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#BOU2022

Avian Reproduction



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Nests, eggs and chicks: reproduction in a changing world

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POSTER PRESENTATION (ECR) | Weds, 13 Apr, 1430 UTC

Katherine Assersohn

University of Sheffield, UK

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Physiological factors influencing female fertility in birds

A degree of infertility is ubiquitous across taxa, but fertilisation failure is likely to be more costly for females, and for taxa that produce large, yolky ova such as birds. Here, we summarise key findings from a recent review, where we highlight factors that affect female fertility in birds and summarise the gaps in knowledge and limitations to progress in the field. We provide evidence that the avian fertility literature has been dominated by studies focussed on males and captive populations, with far less known about females, non-commercial breeds and wild populations. This review lays the groundwork for developing a clearer understanding of the causes of female infertility in birds, with important consequences for multiple fields including reproductive science, conservation and commercial breeding.

Katherine Assersohn is a PhD student based at the University of Sheffield. She uses model species, such as the zebra finch and the domestic chicken, to investigate the genetic and physiological basis of infertility in female birds.

POSTER PRESENTATION | Weds, 13 Apr, 1630 UTC

How wet is that egg? Ecological drivers of eggshell wettability in birds

Marie Attard

Royal Holloway University of London, UK

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Complex and at times extreme environments have pushed many bird species to develop unique eggshell surface properties to protect the embryo from external threats. Because microbes are usually transmitted into eggs by moisture, some species have evolved hydrophobic shell surfaces that resist water absorption, while also regulating heat loss and gas exchange. Here, we investigate the relationship between wettability of eggshells from 441 bird species and their life-history traits. We show that body mass, annual temperature and eggshell maculation primarily explained variance in contact angle between sessile water droplets and the shell surface across species, after accounting for phylogeny. Additionally, we found that droplets spread more quickly on eggshells incubated in open nests compared to domed nests, potentially to decrease heat transfer from the egg. We identify clear adaptations of eggshell wettability across a diverse range of nesting environments, driven by the need to retain heat and prevent microbial adhesion.

Dr Marie Attard is a functional ecologist and evolutionary biologist who combines studies of mechanisms and function to understand phenotypic variation in animals. Throughout her career, she has studied the biomechanics and functional adaptations of living and extinct birds and mammals. Her current research focuses on the physiological and biomechanical processes underpinning variation in eggshell traits across

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a wide phylogenetic diversity of birds, and how this is interlinked with their breeding climate and life-history.

POSTER PRESENTATION | Weds, 13 Apr, 1630 UTC

How wet is that egg? Ecological drivers of eggshell wettability in birds

Marie Attard

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OFFERED ORAL PRESENTATION (ECR) | Tues, 12 Apr, 1615 UTC

Global diversity and adaptations of avian eggshell thickness

Marie Attard

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The amniote eggshell is a fundamental aspect of the embryo life-support system, protecting the embryo from UV light, microbes and mechanical damage, facilitates gas exchange and provides calcium for growth. The thickness of eggshells is highly diverse across modern birds and influences these functions, yet the selective pressures driving eggshell thickness have not been clearly identified. Here, we use a global dataset for 4,260 (>41%) avian species to assess the relative importance of climatic and ecological explanations for variation in eggshell thickness. Thicker eggshells were more prevalent in species with

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precocial young, scavengers or species that primarily feed on vertebrates or plants (excluding nectivores, seed and fruit specialists) and species breeding in open habitats. Overall, variation in eggshell thickness appears to be driven by phylogeny and life-history traits linked to embryo growth rate, calcium content of their food and the need to mitigate excessive light transmission through the shell.

Marie Attard is a Postdoctoral Researcher in the Animal Behaviour and Physiology group at Royal Holloway University of London. She studies the evolution and adaptive functions of eggshells, spanning across the entire avian phylogeny. Marie has a strong interest in conservation, animal behaviour and influence of life-history on eggshell traits.

OFFERED ORAL PRESENTATION | Weds, 13 Apr, 1400 UTC

Migration duration, not distance, had a carryover effect on breeding performance of Asian Houbara

Joseph Azar

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Migration is a demanding life stage that has an impact on productivity. Animals can minimize migration costs by adjusting their migratory routes, changing the frequency and length of stopovers, or changing their wintering or breeding sites, these result in varied travel distance and duration. Using path analysis, we evaluated the direct and indirect impacts of spring migration distance and duration on six breeding traits in 94 female Asian Houbara Bustard *Chlamydotis macqueenii* nesting in four locations in Central Asia over a 12-year period. Our results revealed that migration distance had a positive effect on female productivity, which may be attributed to the effects of breeding or wintering locations; longer migrants can exploit better-quality habitat while having minimal effect on fitness. Conversely, migration duration had a negative impact on clutch size, egg volume, female nesting attempts, and the number of born chicks, owing to slower migrants arriving later and nesting later.

Joseph Azar is a researcher with Reneco International wildlife consultants who is presently focusing on Asian Houbara ecology. In 2012, he received his PhD in ecology and biodiversity from Victoria University of Wellington in New Zealand. He is also well-versed in Middle Eastern avifauna and biodiversity.

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OFFERED ORAL PRESENTATION (ECR) | Tues, 12 Apr, 1545 UTC

Latitudinal variation in incubation behaviour increases embryonic metabolism without affecting developmental rate

Martje Birker

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Parental incubation behavior can cause climate-adaptive metabolism in embryos of many egg laying species, but this has rarely been studied in birds. The metabolic cold adaptation hypothesis predicts increasing metabolism along latitude. This study explores the influences of incubation patterns on embryonic metabolism in a passerine bird broadly distributed over latitude. We compared natural incubation patterns in wild Thorn-tailed Rayaditos *Aphrastura spinicauda* between a warm-temperate and a cold-subantarctic location, and measured embryonic metabolism under natural and artificial incubation in a common garden experiment. We found more partial incubation at the subantarctic, and a positive correlation with embryonic heart rate without causing hatching asynchrony. Interestingly, metabolic reaction norms to egg cooling were weaker at the subantarctic, potentially as an adaptation to cold. Heart rate was positively correlated with latitude, even under the common garden incubation, indicating that intrinsic egg factors determine metabolic rates also, either due to maternal or genetic factors.

Martje Birker: I study whether parental effects can help broadly distributed bird species to adapt to local environments. During my PhD, I experimentally tested the effects of maternally-deposited egg hormones, and parental incubation behavior on embryonic development, and compared populations at the distributional extremes of the Thorn-tailed Rayadito in Chile.

OFFERED ORAL PRESENTATION (ECR) | Tues, 12 Apr, 1335 UTC

Selection pressure on the phenology and productivity of urban and forest Blue and Great Tits

Claire Branston

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Urbanisation is changing the environment many species live in. Some species can adapt to these changes and thrive, others are less successful. Several studies have shown differences in the timing of egg laying (phenology) and clutch size (productivity) between urban and forest populations of songbirds, but whether these traits are under the same selection pressure in these two habitats is largely unknown. We investigated if urbanisation has altered the strength of selection on egg-laying date and clutch size in Blue and Great Tits. We found weaker selection for earlier laying and larger clutch size in urban compared to forest Blue Tits, but not in Great Tits, and these differences are likely driven by food availability. Our results highlight that urbanisation can alter the selection pressures wild animals are exposed to, but that this effect may differ between species, even when closely related.

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Claire Branston: I am currently a post-doc at the University of Glasgow, and my main research interest is how species respond to environmental change. Much of my research to date has investigated how life history traits, such as phenology and productivity, are altered due to urbanisation and climate change.

KEYNOTE | Weds, 13 Apr, 1300 UTC

Biorhythms and incubating shorebirds

Martin Bulla

Max Planck Institute for Ornithology, Germany & Czech University of Life Sciences, Czech Republic
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The behavioural rhythms of organisms are thought to be under strong selection, influenced by the rhythmicity of the environment. Such behavioural rhythms are well studied in isolated individuals under laboratory conditions, but free-living individuals have to temporally synchronize their activities with those of others, including potential mates, competitors, prey and predators. Individuals can temporally segregate their daily activities (for example, prey avoiding predators, subordinates avoiding dominants) or synchronize their activities (for example, group foraging, communal defence, pairs reproducing or caring for offspring). It is thus essential to study individuals in their natural environment and realistic social settings. I will first present diversity and potential drivers of incubation rhythms in biparental shorebirds, i.e. in species where both parents have to synchronize their diel rhythms, because only one parent can incubate at any time and eggs need continuous parental presence. Then, I will highlight the open questions about biparental incubation and present an attempt to answer such questions using captive red knots. Finally, I will present our ongoing work on incubation rhythms of uniparental shorebirds, i.e. work on individual rhythms in the absence of social synchronization.

Martin Bulla studied incubation of Semipalmated Sandpipers, as well as global variation in incubation rhythms of biparentally incubating shorebirds for his PhD at Max Planck Institute for Ornithology. He then worked at the Royal Netherlands Institute for Sea Research investigating biorhythms of Red Knots and is currently a postdoc at Max Planck Institute for Ornithology and at Czech University of Life Sciences, Prague, where he investigates global variation in incubation rhythms of uniparentally incubating shorebirds.

OFFERED ORAL PRESENTATION (ECR) | Weds, 13 Apr, 1530 UTC

Is Whimbrel chick growth limited by food in Iceland?

Camilo Carneiro

University of Iceland & University of Aveiro, Portugal
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Hundreds of thousands of waders migrate to Iceland to breed, including ca. 25% of the world Whimbrel *Numenius phaeopus* population. Contrary to other wader species, during recent decades the whimbrel has

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not changed its spring arrival timings, nor its laying dates, while the spring onset in Iceland has been advancing. It could be expected that trophic mismatches would arise in such seasonal environments, leading to negative population consequences, but that is apparently not the case.

We hypothesise that crowberry fruits, an apparently superabundant resource, allow for a suitable chick development throughout the season even if a mismatch with invertebrates occurs, and consequently allow maintaining productivity. To investigate this idea, crowberry and invertebrate abundance was monitored at 3-day intervals, chicks measured, and their droppings collected.

We will (1) describe how whimbrel chick diet varies from hatching to fledging, and (2) investigate potential effects of resources' abundance on chick development.

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.

OFFERED ORAL PRESENTATION (ECR) | Weds, 13 Apr, 1345 UTC

Investigating drivers of whimbrel productivity in a sub-Arctic ecosystem

Maite Cerezo-Araujo

University of Iceland

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Investigating drivers of population dynamics is essential in order to understand population persistence and survival and to develop appropriate conservation and management strategies. Population dynamics are driven by one or several biotic or abiotic factors that are sometimes subtle and difficult to monitor due to interactions among them or negative feedback loops triggered by the species density.

In this study, we investigated mechanisms driving the Icelandic whimbrel (*Numenius phaeopus islandicus*) population dynamics in south Iceland, one of the most important breeding grounds for waders in Europe. To do so, we explored the relationships between habitat quality, breeding density, breeding behaviour and breeding success along a gradient of different whimbrel densities, ranging from low to high, and divided into three habitat types: river plains, heathland and moss-heath. Preliminary results showed highest breeding densities at river plains, where more invertebrates were sampled but interestingly, breeding success did not follow this trend.

Maite Cerezo-Araujo is a PhD student at the South Iceland Research Centre and University of Iceland whose main interest are Arctic and sub-Arctic ecology, population dynamics, bioacoustics and species movement.

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POSTER PRESENTATION (ECR) | Tues, 12 Apr, 1455 UTC

The effect of extreme events on nest microclimate in the Lesser Kestrel *Falco naumanii*

Alejandro Corregidor-Castro

Università di Padova, Italy

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The increased frequency and intensity of heatwaves associated with climate change can have a major impact on bird reproduction. We report the effects of a natural heatwave (5 days at temperatures above 38°C) occurred in 2021 on the reproductive success of a Lesser Kestrel *Falco naumanii* population breeding in nestboxes in one of the largest colonies in Europe. Using control and shaded nestboxes we showed that a nest temperature above 46°C was related to a drastic reduction in fledging success (from 85% to 20%) and body size of the surviving chicks (-12% in weight and -3% in tarsus). These results indicate that heatwaves have direct, strong effects on nestling (and presumably post-fledging) survival. Considering that the frequency of such events is expected to increase, our results indicate that nest microclimate will be a major factor affecting population dynamic and conservation of this Mediterranean raptor.

Alejandro Corregidor-Castro: I am a PhD student at the University of Padova (Italy) working on the effect of temperature on the breeding biology and behaviour of the Lesser Kestrel *Falco naumanni*.

KEYNOTE | Weds, 13 Apr, 1500 UTC

The impact of parasitism within the family

Emma Cunningham

Edinburgh University, UK

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Parasites are a ubiquitous component of all animal populations. Some infections may be acute and short-lived but more commonly, individuals experience on-going chronic levels of infection that impact on host life-history traits throughout life. The impact of infection is likely to be particularly acute during reproduction when energetic demands are high for both parents working hard to raise a family and offspring in rapid phases of growth. However, this is also a time when costs may be passed on to different family members, leading to indirect costs of infection on individuals other than the primary host. How this plays out across the family can shape both responses to infection and other key life-history traits across an individual's life. In this talk, I report on seventeen years of data on the impact of parasitism in a long-term study of seabirds, The European Shag. Both novel techniques to measure natural levels of parasitism and experimental manipulations of parasite burden have demonstrated that responses to parasitism are shaped in early life but can impact on different family members in the longer term in very different ways. Family members also differ in their sensitivity to how responses to parasitism play out across different environmental conditions. Quantifying how these ultimately link to breeding success over both the short

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and the long term is therefore a major part of understanding how predicted environmental shifts may impact both infection dynamics and their impact on host populations.


Emma Cunningham: Following a PhD at Sheffield University, Emma held a Dorothy Hodgkin Research Fellowship at the University of Cambridge, and then a post-doctoral research post at the University of California Santa Barbara. She then returned the UK as a Royal Society University Research Fellow at the University of Edinburgh, where she now holds a lectureship. Her research group works on the evolution and ecology of reproduction and disease – in particular, how early life conditions affect an individual's ability to deal with parasitism and infection.

ALFRED NEWTON LECTURE | Weds, 13 Apr, 1800 UTC

Cuckoos and Curious Naturalists

Nick Davies

University of Cambridge

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“Scarcely any bird has had so many idle tales” wrote Alfred Newton in a paper on “Cuckow's eggs”, published in 1869 in the first volume of *Nature*. An early champion of Darwin's theory of natural selection, Newton suggested that cuckoo egg mimicry has evolved to deceive hosts and he coined the term “gens” to denote a race of cuckoo that specialised on one particular host species. We now have experimental evidence for how cuckoos trick their hosts not only by mimetic eggs, but also by rapid and secretive laying, and by manipulative begging of cuckoo chicks. We also know that host defences are costly and that hosts vary their defences in relation to perceived parasitism risk, assessed by both personal and social information. In this talk I pay tribute to past curious naturalists, especially Edward Jenner and Edgar Chance, whose brilliant field observations paved the way for current experimental studies, and I raise some puzzles, for example: why do some cuckoos get away with non-mimetic eggs? and why don't hosts of the common cuckoo reject cuckoo chicks, as do some hosts of Australian cuckoos? There is wonderful natural history for future curious naturalists.

Professor Nick Davies has been a member of the BOU for over fifty years and sits at Alfred Newton's old desk in his room in the Zoology Department at Cambridge, where he is Emeritus Professor of Behavioural Ecology and Fellow of Pembroke College. He and his colleagues have studied cuckoo-host interactions for the last thirty five years. His book *Cuckoo – cheating by nature* is published by Bloomsbury.

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TWITTER-ONLY PRESENTATION (ECR) | Weds, 13 Apr, 1720 UTC

Behavioural and reproductive responses of Blue Tit to an olfactory signal from trees

Ségolène Delaitre

CEFE CNRS Centre d'Ecologie Fonctionnelle et Evolutive, France

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Insectivorous birds have to synchronize the chick feeding period with the period of maximal biomass of caterpillars, in order to optimize the fitness of both parents and offspring. Plants adaptively release herbivore-induced plant volatiles (HIPVs) when they are attacked by insects. Birds could thus use these olfactory cues to adapt timing and investment in reproduction. We showed in controlled conditions that blue tits are readily attracted to HIPVs mimicking a caterpillar attack on oak buds in early spring, without having to learn them. We also found that equipping nest-boxes in the field with HIPVs does not advance lay date nor increase reproductive output at the individual level, but it resulted in more eggs, nestlings, and fledglings produced at the population level. Our experiments suggest that birds engage in multitrophic interactions by using an olfactory cue coming from plants to infer information about caterpillar availability and modulate their reproductive effort.

Ségolène Delaitre: I am a 2nd year PhD student working at the CEFE in Montpellier in France. I am interested in phenological timing of reproduction in birds. I am also interested in sexual selection and mate choice and if that mate choice influence timing and investment in reproduction.

POSTER PRESENTATION (ECR) | Tues, 12 Apr, 1445 UTC

Nestling physiological and behavioural response to high temperatures

Jenna Diehl

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How the accelerating pace of global warming will affect animal populations depends on the effects of high temperature across the life cycle. Nestling birds are vulnerable to the effects of high temperature due to their small size, high energy costs associated with rapid growth, undeveloped thermoregulatory systems, and restricted movement. Yet, research on temperature effects on nestlings has yielded conflicting results, and behavioural and physiological responses to increasing temperatures have not been looked at. I investigated the metabolic and behavioural response of superb and purple-crowned fairy-wren nestlings, from temperate and tropical Australia, respectively. The thermoneutral zone was similar for both species: at temperatures above 41°C, resting metabolic rate rapidly increases, indicating heat stress. Heat dissipation behaviours then mirrored metabolism, with wing drooping occurring during the minimum energy expenditure and panting coinciding with increased metabolic rate. Both species responded similarly to increasing temperatures, suggesting the natal climate may not govern the thermal responses of nestlings. Future studies will explore how exposure to high nest temperatures may affect the growth, dehydration, telomere length, and stress response of nestlings.

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Jenna Diehl is a PhD candidate in the Behavioural and Evolutionary Ecology of Birds Lab at Monash University, Australia. She is most excited about the study of bird behaviour and how birds can adapt to the changing environment. Her current research is looking at the effects of high temperatures on fairy-wren nestlings.

OFFERED ORAL PRESENTATION (ECR) | Tues, 12 Apr, 1600 UTC

Asymmetrical effects of diurnal and nocturnal incubation on hatching asynchrony

David Diez-Méndez

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Hatching asynchrony mostly occurs when birds start incubation during the egg-laying period. Egg warming implies embryo development, likely showing first-laid eggs a more advanced embryo stage than last-laid ones at the clutch completion day. First-laid eggs would thus hatch earlier, asynchronous. However, delimiting the onset of incubation is not straightforward. Birds start nocturnal and diurnal incubation progressively and at different rhythms. The time they start in relation to clutch completion, and how intensively they incubate, could have consequences for the hatching pattern. We investigated how the start of partial and full nocturnal and diurnal incubation relative to clutch completion resulted in different hatching patterns in a female-only incubator species, the Great Tit *Parus major*. We found that only the occurrence of diurnal incubation caused hatching asynchrony. Nocturnal incubation, despite doubling daytime incubation and reaching similar temperatures, was not associated with hatching asynchrony, that is, it did not trigger embryo development.

David Diez-Méndez is a postdoctoral researcher at the Institute of Entomology (Biology Centre CAS) in the Czech Republic. His current line of work focuses on the avian gut microbiome, but during his PhD he studied, and continues to work on, incubation behaviour and hatching asynchrony in several passerine species.

KEYNOTE | Thurs, 14 Apr, 1300 UTC

Giving waders a headstart

Lynda Donaldson

Wildfowl & Wetlands Trust, UK
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Populations of wader species are in decline in many parts of the world due to threats such as habitat loss and degradation from agricultural intensification, reclamation, pollution and climate change, unsustainable hunting practices, and increasing levels of predation. These pressures leave breeding waders unable to successfully hatch and fledge adequate numbers of chicks, and maintain sufficient levels

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of juvenile and adult survival, to sustain viable populations in the long-term. Conservation efforts to help reverse these trends are often not immediately apparent or well-established, and can take time to implement and yield improved population trends. In this time, critically small populations are vulnerable to extinction. During this talk I will discuss a technique known as headstarting, which involves hatching wild eggs in captivity and releasing chicks back into the wild at fledging age. I will show how this tool has been developed and applied to assist threatened populations of waders by boosting productivity at the local and global level, using examples of projects involving the Black-tailed Godwit *Limosa limosa limosa*, Eurasian Curlew *Numenius arquata* and Spoon-billed Sandpiper *Calidris pygmaea*, and highlight the challenges and opportunities of this technique for wader population recovery.

Lynda Donaldson is a Principal Research Officer in the Conservation Evidence department at the Wildfowl and Wetlands Trust (WWT). She completed her PhD at the University of Exeter on wetland conservation at the landscape scale in East Africa, helping identify practical conservation solutions for securing viable populations of threatened species. Her current research focuses on close order management techniques for wetland species recovery, including the design and effectiveness of translocation projects.

OFFERED ORAL PRESENTATION (ECR) | Weds, 13 Apr, 1615 UTC

The drivers of female extra-pair behaviour in a monogamous passerine

Jamie Dunning

Imperial College London

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The drivers of extra-pair behaviours in male birds are clear, where fitness is directly related to the number of offspring they can sire by any means; However, for females, where eggs are finite and parental care high, the drivers are less clear. Recent work has suggested that individual social behaviour might predict extra-pair behaviour (EPB). However, without long-term genetic data, where precise measures of individual fitness can be inferred, how these behaviours then relate to fitness (and thus, heritability), are still unclear.

We used intensive monitoring of a closed, population of house sparrow on Lundy island, to build social networks, which we then link to a long-term genetic pedigree to explore why female birds engage in extra-pair behaviour. We find that social network position has fitness benefits but does not predispose female EPB. Instead, female EPB is largely explained by neighbour effects, where adjacent males sire extra-pair offspring.

Jamie Dunning is a PhD student based at Imperial College London, studying female reproductive behaviour in the Lundy island house sparrow system.

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OFFERED ORAL PRESENTATION | Tues, 12 Apr, 1350 UTC

Phenological nesting niche adaptive tracking in a migratory passerine

Mark Eddowes

Freelance researcher, UK

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The impact of climate change on the ability of long-distance passerine migrants to maintain synchrony with seasonal food resources that are key to breeding success is of concern. Northerly range shifts across historical breeding ranges are evident, leading to suggestions that declines are driven by trophic asynchrony and an associated reduced breeding success.

Territory selection patterns and breeding timing of Redstart *Phoenicurus phoenicurus* at upland valley sites, offering micro-climatic sub-sites with a range of phenologies according to altitude and aspect, indicate an alternative hypothesis whereby this mobile migratory species chooses phenologically synchronous breeding sites at a fine scale to maintain breeding success. Redstarts arrive after resident passerines have started to lay at warmer locations, foregoing otherwise apparently suitable habitat and nesting only in cooler locations where breeding is synchronous with residents in those areas. This adaptive response to climatic conditions drives altitudinal and latitudinal range shift.

Mark Eddowes is an independent ornithological researcher with a particular interest in climate change impacts on long distance passerine migrants gained through volunteer involvement. Formal education in chemistry with a doctorate in electrochemical kinetics but no longer active in this field.

POSTER PRESENTATION (ECR) | Thurs, 14 Apr, 1430 UTC

Live long but don't prosper: the population-scale consequences of city life for blue tits

Catrin Eden

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Cities are associated with costly reductions in Blue Tit's *Cyanistes caeruleus* reproductive performance, yet high breeding densities are commonly found in urban areas. How these urban populations are sustained is unclear, as little research has investigated their demographic dynamics. Here, we tested two potential mechanisms for the persistence of urban populations by comparing one urban and one forest population of blue tits: (1) urban birds have higher annual survival than forest birds, (2) urban populations rely on immigration. First, using multi-state survival models we found that urban adults had higher apparent survival than forest adults. Second, using integrated population models we found that despite higher survival, immigration may be the strongest driving factor of population growth rate in the urban population, and thus that the urban population is likely a sink. Our results suggest that urbanisation creates an ecological trap for bird populations with reduced productivity in urban areas.

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Catrin Eden: I am a first-year PhD student at Lancaster University investigating the impacts of habitat quality and insect abundance on Spotted Flycatcher populations. I am mainly interested in the effects of human-induced environmental change on bird populations and understanding what we can do to ameliorate them.

OFFERED ORAL PRESENTATION (ECR) | Thurs, 14 Apr, 1400 UTC

Boosting fledging success of a threatened wader population through local- and landscape-scale management

Harry Ewing

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In recent decades, many breeding wader populations have declined in range and abundance across Western Europe. These declines have been broadly attributed to changes in landscape composition, land management practices and breeding habitat conditions, all of which have made nests and chicks more susceptible to failure. As a result, breeding productivity of many wader populations has reached unsustainably low levels.

To restore wader populations in Western Europe, considerable effort has been made to boost breeding productivity, primarily through deploying tools to protect nests from predation and mechanised farming practices. In many cases, this has resulted in increased hatching success but increases in fledging success have been more challenging to achieve.

This study aims to explore the potential of targeted habitat management to boost fledging success in Eurasian curlews, a species of major conservation concern across Europe. We use daily observations of broods to quantify chick habitat use and survival in relation to spatial and temporal variation in vegetation structure, at local- and landscape-scales.

Harry Ewing is an ornithologist focused on researching the applied ecology and conservation of breeding waders. He is currently undertaking a PhD at the University of East Anglia, on identifying conservation actions to conserve breeding curlew populations.

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OFFERED ORAL PRESENTATION (ECR) | Thurs, 14 Apr, 1345 UTC

Using camera-traps and citizen science to quantify breeding phenology and nest success of tropical ground-nesting petrels

Kirsty Franklin

University of East Anglia

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Monitoring breeding phenology and nest success are important for avian conservation globally. However, obtaining these data can be challenging for tropical seabirds, which may breed year-round in difficult-to-access colonies. Time-lapse photography can be used to overcome these issues, but the subsequent need to process enormous numbers of images means that feasibility remains uncertain. Using the Round Island petrel system in Mauritius, we assess the utility of time-lapse photography as a tool for quantifying year-round breeding phenology and nest success of tropical, ground-nesting petrels. These images have been hosted on the citizen science project Seabird Watch (www.seabirdwatch.org), allowing comparison of image classification from citizen science image annotation and by researchers. Here we will present these findings and discuss the patterns that citizen science-assessed time-lapse photography can reveal, and the associated logistical and analytical requirements, for ground-nesting birds in remote locations.

Kirsty Franklin is a PhD student investigating the drivers of ocean movement patterns in Round Island petrels. She is based at the University of East Anglia, and her PhD is the first to be funded by the BOU's John and Pat Warham Studentship fund.

OFFERED ORAL PRESENTATION (ECR) | Thurs, 14 Apr, 1530 UTC

Body condition influences parental decision-making during incubation in the Manx Shearwater

Natasha Gillies

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The ways in which animals strategically allocate their resources between reproduction and survival gives important insight into the evolution of life history. For many bird species, this allocation trade-off becomes stark during incubation, when caring demands put into direct conflict their investment in reproduction versus survival. Examining resource allocation, which can be indirectly measured using body mass, and behaviour during this time can give important insight into species' investment decisions. We collected daily mass data from Manx shearwaters, a biparentally-caring seabird, and combined this with biologging data to examine allocation decisions made by breeding pairs. We present a detailed study of incubation and foraging routines of parents during the entire incubation period, in which we explore how parents balance their resources, whether this differs between the sexes, and whether parents make decisions cooperatively. Through this, we reveal the critical importance of changes in nutritional reserves for parental care.

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Natasha Gillies: I'm a postdoc at the University of Liverpool, primarily interested in the behavioural ecology of seabirds. I'm currently investigating the influence of personality on foraging behaviour in wandering albatross. I recently completed my PhD at the University of Oxford, which explored the existence and mechanisms of coordinated care in seabirds.

KEYNOTE | Tues, 12 Apr, 1515 UTC

Why do eggs fail? Infertility, prenatal mortality, and implications for bird conservation

Nicola Hemmings

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Hatching failure is a major problem for many threatened bird species. Identifying the mechanisms underpinning hatching failure is therefore key to establishing effective conservation interventions. In this talk, I will summarise our current understanding of the causes of hatching failure in birds, presenting data on the relative importance of infertility and prenatal mortality across a range of wild and managed populations, including both threatened and non-threatened species. I will highlight the importance of distinguishing fertilisation failure from prenatal mortality, both for practical conservation purposes and for our broader understanding of demographic and evolutionary dynamics. Finally, I will consider what unhatched eggs can't tell us: how much do we really know about variation in fertility in wild birds, and how can we fill the gaps in our knowledge?

Nicola Hemmings is a Royal Society Dorothy Hodgkin Research Fellow in the Department of Animal & Plant Sciences, University of Sheffield. She studies the reproductive behaviour and physiology of birds, working with conservation practitioners to apply insights from reproductive biology to conservation management. Nicola also has a strong interest in public engagement with science and is involved with several projects aimed at fostering closer connections between people and nature in the UK.

OFFERED ORAL PRESENTATION (ECR) | Tues, 12 Apr, 1420 UTC

A comparison across two decades, of the breeding biology of two sibling species of procellariiformes

Hannah F. R. Hereward

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Long-term nest monitoring studies help identify changes in breeding productivity and population dynamics in relation to the changing environment and can guide conservation actions. Here we compare, in two different time-periods two decades apart, the breeding phenology of two sibling species of procellariiformes that breed sympatrically but allochronically, one during summer and the other during winter. During two 18-month periods, nest checks were conducted daily for each species, to monitor

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aspects of breeding performance. The summer breeding species had a lower productivity than the winter breeding species, and the productivity of both species was lower in the most recent time-period. Differences between the measures of breeding performance of both species are examined in more detail across the two decades, to identify potential differential responses to decade scale changes, in light of the changing environment and to inform future conservation actions.

Hannah Hereward: I am in the final year of my PhD at Cardiff University looking at the breeding biology and reproduction of two sympatric storm-petrel species. My research interests include these areas of breeding biology alongside identifying threats to seabird survival and their long-term success and to integrate findings into future conservation actions.

OFFERED ORAL PRESENTATION | Weds, 13 Apr, 1330 UTC

Mismatch-induced growth reductions in a clade of Arctic-breeding shorebirds are not mitigated by increasing temperatures

Thomas Lameris

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In seasonal environments subject to climate change, varying rates of phenological change between consumers and their prey may give rise to trophic mismatches during reproduction of the consumers. While in some populations reductions in growth of offspring have been explained by trophic mismatches, this certainly is not always the case. Here we test whether this variation may be caused by the relative strength of the mismatch, or by a mitigating effect of temperature increases reducing thermoregulation costs, using in total 36 years of data from six populations of a clade of Arctic-nesting shorebird species (Red Knot, Great Knot and Surfbird). We found a reduction in growth for chicks hatching later with respect to the seasonal food peak. This growth reduction was smallest for one population where chicks hatched much before the food peak. Although chick growth increased with higher temperatures, this effect was too small to compensate for increasing mismatches.

Thomas Lameris: My main interest is how a warming climate can result in fitness reductions for Arctic migratory birds, and whether birds are able to mitigate such reductions by adjusting their timing of migration. I study animals and their food using long-term tracking and reproduction data, as well as field experiments.

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POSTER PRESENTATION (ECR) | Weds, 13 Apr, 1450 UTC

Fertilisation failure vs. embryo mortality in wild, captive, and free-living managed bird populations.

Ashleigh F. Marshall

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Managed populations play vital roles in the conservation and recovery of threatened birds, with interventions applied to optimise reproductive success. This often involves making decisions based on previous reproductive success, including past egg fertility. Eggs fail to hatch due to either fertilisation failure or embryo mortality, with previous research suggesting that wild populations may experience a higher proportion of embryo mortality, and captive populations a higher proportion of fertilisation failure. Differentiating between these can sometimes be difficult using visual inspection alone, particularly in degraded eggs and those experiencing very early embryo mortality. In this study, fluorescence microscopy methods were applied to failed and apparently undeveloped eggs from captive zoo populations and free-living managed species, revealing high levels of embryo mortality. These findings have potential value for future management decisions, e.g. reducing the risk of excluding possibly fertile individuals from a breeding population, and for our overall understanding of hatching failure.

Ashleigh F. Marshall is a PhD researcher investigating the behavioural, environmental, and disease-related drivers of fertilisation failure and embryo mortality in managed wild and captive bird populations. Her aim is to deliver research that helps to support management decisions and improve reproductive success in conservation programmes.

POSTER PRESENTATION | Tues, 12 Apr, 1505 UTC

Impacts of weather and nest-dwelling ants on bird-ectoparasite interactions

Marta Maziarz

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Host-parasite interactions are common between birds and the invertebrates inhabiting their nests. As most organisms are reliant on suitable weather for successful reproduction, ambient temperature and rainfall may directly affect the hosts and the nest-dwelling ectoparasites, and modify the intensity of the interactions between them. The activity of other nest-dwelling invertebrates, like predatory ants, may further shift the host-parasite relationships by reducing the abundance of ectoparasites within bird nests.

We explored (i) the impact of ambient temperature and rainfall on the prevalence and abundance of parasitic blowflies *Protocalliphora* spp. in Wood Warbler *Phylloscopus sibilatrix* nests. We (ii) tested whether the presence of ants reduced nest infestation with blowflies under a range of ambient

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temperatures, and (iii) whether the changes in blowfly infestation influenced the survival and growth of Wood Warbler nestlings.

Our results show the intricate impact of abiotic and biotic factors on bird hosts and their nest-dwelling ectoparasites.

Marta Maziarz: I'm a woodland ecologist at the Museum and Institute of Zoology, Polish Academy of Sciences. My research has focused mainly on interspecific interactions and long-term bird censuses in the primeval Bia~Çowie~a Forest (Poland). I also collaborate on studies of woodland and farmland birds in the UK.

KEYNOTE | Thurs, 14 Apr, 1500 UTC

Intergenerational effects of parental state on offspring fitness

Pat Monaghan

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Conditions experienced in early life can have long term consequences for individual fitness. These can arise as a consequence of a direct effect on phenotypic development, or indirect effects operating through the developmental environment parents provide for their offspring. My focus in this talk will be on the latter, and particularly on effects operating through the mother. Maternal state is affected by extrinsic factors such as nutrition levels or stress exposure, and intrinsic factors such as age. In birds, effects linked to maternal state can occur pre-natally, for example due to effects on offspring sex ratios, egg composition and embryonic development during incubation, as well as the more obvious post-natal effects arising from the quality of parental care. I will discuss a number of such processes which we have investigated in both wild and captive bird species. I will also discuss some of the proximate mechanisms that may underpin both the nature of the effects and how long they last, such as changes to offspring growth rates, stress responses, telomere lengths and mitochondrial function. I will also discuss whether or not such effects might be adaptive.

Pat Monaghan is an evolutionary ecologist, based at the University of Glasgow, where she holds the Regius Chair in Zoology. She did her PhD at Durham University on seabird ecology, followed by work on the interactions between seabirds and fisheries management. She then began research on the effect of early life conditions in shaping individual life histories, involving studies at many different biological levels from physiology and molecular biology to ecology and behavioural biology. Her work is mainly on birds, involving lab-based and field studies, with related work in other taxa.

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OFFERED ORAL PRESENTATION (ECR) | Thurs, 14 Apr, 1330 UTC

Investigating the genetic mechanisms behind reproductive senescence in a threatened species (Hihi)

Fay Morland

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Reproductive failure presents a large cost to female birds, who invest heavily in laying and incubating eggs. Hatching rates vary between species, with smaller, threatened populations often experiencing higher rates of failure. Hatching failure can also vary between and within an individual's lifespan, and be subject to reproductive senescence. We used long term data from over 350 female birds across 23 years to assess patterns of hatching failure within an island population of threatened Hihi *Notiomystis cincta*. We found a significant quadratic relationship between hatching success and female age, with hatching success peaking at 2 years. We also show that individual females vary in their reproductive lifespan and rate of senescence, and investigate the roles of inbreeding and telomere effects in shaping this variation. Exploring the genetic impacts of inbreeding beyond homozygosity, such as on telomere length, may provide insight into the mechanisms of reproductive failure in threatened species.

Fay Morland is a PhD student at the University of Sheffield and ZSL Institute of Zoology, her work focuses on the patterns, causes and mechanisms behind reproductive failure in birds, from genetics and individual variation to population demographics and the environment. Fay uses the hihi, a threatened New Zealand passerine, as a model system and is interested in the conservation implications of the study of hatching failure.

POSTER PRESENTATION (ECR) | Weds, 13 Apr, 1640 UTC

Kirsty Neller, Warren Harrod-Wilson & Amanda Mead

Middlesex University, UK

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Life on the edge: Clutch size decisions, behavioural interactions and risk in the Black-legged Kittiwake.

Black-legged Kittiwakes *Rissa tridactyla* are in decline. It is important to explore the reproductive decisions and pressures which may impact on breeding success. Clutch size decisions are indicative of current breeding conditions and can inform us of reproductive responses to current pressures. Key behavioural interactions are also of interest. Parent-parent interactions may reveal information on pair quality and sibling interactions may be indicators of current pressures affecting breeding success.

This is a long-term ongoing study of a Kittiwake population on Lundy, a small island off the North Devon coast. Eggs and chicks are counted and behavioural data collected. Real estate, the extent to which individual nests are exposed to risks such as weather and predation, for each nest is also assessed.

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Average clutch size for each colony are calculated. Intra and inter colony variation across the years are examined. We will present some of our analyses and conclusions to date.

Kirsty Neller is an associate lecturer and PhD candidate at Middlesex University. Current research interests are breeding effort measures with a focus on clutch size decisions, parental investment behaviours and risk factors faced by cliff nesting seabirds. She also has a general interest in conservation.

OFFERED ORAL PRESENTATION (ECR) | Thurs, 14 Apr, 1545 UTC

Vital rates of nonbreeders and returning breeders strongly influence population dynamics in a seaduck species

Alex Nicol-Harper

University of Southampton

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Intermittent breeding, whereby recruited individuals forgo attempting reproduction in some breeding periods, is one of the least understood avian life-history parameters, and may be an understudied response to environmental change. We parameterised matrix population models for the Common Eider *Somateria mollissima* to see how different ways of incorporating intermittent breeding affected population dynamics. We found that breeding propensity estimates become less influential when also quantifying the survival cost of breeding – by estimating the proportion of mortality incurred during the breeding season. We then created a life cycle with a ‘refreshed breeder’ stage, to which individuals transition for the time-step following nonbreeding. Transitions in and out of the refreshed breeder stage have the potential to strongly influence population growth rate, mostly driven by the possibility of differential survival of refreshed breeders. These results indicate a need for focussed data-gathering within ringing studies on individuals moving between breeding and nonbreeding states.

Alex Nicol-Harper is a final-year PhD student at the University of Southampton, in collaboration with the Wildfowl & Wetlands Trust and Woods Hole Oceanographic Institution. Her project uses data synthesis and population modelling to inform reproductive ecology and conservation, with the Common Eider *Somateria mollissima* as a primary study species.

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OFFERED ORAL PRESENTATION (ECR) | Weds, 13 Apr, 1415 UTC

Juvenile social environment and range change in Icelandic Black-tailed Godwits

Josh Nightingale

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Alongside multiple growing anthropogenic pressures, many bird populations have been observed to change in space and time through shifts in distribution and phenology. In long-lived, site-faithful species, much of this change is hypothesised to occur inter-generationally.

In this study we explore the mechanisms driving a population's changing distribution, using a twenty-year dataset of individually marked Icelandic Godwit chicks. This population has expanded both its breeding and wintering distributions over the last century, a trend linked to favourable effects of climate warming. We complement this long-term perspective with a study of juveniles individually colour-ringed on the breeding grounds, exploring how juveniles' access to experienced adults varies with fledging phenology, and in turn how this social environment influences subsequent settlement into a winter location.

By examining the mechanisms underlying this population's response to environmental change, we aim to deepen understanding of the challenges and limitations affecting other migratory populations in the Anthropocene.

Josh Nightingale is a PhD student at the University of Aveiro, studying the role of juvenile settlement as a driver of population responses to environmental change.

POSTER PRESENTATION (ECR) | Weds, 13 Apr, 1650 UTC

The breeding biology of the African Pygmy Falcon, *Æ* an obligate associate of Sociable Weaver colonies

Olufemi Olubodun

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African Pygmy Falcons (*Polihierax semitorquatus*) in southern Africa nest solely in Sociable Weaver (*Philetairus socius*) colonies. These haystack structures are important resources to Kalahari animal communities and understanding the falcon life history is critical for understanding their impacts on weavers and other colony associates. We followed 323 breeding attempts initiated between August, *Æ* February across ten years in Tswalu Kalahari. Falcons were more likely to occupy larger colonies built in *Vachellia erioloba* than *Boscia albitrunca*. Falcons laid between 1, *Æ* 3 eggs, with the likelihood of 3-egg clutches varying significantly between years. Most territories bred successfully only once per season, however 27% initiated multiple breeding attempts. The number of fledglings was explained by the egg-laying month, but also varied significantly between years. We observed 62.1% breeding success with the probability of success dependent on egg-laying month. Overall, reproductive investment and outcomes differed strongly across years, and we explore what drives this variation.

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Olufemi Olubodun: I am currently studying towards a doctoral degree at the Fitzpatrick Institute of African Ornithology. My thesis focuses on the life history of the Pygmy Falcon and how it impacts the Sociable Weavers. I began in mid-2019 and have spent 2 years monitoring the breeding of Pygmy Falcon population.

OFFERED ORAL PRESENTATION (ECR) | Tues, 12 Apr, 1405 UTC

Higher temperatures are associated with reduced nestling body condition in a range-restricted mountain bird

Krista N. Oswald

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Demonstrated negative effects of increased temperatures on avian reproductive success suggest a mechanism by which climate change may impact species persistence. High temperatures can result in reduced parental care and reduced nestling condition in passerines with dependent young, resulting in lowered fledging success and population recruitment. We examined provisioning rate and nestling condition in a South African mountain endemic, the Cape Rockjumper *Chaetops frenatus*, whose population declines correlate with warming habitat. Our aim was to determine whether Rockjumper reproductive success could be affected by high air temperatures. We set up video cameras on nests at three nestling age classes (≤ 7 days old; 8–12 days old; ≥ 13 days old) for 8 hours on 37 separate days. We successfully collected full-day footage on 25 of the 37 days (4 days with predation, 8 with equipment failure). Nestlings were weighed at the beginning and end of each film day, barring the 4 days with mid-day predation (N = 65 nestling measures from 33 of the 37 days). Average mass gain across all nestlings per nest was positively correlated with provisioning rate (0.78 g provisions⁻¹ hr⁻¹, CI: 0.26 – 1.30), and provisioning rate decreased at increasing temperatures (-0.08 provisions hr⁻¹ °C⁻¹, CI: -0.15 – -0.01). Daily change in mass of individual nestlings was negatively correlated with air temperatures above a significant temperature threshold (22.4 °C; -0.30 g °C⁻¹, CI: -0.40 – -0.19). This suggests nestling energy requirements were not being met on higher temperature days -- perhaps because nestling energy and water demands for thermoregulation are elevated and provisioning rate is not correspondingly maintained or increased. These results suggest that higher temperatures negatively affect nestling mass gain. While in our study this did not directly affect fledging rates, it may affect post-fledging survival.

Dr. Krista N. Oswald completed her Honours BSc at Dalhousie University in Canada before moving to South Africa from 2015 through 2019 to complete an MSc and PhD studying climate vulnerability on Cape Rockjumpers. Her dissertation involved mainly an examination of temperature effects on Cape Rockjumpers that included their physiology (cold responses, heat responses, and comparisons of adult to juveniles), behaviour, reproductive success (nest failure and provisioning), and population genetics. She is now working for North Winds Environmental Services, and actively seeking options for the next stage in her career.

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POSTER PRESENTATION (ECR) | Thurs, 14 Apr, 1450 UTC

Functional responses of breeding wetland birds to habitat degradation and climate change

İ. Kaan Özgencil

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Human-caused habitat degradation and loss, and global climate change affect birds worldwide, altering their community structure and delivery of ecosystem services. We investigated how breeding wetland bird communities responded to two decades of wetland loss and degradation and climate change in Konya Closed Basin in Turkey, a closed basin larger than the Netherlands. We found that the loss of functional diversity at the basin scale was three times more intense than the taxonomic loss. Changes in taxonomic and functional compositional beta diversity patterns were contrasting. We also found that the larger species, late-breeders, reed-nesters, and species with smaller brain mass were the losers and that higher trait plasticity did not confer any advantage to their bearers. We offer earlier drying/shrinking of the lakes and resulting potential increases in competition as a novel mechanism for the decline of breeding populations of already late-breeding endangered diving ducks.

İ. Kaan Özgencil (he/him) is a Ph.D. candidate in ecology, a research assistant, and a volunteer research manager at a conservation NGO in Turkey. His studies focus on avian functional ecology, community ecology, conservation, and frugivore bird-mistletoe interactions.

POSTER PRESENTATION (ECR) | Weds, 13 Apr, 1440 UTC

Differing demographic drivers of low reproductive success within a high arctic migrant meta-population

Luke Ozsanlav-Harris

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To diagnose meta-population declines we often measure changes in demographic rates within a single or few sub-populations and presume that they are representative. However sub-populations are often spatially separated so are exposed to different environmental changes that could alter demographic rates differently. In a high arctic migrant, which comprises of two spatially separated sub-populations, we show that changes in nest success and chick survival, influence sub-population trends to different extents. Using population-level and individual-level analysis we find that reproductive success in the northerly population is driven by changes in nest success, in the southerly population it, is driven by changes to both nest success and chick survival. We hypothesize that this is due to different climatic averages and trends in the two breeding ranges and a possible carry-over effect acting on the northerly population. This has implications for conservation practitioners as bespoke strategies may be required for sub-population level mitigation.

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Luke Ozsanlav-Harris: I am a PhD student at the University of Exeter CEC department. My research focuses on understanding the drivers of population decline in Greenland White-fronted geese. More broadly I am interested in the implications of carry over effects in migrants, the consequences, costs and benefits of migrant range shifts, and the application of biologging technology

POSTER PRESENTATION | Weds, 13 Apr, 1700 UTC

Differences along the slow-fast continuum are associated with the temporal scale of reproductive investment

Samantha C. Patrick

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Different life-history strategies differ with respect to investment in current versus future reproduction. However, with the novel 'temporality in life-history trade-off hypothesis', we postulate variation should also exist in the time frame over which costs are paid. With this hypothesis, slow-paced individuals should accept short-term now trade-offs to prevent reproductive costs accumulating across reproductive episodes. In contrast, fast-paced individuals should accumulate costs that manifest as longer-term trade-offs. Using Fourier transforms, we quantify changes in clutch size with age, across four populations of Blue Tits *Cyanistes caeruleus*. Populations in evergreen forests, with slower pace-of-life, showed more prevalent short-term trade-offs while faster populations in deciduous forests had more prevalent long-term trade-offs. Inter-annual environmental variation partly accounted for short-, but not long-term trade-offs. Our study reveals that individuals differ in when they pay the cost of reproduction and that failure to partition this variation across different temporal scales and environments could underestimate life-history trade-offs.

Samantha Patrick is behavioural and evolutionary ecologist working mainly avian life-history

KEYNOTE | Tues, 12 Apr, 1305 UTC

The effect of trophic asynchrony on fitness in blue tits

Ally Phillimore

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The implications of rising spring temperatures for feeding interactions has generated a lot of recent interest, with the timing of nesting of woodland insectivore birds in relation to their caterpillar resource widely used as a system to test the effects of trophic asynchrony on fitness. For eight years we have been collecting data on caterpillars and blue tits from 44 woodland sites in Scotland, with the aim of examining whether trophic asynchrony and its consequences for birds varies among habitats. Most previous work on this this type of woodland food chain has tempted to lump all caterpillars together or assume that one

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or two species, such as the winter moth, predominate. By adopting a metabarcoding approach which we've applied to faecal samples obtained from nestlings we have been able to gain a very detailed insight into what the nestlings are being fed. We find that moth caterpillars do comprise the majority of the resource, with Geometrids and particularly winter moths especially preferred. Our next step involves examining how the phenological distribution (i.e. timing, abundance and duration) of woodland caterpillars in relation to the timing of blue tit breeding impacts on the ability of birds to fledge young. Finally, by identifying the effects of temperature on the phenological distribution of woodland caterpillars, we are aiming to get a more complete picture of whether rising spring temperatures will exacerbate the impacts of trophic asynchrony on woodland passerines.


Ally Phillimore: after a PhD at Imperial College, London, Ally was awarded a NERC advanced research fellowship which he took to Edinburgh University, where is now a Reader. The main focus of his group's research is on how climate change impacts the phenology of different plant and animal species and the knock-on effects for species interactions. Since 2014 he has been running the Phenoweb project that looks at a woodland food web composed of trees, caterpillars and blue tits at 44 sites in Scotland.

POSTER PRESENTATION (ECR) | Weds, 13 Apr, 1710 UTC

Manipulating breeding female quality reveals subtle helper effects in a cooperatively breeding bird

Abigail Robinson

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Although a major assumption of hypotheses used to explain the evolution of cooperative breeding, helper benefits to breeders are often hard to detect. Variables such as breeder quality can confound helper effects on breeder fitness. I manipulated breeding female quality in the Superb Fairy-wren *Malurus cyaneus* by clipping wing feathers to increase flight costs. To females with and without helpers I randomly assigned clipped and control treatments and collected data on their reproductive investment and output. Clipped females laid lighter eggs and provisioned nestlings less than control females. Females with helpers laid heavier eggs than those without helpers but showed no difference in provisioning rates, suggesting helpers might have a role in mitigating the negative effects of clipping on reproductive success. This research indicates that helper benefits might manifest at low levels at different stages in the reproductive cycle, and that manipulation of breeder quality via wing clipping allows detection of these subtle effects.

Abigail Robinson: I am an evolutionary and behavioural ecologist interested in understanding the ultimate causes of the evolution and maintenance of cooperative breeding systems in birds. I am currently a PhD candidate at Monash University, Melbourne, investigating the stability of this complex breeding system in the Superb Fairy-wren.

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OFFERED ORAL PRESENTATION (ECR) | Weds, 13 Apr, 1600 UTC

Social networks and productivity in a tropical wild bird

Theresa Robinson

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Social interactions between breeding adults are known to impact on individual life history, and therefore seasonal and lifetime productivity. Understanding the causes and consequences of social relationships is therefore a key issue in population ecology, but this understanding requires detailed long-term monitoring data which is infrequently available. Here we use a detailed individual-based dataset on a formerly critically endangered wild bird the Mauritius Fody *Foudia rubra* to explore the impact of social network size on seasonal productivity. Individual males and females with a larger social network - measured as the number of surviving adult birds the individual has nested with before - had higher productivity. This was because intervals between discrete nesting attempts were shorter if birds were pairing with familiar compared with unfamiliar individuals, enabling them to nest more frequently within a breeding season and hence produce more fledglings.

Theresa Robinson: I'm a PhD student at the University of Reading and the Institute of Zoology, working with the Natural History Museum and the Mauritian Wildlife Foundation, studying the conservation biology of the Mauritius Fody, a formerly critically endangered Mauritian endemic passerine.

TWITTER-ONLY (ECR) | Thurs, 14 Apr, 1440 UTC

Bird communities in urban parks. Is the trend of artificial grass a problem for avian diversity?

David Sanchez Sotomayor

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Urban parks provide trophic resources and nesting places for avifauna, acting as key ecosystems in cities. Consequently, modifications of these green zones can imply major changes in biodiversity. Potential pernicious urban remodelling is taking place in eastern Spain because natural grass is being replaced. This study aimed to determine whether remodelled parks with artificial grass gather lower avian diversity (in alpha, beta and gamma diversity terms) than traditional parks with natural grass. We surveyed 45 parks both types of the Valencia Region in autumn 2020. The group of parks with natural grass harboured higher gamma diversity. Species richness and abundances were also higher in natural grass ones. Differences in community composition were due mainly to abundance differences in common birds. We highlight that the artificial grass trend in urban parks has harmful effects on bird communities, since it reduces the availability of resources and may have negative implications for reproduction.

David Sanchez Sotomayor: Young Spanish biologist specialized in research applied to biodiversity conservation of birds and mammals, wild tracking and following populations of Iberian wolves, carnivores

ABSTRACTS

Avian Reproduction

Nests, eggs and chicks: reproduction in a changing world

#BOU2022



All presentations in alphabetical order by presenting author

and ungulates. I'm preparing as bird bander. I studied at Universidad Autónoma de Madrid. I work as coordinator the bird and mammal section in Asociación Iberozaa.

OFFERED ORAL PRESENTATION (ECR) | Thurs, 14 Apr, 1600 UTC

Plasticity in embryonic metabolism of maternal hormones and the scope for mother offspring conflict: a study in the Rock pigeon

Yuq Wangi

Groningen University, the Netherlands

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Mothers can differentially transfer resources in one reproductive attempt to offspring depending on the position in the sibling hierarchy, which is a flexible tool to adjust the developmental trajectory of young in fluctuating environments. However, whether embryos can respond plastically to this transfer is unclear. Therefore, we used Rock pigeons, that produce two egg clutches in which second eggs have higher androgen levels at oviposition than first eggs, to investigate the embryo's plasticity in metabolizing maternal androgens. We elevated androgen concentrations (androstenedione and testosterone) in 1st eggs to that present in 2nd eggs and measured their change and that of their metabolites after 3.5 days of incubation. Eggs with increased androgens showed metabolism depending on the laying position, but such difference did not occur in the change of the metabolites. This indicates that embryos have certain plasticity to respond to maternal androgens depending on both their positions and other maternal signals.

Yuq Wangi: As a PhD candidate at University of Groningen, I study the effects of maternally derived hormones on embryonic development, immunology and behaviour. Taking the advantages of avian species, I also investigate the role of the embryos in response to the maternal cues and whether such response is flexible or context dependent which meets the expect to Darwinian perspective.

OFFERED ORAL PRESENTATION (ECR) | Weds, 13 Apr, 1545 UTC

Effects of brood size on offspring quality and their lifetime fitness in a long-lived and altricial bird

Xianglong Xu

Beijing Forestry University, China

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Understanding relationships between life history traits and its fitness consequences has always been a goal of animal ecologists. Although numerous studies have experimentally documented the variation in quality of nestlings from different brood sizes, little is known about the effects of brood size on the survival of nestlings when they are adults, and long-term fitness during entire lifetime. Using 26-year of data of a Crested Ibis *Nipponia nippon*, we investigated the effects of brood size on offspring quality and

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its lifetime reproduction. We found that body mass was maximized for broods of three nestlings. Individuals from three nestlings had higher survival rate as adults, longer breeding lifespan, higher lifetime reproductive success than these from only one and two nestlings. Our results thereby emphasize the fact that female crested ibis has an optimal brood size of three, offspring number could not only influence quality of nestlings, but their lifetime fitness consequences.

Xianglong Xu: I am a Ph. D. student at Beijing Forestry University, my study interests mainly related to animal ecology and conservation biology. At present, my research focus on an endangered bird species, crested ibis, to investigate the long-term variation in life history traits, reproductive strategy, and their driving factors at different spatial and temporal scales.
