ABSTRACTS | POSTERS

Alphabetical order

ECR PRESENTER

Influence of weather conditions on the migratory performance of juvenile White Storks (*Ciconia ciconia*)

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White Storks (*Ciconia ciconia*), traditionally a fully migratory species, established resident populations in the Iberia Peninsula in recent decades and the number of resident and wintering storks has been increasing since the 1980s. This change in migratory behaviour has been accredited to several factors including the use of landfill sites, a stable food resource all year-round. Landfill use seems to influence adult movements, however the effects of landfills on juvenile movement and survival remains poorly understood.

White storks are large soaring birds, requiring suitable weather conditions to succeed in their migration. Weather conditions that enable thermal soaring facilitate the crossing of large migratory barriers, such as the Mediterranean Sea and the Sahara desert. However, the weather is not constant throughout the migratory season hence, the timing of migration will be crucial to determine the conditions birds' experience.

We used data from 107 juvenile white storks, tracked with GPS/GPRS devices deployed between 2016 and 2018, to examine the influence of landfill use on the timing, duration and efficiency of migration. Landfill use did not influence the total migration duration or efficiency of juvenile white storks. However, storks that foraged on landfills began the migration later in the season and had different performance from non-landfill users while crossing migratory barriers. We used weather variables, such as temperature, humidity and wind speed and direction, to understand how different weather

ABSTRACTS | POSTERS

Alphabetical order

conditions influence barrier crossing, as well as total migration distance, speed, efficiency and mortality during the first migration of juvenile white storks.

Marta Acácio is a biologist with an interest in movement ecology. She is studying the environmental drivers of dispersal and migratory behaviour of white and black storks from the Portuguese partially migratory population.

ECR PRESENTER

Investigating the effect of breeding large gulls on Roseate terns in a mixed-species seabird colony

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Roseate Tern are Britain's rarest breeding seabird, the last persistent colony breed on Coquet Island; an RSPB reserve. In order to protect this species, their natural predators (Herring Gull and Lesser Black-backed Gull) have been managed and controlled. However, in order to maintain natural biodiversity on the island a small population of large gulls is required. 2014 was the first year of an on-going research project to determine the effect breeding large gulls may have on the other species on the island. A preliminary data has been collected through direct observation, GPS tags, camera traps and pellet samples. We are beginning to develop an understanding of the relationship breeding large gulls have with the seabird assemblage on Coquet Island, although analysis is not yet complete. Continued research will provide the necessary understanding to determine whether a breeding population of large gulls would be viable on Coquet Island without posing an unacceptable level of threat to the Roseate Tern colony.

PhD student – Ecologist/MSc in Biodiversity conservation and Ecosystem management. I am interested in understanding the ecology and behaviour of birds, particularly seabirds' predation ecology using remote monitoring technology. Currently, I am using DNA barcoding techniques to analyse the predator's diet.

ABSTRACTS | POSTERS

Alphabetical order

ECR PRESENTER

Bird-habitat relationships to inform environmental management at a landscape-scale in order to mitigate bird population declines in the UK

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Biodiversity is declining on a global scale despite efforts to the contrary, and many UK birds have declined since the 1960s, particularly on farmland. Birds are effective indicators of ecosystem health, occurring in almost every habitat on Earth. Therefore, habitat diversity affects avian diversity attesting that birds are a vital resource to conservationists. Not only are the birds influenced directly by their immediate habitat, they are also indirectly affected by the surrounding landscape, indicating the need for local and landscape-level studies and management. This study takes a multi-scale approach to examine the consequences of habitat and landscape changes on bird populations in two contrasting and mixed land-use sites, the New Forest in Hampshire and predominantly arable farmland in Cambridgeshire. The New Forest is a National Park comprising a mixed woodland and heathland landscape. The woodlands are a mix of broadleaved Beech and Oak, interspersed with conifer plantations and stretches of heathland with encroaching scrub. Cambridgeshire, by contrast, is an agricultural landscape of mainly arable farmland with mostly deciduous woodland patches and hedgerows. Recently acquired, high resolution airborne remote sensing datasets (LiDAR) will be used to develop metrics that quantify structure, composition and condition of the two study landscapes. Bird diversity and community composition will be assessed in relation to remotely sensed metrics to determine the effects of landscape characteristics on bird community dynamics. At the landscape scale, bird distribution and abundance will be assessed in relation to landscape structure and vegetation composition, testing scenarios of how changes in land-use would affect bird population persistence. The overall aim of this study is to provide realistic measures to develop sustainable landscapes in order to conserve avian diversity.

Ailidh Barnes is in her final year of her PhD studying bird communities in various habitats in two contrasting landscapes. Her aim is to utilise habitat structure and composition in spatial modelling to evaluate habitats and provide sustainable management strategies in order to conserve bird species communities.

ABSTRACTS | POSTERS

Alphabetical order

ECR PRESENTER

Using temporal patterns of day-to-day passerine migration over the North Sea to infer departure behaviour

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Increasing number of tracking and radar studies is revealing the migratory patterns of even the smallest avian migrants, the passerines. However, studying migratory behaviour of these small migrants at sea remains challenging as well as intriguing. Large water bodies are considered ecological barriers for small migrants, which they generally tend to cross by trying to make use of preferable weather conditions, according to which they calibrate their departure times.

Previous studies of bird migration around the North Sea basin have suggested that most of the birds that migrate over the North Sea are nocturnal migrants. They are believed to depart from land one hour after sunset, whereupon they take one of the main proposed migratory routes (between Scandinavia and S Europe and Africa, between NE Europe and the UK and between Norway and the Netherlands). To test expectations regarding departure decisions, we used a 4-year dataset collected simultaneously by two different types of radar offshore and at the coast in the NW Netherlands during both spring and autumn migration. Based on the timing of arrival at the radar location, measured groundspeed and track direction and assuming constant flight behaviour we answered the following questions: I) What are the potential departure times and locations on land? II)Knowing this, how much time do migrants potentially need to reach the radar location? III) How much time do they need to cross the North Sea? IV) To what extent does timing of arrival at sea vary within a season?

The results describe daily temporal migration patterns over the North Sea and suggest how they can be used to understand departure decisions from land. Furthermore, they provide important information needed to mitigate the impact of wind farms on migratory birds.

Maja Bradarić is an ecologist with the main research focus on animal movement ecology. She is principally curious to understand how environmental factors shape spatio-temporal animal

ABSTRACTS | POSTERS

Alphabetical order

movement patterns in order to better comprehend their ecology, thus helping development of proper conservation management plans.

ECR PRESENTER

Carry-over effects of the non-breeding ground quality on the phenology of annual cycle

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Long-distance migratory birds spend most of their lives on the non-breeding grounds or *en route*. Therefore, studying how non-breeding habitat conditions impact the annual cycle events is essential for understanding the inter-individual variability observed on the breeding grounds in e.g. timing of arrival or breeding success.

Here, we will quantify the carry-over effects of the timing of the previous phases and the non-breeding ground quality to the subsequent phases of the annual cycle in the Great Reed Warbler (*Acrocephalus arundinaceus*). We will use spatio-temporal information of 146 full annual cycles obtained from geolocator-tagged individuals breeding in five populations (Sweden, Czech Republic, Bulgaria, Turkey and Kazakhstan). We will gather Normalized-Difference Vegetation Index values for the stationary locations as proxies for the non-breeding habitat greenness and estimate greenness stability and trend. Moreover, remarkable intra-tropical movements in response to seasonal habitat changes in sub-Saharan Africa were detected in many of the tracked individuals. We will relate these intra-tropical movements as well as non-breeding habitat quality and the information on individual movement strategies (such as ratio of stopover duration to duration of migration) to the timing of the subsequent annual cycle stages. Our results will identify the most important temporal dependencies among the annual cycle events and the effect of individual movement strategies especially on the

ABSTRACTS | POSTERS

Alphabetical order

arrival at the breeding grounds. Finally, this unique dataset could help us find proximate causes of the differences between sexes and populations.

Vojtěch Brlík is a master's student of ecology with main research focus on bird migration. He is particularly interested in the temporal and spatial links between annual cycle events and implications of using different flyways by sympatric populations at migratory divides.

ECR PRESENTER

Leave or Remain? Fitness consequences of different migratory strategies in partially migratory populations: a multi-taxa meta-analysis

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Migration – spatial displacement in response to environmental variability – is risky, and must confer sufficient fitness benefits to have evolved as a viable strategy. Partial migration, wherein migratory and non-migratory individuals exist within the same population, represents a behavioural dimorphism; for it to persist over time, both strategies must yield overall equal individual fitness returns. This balance may be maintained through a trade-off in which migrants gain survival benefits by avoiding unfavourable conditions, while residents gain breeding benefits through early access to resources – but there has been little overarching quantitative analysis of the evidence for this. Given that migrants – especially long-distance migrants – may be particularly susceptible to environmental change, it is also unclear whether anthropogenic stressors may be altering the relative balance of these trade-offs in favour of residency.

ABSTRACTS | POSTERS

Alphabetical order

We conducted a multi-taxa meta-analysis to assess these predictions – including examining for any deviance from the expected parity in benefits according to population latitude and migratory distance, as would be expected from differential effects of environmental change.

Of 2103 studies found in a systematic literature search, twelve contained suitable information for meta-analysis, from which we calculated 53 standardized effect sizes. Once these were weighted according to precision, we found residency to confer greater fitness benefits than migration, and that these benefits were generally associated with survival, not productivity. The benefits of residency increased with the number of years of data over which effect sizes were calculated, suggesting that deviations from fitness parity are not due to sampling artefacts.

Selection pressures driving the evolution of migratory behaviours may be changing: altered seasonality and increasing anthropogenic threats posed along migratory routes may be altering the balance of relative fitness between strategies. Long-term studies concerning partial migration may be increasingly important as a means of shedding light on responses of migratory species to environmental change.

Claire Buchan is a PhD student at the University of East Anglia studying the fitness consequences of different migratory strategies in partially migratory populations of Lesser Kestrels (*Falco naumanni*).

ECR PRESENTER

Individual variation in migration of Guillemots and Razorbills: insights from a multi-colony tracking study

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Many avian studies have focussed on periods of the annual cycle when individuals are comparatively immobile and at high density, and therefore more readily studied, such as during colonial breeding or winter aggregating. Yet migration is a key biological trait undertaken by a huge range of species

ABSTRACTS | POSTERS

Alphabetical order

and remains an understudied phenomenon. In particular, we lack a clear understanding of how migration strategies vary across populations and among individuals within populations. This variation is a critical question in migration ecology, as it has profound effects on population dynamics and conservation management. Many seabird species are colonial during the breeding season, but undertake extensive migrations in the autumn and spring between colonies and distant wintering grounds, often far from land, limiting opportunities for direct observation. Quantifying variation in migration strategies is therefore particularly challenging in seabirds. Tagging devices have revolutionised the study of seabird migration, enabling year-round studies. In a multi-colony study of two species of colonially breeding seabirds, the Common Guillemot l and Razorbill *Alca torda*, we quantified variation in migration strategies among and within populations. Over 400 tags were deployed in the 2017 breeding season across 13 colonies in the northern UK, with 118 Guillemots and 47 Razorbills recaptured in 2018, providing a substantial data set on movements in the 2017-18 winter. We mapped migration routes and identified key hotspots during two key potential energetic bottlenecks: the flightless moult period and late winter when food is scarce. In addition, we determined how migration movements varied both among colonies and between individuals. Our results provide key insights into drivers of variation in winter movements of multiple populations, which can be used to inform population models and spatial planning, particularly in the context of future marine developments and conservation designations.

Lila Buckingham is an ecologist with a particular interest in movement ecology, using seabirds as a study system. She has recently started a PhD studying the wintering ecology of guillemots and razorbills, with previous experience as a spatial analyst within government.

ABSTRACTS | POSTERS

Alphabetical order

ECR PRESENTER

Birds on the beb – Sightings of feral parakeets around the world

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Parakeets are naturally found in tropical and sub-tropical areas of the world, yet many parakeet species are found as feral birds across the temperate zone. In the United Kingdom, more than 30,000 Rose-ringed Parakeets (*Psittacula krameri*) are found, mostly in London and the Isle of Thanet. The London population is rapidly increasing in numbers (possibly by 30% a year) and yet their range is increasing very slowly (less than 2km a year).

What is limiting the spread of these highly successful non-native invasive birds?
To try to answer this question and model their distribution, it is vital to find out where the feral parakeets actually are. We are looking to map the distribution of feral parakeets across Europe, the USA and Canada.

To do this, we have produced a website, parakeetsightings.bham.ac.uk , to gather details on sightings (presence) and non-sightings (absence) of feral parakeets and some details of their populations (where known). A smartphone app is also in production!

We need sightings (and non-sightings) of feral parakeets, not just in the United Kingdom, but in any European or North American country. Every sighting and every bit of information on the populations of feral parakeets and parrots will help us to identify why these birds thrive so well in so many of our cities.

We need your sightings! (and non-sightings…..)

Richard Bufton, twenty years a nurse, trained as a bird-ringer, before studying BSc Conservation Biology at Roehampton University and MSc Applied Wildlife Conservation at Anglia Ruskin University.

ABSTRACTS | POSTERS

Alphabetical order

In 2017, he started a PhD at the University of Birmingham, investigating whether Urban Heat Islands influence bird activity budgets.

Human food waste and the recent changes on migratory behaviour of White-storks (Ciconia ciconia): towards the end of migration?

Inês Catry [1,2,3], Aldina Franco[3], Marta Acácio[3], Katharine Rogerson[3], Teresa Catry[4], Carlos Pacheco[5], Phil Atkinson[6] & Francisco Moreira[1,2]

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The migratory patterns of birds are changing in response to global environmental change with many species forming resident populations in areas where they were once migratory. The iconic White Stork (*Ciconia ciconia*) is a very adaptable, opportunistic species. Since the mid-1980s, increased food availability and milder temperatures in winter have enabled increasing numbers of residents, individuals that choose to stay in Iberia, rather than migrate to Africa. Between 5 and 10 October 2015, we surveyed the wintering population of white-storks in Portugal to assess the proportion of resident individuals and describe the trend of the wintering population using data from seven previous surveys (1995 to 2008). Moreover, we used data from resident storks fitted with GPS track devices to quantify the extent and consistency of landfill attendance during the winter. The number of wintering white-storks in Portugal has increased significantly from 1187 individuals in 1995 to 14434 in 2015. Although the long-term positive trend in the number of breeding birds could partially explain the observed increase in the wintering population numbers, our results unveil a change in the migratory behaviour of white-storks, as the proportion of resident individuals in the population increased from 18% in 1994/1995 to 62% in 2014/2015. Our results from tracked storks showed that resident adult birds strongly rely on landfill sites for foraging during the winter season, when other

ABSTRACTS | POSTERS

Alphabetical order

food resources are scarcer. The migratory status of the white-stork is changing substantially and, in the mid-term, if environmental conditions continue to favour non-migratory individuals, the population is likely to change towards full residency. Nonetheless, the closure of landfills, as required by EU Landfill Directives, might invert the observed patterns, causing dramatic impacts on white stork populations.

Inês Catry is an ecologist mainly interested in understanding how global environmental changes can impact the breeding biology, migratory behaviour, habitat quality and population dynamics of birds. Her ongoing project "Birds on the move" aims to investigate the adaptive migratory behaviour of white-storks in response to human-induced environmental change.

ECR PRESENTER

Linking migratory patterns with breeding success: unravelling migration of the European Bee-eater (*Merops apiaster*) breeding in southwest Iberia

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Throughout Europe, population declines are being reported in a wide range of Afro-Palearctic migrants. The causes of these declines remain unclear due to their wide distribution ranges and the large number of locations which individuals use. In order to determine when and where these species may be mostly affected and how potential consequences for productivity we require a detailed understanding of their migratory schedule and routes, as well as, the location of nonbreeding areas and breeding season parameters.

The European Bee-eater (*Merops apiaster*) is an AP migrant that breeds in temperate regions and overwinters at tropical latitudes. Despite the species' relatively well known breeding area, little is currently known about their spatio-temporal distribution throughout the annual cycle. We used light-level geolocators to explore migratory patterns of adult bee-eaters breeding in southwest Iberia. We

ABSTRACTS | POSTERS

Alphabetical order

attached 60 geolocators during the breeding season of 2016, from which we were able to retrieve 20 full annual tracks and 2 incomplete tracks in the following year. In addition, we quantified breeding season parameters such as hatching date and the number of fledglings per nest of each brood.

The tracks confirmed that Bee-eaters breeding in Iberia use a western migratory corridor to overwinter in West Africa with the majority of birds stopping more than once during spring and autumn migration. Wintering latitude doesn't seem to influence individuals' arrival date to the breeding grounds and no differences were found in migratory timings between males and females or between 2nd year and older birds. However, birds arriving earlier to their breeding grounds tend to lay their eggs earlier in the breeding season and have higher productivity. Our results provide the first insight into migratory patterns and its association with breeding success of European bee-eater breeding in Iberia.

Joana Costa is a biologist interested on bird phenology and migration, population ecology, behavior and conservation. She is currently conducting a PhD at the University of Aveiro and Swiss Ornithological Institute on migratory strategies and demographic processes of an Afro-Palearctic migrant, the European Bee-eater.

Between species variation in arrival phenology investigated using field observation data

Mark Eddowes

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Technological advances in micro-electronics are providing exciting new insights into migration, in particular migration behaviours across areas of the world for which direct field observation and ringing recovery data are often very sparse, for example identifying migration routes and wintering areas across Africa.   These new tracking data are typically available for a limited number of individuals and species only.

In other areas, such as Western Europe, field observation data is often available for a large number of individuals and species. For example, the UK BirdTrack internet-based survey holds data on a wide range of species, including several thousand individual weekly observations across the UK of the

ABSTRACTS | POSTERS

Alphabetical order

more common summer migrants. Amid the excitement generated by the findings provided by new tracking technologies, it is important not to overlook the potential insights into migration behaviour at the population level that can be gained from these field observations.

Analysis of the arrival distributions determined from these data and the associated variation between years has demonstrated the utility of these field observation data in the study of the response of some species to warming along the migration route and its possible role in influencing phenological change (Eddowes, 2018).   Study of a wider range of species covered by these data indicates variable responses to en-route climate variables. Analysis of these differences may further improve the understanding of the mechanisms influencing these phenological responses, their variations between species and the varied fortunes of different summer migrant species in the face of climate change.

Eddowes, M.J. 2018 Does warming along migration routes explain the advancement of spring arrival in long distance migrants? Presentation at BOU2018

Mark Eddowes is an independent researcher with a wide range of ornithological interests developed through volunteer involvement in ornithology. He has a particular interest in long-distant passerine migrant arrival phenology.

ECR PRESENTER

Repeated migration of a juvenile European Nightjar Caprimulgus europaeus

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ABSTRACTS | POSTERS

Alphabetical order

Studies that compare migration strategies between juvenile and adult light-weight (<100g), long-distance migrants are scarce. Most of our current knowledge on migration strategies in juvenile light-weight birds still originates from laboratory studies, displacement experiments and partial migration tracks. It is presently assumed that naïve migrants, which migrate without apparent social input from experienced conspecifics, rely on their innate clock-and-compass program during their first migration. In subsequent years, these birds are expected to re-use stopover sites and wintering areas from previous years, as such behaviour promotes their survival.

In this study we deployed one geolocator on one juvenile European Nightjar (*Caprimulgus europaeus*). This bird was recaptured two years later as a territorial male, approximately two kilometres from its birth place. The recovered geolocator contained robust data covering two complete migration tracks, one track as a juvenile and the consecutive second as an adult. Analysis of the migration routes indicated a loop migration pattern of approximately 16,500 km between breeding periods. This bird crossed the Mediterranean, the Sahara and the Central African Tropical Rainforest on its way to wintering sites in sub-equatorial Africa. This Nightjar showed remarkable capabilities during its first naïve migration to search for stopover zones and wintering areas similar to those used by adult Western European Nightjars and to relocate these specific areas again the next year. During the second migration cycle, arrival times at stopover zones were earlier and stopover times in Europe were shorter. Following these observations, our results suggest that the innate migration program of juvenile nightjars allows them to reach species-specific stopover zones and wintering grounds during their first migration and that experience allows them to fine-tune this program in order to re-use such important areas the next year.

Ruben Evens is a biologist with a main research focus on foraging ecology, migration and conservation. He is mainly interested in investigating the impact of individual foraging and migration strategies on population processes in order to improve conservation management.

ABSTRACTS | POSTERS

Alphabetical order

ECR PRESENTER

Changes in the distribution and abundance of breeding Eurasian curlew (Numenius arquata) in Breckland, UK

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In recent decades, ground-nesting waders have experienced steep declines globally, none more so than large-bodied waders within the tribe Numeniini, of which two species may already be extinct and five are classified globally as Endangered, Vulnerable or Near Threatened. Recent studies implicate low breeding productivity, mainly caused by land-use change, agricultural intensification and an increased abundance of generalist predators, as a key driver behind declines of many wader species. However, understanding these declines in detail is complex and requires in-depth knowledge of key demographic rates and changes, within populations.

In the UK, numbers of breeding Eurasian Curlew (*Numenius arquata*), a near-threatened, large-bodied wader, have declined 48% in the last 20 years, leading to many local extinctions. However, the lowland population breeding in the Brecklands of Norfolk and Suffolk still persists, despite unsustainably low breeding productivity. Consequently, efforts to maintain this population are likely to require the use of tools designed to increase hatching and fledging success. This study will use BTO and RSPB survey and nest record data to explore the spatial and temporal-scale over which population-level demographic changes are occurring in Breckland and the landscape and environmental changes that may be influencing them. This will provide a strong foundation for targeted, evidence-based conservation of the lowland Curlew population, in the Brecks.

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 understanding the causes of Curlew declines in the UK and how to best to conserve important lowland populations.

ABSTRACTS | POSTERS

Alphabetical order

ECR PRESENTER

Spatial and temporal consistency in migration routes of seabirds

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There is growing evidence that migratory species are particularly vulnerable to rapid environmental changes arising from human activity. However, assessing the ability of a species to adjust to these changes in the environment relies on understanding the degree of individual flexibility (or, conversely, consistency) in migratory routes and timings. This individual-based approach has been made possible by recent advances in remote-tracking technology, and so far has revealed a high degree of between-individual variation but within-individual consistency in the movement patterns of multiple bird species. Despite this, our understanding of the ecological processes involved in these large-scale movements remains rather limited. For example, the degree to which individual differences in migration strategies are influenced by genetics or environmental conditions still requires further investigation. Here, we will present preliminary results from an extensive literature search on all papers estimating repeatability of avian migratory strategies. In addition to this, we will investigate the consistency of individual movement patterns in time and space of a tropical seabird, using light-level geolocators. The Round Island petrel population in the Indian Ocean is a three-way hybrid complex consisting of one species from the Atlantic (*Pterodroma arminjoniana*), two species from the Pacific (*P. heraldica & P. neglecta*), and inter-specific hybrids. By comparing data on migration trips from the same individuals across multiple years, we will examine how consistent they are in their migratory routes and timings. Using genetic and environmental data, this project will be able to explore associations between individual genotype (which describes individual origin), the environmental conditions experienced, and the migratory routes and timings that are undertaken, and the potential consequences at the individual and population levels.

Kirsty Franklin is a first year PhD student at the University of East Anglia interested in movement ecology and conservation. Her PhD uses a combination of spatial, genetic, demographic, and

ABSTRACTS | POSTERS

Alphabetical order

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environmental data in order to investigate the drivers of ocean movement patterns in Round Island petrels. Kirsty's PhD is the first to be funded by the BOU's John & Pat Warham Studentship Fund.

ECR PRESENTER

The role of physical condition in the carry-over effects between breeding and migration

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Migration and breeding are energetically expensive and often reported to require trade-offs with other physiological processes. Early return to the breeding grounds in high physical quality, particularly in the case of males, is hypothesised to increase the individual's chance to secure and defend a nest and cope with energetic demands of breeding. Moreover, arrival condition is thought to carry over from the costs of previous reproduction or migration strategy. In the Cory's Shearwater (*Calonectris borealis*), a long-lived seabird exhibiting partial migration, early relief from breeding duties due to failure has been associated with earlier moult and altered movement phenology into the following spring. Here, we expand on this knowledge by investigating whether immune function and nutritional condition are tied to the energetic trade-offs of migration and the costs of reproduction. We quantified an array of physical condition indices on Cory's Shearwaters on their arrival to the breeding colony (Selvagem Grande) from return migration, after experimentally manipulating previous breeding success. We found no differences in haptoglobin concentration, natural antibody and complement activity, leukocyte profile, nitric oxide concentration, and size-corrected body mass between experimental and control groups for breeding success or between birds of different migration strategies. Tail feather fault bar frequency, a reflection of acute stress during feather growth, was the only variable to be significantly lower in resident birds. This apparent lack of carry-

ABSTRACTS | POSTERS

Alphabetical order

over effects reflects the possibility of Cory's Shearwater to canalise against energetic costs in their annual cycle.

Marie Claire is a PhD student studying the causes and consequences of individual variability in migratory behaviour of the Cory's Shearwater. Throughout her scientific career she has been working on themes related to movement ecology, physiology, and behaviour, mostly in relation to seabirds.

ECR PRESENTER

Testing the efficiency of Stone-curlew Burhinus oedicnemus management through a landscape-scale experiment

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Stone-curlew *Burhinus oedicnemus* is a Species of European Conservation Concern protected under Annex 1 of the EC Birds Directive (EC 1979) due to historic declines across their European range. In the UK, most pairs breed in arable habitats in Southern and Eastern England, where the population depends upon costly interventions (nest marking and chick rescues) to prevent brood destruction through farming operations. To reduce their reliance on this strategy, conservationists are attempting to increase the number of breeding pairs on 'safe' grassland habitats by creating areas of physically disturbed ground (herein 'grassland plots'). Although this management provides suitable nesting habitat, it is unclear whether it provides a foraging resource, and whether prescription detail matters.

Here, we examine the habitat preferences of five adult Stone-curlew, using GPS loggers, within a grassland-arable matrix comprised of 144 experimental grassland plots (differing in establishment method and disturbance age/frequency). Preliminary results from nocturnal habitat models (when birds feed) suggest that during breeding attempts birds utilise grassland plots, but not exclusively; relying also on arable habitats, including spring-sown crops, pig farms and manure heaps, but avoiding undisturbed grassland and winter-sown crops. Nocturnal habitat selection is similar after brood failure, but grassland plots and spring-sown crops are used to a greater and lesser extent,

ABSTRACTS | POSTERS

Alphabetical order

respectively. During and after breeding the number of daily fixes, per grassland plot, was higher on recently disturbed plots (compared to one-year-old fallows), and on plots closer to the nest/territory centre.

Our results suggest that targeting grassland plots close to preferred arable habitats (spring-sown crops, manure heaps, and pig units), and creating nearby areas of recently-disturbed grassland, will give breeding Stone-curlew access to their preferred foraging habitats. This has important implications for how limited conservation resource is targeted.

Robert Hawkes is a PhD student at the University of East Anglia, UK. His research investigates outcomes of management to support avian figurehead species for other diverse taxonomic groups (plants, beetles, true bugs, ants, bees, wasps and spiders), utilising one of the largest replicated landscape-scale experiments in Europe.

ECR PRESENTER

Do light-level geolocators affect the behaviour and fitness of Common Terns?

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Light-level geolocators are increasingly popular devices for the individual tracking of many migratory bird species. However, for each species, the potential effects of these devices on behaviour and performance should be assessed prior to extensive use. We therefore investigated whether light-level geolocators affected a ~125 g long-distance migratory seabird, the Common Tern *Sterna hirundo*. Using a balanced experimental design, we tested for 48 focal birds (24 geolocator and 24 control birds; 12 ♂ and 12 ♀ each) and their partners, all of known identity and life history, whether geolocators (Intigeo-C65; ~1.3 % of body mass) deployed during early incubation affected subsequent

ABSTRACTS | POSTERS

Alphabetical order

incubation and provisioning behaviour, reproductive performance, phenology and survival. In the year of deployment (2016), we found no evidence for the behaviour of focal birds, or that of their partners, to be affected by the geolocators. Moreover, we found no differences in reproductive performance and departure date from the colony. Finally, neither local survival to 2017 nor arrival date in 2017 differed between focal birds or their partners. Our results therefore show that light-level geolocators can be used for individual tracking of common terns and that any potential effects on the birds' behaviour and fitness are minor.

Nathalie Kürten is a PhD candidate at the Institute of Avian Research with a main research focus on ecology and evolution. She investigates effects of climate, as well as climate change, on migratory strategies of a threatened seabird, the common tern.

Sympatric wintering of Red Kites and Black Kites in southeastern Europe

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Ten juvenile (pulli) Red Kites *Milvus milvus* equipped with GPS/GSM telemetry loggers in nests in central Europe (Austria, Czech Repubic, Slovakia) from 2014 till 2017 and wintering in southeastern Europe were included in the study. These Red Kites occupied winter grounds in Hungary, Croatia and Greece. Birds arrived to winter grounds from 10 July to 12 December and departed from winter

ABSTRACTS | POSTERS

Alphabetical order

ground from 14 February to 22 May, staying at winter grounds from 121 to 229 days. Usually, we found during *in situ* inspection a number of Red Kites wintering together at winter grounds, some of Red Kites wintered alone.

We found Black Kites *Milvus migrans* wintering together with Red Kites at the same winter grounds in 6 out of 14 cases. The numbers of Black Kites wintering together with Red Kites were higher than the number of Red Kites in all Greek winter grounds. In winter grounds in Hungary and Croatia, the numbers of Black Kites were lower than the numbers of Red Kites or Black Kites were lacking. Habitats of all winter grounds were similar: they were located in lowlands with agricultural landscape characterized by small fields, orchards and meadows and small to medium-sized forest patches. Small villages to medium sized cities were nearby.

If we use as a most important marker of the size of a home range Kernel Density Estimate 80% (area of main foraging and roosting activities), we revealed that the size of a home range of Red Kites staying at one place for all winter is from 10 to 108 km^2 and that the size of home range of birds with local shift(s) in winter ground is from 344 to 620 km^2 which is substantially higher than the size of home ranges of Red Kites wintering in central and southwestern Europe published till now.

Ivan Literák is a biologist with a main research focus on wildlife diseases and movement ecology of wild birds, now especially Eurasian raptors. He is particularly interested in kites and their species-habitat interactions and migrations.

ECR PRESENTER

Using citizen science data to understand changes in wader migratory phenology

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Avian species globally are expected to face increased environmental pressures due to anthropogenic climate change. Documenting the responses of individuals and populations to such change is

ABSTRACTS | POSTERS

Alphabetical order

increasingly at the forefront of ecological studies. Migratory species are thought to be particularly susceptible to climate change as they are reliant on distinct geographic regions whose local climate regimes may change differently over time. This has resulted in changes to the timing of migration, an important life history trait to understand as it can have significant knock-on effects for reproductive success and survival.

There have been many studies documenting changes in migratory species' phenology, focussing on both single populations and multiple populations from across a species' range. Although theory suggests that migratory species should advance arrival to the breeding grounds in order to coincide with the earlier onset of spring, studies have often found contradictory results regarding whether the timing of migration has advanced or delayed. The impact of climate change across different species is not well understood, but could reveal important information about how they respond and shed light on their potential to adapt. Using bird sightings data collected from the online resource eBird and changepoint analysis we investigate changes in the timing of spring and autumn migration in forty-six wading bird species from the Nearctic and Afro-Palearctic Flyways. To our knowledge, previous studies of phenology using citizen science have typically worked on relatively small scales, investigating the timing of arrival of a few species to specific locations. We aim to determine whether it is possible to use citizen science data to investigate migratory bird phenology across flyways, rather than at a population level, and to identify any overarching trends in the timing of migration over recent decades.

Thomas Mondain-Monval is a PhD student interested in behavioural, population and conservation ecology, currently focussed on understanding declines in migratory bird species. He is particularly interested in how the behaviour of individuals influences whole-population trends, in order to implement conservation schemes.

ABSTRACTS | POSTERS

Alphabetical order

ECR PRESENTER

Migration and breeding phenology in Common Greenshank: Individual consistency and latitudinal variation revealed by light-level geolocators

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Timing of life-history events such as migration and breeding is commonly variable in wader populations, with departures from wintering grounds and arrival on breeding grounds spanning several weeks. This variation could reflect inter-annual variation in individual phenologies or population-level variation among individuals. Here we explore sources of phenological variation by tracking individuals from one winter location during the breeding season.

We present results from nine Common Greenshank *Tringa nebularia* tagged with geolocators in the Solent, south UK, during autumn or winter. Two birds bred in Scotland; all others migrated to Scandinavia or west Russia during the breeding period, but were spread widely over the area.

Individual migration schedules varied greatly with the latitude at which those individuals bred. During spring migration, more northerly-breeding birds left the Solent later, travelled for longer, and arrived later at their breeding sites. More northerly birds also initiated incubation later. However, the gap between arrival on territory and beginning incubation was shorter for more northerly individuals.

For all individuals, returning migratory travel duration during autumn (from breeding sites to the Solent) was shorter than in spring. Schedules in autumn were less strongly influenced by latitude, and more by events during the breeding season. Timing of spring migration and incubation showed high individual inter-annual consistency relative to the population variance. We also found that individuals tended to incubate consistently diurnally or nocturnally.

ABSTRACTS | POSTERS

Alphabetical order

These results show that wintering flocks contain individuals on very different schedules. These consistent individual differences lead to the variation seen at a population level.

Josh Nightingale is an ecologist with particular interests in waders and migration. He is currently a PhD candidate at the University of Aveiro, studying juvenile waders' settlement decisions and their role in populations' responses to environmental change.

ECR PRESENTER

Radar View on the Adriatic Flyway – First Bird Migration Research Using Radar in NW Balkans

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The Adriatic Flyway through the Balkan Peninsula is quite broad, making it challenging to study and to give estimation on its usage. Also, due to its geopolitical past, large areas in this region are understudied when it comes to bird migration, particularly with relatively novel and costly methodologies, such as radar monitoring.

This study focused on the Podveležje mountain (Bosnia and Herzegovina), where two X-band marine radars were used (horizontal and vertical) to study autumn migration in 2014. Results have shown daily and diurnal difference in migration rate, with two large peaks of nocturnal migration, during the research period. Altitudinal distribution of migration traffic rates has shown that the nocturnal migration peak is between 1000 and 1300 m, while during the daytime most signals were found on much lower altitudes. General direction of the nocturnal migration was N to S and also NE to SW, as expected.

ABSTRACTS | POSTERS

Alphabetical order

These data provide new insight to the usage of the Adriatic Flyway, chiefly for nocturnal migration patterns and intensities. In order to better describe the importance and threats for this flyway, comparison to other flyways is given in this work.

Elena Patčev is an ornithologist with research focus in bird conservation and ecology. Her special interest is radar research of bird migration, focusing on Balkans region and the understudied Adriatic flyway.

ECR PRESENTER

Post-breeding movements of Pink-footed Geese on Svalbard: two routes with different causes and consequences

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Post-breeding movements of Pink-footed Geese on Svalbard have been described for failed and non-breeders, and show that the geese move east and north before moult, presumably avoiding competition with breeders (i.e. in the west) and exploiting areas with later phenology and thus higher food quality. However, for breeders, post-breeding movements are not well-studied even though geese stay on Svalbard 1.5 months after the chicks fledge. We caught groups of breeders and tagged 35 female Pink-footed Geese with GPS-GSM neckband transmitters, in two areas: Longyearbyen (southeast of Isfjorden) and Daudmannsøyra (northwest of Isfjorden). We found that these geese used two main post-breeding routes: via Edgeøya in the east, and via the western Nordenskiöld Land and South Spitsbergen. However, the birds from the western tagging location mainly used the eastern route, and those from the eastern location mainly used the western route. We think that local geography explains this pattern, because geese from Daudmannsøyra moved mainly along the north coast of Isfjorden towards the east, thereby ending up in the valley of Sassendalen that leads them to the east. Geese that migrated east, from both areas, were later in their moult cycle during our catches. In the group from Longyearbyen, those geese that took the eastern route had more chicks.

ABSTRACTS | POSTERS

Alphabetical order

Nevertheless, geese on the eastern route left almost a week earlier for over-sea migration than geese taking the western route. We test if this is a constraint (i.e. does winter start earlier in the east due to the influence of the Arctic Ocean?) or facilitated by a higher food quality in the east (as suggested by the elevation of the areas that the geese actively visited, and by CN-ratio of droppings). These findings suggest that local geography plays an important role for post-breeding movements of Pink-footed Geese on Svalbard.

Kees Schreven is a biologist interested in a variety of systems and eco-evolutionary questions. His focus has been on raptors, waders, skuas, passerines and geese while looking at ageing, foraging decisions, annual timing, copulation behaviour, personality and migration. His PhD project is about the potential of Pink-footed geese to cope with effects of climate change in the Arctic.

ECR PRESENTER

Climatic niche of the Saker Falcon: predicted new areas to direct population surveys in Central Asia

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Accurate species distribution data across remote and extensive geographic areas are difficult to obtain. Here, we use bioclimatic envelope models to determine climatic constraints on the distribution of the migratory Saker Falcon *Falco cherrug* to locate unknown populations in data-deficient regions. Sakers live at low densities, across large ranges in remote regions, making distribution status difficult to assess. We show the utility of Species Distribution Modelling (SDM) to address distribution knowledge gaps, and target surveys for this endangered species.

Using presence-background data and eight bioclimatic variables, we applied the MAXENT algorithm to construct bioclimatic envelope models for both breeding and wintering ranges. Occurrence data were spatially-filtered and climatic variables tested for multicollinearity, before selecting best fit models using Akaike Information Criteria (AIC) by tuning MAXENT parameters. Biogeographical

ABSTRACTS | POSTERS

Alphabetical order

interpretations were based on predicted climatic suitability, response curves and jack-knife tests of variable importance.

Model predictive performance tested using continuous Boyce index (B) was high for both breeding (BTEST = 0.921) and wintering models (BTEST = 0.735), with low omission rates and minimal overfitting. The Sakers' climatic niche was defined by precipitation in the warmest quarter in the breeding range model, and mean temperature in the wettest quarter in the wintering range model. Model predictions identified new areas to guide exploratory surveys in Central Asia, in particular the Qinghai-Tibet plateau in western China.

Our models accurately predict areas of highest climate suitability and define the climatic constraints on a wide-ranging rare species, suggesting that climate is a key determinant of Saker distribution across macro-scales. We recommend targeted population surveys for the Saker based on model predictions to areas of highest climatic suitability in key regions with distribution knowledge gaps. Further applications of our models could identify protected areas and reintroduction sites, inform development conflicts, and assess climate change impacts.

Luke Sutton is a raptor biologist and biogeographer interested in how apex predators function in ecosystems and spatio-temporal patterns of raptor distributions. He is particularly interested in using spatial models to identify unknown populations of endangered raptors, and to assess the potential impact of climate change on raptor distributions.

ECR PRESENTER

Discovering the new population of Black-tailed Godwits alone East Asia – Australasian Flyway

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ABSTRACTS | POSTERS

Alphabetical order

Black-tailed Godwits *limosa limosa* are widely distributed in the Palearctic realm. In China, each year more than 20.000 Black-tailed Godwits stage at the northern part of Bohai Bay in order to refuel for subsequent northward migration. However, there is little knowledge about this staging-population: to which subspecies do they belong? where is their breeding/wintering grounds, do they stopover after leaving Bohai Bay?

In order to investigate this, we compared the morphometrics of this population with all known *Limosa limosa* subspecies, tracked 21 individuals with high-resolution GPS-trackers and evaluated the genetic similarity of this staging-population with the other known subspecies.

Overall, Black-tailed Godwit in Bohai Bay was larger than *Limosa limosa melanuroides*, it is the only subspecies ever recorded within this flyway, GPS-tracking revealed that the distribution of Black-tailed Godwits from Bohai Bay is not overlapping with *melanuroides,* and lastly, we found a unique haplotype of Bohai Bay population on its mitochondrial control region which could distinguish them out of 3 known subspecies . By taking into account these findings we will discuss whether Black-tailed Godwits in Bohai Bay should be classified as a new subspecies.

Bingrun Zhu (Drew) is an ornithology/ecology major Ph.D. candidate, his research focuses on a specific population of wader species (black-tailed godwit) in East Asian - Australasian Flyway (EAAF), and describe this population through the perspectives of morphology, migration and molecular.