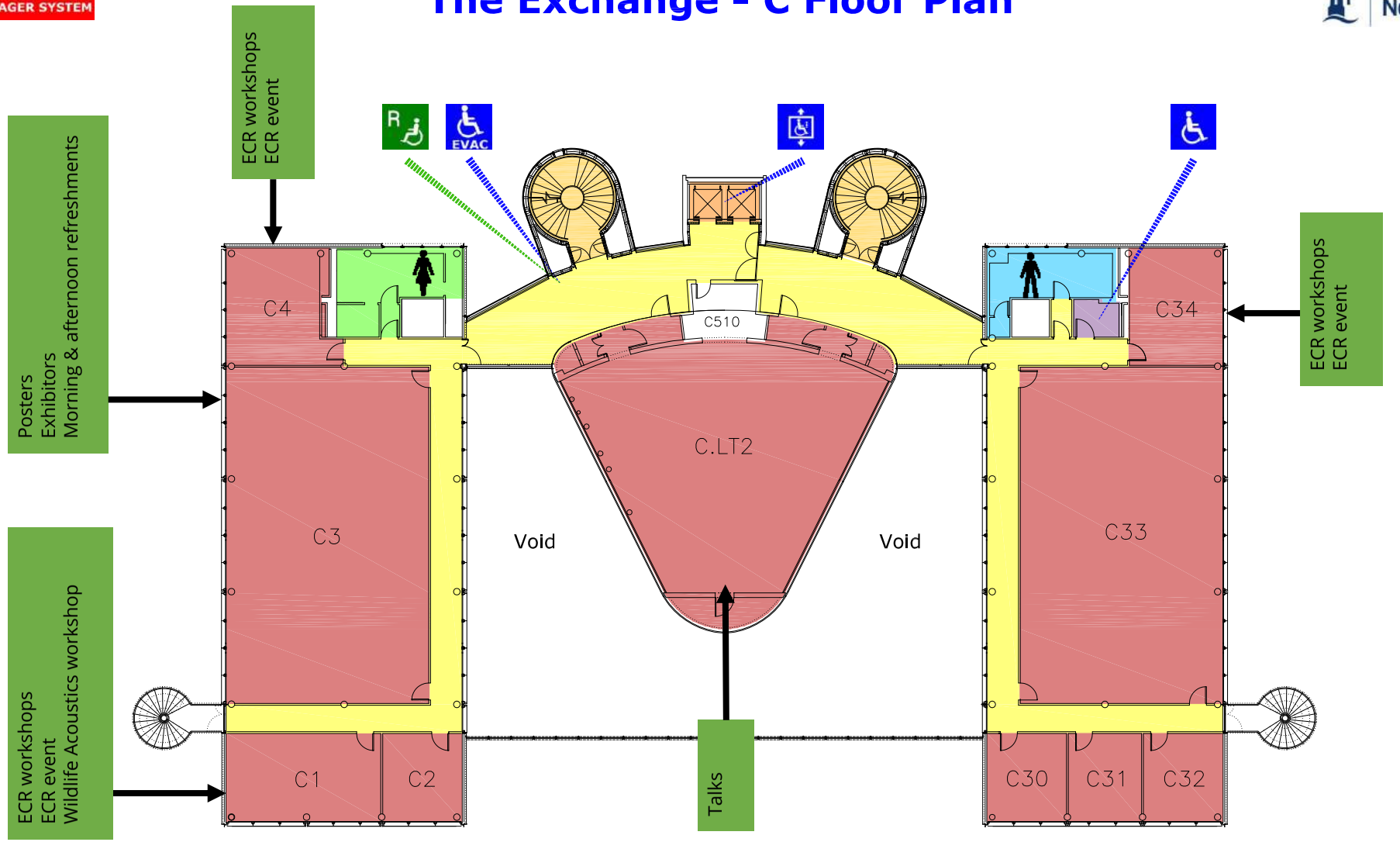
Cafés	2
Café Terrazzo	5
The Atrium	7
Library Café	11
Café Aspire	32
Starbucks	2
Cashpoint	2
Shops	2
Library	3/7

- BC — Barrier access control
- G — Gatehouse
- Footpath
- Public bus stop
- Hopper bus stop
- Sports court/pitch
- SC — Secure cycle parking
- Conference parking zones
- P — Conference parking
- Blue-badge parking
- PD — Pay & Display parking
- Conference delegate buildings
- Conference accommodation
- Conference restaurant/café
- Other University buildings
- Building main entrances

The Exchange - C Floor Plan

VIBRATING PAGER SYSTEM

The University of Nottingham



Key

- Designated Badge-Holder Parking
- Access Ramp
- Automatic Doors
- Accessible Lift
- Entrance
- Accessible Entrance
- Evacuation Chair
- Emergency Refuge
- Toilet (Female / Male)
- Accessible Toilet
- Reception
- Refectory/Cafe
- Central Timetabled Room
- Circulation
- Stairs
- Lift
- Fire Assembly Point

March 2009
Estate Office

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