Abstracts

EOU 2023

LUNDS UNIVERSITET

14TH EUROPEAN ORNITHOLOGISTS' UNION CONGRESS | DEPARTMENT OF BIOLOGY| LUND UNIVERSITY

Acceptance type: Oral presentation

14

Bird migration modelling in Finland using citizen science, population data and weather prediction model

Nadja Weisshaupt ORCID iD, Miguel Aldana, Heikki Myllykoski, Jarmo Koistinen ORCID iD

Finnish Meteorological Institute, Helsinki, Finland

Abstract

Human wild-life conflicts are expected to increase as human activity and infrastructures expands skywards interfering with aerial habitat of countless birds. Prediction services based on environmental modelling for, e.g., aviation and wind power production, so-called ecological forecasting, can help mitigate the impact of such developments on aerofauna and human activities. The Finnish Meteorological Institute has developed a bird migration model predicting the presence and passage of the 115 most abundant species assigned to six migration types in the Finnish airspace. It provides 2-days (66 h) forecasts and is updated on a 3-hour cycle in a domain of 850 x 1350 km2. Bird populations are estimated from line transect and migration count data and their phenological daily numbers derived from a large sample of citizen science data. The hourly numbers of resting or migrating individuals are estimated based on gridded weather conditions with a resolution of 10 x 10 km2 available from the numerical weather prediction model Harmonie. Weather forcing on migration at 16 altitude levels is obtained using fuzzy logic membership functions related to wind, visibility, precipitation, clouds and temperature. Behavioural species-specific functions of flight altitude and response to land, coast and sea regions are included as well. As a partial validation to the forecast, a service is utilized, showing real-time bird migration as quantified by the polarimetric weather radar network of FMI consisting of 11 weather radar systems.

Synopsis

Gridded bird migration model in Finland coupled with citizen science, population data and numerical weather prediction model

Twitter handle

naweisshaupt

15

Inferring whole-organism metabolic rate from red blood cells in birds

Kasja Malkoc ORCID iD, Stefania Casagrande, Michaela Hau

Max Planck Institute for Biological Intelligence, Seewiesen, Germany

Abstract

Metabolic rate quantifies the energy expenditure needed to fuel almost all biological processes in an organism. Metabolic rates are typically measured at the whole-organism level (woMR) but these protocols are often impractical in field conditions and can elicit stress responses due to handling and confinement, potentially biasing resulting data. Recently, techniques to measure cellular metabolic rate (cMR) in mitochondria of blood cells have become available, suggesting that blood-based cMR – a measure unlikely affected by stress responses if blood samples are collected immediately after capture – can be a proxy of organismal aerobic performance. Using captive Great Tits Parus major, we tested the hypothesis that blood-based cMR correlates with woMR, by combining repeated blood sampling and respirometry during day-time to reflect ecologically relevant conditions. From blood samples, we measured erythrocyte cMR and plasma corticosterone concentrations. Despite the additional variance introduced by collecting MR measurements during the active phase, birds that had relatively low corticosterone concentrations, and displayed little locomotor activity throughout respirometry showed a positive correlation between cMR and woMR. By contrast, woMR and cMR covaried negatively in birds that increased corticosterone concentrations and activity levels substantially. Our findings highlight the importance of accounting for individual stress responses when measuring metabolic rate at any level. More importantly, they provide the first direct evidence that metabolism measured in a systemic tissue like blood can be informative of the overall metabolic status of an individual, making blood-based cMR a potentially suitable measure for field metabolic rates in birds.

Synopsis

A drop of blood can tell how fast the metabolism of the whole organism is!

Twitter handle

@KasjaMalkoc

20

Does urbanisation lead to poor health? A global meta-analysis on birds

Rachel Reid, Davide Dominoni, Jelle Boonekamp, Pablo Capilla Lasheras

University of Glasgow, Glasgow, United Kingdom

Abstract

Associated with the growing human population, urbanisation has been increasing at an unprecedented rate the last century. Animals inhabiting urban areas face many novel and unique stressors, such as chemical, air, light and noise pollution as well as increased human presence and anthropogenic food sources. This has the potential to impact the morphological, physiological, and behavioural traits of organisms. While such impacts have been suggested to translate to poorer health in urban individuals compared to rural conspecifics, a current challenge in urban ecology is to synthesise the available evidence and assess the link between urbanisation and health. Health remains a difficult concept to define and measure in wild organisms as it is a multivariate trait, therefore there needs to be a better understanding of how urbanisation impacts different biomarkers of health. We have conducted a meta-analysis using 651 effect sizes on 16 health biomarkers from 54 bird species in urban and rural habitats of 25 countries. In our contribution we will present and discuss the results of our meta-analysis. Preliminary analyses show that urbanisation impacts biomarkers of health in different ways, making it hard to see an overall effect on health. This relationship also depends on species and the life stage. More studies are needed from developing countries, where urbanisation has been increasing the most over the last decade.

Synopsis

Does urbanisation lead to poorer health in birds species? A global meta-analysis was conducted to investigate this relationship.

Twitter handle

@rachelrosereid3

23

Vegetation greenness and microclimate refugia influence the migration timings of a threatened grassland bird

Rita Ramos ORCID iD[1,2,3,4,5], Aldina M.A. Franco ORCID iD[1], James J. Gilroy ORCID iD[1], João P. Silva ORCID iD[2,3,4]

[1]University of East Anglia, Norwich, United Kingdom. [2]CIBIO/InBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, Laboratório Associado, Universidade do Porto, Campus Agrário de Vairão, Vairão, Portugal. [3]CIBIO/InBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, Laboratório Associado, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, Lisbon, Portugal. [4]Associação BIOPOLIS, Vairão, Portugal. [5]Departamento Biologia, Faculdade de Ciências, Universidade do Porto, Porto, Portugal

Abstract

Seasonality and resource depletion are known to influence the migratory behaviour of animals. However, within species and populations there can be variability in the movement strategy individuals adopt as well as in their migratory timing and distance. Both intrinsic and environment factors affect individual decisions but the environmental cues that determine migratory behaviour have rarely been examined at the scale individuals experience them limiting our ability to understand the mechanisms underlying variability within populations.

This study combines high-spatial and temporal resolution environmental information with 11-year GPS tracking data to identify the contribution of micro-scale environmental determinants on the migratory behaviour of the little bustards a partial migrant threatened grassland bird. We aimed to determine (i) the level of individual consistency in migratory behaviour (timing and distance) and (ii) the influence of microclimate refugia availability on the timing of migration to and from post-breeding sites.

Migratory distance was consistent for birds tracked over multiple years however, there was high variability in departure dates from breeding areas, which spanned from May to August, and some birds never abandoned their breeding areas.

Individuals in sites with higher values of vegetation greenness (NDVI) (proxy of food availability) and microclimate refugia availability spent more time in the breeding areas. Birds exposed to low-intermediate temperatures in areas with higher availability of microclimate refugia had a prolonged stay in the breeding area. Microclimate refugia combine with green vegetation are associated with prolonged stays at breeding areas for little bustards and should be considered when planning conservation actions.

Synopsis

#Vegetation greenness and microclimate #refugia influence the #migration timings of the endangered little bustard

Twitter handle

@RitaafRamos

24

Avalanche create unique habitats for birds in the Alps

Riccardo Alba[1], Ludovica Oddi[1], Domenico Rosselli[2], Dan Chamberlain[1]

[1]University of Turin, Turin, Italy. [2]Ente di Gestione delle Aree Protette delle Alpi Cozie, Salbertand, Italy

Abstract

Mountain regions harbour ecosystems that have been historically shaped by interactions between natural processes and human activities, but nowadays are threatened by global changes. Avalanches are one of the main sources of natural disturbance in mountains, creating habitat mosaics with a high vegetation heterogeneity that can be exploited by animal species. Since snow precipitation regimes in mountain regions will be altered by climate change, it is fundamental to study the interactions between avalanches and biodiversity. We carried out surveys on 240 points to study birds and habitats in the Western Italian Alps to assess the differences in habitat and bird assemblage composition and ecological traits between avalanche tracks and control points. Differences in both habitat and in bird assemblages were more pronounced at lower elevations and became less obvious towards alpine grasslands. Avalanche tracks were characterized by a higher structural vegetation diversity with a greater cover of rocks, shrubs and a higher number of small trees. Bird assemblages differed between avalanche tracks and adjacent control points, with the former being more diverse and characterised by a higher proportion of species typical of open habitats. Importantly, the avalanche track bird assemblage differed from both forest and treeline ecotone assemblages, showing that these heterogeneous areas are unique, harbouring a mixture of species from different habitats. Future environmental change that may affect the frequency of avalanches has the potential to affect broader-scale diversity in mountains, and hence should be a priority for alpine ecological research.

Synopsis

Avalanches in the Alps create habitat mosaics that host high biodiversity and act as refugia for threatened open habitat birds

Twitter handle

rickyalba26

26

Impacts of arbovirus outbreaks on wild bird populations in the Netherlands

Jurrian van Irsel[1,2], Henk van der Jeugd[1], Fred de Boer[3], Kevin Matson[3], Ruud Foppen[4,2]

[1]Vogeltrekstation – Dutch Centre for Avian Migration and Demography, NIOO-KNAW, Wageningen, Netherlands. [2]Department of Animal Ecology and Ecophysiology, Institute for Water and Wetland Research, Radboud University, Nijmegen, Netherlands. [3]Wildlife Ecology and Conservation Group, Wageningen University, Wageningen, Netherlands. [4]Sovon – Dutch Centre for Field Ornithology, Nijmegen, Netherlands

Abstract

Recent outbreaks of the mosquito-borne West Nile virus (WNV) and Usutu virus (USUV) led to significant increases in avian mortality worldwide. USUV was first detected in the Netherlands in August 2016 in Common blackbirds, and since then, infections have been detected in more than 20 bird species. Thus far, only few studies have attempted to assess the large-scale impact of these pathogens on bird populations. However, these studies used datasets with questionable reliability and the results were inconclusive. We conducted a study to assess the impact of USUV on breeding bird populations in the Netherlands. To account for potential sampling bias, we will use bird monitoring data from two different schemes to investigate population changes in a range of European breeding bird species in USUV occurrence areas. The occurrence of USUV will be determined based on surveillance data from both live and dead birds. Using the Common blackbird as a proxy for the overall risk of USUV circulation we will explore the strengths and weaknesses of each monitoring scheme in detecting population patterns using linear and hierarchical Bayesian models. Subsequently, we will investigate the impact of USUV on avian populations in other bird species, taking into account immunity effects. The results of this study will help us understand the effectiveness of the Dutch surveillance system in identifying species at risk for pathogen infections and identifying potential sentinel host species that may be involved in the local transmission/amplification cycle.

Synopsis

"NA"

Twitter handle

JurrianvanIrsel

30

Where have all the petrels gone? 40 years of environmental change and population dynamics of Wilson's storm-petrels

Anne Ausems ORCID iD[1,2], Nadja Kuepper ORCID iD[2], Diego Archuby[3,4], Christina Braun[5], Andrzej Gębczyński[6], Anja Gladbach[5,7], Steffen Hahn ORCID iD[5,8], Piotr Jadwiszczak ORCID iD[6], Philipp Kraemer[2], Marcela Libertelli ORCID iD[3], Stefan Lorenz ORCID iD[5,9], Benjamin Richter[2], Anja Ruß ORCID iD[5,10], Tim Schmoll ORCID iD[5,11], Simon Thorn ORCID iD[2,12], John Turner[13], Katarzyna Wojczulanis-Jakubas ORCID iD[1], Dariusz Jakubas ORCID iD[1], Petra Quillfeldt ORCID iD[5,2]

[1]University of Gdansk, Gdansk, Poland. [2]Justus Liebig University Giessen, Giessen, Germany. [3]Instituto Antártico Argentino, Buenos Aires, Argentina. [4]Universidad Nacional de La Plata, La Plata, Argentina. [5]Friedrich Schiller University Jena, Jena, Germany. [6]University of Białystok, Białystok, Poland. [7]Bayer AG, Monheim, Germany. [8]Swiss Ornithological Institute, Sempach, Switzerland. [9]Julius Kühn Institue, Berlin, Germany. [10]tier3 solutions GmbH, Leverkusen, Germany. [11]Bielefeld University, Bielefeld, Germany. [12]Julius-Maximilians-University Würzburg, Rauhenebrach, Germany. [13]British Antarctic Survey, Cambridge, United Kingdom

Abstract

Numerous seabird species are experiencing population declines, and this trend is expected to continue and accelerate in the future. To understand the effects of environmental change on seabird populations, long-term studies are vital. Here, we present over four decades (1979-2020) of population dynamic and reproductive performance data of Wilson's storm-petrels (*Oceanites oceanicus*) from King George Island (Isla 25 de Mayo), Maritime Antarctic. We determined trends in population size, reproductive performance, and chick growth rates, and related interannual variation to environmental conditions. Our analysis revealed a substantial local decline of up to 90% in the population size of Wilson's storm-petrels, and significant temporal changes in reproductive performance and chick growth rates. We show that these changes in reproductive performance are generally linked to variation in environmental conditions, either in food availability (particularly Antarctic krill, *Euphausia superba*) or in nest burrow accessibility due to snow blocking the entrance. With the expected rise in air and sea surface temperatures, the predicted increases in precipitation over the Antarctic Peninsula will likely lead to increased snowstorm prevalence. Additionally, the rising temperatures will likely reduce food availability due to reduced sea ice cover in the wintering grounds of Antarctic krill, or by changing phyto- and zooplankton community compositions. The ongoing environmental changes may thus lead to further population declines, or at the very least will not allow the population to recover. Monitoring the population dynamics of Antarctic seabirds is vital for our understanding of climate change-induced changes and its consequences for Antarctic food webs.

Synopsis

Wilson's storm-petrel population crash (up to 90% decline) in Maritime Antarctic linked to changes in environmental conditions.

Twitter handle

@AnneAusems

38

Blood oxygen-carrying capacity and foraging behaviour in a colonial gull: an experimental study

Piotr Minias[1], Maciej Kamiński[1], Tomasz Janiszewski[1], Piotr Indykiewicz[2], Jarosław Kowalski[2], Dariusz Jakubas[3]

[1]University of Lodz, Lodz, Poland. [2]UTP University of Science and Technology, Bydgoszcz, Poland. [3]University of Gdansk, Gdansk, Poland

Abstract

Blood oxygen-carrying capacity is a key component of oxidative metabolism, as it primarily determines aerobic performance of an organism. However, experimental manipulations of blood oxygen-carrying capacity in natural avian populations are scarce. Here, we report the results of an experimental manipulation of blood oxygen-carrying capacity in a colonial waterbird, the black-headed gull Chroicocephalus ridibundus. Experimental procedures were combined with GPS-tracking to test for the associations between aerobic capacity and foraging behaviour in gulls. We used phenylhydrazine (PHZ) treatment to reduce individual aerobic capacity and our validation revealed significant post-treatment reductions in haematocrit and blood haemoglobin concentration. GPS-tracking of experimental (PHZ-treated) and control (saline-treated) gulls during the incubation period provided no support for decreased total investment in energetically costly activities (long-distance foraging trips) by experimental birds. In contrast, we found evidence for fine-scale alterations in foraging behaviour of PHZ-treated individuals, as their foraging trips were less frequent, longer and more distant compared to control birds. We speculate that these differences may reflect reduced foraging performance of experimental birds. Our study provides a rare non-correlative support for the physiological effects of blood oxygen-carrying capacity on key components of bird ecology.

Synopsis

NA

47

Heatwaves impair reproduction in a Mediterranean raptor

Alejandro Corregidor-Castro ORCID iD[1], Jennifer Morinay[2,3], Susan E. McKinlay[4], Samuele Ramellini[4,5], Alexandra Glavaschi[1], Enrico L. De Capua[6], Alessandro Grapputo[1], Andrea Romano[4], Michelangelo Morganti[7], Jacopo G. Cecere[2], Andrea Pilastro[1], Diego Rubolini[4,5]

[1]Dipartimento di Biologia, Università di Padova, Padova, Italy. [2]Area Avifauna Migratrice, Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Ozzano Emilia, Italy. [3]Centre for Biodiversity Dynamics, Institutt for Biologi, NTNU, Gløshaugen, Norway. [4]Dipartimento di Scienze e Politiche Ambientali, Milano, Italy. [5]Consiglio Nazionale delle Ricerche – Istituto di Ricerca sulle Acque (CNR-IRSA), Bruggherio, Italy. [6]Provincia di Matera – Parco della Murgia Materana, Matera, Italy. [7]Consiglio Nazionale delle Ricerche – Istituto di Ricerca sulle Acque (CNR-IRSA), Brugherio, Italy

Abstract

Future climatic scenarios forecast increments in average temperatures and in both frequency and magnitude of extreme events, such as heatwaves. Whereas animals' behavioral adjustments could buffer direct physiological and fitness costs of exposure to excessive ambient temperature (T_a), such an option may not exist during specific phases of the life cycle where vagility is reduced (e.g. egg or nestling stages). We investigated the effects of extreme air temperatures (T_{air}) on reproduction in a cavity-nesting raptor from the Mediterranean region, the lesser kestrel (*Falco naumanni*). We performed a nest-cooling experiment to investigate the effects of elevated T_a within breeding cavities (nestboxes placed on rooftops) on hatching success as well as on nestling survival and morphological development. To reduce T_a, nestboxes were shaded to prevent direct sunlight exposure. T_a in shaded nestboxes was substantially lower (ca. 4°C) than in control nestboxes. Hatching success declined with increasing T_a during hatching, where maximum temperatures in the nest above 44°C predicted a >50% hatching failure. Shading markedly reduced nestling mortality during heatwaves (~10% vs. ~55% in control nestboxes). Shading also enhanced early nestling growth and plumage development of surviving nestlings. Our results demonstrate that heatwaves occurring during the breeding period can have strong negative impacts on different components of avian reproduction, from egg hatching to nestling fledging. More broadly, these findings suggest that the projected future increases of summer temperatures and heatwaves frequency in the Mediterranean basin and elsewhere in the Northern Hemisphere may threaten the local persistence of even relatively warm-adapted species.

Synopsis

High temperatures during heatwaves induce hatching failure and nestling mortality in a Mediterranean raptor, the Lesser Kestrel

Twitter handle

@AlexCoCastro

51

Effects of urbanization and malaria infection on the oxidative status of wild birds

Jéssica Jiménez-Peñuela ORCID iD[1,2], Martina Ferraguti ORCID iD[3], Josué Martínez-de la Puente ORCID iD[4], Ramón Soriguer ORCID iD[2], Jordi Figuerola ORCID iD[2]

[1]Instituto de Recursos Cinegéticos (IREC-CSIC-UCLM-JCCM), Ciudad Real, Spain. [2]Estación Biológica de Doñana (EBD-CSIC), Sevilla, Spain. [3]Department of Theoretical and Computational Ecology (TCE), Institute for Biodiversity and Ecosystem Dynamics (IBED), University of Amsterdam, Amsterdam, Netherlands. [4]Department of Parasitology, University of Granada, Granada, Spain

Abstract

Urbanization and parasite infection are both important sources of reactive oxygen species (ROS) which cause oxidative damage to biomolecules with different harmful effects on wildlife health, but the potential synergies between both factors are poorly known. We analysed the oxidative stress status of 688 wild house sparrows (*Passer domesticus*) captured at 45 localities from southern Spain grouped in triplets including an urban, a rural and a natural habitat. We also studied the effects of the infection status by three common blood parasites (*Plasmodium*, *Haemoproteus* and *Leucocytozoon*) and bird body condition. The oxidative stress status of birds was measured by analysing the oxidative damage to lipids through the level of thiobarbituric acid reactive substances (TBARS) and bird's antioxidant capacity through the activity of three antioxidant enzymes named glutathione peroxidase (GPx), superoxide dismutase (SOD) and glutathione reductase (GR). Our results suggest that both urbanization (marginally) and malaria infection (significantly) affect the oxidative status of wild birds. Urban birds and those infected with *Haemoproteus* showed higher levels of TBARS than rural and uninfected birds. The relationship between TBARS and body condition was negative for urban and *Haemoproteus-infected* birds but positive por nonurban and uninfected birds. *Plasmodium*-infected birds had lower antioxidant activity than in uninfected ones while individuals with higher body condition had higher GPx and SOD activity in relation to a lower GR activity. Overall, these results highlight the role of bird's body condition on the regulation of the oxidative stress status under scenario of anthropogenic landscape alteration and malaria infection.

Synopsis

How habitat #Anthropization #AvianMalaria infection and bird's #BodyCondition affect the #OxidativeStatus of wild #HouseSparrows

Twitter handle

@JJimenezPenuela

52

Expanding ranges in sociable species of conservation concern: 30 years of corn bunting (*Emberiza calandra*) monitoring in Scotland show range decreases which are not regained even as populations recover

Will Cresswell ORCID iD, Sorcha Wood, Sam Barrett, Clarice Yan Pei Ling

University of St Andrews, St Andrews, United Kingdom

Abstract

Corn buntings are a widespread European farmland bird species of conservation concern. Many populations have declined but some have increased after conservation interventions to increase quality of nesting and wintering habitat and to reduce nest mortality due to harvesting. We report on an isolated population of corn buntings in south-east Scotland (Fife) that has been monitored by citizen science for the last 30 years. Initially a severe decline in numbers and range was documented from 1992 to 2006, leaving fewer than 80 territories. After conservation interventions the population began to increase, with 373 territories recorded in 2022, but without any major increase in range compared to years with the lowest territory counts. Here we analyse the potential reasons for this: how habitat requirements, breeding system, nesting success and particularly social facilitation (all measured across the entire population in 2021 & 2022) lead to clustering of territories and high densities with an increasing population rather than an increased range. The results have implications for management of corn buntings and the conservation of other socially facilitated species with reduced range.

Synopsis

30 years of corn bunting monitoring in Scotland show range decreases which are not regained even as populations recover

Twitter handle

NA

54

Combining radio-telemetry and radar measurements to test aerial optimal foraging of an insectivore and its insect prey

Itai Bloch[1], David Troupin[1], Sivan Toledo[2], Ran Nathan[3], Nir Sapir[1]

[1]University of Haifa, Haifa, Israel. [2]Tel-Aviv University, Tel-Aviv, Israel. [3]The Hebrew University of Jerusalem, Jerusalem, Israel

Abstract

Foraging animals are known to vary their movement in relation to prey abundance in terrestrial and marine environments. Yet, due to technological and logistical limitations, aerial foraging and factors affecting it have only been rarely studied. By uniquely using BirdScan-MR1 radar to estimate the Movement Traffic Rate (MTR) of insects over the Hula Valley in northeastern Israel and the ATLAS biotelemetry system to track foraging movements of breeding Little swifts (*Apus affinis*), we explored how the movement and behavior of aerial insectivores varied in relation the dynamics of their insect prey. We found that insect MTR varied between different days by more than an order of magnitude and that the mean and the maximum flight distance of the birds from the breeding colony significantly decreased on days with higher insect MTR. We found a positive effect of insect MTR on the distance between individuals but no effect of insect MTR on the flight speed of the birds during foraging flights. The frequency of colony visits and the duration of the visits increased on days with higher insect MTR. The morning departure from the colony was delayed in days with higher insect MTR, but the evening arrival time was not affected.

The study suggests that Little swifts optimize their movement and behavior in relation to aerial insect abundance by altering several key foraging properties, with possible consequences for swift breeding and population dynamics.

Synopsis

Using advanced tracking systems to examine the foraging suitability of aerial insectivores to the abundance of insects

Twitter handle

Animal Flight Lab

57

Different foraging activities of the Common Tern along the eastern and western flyways

Željko Pavlinec ORCID iD[1], Ana Galov ORCID iD[2], Veronika Lončar ORCID iD[2], Vesna Tutiš ORCID iD[1], Sanja Barišić ORCID iD[1], Davor Ćiković ORCID iD[1], Luka Jurinović ORCID iD[3], Jelena Kralj ORCID iD[1]

[1]Croatian Academy of Sciences and Arts, Zagreb, Croatia. [2]Faculty of Science, University of Zagreb, Zagreb, Croatia. [3]Croatian Veterinary Institute, Zagreb, Croatia

Abstract

Long-distance migration can potentially have strong carryover effects, which may vary among populations using different flyways. This study aims to shed light on the migration patterns of the Common Tern (*Sterna hirundo*), a seabird that is common along coastlines all over the globe. Using light-level geolocation and immersion data, we compared the migration patterns of two populations of terns breeding in Croatia, one coastal and one inland. We analyzed their use of stopover sites during migration and foraging activities during the migration and wintering period. Monthly marine productivity data for stopovers and wintering areas were downloaded from the Ocean productivity webpage. Terns from the coastal colonies used the west African migration route with wintering areas between Mauritania and Nigeria, while terns from the inland colonies used the east African migration route, wintering between Tanzania and south Mozambique Channel. The primary production in wintering areas was higher along the western African coast, compared to the eastern African coast, and terns wintering along western African coasts spent less time foraging during winter. During autumn migration, birds from both populations spent more time foraging at stopover sites than while travelling, but the same was not observed for the spring migration. Compared to autumn migration, spring migration stopover periods were significantly shorter. The difference in primary production between the two wintering areas was compensated by longer foraging time in eastern wintering areas, and spring migration did not show the difference between the two populations in the stopovers duration or the length of total migration.

Synopsis

NA

58

Migratory swans adjust their wintering area to a warming climate

Hans Linssen ORCID iD

University of Amsterdam, Amsterdam, Netherlands. Netherlands Institute of Ecology, Wageningen, Netherlands

Abstract

Migratory animals are strongly affected by climate warming because they inhabit multiple geographic areas where changes can occur to a different extent and at different rates. Although climate warming effects on spring migration and breeding ecology in migratory birds have been studied extensively, much less is known about the influence on autumn migration and wintering area choice. The Bewick's swan (*Cygnus columbianus bewickii*) is a large migratory waterbird whose wintering area has shifted more than 350 km closer to the breeding ground since 1970 due to shortened autumn migration. We use multi-year GPS tracking data to study to what extent Bewick's swan autumn migration is driven by temperature and wind conditions encountered on a daily basis, and whether the observed shift in wintering area can be explained by a warming climate. We show that stopover departure in autumn is driven by favourable winds early in the season and by low temperatures throughout the season. As a result, individuals spend milder winters closer to the breeding ground (on average 113 km per °C mean December-January temperature). Our results imply strong individual flexibility to climate warming in the non-breeding season in terms of wintering area selection. Climate-driven distribution shifts and consequential changes in local abundance have large implications for conservation management along the migratory route. Our study adds to our understanding of the processes that shape autumn migration decisions and wintering distributions, which is crucial in predicting how climate and land use may impact these processes in the future.

Synopsis

Migratory swans adjust their wintering area to a warming climate

Twitter handle

HansLinssen1994

59

Unravelling the scale of illegal online trade of bird species

Andrea Soriano-Redondo ORCID iD, Haider Alwasiti, Ritwik Kulkarni, Ricardo Correia, Sofiya Bryukhova, Enrico Di Minin

University of Helsinki, Helsinki, Finland

Abstract

Illegal wildlife trade is widespread and affects thousands of species, and the Internet has multiplied trading opportunities. Yet attempts to quantify online wildlife trade have mainly focused on few platforms and taxonomic groups. Here, we use automated methods for data collection and analysis to study the prevalence of illegal wildlife trade across four digital platforms, namely Google, Twitter, YouTube, and Flickr, and for 163 bird species included in Appendix I of CITES, for which international trade is prohibited. We detected 8.9 million potential trade advertisements, 1.4 from Google, 2.8 from Twitter, 4.3 from YouTube, and 0.2 from Flickr, belonging to 142 species. We characterize the magnitude of online trade for the affected bird species and evaluate the subsequent effects on their conservation. Scaling up these studies to more bird species is key to understanding the extent of digital trade across the globe and ensure the conservation of affected species.

Synopsis

Unravelling the scale of illegal online trade of bird species

Twitter handle

@SorianoRedondo

60

Increasing winter temperatures explain declines in body size of boreal birds

Laura Bosco ORCID iD[1], Andreas Otterbeck[1], Thord Fransson[2], Andreas Lindén[3], Markus Piha[3], Aleksi Lehikoinen[1]

[1]The Helsinki Lab of Ornithology, Finnish Museum of Natural History, University of Helsinki, Helsinki, Finland. [2]Department of Environmental Research and Monitoring, Swedish Museum of Natural History, Stockholm, Sweden. [3]Natural Resources Institute Finland (Luke), Helsinki, Finland

Abstract

Body size of individuals is typically increasing towards colder and higher latitudes, as larger body size is known to be a thermoregulatory adaptation to colder circumstances. We explored the spatio–temporal changes in wing length and body weight of 24 wintering bird species in Northern Europe (Sweden and Finland) and how they are related to annual changes in winter temperature. Making use of accurate ringing locations over 1500 km along the latitudinal axis, we further were able to investigate varying response patterns along the spatio–climatic gradient. We show that across all species, body size has decreased since the 1970s. We found a negative relationship between wing length and temperature anomalies of previous winters, suggesting carry over effects likely linked with body size–related survival or dispersal. Body weight was negatively related with the temperature anomaly of the same winter, indicating more immediate effects related to reduced fat reserves during mild winters. Our study further shows that different morphometrics vary in their spatio–climatic pattern, where wing lengths did not show a clear response across species within our study area, while for body weight we found that the warmer, more southerly located, the heavier the birds were. Our results highlight climate–driven decrease in body size across several species and its' association with annual variation in winter temperature in the high latitudes.

Synopsis

Climate–driven decrease in body size of boreal birds is driven by annual variation in winter temperature in the high latitudes

Twitter handle

@LullulaBosco

62

Multi-sensor geolocators unveil global and local movements in an Alpine-breeding long-distance migrant

Yann Rime[1,2], Raphaël Nussbaumer[3], Martins Briedis[1,4], Martha Maria Sander[5], Dan Chamberlain[5], Valentin Amrhein[2,1], Barbara Helm[1], Felix Liechti[1], Christoph M. Meier[1]

[1]Swiss ornithological institute, Sempach, Switzerland. [2]Department of Environmental Sciences, Zoology, University of Basel, Basel, Switzerland. [3]Cornell Lab of Ornithology, Ithaca, USA. [4]University of Latvia, Institute of Biology, Riga, Latvia. [5]University of Turin, Department of Life Sciences and Systems Biology, Turin, Italy

Abstract

To understand the ecology of long-distance migratory bird species, it is necessary to study their full annual cycle, including migratory routes and stopovers, but also local movements. This is especially important for species in high-elevation habitats that are particularly vulnerable to environmental change. The Northern Wheatear Oenanthe oenanthe is one of the few high-alpine birds migrating south of the Sahara. We tagged individuals from the central-European alpine population with multi-sensor loggers recording atmospheric pressure and light intensity. We modelled migration routes and identified stopover and non-breeding sites by correlating the atmospheric pressure measured on the birds with global atmospheric pressure data. Furthermore, we described migratory flights during autumn and spring migration. Migratory flights were typically nocturnal and characterized by fluctuating flight altitudes, frequently reaching elevations between 2000 and 4000 m, up to 5150 m above the sea level. Barrier crossing flights, i.e., above the Mediterranean Sea and the Sahara Desert, were longer, higher, and faster. In addition to this new insight into migratory behaviour and positioning throughout the annual cycle, we detected altitudinal movements at the breeding site in response to local meteorological hazards during the pre-breeding period, as well as unexpected diel commuting towards roosting sites at cliffs near the breeding territory. Our data describe both local and global scale movement, calling for a wider use of multi-sensor loggers in songbird migration research.

Synopsis

Multi-sensor loggers reveal local and global movements in an Alpine-breeding long-distance migrant, the Northern Wheatear

Twitter handle

NA

67

Human and time-related impacts on avian malaria infections in native and introduced populations of house sparrows (*Passer domesticus*)

Martina Ferraguti ORCID iD[1], Sergio Magallanes ORCID iD[1], Jéssica Jiménez-Peñuela[2,1], Josué Martínez-de la Puente[3], Luz García-Longoria[4], Jordi Figuerola[1], Jaime Muriel[5], Tamer Albayrak[6], Staffan Bensch[7], Camille Bonneaud[8], Rohan H. Clarke[9], Gábor Árpád Czirják[10], Dimitar Dimitrov[10], Kathya Espinoza-Ramirez[11], John G. Ewen[12], Farah Ishtiaq[13], Wendy Flores-Saavedra Flores-Saavedra[14,11], László Zsolt Garamszegi[15], Olof Hellgren[7], Dita Horakova[16], Kathryn P. Huyvaert[17,18], Henrik Jensen[19], Asta Krizanauskiene[20], Marcos R. Lima[21], Charlene Lujan-Vega[22], Eyðfinn Magnussen[23], Lynn B. Martin[24], Kevin D. Matson[25], Anders Pape Møller[26], Pavel Munclinger[27], Vaidas Palinauskas[28], Peter Laszlo Pap[29], Javier Pérez-Tris[30], Swen C. Renner[31], Robert Ricklefs[32], Sergio Scebba[33], Ravinder N.M. Sehgal[34], Manuel Soler[5], Eszter Szöllősi[35], Gediminas Valkiūnas[28], Helena Westerdahl[7], Pavel Zethindjiev[36], Alfonso Marzal[4]

[1]Doñana Biological Station (EBD-CSIC), Seville, Spain. [2]Instituto de Recursos Cinegéticos (IREC-CSIC-UCLM-JCCM), Ciudad Real, Spain. [3]University of Granada (UGR), Granada, Spain. [4]University of Extremadura, Badajoz, Spain. [5]University of Granada, Granada, Spain. [6]Burdur Mehmet Akif Ersoy University, Burdur, Turkey. [7]Lund University, Lund, Sweden. [8]University of Exeter, Penryn, United Kingdom. [9]Monash University, Clayton, Australia. [10]Bulgarian Academy of Sciences, Sofia, Bulgaria. [11]Universidad Científica del Sur, Lima, Peru. [12]Institute of Zoology, Zoological Society of London, London, United Kingdom. [13]Tata Institute for Genetics and Society, Bangalore, India. [14]Universidad Nacional Agraria la Molina, Lima, Peru. [15]Institute of Ecology and Botany, Centre for Ecological Research, Vácrátót, Hungary. [16]Czech Society of Ornithology, Prague, Czech Republic. [17]Colorado State University, Colorado, USA. [18]Washington State University, Colorado, USA. [19]Norwegian University of Science and Technology, Trondheim, Norway. [20]University, Vilnius, Lithuania. [21]State University of Londrina, Londrina, Brazil. [22]University of California, California, USA. [23]University of the Faroe Islands, Torshavn, Faroe Islands. [24]University of South Florida, Tampa, Spain. [25]Wageningen University & Research, Wageningen, Netherlands. [26]Université Paris-Sud, Orsay Cedex, France. [27]Charles University, Prague, Czech Republic. [28]Nature Research Centre, Institute of Ecology, Vilnius, Lithuania. [29]Babeş-Bolyai University, Cluj-Napoca, Romania. [30]Complutense University of Madrid, Madrid, Spain. [31]Ornithology, Natural History Museum, Vienna, Austria. [32]University of Missouri-St. Louis, St. Louis, USA. [33]Gruppo Inanellamento Limicoli, Naples, Italy. [34]San Francisco State University, San Francisco, Spain. [35]Eötvös Loránd University, Budapest, Hungary. [36]Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia, Bulgaria

Abstract

The increasing spread of vector-borne diseases has resulted in severe health concerns for humans, domestic animals and wildlife, with changes in land use and the introduction of invasive species being among the main factors for this increase. We explored several ecological drivers potentially affecting the local prevalence and number of observed lineages of avian malaria parasites in native and introduced house sparrows (*Passer domesticus*) populations. We analysed data from 2,220 samples from 69 localities across all continents. The influence of different anthropic-related factors such as urbanisation index and human density and temporal variables (e.g., bird breeding season and years since

introduction) were analysed using GAMM and Random Forests. Overall, 670 sparrows (30.2%) were infected with 22 *Plasmodium* lineages. In native populations, parasite prevalence was positively related to urbanisation index, with the highest prevalence values in areas with intermediate urbanisation levels. Likewise, in introduced populations, prevalence was positively associated with urbanisation index; however, higher infection occurred in areas with either extreme high or low levels of urbanisation. In introduced populations, the number of parasite lineages increased with the years elapsed since the establishment of sparrows in a new locality. Here, after a decline in in the number of parasite lineages in the first 30 years, an increase from 40 years onwards was detected. Urbanisation was related to parasite prevalence in both native and introduced bird populations. In invaded areas, time since bird introduction were related to the number of *Plasmodium* lineages found infecting sparrows.

Synopsis

Urbanisation impacts avian malaria prevalence in native and introduced Passer domesticus populations.

Twitter handle

@M_Ferraguti

69

Colour morph specific variation in survival and reproduction across Europe in the tawny owl Strix aluco

Gian Luigi Bucciolini[1,2], Chiara Morosinotto[3], Al Vrezec[4,5,6], Peter Ericsson[7], Lars-Ove Nilsson[8], Daniele Baroni[1], Karel Poprach[9], Ingar Jostein Øien[10], Jon Brommer[1], Patrik Karell[11]

[1]Department of Biology, University of Turku, Turku, Finland. [2]Department of Bioecology, Novia University of Applied Sciences, Ekenäs, Finland. [3]Department of Biology, University of Padova, Padova, Italy. [4]Department of Organisms and Ecosystems Research, National Institute of Biology, Ljubljana, Slovenia. [5]Jožef Stefan International Postgraduate School, Ljubljana, Slovenia. [6]Slovenian Museum of Natural History, Ljubljana, Slovenia. [7]Sågvägen 24, Fagersanna, Sweden. [8]Lingonstigen 14B, Karlsborg, Sweden. [9]Faculty of Science, Department of Development and Environmental Studies, Palacky University Olomouc, Olomouc, Czech Republic. [10]Norwegian Ornithological Society, BirdLife Norway, Trondheim, Norway. [11]Department of Biology, Lund University, Lund, Sweden

Abstract

Changes in environmental conditions are predicted to lead to microevolutionary processes. If the habitat changes, across time and space, animals need to adapt to the new local conditions in order to persist. We expect a large-scale spatial variation in such adaptations and attempts to tackle this question with individual-based data are scarce. Organisms with genetically based colour polymorphism are excellent candidates to study microevolutionary responses to environmental variation based on phenotypes. In tawny owls, Strix aluco, which come in two melanin-based color morphs, grey and brown, morph-specific fitness has been strongly associated with variation in the fitness of colour morphs. Previous studies observed that breeding life span (BLS) and lifetime reproductive success (LRS) in Finland were morph-dependent while the survival between morphs was climate-dependent.

Here, *we propose a wide geographical-scale comparison of survival and reproduction of the colour morphs in five different populations across the distribution range.*

We found a large variation in LRS between the study populations and also between morphs, e.g. brown individuals have higher LRS than grey ones in Finland, Norway and Slovenia, whereas in Sweden and Czech Republic is the opposite. Additionally, we present data and discuss how LRS is linked with survival differences between morphs in these populations.

These results suggest that the fitness of morphs vary on a large spatial scale, which is likely to affect the large-scale patterns of colour polymorphism in this species.

Synopsis

Wide geographical-scale comparison of survival and reproduction of the tawny owl colour morphs across the distribution range

Twitter handle

Gian Luigi Bucciolini; @Gianlu_Buccio

72

Seasonal variation in thermoregulatory capacity of three closely related Afrotropical Estrildid finches introduced to Europe

Cesare Pacioni ORCID iD[1], Marina Sentís ORCID iD[1], Anvar Kerimov ORCID iD[2], Andrey Bushuev ORCID iD[2], Luc Lens ORCID iD[1], Diederik Strubbe ORCID iD[1]

[1]Terrestrial Ecology Unit, Ghent University, Ghent, Belgium. [2]Department of Vertebrate Zoology, Faculty of Biology, M.V. Lomonosov Moscow State University, Moscow, Russian Federation

Abstract

A species' potential geographic range is greatly influenced by how physiologically it responds to its changing environment. Therefore, it is essential to study the physiological processes that species use to maintain their homeothermy in order to solve biodiversity conservation issues, such as species invasions. The common waxbill *Estrilda astrild*, the orange-cheeked waxbill *E. melpoda* and the black-rumped waxbill *E. troglodytes* are Afrotropical passerines that have established invasive populations in regions where the climate is colder than in their native ranges. As a result, they are excellent model species for studying potential mechanisms for coping with a colder and more variable climate. The "cold tolerance hypothesis" and the "climate variability hypothesis" were tested in captive-bred waxbills for explaining seasonal variation in thermoregulatory traits, such as basal (BMR), summit (M_{sum}) metabolic rates and thermal conductance. We found that, from summer to autumn, their cold tolerance increased. This was not related to larger body masses or higher metabolic rates, as predicted by the cold tolerance hypothesis. Instead, species downregulated BMR and M_{sum} toward the colder season, suggesting energy conservation mechanisms to increase winter survival. In line with the climate variability hypothesis, BMR and M_{sum} were most strongly correlated with temperature variation. The common waxbill and the black-rumped waxbill, whose native ranges encompass the highest degree of seasonality, showed the most flexibility in metabolic rates. This ability to adjust thermoregulatory traits, combined with increased cold tolerance and energy-saving mechanisms, may facilitate their establishment in areas characterized by colder winters and less predictable weather.

Synopsis

Three closely related Afrotropical Estrildid finches introduced to Europe show seasonal variation in thermoregulatory capacity

Twitter handle

@CesarePacioni

75

The effects of urbanisation on daily rhythms of songbirds: new insights from parallel recording of activity and body temperature around the clock

Davide Dominoni ORCID iD[1], Claire Branston[1], Barbara Helm[2], Pablo Capilla-Lasheras[1]

[1]University of Glasgow, Glasgow, United Kingdom. [2]Swiss Ornithological Institute, Sempach, Switzerland

Abstract

Increasing worldwide urbanisation and light pollution have been associated with changes in the daily rhythms of wildlife. In birds, several studies have shown that some, but not all, diurnal species can shift their daily rhythms into the night in urban areas, with suggested fitness benefits. However, it is unclear whether this increased nocturnal activity is compensated by a decreased in diurnal activity. Moreover, previous work focused on behavioural rhythms (eg singing and locomotor activity), but physiological rhythms might also respond to urbanisation. We used automated biotelemetry on six different songbird species (European robin, Eurasian blackbird, Great tit, Blue tit, Dunnock, Common chaffinch) inhabiting urban and forest areas, to obtain activity and skin temperature recordings around the clock. The analysis of activity data confirmed previous results, as we found species-specific response to ALAN. Robins and blackbirds advanced their morning onset of activity in urban areas of up to 3 hours, while the other species did not. The increased nocturnality was not compensated by decreased activity during the day, as urban robins and blackbirds were more active at daytime than forest conspecifics. We are currently analysing the skin temperature data, but preliminary results show that the morning increase in body temperature in urban blackbirds and robins did not follow the activity advancement. This points to a disruption of physiological and activity rhythms due to urbanisation, which could have fitness consequences. We anticipate that our contribution will offer an important new perspective on the effects urbanisation on the daily lives of wild animals.

Synopsis

Disruption of daily behavioural and physiological rhythms in urban blackbirds and robins

Twitter handle

@dmdominoni

77

Effects of parental age on offspring life history trajectories in the Alpine swift.

Héloïse Moullec ORCID iD[1], Vérane Berger ORCID iD[1], Christoph Meier ORCID iD[2], Sophie Reichert ORCID iD[1], Pierre Bize ORCID iD[3]

[1]University of Turku, Turku, Finland. [2]Swiss Ornithological institute, Sempach, Switzerland. [3]Swiss Ornithological Institute, Sempach, Switzerland

Abstract

Advanced parental age at conception can have pronounced consequences on offspring health, survival, and reproduction. If carried over to the next generation, such fitness effects could have important implications for population dynamics and the evolution of ageing, but these remain poorly understood. While many laboratory studies have investigated parental age effects, very few studies have been conducted in natural populations, which usually only consider maternal age effects and present a "snapshot" of an offspring's lifetime. Here, we use a unique multigenerational demographic dataset of a natural population of Alpine swifts, intensively monitored in Switzerland, to investigate parental age effects on offspring reproductive success and long-term survival in this long-lived bird. We show the first evidence of paternal age effects on fitness related traits in Alpine swifts, with male offspring (but not females) born from older fathers showing lower reproductive success and realised lifespan. Our study will help better understand which factors contribute to the variation in ageing rates and fitness among individuals.

Synopsis

Advanced parental age at conception impacts offspring reproductive success and lifespan in the long-lived Alpine swift.

Twitter handle

@HMoullec

78

Drone impacts on a bird flock: Rapid physiological habituation and behavioural response in greylag geese (*Anser anser*)

Petra Sumasgutner ORCID iD[1], Nicolas Adreani ORCID iD[1,2], Didone Frigerio ORCID iD[1], Shane Sumasgutner ORCID iD[1,3,4], Josef Hemetsberger[1], Verena Pühringer-Sturmayr ORCID iD[1], Sonia Kleindorfer ORCID iD[1]

[1]University of Vienna, Grünau/Almtal, Austria. [2]Max Planck Institute for Biological Intelligence, Seewiesen, Germany. [3]Technical Office for Biology Raab, Deutsch Wagram, Austria. [4]University of KwaZulu-Natal, Pietermaritzburg, South Africa

Abstract

Unmanned aerial vehicles ('drones') have rapidly become important in wildlife monitoring, but studies pairing behavioural indicators with physiological stress responses are largely missing. Here, we used a flock of 108 individually marked greylag geese (*Anser anser*), habituated to close human observations in Austria. We conducted two trial periods: in the first, the flock was exposed to an approaching drone overflying their feeding site at 30 m altitude daily for a week. We used scan samples to quantify vigilance behaviour at intervals before, during and after exposure, together with comparisons to baseline data collected over three days before the experiment. This was paired with corticosterone metabolites measured from faecal samples at the individual level. We detected heightened vigilance, which decreased to the baseline level on day five, indicating a quick habituation effect towards the drone. Furthermore, there was a continuous decline in corticosterone levels which were significantly lower between the baseline and the exposure days. In the second trial period, we conducted focal observations on individual responses to the drone, with more invasive flights including vertical descents from 30 to 10 m. Beak-straight vigilance was neither affected by age nor pairing status, but older individuals spent less time in one eye-up posture – a behaviour known to indicate the highest vigilance levels toward aerial objects/potential predators. Our study shows that behavioural responses do not necessarily correlate with physiological stress and that experienced individuals (both, in terms of individual age and prior-exposure to the drone) are less vigilant to an approaching drone.

Synopsis

Drone impacts on birds: quick behavioural habituation & no physiological stress response in Anser anser #ornithology @KLF_UniVienna

Twitter handle

@PeSumas

79

How season and latitude correlate with the gut microbiome of great tits (*Parus major*) across the European continent

Martta Liukkonen ORCID iD[1], Veli-Matti Pakanen[2], Andreas Nord[3], Balázs Rosivall[4], Jaime Muriel[5], Jesús Martínez-Padilla[6], Vallo Tilgar[7], Kees van Oers[8], Antoine Stier[9,10,11], Kirsten Grond[12], Suvi Ruuskanen[1]

[1]University of Jyväskylä, Jyväskylä, Finland. [2]University of Oulu, Oulu, Finland. [3]Lund University, Lund, Sweden. [4]Eötvös Loránd University, Budapest, Hungary. [5]Instituto de Investigación en Recursos Cinegéticos, Ciudad Real, Spain. [6]Instituto Pirenaico de Ecología, Jaca, Spain. [7]University of Tartu, Tartu, Estonia. [8]Wageningen University & Research, Wageningen, Netherlands. [9]University of Turku, Turku, Finland. [10]Université Claude Bernard Lyon 1, Lyon, France. [11]CNRS UMR7178 IPHC, Strasbourg, France. [12]University of Alaska Anchorage, Anchorage, USA

Abstract

The avian gastrointestinal tract is home to a diverse group of microorganisms that form the gut microbiome, which influences individual health, and there may be considerable intraspecific variation in the gut microbiome across the avian host species' populations. This variation could be explained e.g., by variation in the presence of different microorganisms in the environment, differences in the relative importance of vertical transfer, and hosts selecting and/or filtering certain microbiome depending on the prevailing environmental conditions. We collected faecal samples from great tit (*Parus major*) populations at eight different locations spread across the European distribution range during winter (January-February) and summer (May-June) in 2021. We used the 16S rRNA gene sequencing to detect possible between-population differences in the gut microbiome that could be related to latitude and season. We hypothesised that there could be an interaction between population's gut microbiome and season, because European great tit populations can experience seasonally varying environmental conditions. We predicted that the more northern populations' gut microbiome would differ more between winter and summer than the more southern populations' gut microbiome, because environmental variation between seasons is stronger closer to the Arctic. We also predicted that populations would show more variation in their gut microbiome during winter than summer, because winter environmental conditions can vary largely across Europe, whereas environmental conditions vary less during summer. Our results contribute to the knowledge about gut microbiome responses to environmental conditions in a widely dispersed species.

Synopsis

A deep dive into the great tit gut microbiome and its potential connections to season and latitude

80

Patterns and drivers of landscape and local habitat use by UK Hawfinches *Coccothraustes coccothraustes* during the breeding season and late winter

Will Kirby, Paul Bellamy

RSPB Centre for Conservation Science, Sandy, United Kingdom

Abstract

Hawfinches *Coccothraustes coccothraustes* are red listed in the UK following a reduction in breeding numbers and substantial range contraction over recent decades, the causes of this decline are not fully understood but the most recent population estimate suggests only 500-1000 pairs remain. This study used GPS tracking devices fitted to adult birds in one of their remaining strongholds to investigate how and at what scale they used their local landscape, whether they were selecting for particular attributes within their focal range and whether these differed between the breeding season and winter. A variety of measurements related to habitat type, structure and species composition were collected from locations visited by the tagged birds and compared with those collected from randomly selected control locations within the study area. In both seasons Hawfinches selected positively for broadleaved woodland at two different scales and they used woodland edges more than interiors. Beech *Fagus sylvatica* was a preferred tree species in both seasons, along with Cherry *Prunus sp.* and Rowan *Sorbus aucuparia* in the summer. Conifer species were little used, other than as roost sites. Artificial feedsites and gardens were used extensively, particularly in the winter, potentially exposing visiting Hawfinches to increased risk from transmissible diseases. Results from this study will help inform future woodland and landscape management to benefit the conservation of Hawfinches.

Synopsis

GPS tracking study reveals habitat preferences of UK Hawfinches

Twitter handle

willkirby_1

81

Early breeders have greater nest failure rates but better nestling quality in an alpine population of Northern Wheatear (*Oenanthe Oenanthe*).

Camille Mermillon ORCID iD[1], Martha Maria Sander ORCID iD[1,2], Susanne Jähnig[3], Simeon Lisovski ORCID iD[4], Riccardo Alba ORCID iD[1], Domenico Rosselli[5], Dan Chamberlain ORCID iD[1]

[1]Department of Life Sciences and Systems Biology, University of Turin, Turin, Italy. [2]NABU (Naturschutzbund Deutschland), Berlin, Germany. [3]tier3 solutions GmbH, Leverkusen, Germany. [4]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Polar Terrestrial Environmental Systems, Potsdam, Germany. [5]Ente di Gestione delle Aree Protette delle Alpi Cozie, Salbertrand, Italy

Abstract

Climate change is leading to the advancement of spring conditions, resulting in an earlier snowmelt and green-up, with the highest rates of change in highly seasonal environments, including alpine habitats. High elevation birds need to adjust their phenology accordingly to maximise reproductive output. Nest survival probability and mean nestling mass were analysed in relation to lay date and habitat in an alpine population of the Northern Wheatear *Oenanthe oenanthe* collected over six consecutive breeding seasons in the Western Italian Alps. This species showed the lowest nest survival in years with early spring conditions. Within-season, nest survival was highest in late nests, at lower elevations, and when grass cover and grass height were higher. In both cases, severe weather conditions may indirectly lead to higher early season nest failure rates by increasing predation risk. On the contrary, mean nestling mass, and thus the quality of the fledglings, was lower in late nests, which might be driven by a trophic mismatch. Breeding early is thus generally advantageous for chick quality in our alpine population, but reproductive success is limited by a higher risk of nest failure in early springs and early in the season. This trade-off between breeding early and late may allow Northern Wheatears to maximize fitness under highly variable spring conditions. However, climate change may disrupt this, and shifts in phenology could become a threat for migratory alpine birds that might not be able to follow advancing spring conditions.

Synopsis

Facing climate change in alpine habitat: trade-offs between breeding early and late for the Northern Wheatear Oenanthe oenanthe

Twitter handle

@MermillonCamil1

86

Efficiency of raptors as biodiversity indicators: is multispecies movement ecology the key?

Ülo Väli ORCID iD[1], Jaan Grosberg[1], Thea Kull ORCID iD[1], Pelle Mellov[2], Grete Tõnisalu[1], Vivika Väli ORCID iD[1], Paweł Mirski ORCID iD[1,3]

[1]Estonian University of Life Sciences, Tartu, Estonia. [2]University of Tartu, Tartu, Estonia. [3]University of Białystok, Białystok, Poland

Abstract

Observational studies and analyses of nest sites have shown that birds of prey can be effective indicators of biodiversity and viable ecosystems, but the evidence is conflicting and the results are inconsistent. We propose that movement patterns of avian predators, directly influenced by landscape functional heterogeneity, reflect biodiversity better than indirect presence-absence data used in previous studies. To test this concept, we conducted a multispecies GPS telemetry survey of raptors in mosaic farmland. Over a three-year period, we tracked 62 individuals of four raptor species (Common Buzzard *Buteo buteo*, Lesser Spotted Eagle *Aquila pomarina*, Western Marsh Harrier *Circus aeruginosus* and Northern Goshawk *Accipiter gentilis*). We also assessed the abundance and diversity of potential prey taxa (birds, mammals, amphibians) and lower trophic level taxa (vascular plants) at sites with high and low use by GPS-tracked predators. Indeed, areas of high predator activity were characterised by higher abundance and/or species richness in all studied taxa compared to control areas. Sites with high predator activity identified in one year were also more frequently used in the following year, indicating that biodiversity hotspots persist in farmland over the years. We conclude that multispecies movement data of avian predators can be a reliable source of information for indicating biodiversity hotspots; this could be used as a key to the successful use of avian predators as bioindicators.

Synopsis

Multispecies movement data of raptors indicates biodiversity hotspots in farmland

87

Two genetic loci behind migratory direction in willow warblers (Phylloscopus trochilus): combining genome analyses with years of geolocator data.

Violeta Caballero Lopez ORCID iD, Kristaps Sokolovskis, Staffan Bensch

Lund University, Lund, Sweden

Abstract

It is well established that most songbirds migrate solitarily and their routes are determined by a genetic program.Two Willow Warbler subspecies, Phylloscopus trochilus trochilus and Phylloscopus trochilus acredula, follow different migratory routes to their wintering grounds in West and South Africa respectively. Their breeding territories overlap in a “migratory divide” across central Scandinavia and eastern Poland. Earlier analyses demonstrate that the few genetic differences between the two migratory phenotypes cluster in chromosomes 1, 5 and a repeat-rich scaffold (MARB) which failed to be mapped in the genome. In our study we combine the geolocator tracks of 72 individuals (from both subspecies in allopatric populations and the migratory divide hybrids) with genome analyses. We found evidence that migration direction follows a dominant inheritance pattern with epistatic interactions between two loci (the divergent region in Chromosome 1 and MARB) explaining 74% of the variation. We also found that, contrary to the classical assumption, there is no evidence that F1 hybrids take an inferior migratory route compared to parental subspecies. We propose that these candidate loci affect migratory direction likely by their interaction with regions elsewhere in the genome, and/or through epigenetic mechanisms. In our attempt to disentangle this, we are also using FISH techniques applied to willow warbler karyotypes in order to find the location of the enigmatic MARB region.

Synopsis

Two epistatic loci explain 74% of variation in migration direction in willow warblers, which follows a dominant inheritance pattern.

Twitter handle

@VioJagger

89

Brood parasitism risk drives birds to breed near humans

Jinggang Zhang[1,2], Peter Santema[1], Jianqiang Li[3], Wenhong Deng[2], Bart Kempenaers[1]

[1]Max Planck Institute for Biological Intelligence, Seewiesen, Germany. [2]Beijing Normal University, Beijing, China. [3]Beijing Forestry University, Beijing, China

Abstract

Urbanization is transforming ecosystems at a global scale and at an increasing rate, and its profound consequences for wildlife have been well documented. Understanding how animals thrive in the urban environment and how this environment affects (co-)evolutionary processes remains an important challenge. Urban environments can provide resources such as food or nest sites (e.g., cavities), and also reduce exposure to predators. For some species, urban environments may also affect susceptibility to brood parasitism, but this has never been tested experimentally. Here, we use a combination of field observations and experimental manipulations to show that Daurian redstarts *Phoenicurus auroreus*, a common host of the common cuckoo *Cuculus canorus*, nest in proximity to humans to avoid brood parasitism. First, redstarts were more likely to be parasitized with increasing distance to the nearest building. Second, redstarts adjusted their nesting location in response to a seasonally predictable change in the risk of brood parasitism. Third, experimentally simulating the presence of cuckoos during a period when they are naturally absent increased the likelihood that redstarts nested indoors or closer to human settlements. These findings suggest that redstarts actively choose to place their nest in the vicinity of a human residence as a defense against cuckoos. Our study exemplifies how animals take advantage of the urban environment by using it as a novel line of defense against detrimental interspecific interactions.

Synopsis

Daurian redstarts actively choose to nest nearby humans as a defense against cuckoos

Twitter handle

@Jinggang_Zhang

91

Can movement ecology help finding mitigation measures to reduce demographic impact of wind turbine mortalities of Lesser kestrels?

Olivier Duriez ORCID iD[1], Aurélien Besnard[1], Philippe Pilard[2], Nicolas Saulnier[3], Lise Bartholus[1], Patrick Boudarel[4], Yohan Sassi ORCID iD[1]

[1]CEFE, Univ Montpellier, CNRS, EPHE, IRD, Univ Montpellier 33, Montpellier, France. [2]LPO Mission Rapaces, Rochefort, France. [3]LPO Occitanie, Villeveyrac, France. [4]DREAL Occitanie, Montpellier, France

Abstract

The conflict between birds and windfarms often results from siting windfarms at places important for birds. The Lesser kestrel Falco naumanni is a vulnerable species that ranks among the most killed species at wind turbines. Using a 15-year demographic monitoring at two breeding colonies in southern France, combined with a 8-year mortality monitoring at an important windfarm close to the main colony, we estimated vital demographic parameters and run a Population Viability Analysis. The population trend of the nearby colony was overall positive, passing from 35 pairs in 2006 to 254 pairs in 2020, boosted by the regular arrival of immigrants. Yet, with 43 cadavers found over 8 years, the annual population growth rate was reduced by 4% due to collisions. The spatial behaviour of 24 adult kestrels was studied during 4 years using GPS telemetry. Between May and July, birds spent 25-47% of their activity near the windfarm, that appears as a major foraging habitat. Using aerodynamic theory, we built a model to predict kestrel's distribution in the windfarm based on orographic uplifts (generated by wind on slopes) and on kestrels' phenology. We observed a predominant use of certain updraft areas, perpendicular to dominant wind regime, and presence probabilities were positively correlated with orographic updraft velocity. These results can allow identifying risky wind conditions (when kestrels may be attracted) around each turbine and potentially give recommendation to selectively curtail these turbines under certain wind conditions to reduce collision risks and their consequence for population viability and trends.

Synopsis

Collision with wind turbines impact lesser kestrel populations dynamics. Curtailment according to aerology may reduce collision.

96

Indirect maternal effects via nest microbiome composition drives gut colonization in altricial chicks

David Diez-Méndez ORCID iD[1], Kasun H. Bodawatta ORCID iD[2], Inga Freiberga ORCID iD[1], Irena Klečková ORCID iD[1], Knud A. Jønsson ORCID iD[3], Michael Poulsen ORCID iD[4], Katerina Sam ORCID iD[1,5]

[1]Institute of Entomology, Biology Centre of Czech Academy of Sciences, České Budějovice, Czech Republic. [2]Section for Molecular Ecology and Evolution, University of Copenhagen, Copenhagen, Denmark. [3]Natural History Museum of Denmark, University of Copenhagen, Copenhagen, Denmark. [4]Section for Ecology and Evolution, University of Copenhagen, Copenhagen, Denmark. [5]Faculty of Science, University of South Bohemia, České Budějovice, Czech Republic

Abstract

Gut microbial communities are complex and heterogeneous and play critical roles for animal hosts. Wild bird hatchlings exhibit a nearly sterile digestive tract that is rapidly colonized by bacteria from a variety of surrounding sources. Disturbances to the microbiome colonization in early life can negatively impact host fitness and development. However, the consequences of such early-life disruptions are unknown in wild birds. To address this gap, we investigated the effects of continuous early-life disruption of the gut microbiome on the establishment and development of gut communities in wild Great tit (*Parus major*) and Blue tit (*Cyanistes caeruleus)* nestlings by applying antibiotics and probiotics. Treatment neither affected nestling growth nor their gut microbiome composition despite we expected an overall positive effect in nestlings treated with probiotics and a negative effect on the diversity of the gut microbiome of antibiotic treated nestlings. Independent of treatment, nestling gut microbiomes of both species clustered according to the brood, which shared the highest numbers of bacterial taxa with both nest environment and their mother. Fathers showed different gut communities than their nestlings and nests, contributing to a lesser extent to chick gut microbiome. Lastly, we observed that distance between nests increased the dissimilarity of the microbiome between broods, but only in Great tits, indicating that species-specific foraging behavior and/or microhabitat influence gut microbiomes. Overall, the strong maternal effect driven by continuous recolonization from the nest environment and vertical transfer of microbes during feeding, appears to provide resilience to early-life disruptions in nestling gut microbiomes.

Synopsis

Indirect maternal effects shape chick microbiomes

Twitter handle

@Dd10Mz

101

An ecological model of avian migratory connectivity

Marius Somveille[1], Rachael Bay[2], Thomas Smith[3], Peter Marra[4], Kristen Ruegg[5]

[1]University College London, London, United Kingdom. [2]UC Davis, Davis, USA. [3]UCLA, Los Angeles, USA. [4]Georgetown University, Washington DC, USA. [5]Colorado State University, Fort Collins, USA

Abstract

Birds exhibit a remarkable array of seasonal migrations. Despite much research describing migratory behaviour, the underlying forces driving how a species' breeding and wintering populations redistribute each year, that is, migratory connectivity, remain largely unknown. In this study, we test the hypothesis that birds migrate in a way that minimises energy expenditure while considering intra-specific competition for energy acquisition, by developing a modelling framework that simulates an optimal redistribution of individuals between breeding and wintering areas. Using 25 migratory bird species, we find that the model accurately predicts empirical migration patterns, and thus offers an explanation for migratory connectivity based on first ecological and energetic principles. Our model provides a strong basis for exploring additional processes underlying the ecology and evolution of migration, but also a framework for predicting how migration impacts local adaptation across seasons and how environmental change may affect population dynamics in migratory species.

Synopsis

Energy and competition shape avian migratory connectivity patterns

Twitter handle

@MariusSomveille

102

Natal dispersal behaviour and habitat selection of the white-tailed eagle revealed by molecular genotyping

Ida Penttinen[1], Carina Nebel[1], Torsten Stjernberg[2], Toni Laaksonen[1]

[1]University of Turku, Turku, Finland. [2]University of Helsinki, Helsinki, Finland

Abstract

Natal dispersal refers to the distance between the site of birth and the site of first breeding. Drivers of natal dispersal in species with high adult site-fidelity are important to understand as they shape spatial trends and can cause shifts in the range of species. The Finnish population of the white-tailed eagle (*Haliaeetus albicilla*) has recovered from near extinction to over 600 pairs. We study natal dispersal in this population to reveal processes behind its growth and to get insights on how the population might expand in the future. We have identified nesting white-tailed eagle individuals with a combination of resightings and microsatellite genotyping. DNA for the genotyping was extracted from feathers. Nestlings were sampled during ringing and feathers shed by adults were collected from nests and nest sites. Natal dispersal is determined by matching nestling genotypes to adult genotypes. Our results reveal that white-tailed eagles often return to their natal area for nesting, but that females disperse further than males. Furthermore, high population density reduces dispersal distance, likely because white-tailede eagles can use social information to identify good nesting areas. Future analyses will reveal by which habitat characteristics white-tailed eagles choose their breeding site.

Synopsis

Molecular methods used to reveal natal dispersal behavior of a long-lived bird of prey.

Twitter handle

@IdaPenttinen

118

Spatial variation in the phenology of Afro-Palearctic bird migration across Europe

Jennifer Border ORCID iD[1], Philipp Boersch-Supan[1], James Pearce-Higgins[1], Chris Hewson[1], Christine Howard[2], Philip Stephens[2], Stephen Willis[2], Stephen Baillie[1]

[1]British Trust for Ornithology, Thetford, United Kingdom. [2]Durham University, Durham, United Kingdom

Abstract

Climate change has significantly altered the phenology of plants and insects over the last few decades, such that the timing of peak food availability for migratory animals has changed. Many species have altered their arrival and departure times to compensate for this, but the degree to which species are able to shift their phenology varies. A better, more mechanistic, understanding of the extent and causes of variation in phenology between species is vital for us to be able to better understand, predict and respond to current and future climate related threats to biodiversity. To date the majority of phenology studies have focused on relatively small geographical areas with few analyses of spatial variation in phenology, either within and among species, and on possible causes of such variation. The growth in citizen science recording, especially for popular taxa like birds, and the consequential development of large-scale standardised databases has meant that it is now possible to model continental scale variation in phenology for many species. Here we use data on the occurrence of 30 African-European migratory bird species from EuroBirdPortal to model phenology at a 100km by 100km resolution throughout Europe. In this way, we identify the ecological characteristics of early arriving versus late arriving species, narrow versus broad migration windows and rapid versus slow advancement across Europe. We also determine the extent to which these phenological traits correlate with long-term population trends across Europe.

Synopsis

Spatial patterns in spring arrival for African-European migrants, morphological predictors and effects on species long-term trends

Twitter handle

@Jenni**Border**

121

Among-species variation in avian migration timing over 60 years: effects of ecology and life-history

Vicki Dale[1], Mark Bolton[2], Anne Magurran[3], Maria Dornelas[3], Jane Reid[1]

[1]University of Aberdeen, Aberdeen, United Kingdom. [2]Fair Isle Bird Observatory Trust, Fair Isle, United Kingdom. [3]University of St Andrews, St Andrews, United Kingdom

Abstract

Seasonally migratory species are widely documented to have responded to historic large-scale climatic changes by altering migration timings, yet such phenological changes vary substantially among species. Now, advancing phenological research from description towards prediction requires that we identify mechanisms underlying this observed among-species variation. Yet, while key mechanistic hypotheses have been proposed and tested through cross-study meta-analyses, substantial heterogeneity in data and analytical methods contributes considerable additional variation and impedes clear interpretation. New studies that rigorously test mechanistic ecological hypotheses explaining variation in changing migration timings across diverse species, using standardized methodologies, are therefore required. Accordingly, we applied phylogenetically controlled quantile regressions to 60 years of high-quality spring and autumn migration data from Fair Isle, Scotland, showing that cross-decadal changes in migration timings varied considerably among 71 bird species. Species with more specialist seasonally-restricted diets, narrower breeding habitat breadths, shorter generation lengths and capability to produce multiple offspring broods per year advanced their average migration timing by up to 1.3 days/decade in spring and/or autumn. In contrast, omnivorous species, and species constrained to a single annual offspring brood, have not changed migration timings while, unexpectedly, carnivorous species delayed their spring migrations by 1.1 days/decade. Changes in migration timings also increased with increasing species' local migratory abundances, implying potential links between phenology change and population dynamics. These results reveal key forms of ecological and life-history structure underlying diverse changes in avian migratory phenology, which will be valuable in informing future predictions of species vulnerabilities under on-going climate change.

Synopsis

Strong and unexpected effects of species ecology and life history on changing migration timings across 60 years.

Twitter handle

@VickiDale26

124

Can pied flycatcher nestlings distinguish songs from social fathers and strangers?

Lan Ma, Samyuktha Rajan, Fanny Linn-Kraft, Mario Gallego-Abenza, David Wheatcroft

Stockholm University, Stockholm, Sweden

Abstract

Juvenile songbirds learn to sing by listening to and memorizing the songs produced by surrounding conspecific adults. These early song memories strongly guide the subsequent development of songs. The social father is often assumed to be an important influence on early song development, but for many species, when and how that impact work on nestlings still remains unknown. Pied flycatcher *(Ficedula hypoleuca)* is a long-distance migrant passerine bird in which early conspecific song discrimination from closely related species has a large genetic component, and cultural heritance exists between father and son. We compared the response of day 13 nestlings to social father songs and stranger male songs in a population on the Swedish mainland. The hypothesis is that nestlings would react more actively to their social fathers' songs comparing to a stranger's song especially when their social fathers sing more during the nestling stage. If there is no difference between the two treatments, it suggests that the cultural inheritance of the social father doesn't play an important role in the early song learning stage.

Synopsis

Early stage of song learning: pied flycatcher nestlings' ability to distinguish their fathers' songs from strangers

Twitter handle

@lan_jyhs

129

Species Recognition and Song Memory in Nestling Flycatchers

Fanny-Linn H. Kraft ORCID iD, David Wheatcroft

Stockholm University, Stockholm, Sweden

Abstract

Most bird species use songs as a signal to attract mates or deter competitors, and birdsong has been implicated as a possible driver of avian speciation. However, songs are socially learned, and the environment experienced by young birds influence the songs they produce later in life. This raises a question as to how this learning process affects species recognition and to what degree the response to song is innate or learned. Although birdsong has been researched extensively, little is known of how innate biases facilitate the learning of conspecific song during the early life-history stages. Previous research on flycatchers has indicated that nestlings have an innate response to conspecific song, but the underlying neural mechanisms are unknown. We aim to investigate whether the innate response to song is reflected in brain regions essential for song learning. Pied and collared flycatchers (*Ficedula hypoleuca* and *F. alcicollis*) are closely related species that sometimes hybridize. We exposed nestlings of these two species to conspecific and heterospecific song and examined gene expression in brain regions involved in song memory (NCM, CMM, and field L). We were able to test whether brain gene expression differed between the two species, and whether gene expression differed depending on whether the bird had been exposed to conspecific or heterospecific song. This study investigates the neural mechanisms that may underly how song develops in regions where hybridisation between closely related species occur. Our results have implications for the neural basis of early-life song discrimination and reproductive isolation in songbirds.

Synopsis

Songbirds learn to sing by copying songs they hear, but how do they know who to copy? We tested mechanisms of innate song biases.

Twitter handle

@hovringkraft

131

Drivers of variation in the gut microbiome of urban blue tits

Pablo Capilla-Lasheras, Claire Branston, Mark Pitt, Norah S S Alhowiti, Eugenio Carlon, Darryl McLennan, Pat Monaghan, Davide Dominoni

University of Glasgow, GLASGOW, United Kingdom

Abstract

Recent work highlights that the urban environment has a very distinct microbiome, harbouring pathogenic species and antimicrobial resistance genes that could be easily transmitted to wildlife and humans. Interestingly, evidence is accumulating to suggest that urban birds also have different gut microbiomes compared to their non-urban counterparts. However, the eco-evolutionary causes of this difference in gut microbiomes are not well understood. Amongst the novel stressors that birds face in cities, shifts in diet are prevalent, have negative survival consequences (particularly for growing nestlings) and can dramatically impact the composition of the gut microbiome. In this talk, we will present recent findings of a project investigating the drivers of gut microbiome composition in urban and non-urban blue tits (Cyanistes caeruleus). To this end, we carried out a cross-fostering experiment between an urban and a non-urban population of blue tits to assess (i) the influence of genetic/maternal and environmental (i.e., urban) factors on gut microbiome composition, and (ii) the impact of diet (quantified via metabarcoding) on the variation in gut microbiome composition of 13-day old nestlings. We extracted DNA from faecal samples to quantify gut microbiome composition using 16S sequencing and whole-metagenome shotgun sequencing. The combination of an experimental field approach with traditional and modern sequencing techniques allows us to shed new light on the drivers of variation in gut microbiomes of urban birds.

Synopsis

Drivers of variation in the gut microbiome of urban blue tits

Twitter handle

@p_capi

135

Extreme and rapid range expansion by arctic geese: coping with climate change?

Kees Schreven ORCID iD

Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands. University of Amsterdam, Amsterdam, Netherlands

Abstract

The Arctic has seen the fastest rate of climate change on earth. Increasing temperatures lead to earlier springs and in response organisms may advance their phenology or colonize colder areas with later springs. For migratory birds, both ways of adjustment may be challenging as arctic spring timing cannot be forecasted from temperate locations, and range expansion is usually a slow gradual process. However, here we show with GPS-tracking that Pink-footed Geese (Anser brachyrhynchus) from Svalbard have expanded their range 1000 km eastwards by colonizing Novaya Zemlya as breeding ground. Social transmission of migration behaviour (particularly, flocking with Taiga Bean Geese) may have been key to this fast development. This Novaya Zemlya subpopulation (which grew to 3-4000 birds in only 10 years, partly by continued immigration) uses more eastern migration stopovers than the traditional western route to Svalbard (60-75,000 birds). Overall, Novaya Zemlya and Svalbard have both warmed up, but Novaya Zemlya is colder (similar to Svalbard 40 years ago). Moreover, the rate of spring advance has been more uniform along the new eastern route than along the traditional western route, enabling geese to keep in better pace with spring. We also discuss fitness consequences of timing of migration and spring on both routes. We conclude that the rapid formation of this new subpopulation was facilitated by (and possibly prompted by) climate change, although also other environmental changes occur on the flyway such as the increased size of other goose populations and competition on traditional stopovers.

Synopsis

We witness an extreme and rapid range expansion by arctic geese: are they coping with climate change?

Twitter handle

NA

139

Does Environmental Variability Determine Shearwater Over-Wintering Distribution, Behaviour and Phenology?

Katrina Siddiqi-Davies[1], Oliver Padget[1], Joseph Wynn[2], Patrick Lewin[1], Lewis Fisher-Reeves[1], Joe Morford[1], Paris Jaggers[1], Natasha Gilles[1], Annette Fayet[3], Martyna Syposz[4], Jonathon Rutter[1], Akiko Shoji[5], Louise Maurice[6], Sarah Bond[7], Chris Perrins[1], Tim Guilford[1]

[1]Oxford University, Oxford, United Kingdom. [2]Vogelwarte Helgoland", Helgoland, Germany. [3]NINA, Trondheilm, Norway. [4]Gdansk University, Gdańsk, Poland. [5]University of Tsukuba, Tsukuba, Japan. [6]British Geographical Survey, Oxford, United Kingdom. [7]Bangor, Bangor, United Kingdom

Abstract

Far from observation, procellariform seabirds' over-winter at sea, a dynamic environment subject to great variability. Large scale oceanographic phenomena such as the El Niño–Southern Oscillation impact winds and temperatures globally, which can change the location of productive foraging areas. Over-wintering foraging is considered an important time for rest and re-cooperation for the coming breeding season. Therefore, the conditions experienced during these months could determine breeding season behaviour. Understanding how seabirds adapt their annual cyclic behaviour with such periodic variation relies on long-term tracking. This study makes use of a 13-year geolocator dataset of over 400 tracks of Manx Shearwater movements. Manx shearwaters are trans-equatorial migrants, breeding mainly in northern Europe and migrating to the Patagonian Shelf. In El Niño years, birds were found to over-winter at significantly higher latitudes than in La Niña years, linked to changes in both wind and chlorophyll distribution. Individuals seem to adjust their position between years indicating adaptation to varying conditions. This latitudinal shift is correlated with the proportion of time the birds spend foraging over-winter, with birds foraging less in El Niño years. Variation in over-winter foraging appears linked to breeding season foraging behaviour and chick provisioning rates. This subsequently impacts phenology, with birds leaving later in La Niña years. This study provides insights into how seabirds might respond to changing environmental conditions, raising questions about future climatic change and survival consequences.

Synopsis

Manx shearwaters over-wintering latitude shifts northwards with El Niño conditions resulting in changes in foraging behaviour.

Twitter handle

@katrinarosheen

141

Using GPS and accelerometer data to study the breeding behaviour of two sandgrouse species

Gonçalo Ferraz ORCID iD[1,2,3,4], Carlos Pacheco[2,3], Ana Teresa Marques ORCID iD[2,5,3], Paulo Célio Alves ORCID iD[1,2,3,4], João Paulo Silva ORCID iD[2,3], François Mougeot ORCID iD[6,7]

[1]Departamento de Biologia, Faculdade de Ciências, Universidade do Porto, 4169-007 Porto, Porto, Portugal. [2]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, 4485-661 Vairão, Vairão, Portugal. [3]BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairão, 4485-661 Vairão, Vairão, Portugal. [4]Estação Biológica de Mértola (EBM), Praça Luís de Camões, 7750-329 Mértola, Mértola, Portugal. [5]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Instituto Superior de Agronomia, Universidade de Lisboa, 1349-017 Lisboa, Lisbon, Portugal. [6]Consejo Superior de investigaciones Científicas (CSIC), Madrid, Spain. [7]Instituto de investigación en Recursos Cinegéticos (IREC) CSIC-UCLM-JCCM, Ronda de Toledo 12, 13005 Ciudad Real, Ciudad Real, Spain

Abstract

The Iberian Peninsula represents a stronghold for some iconic steppe and farmland species, whose populations have declined severely in recent decades, mainly due to agricultural intensification. Identification and understanding of the factors that influence the breeding success of these species is essential to design effective conservation measures. Obtaining reliable breeding data has been limited by difficulties in encountering nests or chicks of elusive, cryptic species such as sandgrouse. In this work, we use remote sensing (GPS and accelerometer data) to study the breeding biology of black-bellied (*Pterocles orientalis*) and pin-tailed sandgrouse (*Pterocles alchata*) in the Iberian Peninsula. We provide a novel protocol and framework to remotely monitor the breeding of both species and to improve the very limited knowledge of their breeding performance and the factors influencing it.

From May to September 2021 and 2022, we analysed the breeding behaviour by looking at movement patterns and the Overall Dynamic Body Acceleration (ODBA), calculated from onboard sensor data of the tracking devices. Overall, we identified 37 black-bellied and 41 pin-tailed sandgrouse breeding attempts and performed subsequent visits to nests and families without jeopardizing nesting success. Despite the extensive breeding season of both species and frequent replacement clutches, we observed low reproductive success: only 9.7% and 6.7% of breeding attempts were successful for *P. orientalis* and *P. alchata*, respectively. The very low productivity (less than 0.6 chicks per reproductive pair and year) highlights the urgent need for effective conservation measures to improve productivity and recruitment and stop declines in the sandgrouse population.

Synopsis

A new approach to study the breeding biology of sandgrouse reveals very low productivity in these declining species in Iberia

Twitter handle

@awildferraz

147

Quantifying shorebird mating behaviour using accelerometry and machine learning

Anne Aulsebrook, Rowan Jacques-Hamilton, Bart Kempenaers

Max Planck Institute for Biological Intelligence, Seewiesen, Germany

Abstract

Accelerometry and machine learning are powerful tools for collecting in-depth information about animal behaviour. However, such methods are rarely used to quantify mating behaviours, such as competition, courtship and copulation. In part, this is likely due to the inherent challenges of classifying behaviours that can be brief and infrequent, and that are not necessarily exhibited by all individuals. We used accelerometry and machine learning methods to quantify the mating behaviours of captive male ruffs (Calidris pugnax), a polymorphic, lekking shorebird with highly skewed mating success. Using this system as a case study, we (i) describe possible approaches to classifying mating behaviour, (ii) compare the classification performance of three supervised machine learning methods: Random Forest, Hidden Markov Models and Neural Networks, (iii) highlight potential pitfalls that can cause overestimation of model performance, and (iv) offer suggestions for avoiding these pitfalls.

Synopsis

Accelerometry and machine learning can provide unprecedented insights into how animals attract mates. However, challenges remain.

Twitter handle

@AnneAulsebrook

148

Mechanistic modeling of the impacts of climate change on avian energetics

Juan G. Rubalcaba ORCID iD

Universidad Complutense de Madrid, Madrid, Spain

Abstract

Climate is a fundamental abiotic factor determining avian phenology and species geographical distributions, primarily due to its impact on energy uptake and demand. To accurately predict the responses of organisms to climate change, we need to understand how climate modulates key components of the individual's energy balance such as thermoregulation. Microclimate and biophysical models arise as promising tools to meet this challenge because they provide accurate descriptions of the mechanisms driving heat exchange between individuals and their environment. Here I show how microclimate and biophysical models can be used to compute thermoregulatory costs of birds across latitudinal gradients. I used these models to investigate the energetic barriers imposed by climate at high latitudes and their potential to explain geographical range limits in birds. I also outline challenges that currently limit the widespread application of biophysical models in avian biology. Finally, I show the potential of biophysical models to investigate the mechanisms underpinning bird-climate interactions and forecast their responses to climate change.

Synopsis

Biophysical modeling of bird-climate interactions to predict the impacts of climate change across avian species

Twitter handle

https://twitter.com/JGRubalcaba

158

The MalAvi database – both a treasure chest and a hard nut to crack

Tamara Emmenegger ORCID iD, Staffan Bensch

Lund University, Lund, Sweden

Abstract

Besides ecological studies on host-parasite associations also the genetic diversity of haemosporidian is of long-standing scientific interest. Since laboratory protocols for molecularly detecting avian haemosporidian parasites were standardised, the description of genetic lineages underwent a massive upswing. This development entailed the establishment of a public database for avian haemosporidian parasites, the MalAvi database, which now encompasses over 3'000 unique lineages from approx. 400 studies. With the increasing number of entries, the database gets more and more valuable for comprehensive analyses, but also causes challenges for the maintenance and curation of the database.
Here, I will illustrate the scientific value and potential of the MalAvi database with a few example studies. I will further give an update about the revision of the database and present the results of my analyses of the data therein quantifying the repeatability of haemosporidian infection parameter estimates and potential consequences for the applicability of the Hamilton-Zuk hypothesis.

Synopsis

Updates from the revision of the #MalAvi database and new research results from an analysis of the data therein

Twitter handle

@tavimalara

159

Telomere dynamics, heritability and immunity – a comprehensive case study in zebra finches

Ye Xiong ORCID iD, Arne Hegemann ORCID iD, Julian Melgar ORCID iD, Maja Tarka ORCID iD, Michael Tobler ORCID iD, Dennis Hasselquist ORCID iD

Lund University, Lund, Sweden

Abstract

Telomeres, the protective caps at the end of chromosomes, protect important genetic material of organisms. Telomere shortening has been suggested and is tightly associated with aging, immune function and life history strategies. How telomere length is inherited and which genetic and environmental factors are influencing this process is still puzzling. Studies on birds have reported high telomere length (TL) heritability, but also great variance within and between species.

We designed a selective breeding experiment on captive zebra finches (*Taeniopygia guttata*) to investigate TL dynamics during early life stages (pre- and postnatal development). With these experimental data, we quantified TL heritability. In addition, we also investigate how telomere dynamics and physiological condition can be affected by environmental stressors. Finally, we studied the cost of immune defense on physiological function and on the short-term effects of immune challenges on telomere length.

We discuss the discrepancies in heritability estimates, telomere dynamics in the context of immune function and how the results of our comprehensive experimental studies integrate into the international telomere research landscape.

Synopsis

NA

161

Behavioural and cognitive differences between rural and urban great tits – A common garden study

Utku Urhan[1,2], Barbara Tomotani[1,3], Marcel Visser[1], Kees van Oers[1]

[1]Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands. [2]Lund University, Department of Biology, Lund, Sweden. [3]The Arctic University of Norway, Department of Arctic and Marine Biology, Tromsø, Norway

Abstract

Individuals from different populations of the same species may differ in a range of phenotypes. Such phenotypic differences can be shaped by non-genetic responses to environmental factors and can be caused by genetic differences due to differences in selection between populations. For example, urban and rural habitats differ in their demands for survival and reproduction. Cognitive and behavioural adaptations are important for fitness optimisation and have been found vary between rural and urban populations of the same species. However, whether differences in cognitive abilities between urban and rural populations are predominantly caused by genetic differences or are formed as non-genetic responses to disparate environmental factors has rarely been studied. In order to do this, we conducted a common garden experiment using the great tit as a model species. We collected eggs from in total 6 rural and 5 urban populations in Belgium and The Netherlands. Eggs hatched in foster nests in one wild population in the Netherlands and were hand reared in captivity from day 10 onwards. We then tested these birds in problem solving and motor inhibition tasks and for novel environment behaviour in this F1 and a subsequent F2 generation. We expect that the variation between rural and urban birds in these traits is mainly caused by genetic differences between populations and are therefore maintained in both the F1 and F2 generations. This study will add to discussions of whether plastic or genetic factors underlie the phenotypic differences between populations living in contrasting environments.

Synopsis

Do plastic or genetic factors underlie the cognitive and behavioural differences between rural and urban populations?

Twitter handle

@utkurhan

168

Coevolution of cooperative breeding and immunity across the bird tree of life

Emily O'Connor ORCID iD, Mads Schou, Charlie Cornwallis

Lund University, Lund, Sweden

Abstract

In family groups of cooperative breeding birds, offspring remain with their parents to help raise subsequent broods of chicks. A consequence of this breeding strategy is that high contact rates with genetically similar individuals expose individuals to more pathogens. However, cooperative breeding has evolved independently on multiple occasions across the bird phylogeny. Immune system adaptations that enable individuals to cope with increased pathogen pressure have consequently been proposed to facilitate the evolution of cooperative breeding. We tested this theory by sequencing the genomes of 50 species of bird to quantify the strength of adaptive evolution across 215 immune genes over 18 independent evolutionary transitions to cooperative breeding. Using phylogenetic comparative methods, we analyse whether changes in selection on immune traits have preceded or followed the evolution of cooperative breeding. Our results shed new light on unresolved questions about the importance of immune traits in the evolutionary origins of family-based cooperative societies.

Synopsis

The importance of a strong immune system for birds living in extended family groups

Twitter handle

@Emily_EvolBiol

174

Breeding under predation threat: A long-term study of corticosterone levels and parental investment in incubating female common eiders

Bertille Mohring ORCID iD[1,2], Markus Öst ORCID iD[1], Kim Jaatinen ORCID iD[3], Charline Parenteau[2], Emmanuelle Grimaud[2], Frédéric Angelier ORCID iD[2]

[1]Åbo Akademi University, Turku, Finland. [2]Centre d'Etudes Biologiques de Chizé, Villiers-en-Bois, France. [3]Nature and Game Management Trust Finland, Degerby, Finland

Abstract

Reproduction is costly because parents have to allocate resources between parental care and self-maintenance. Life-history theory predicts that individuals should adjust reproductive investment to their state to maximize fitness. Accordingly, breeding decisions are expected to be affected by predation threat. Studying corticosterone (CORT) – the main avian glucocorticoid – is relevant because moderate increases in CORT level are thought to promote the allocation of resources into reproduction (the CORT-adaptation hypothesis). However, the links between CORT levels, predation risk and reproductive investment have rarely been studied in wild populations. Using a long-term monitoring of baseline CORT levels in female common eiders (*Somateria mollissima*) breeding under fluctuating predation pressure (1484 females, 2009-2021), we investigated whether variation in CORT levels could mediate the link between predation risk and reproductive investment. We predicted that baseline CORT levels would support increased parental investment, and, accordingly, that both CORT levels and reproductive investment would decrease under increasing risk. Supporting the CORT-adaptation hypothesis, we found that (1) females investing more into reproduction – older breeders and those laying larger clutches – had higher CORT levels; (2) CORT levels were positively associated with reproductive success. Importantly, females were found to plastically downregulate CORT under higher predation risk, likely reflecting reduced reproductive investment. Accordingly, population CORT levels decreased over the study period as predation pressure increased, and reproductive investment concomitantly decreased. Our study highlights CORT levels as a promising physiological tool to investigate how individuals modulate parental investment in response to environmental constraints such as predation risk.

Synopsis

Baseline corticosterone levels mediate the adjustment of reproductive investment to predation threat in a long-lived seabird

Twitter handle

@BertilleMohring

176

DNA metabarcoding reveals the complexity and flexibility of boreal bird-insect food webs

Coen Westerduin ORCID iD[1,2], Emma Vatka ORCID iD[1], Oona Herzog[1], Seppo Rytkönen ORCID iD[1], Marko Mutanen[1], Markku Orell[1]

[1]University of Oulu, Oulu, Finland. [2]University of Eastern Finland, Joensuu, Finland

Abstract

Highly variable intra- and interannual environmental conditions require organisms in boreal ecosystems to constantly adapt — both as individuals and as species. Increasingly, anthropogenic climatic change and habitat degradation are testing their adaptive abilities further yet. Some species from across the taxonomic spectrum have responded to these by shifting their phenologies or distributions over the past decades, and the upcoming decades may prove disastrous for those unable to adapt in one way or another. Where some shifts are directly linked to environmental conditions, others will be necessary to for instance match corresponding changes in food sources. In this study, we use DNA metabarcoding to unravel the food webs of five boreal passerine species and their numerous arthropod prey; a system known to be ongoingly affected by environmental changes. With data collected over three breeding seasons, we look into niche differences between the birds as well as variability across the years. Although broadly seen as generalists, our findings indicate a fine-scale variation in prey use and levels of specialism among the birds. By connecting the largely species-level dietary data to knowledge on the arthropods' traits (e.g., host plants, defence mechanisms), we subsequently infer differences in the birds' foraging behaviour and habitat requirements. The detailed information offered by DNA-based techniques reveals relevant, previously unknown dietary differences between several closely related birds. These can help explain past phenological patterns, and indicate differential vulnerability to future environmental changes for the focal birds — of which some are thriving, while others are already of increasing conservational concern.

Synopsis

NA

179

Using metabolic data to uncover the ontogeny of endothermy in altricial birds

Elana Rae Engert ORCID iD, Andreas Nord ORCID iD, Fredrik Andreasson ORCID iD, Jan-Åke Nilsson ORCID iD

Lund University, Lund, Sweden

Abstract

Altricial birds have young that depend on their parents for food and warmth during the first days of their life. Brood size typically influences the thermal environment and nutritional status of altricial nestlings during their rapid growth and development. This could lead to energy allocation trade-offs resulting in differences in growth and development trajectories in relation to brood size. One important development milestone for nestlings is the onset of endothermic heat production. Before nestlings are able to regulate their own temperature, they are vulnerable to cooling while the female is off the nest, which could lead to nest abandonment if nestlings become unresponsive. We hypothesized that experimentally enlarged broods have a delayed development of endothermy compared to reduced broods, owing to differences in the thermal environment and nutritional status. To pinpoint the onset of homeothermy, previous studies have investigated cooling rates of entire nests or individual nestlings. However, cooling rates alone are not sufficient to determine the onset of endothermic heat production. Hence, we measured metabolic rate in thermoneutrality as well as the metabolic response to a cooling challenge during the first week after hatching in Blue Tit nestlings from experimentally manipulated brood sizes in southernmost Sweden. To our surprise, there was no effect of the brood size manipulation in our study. However, our study lends important and rare insights into the timing and development of endothermy in altricial nestlings, which we found begins already in the first few days after hatching.

Synopsis

Important and rare insights into the timing and development of endothermy in altricial nestlings.

Twitter handle

@EngertRae

180

Aridity and demography drive the Luxury Effect: Influences on bird diversity patterns in cities

Irene Regaiolo[1], Arjun Amar[2], Péter Batáry[3], Chevonne Reynolds[2,4], Dominic A. W. Henry[5,6], Enrico Caprio[1], Dan Chamberlain[1]

[1]Department of Life Sciences and Systems Biology, University of Turin, Turin, Italy. [2]FitzPatrick Institute of African Ornithology, Department of Biological Sciences, University of Cape Town, Rondebosch, South Africa. [3]"Lendület" Landscape and Conservation Ecology Group, Institute of Ecology and Botany, Centre for Ecological Research, Alkotmány u. 2-4, Vácrátót, Hungary. [4]School of Animal Plant & Environmental Sciences, University of the Witwatersrand, Johannesburg, South Africa. [5]Statistics in Ecology, Environment and Conservation, Department of Statistical Sciences, University of Cape Town, Rondebosch, South Africa. [6]Endangered Wildlife Trust, Johannesburg, South Africa

Abstract

Urban biodiversity can improve the quality of life of urban residents, but its benefits are not shared equitably by the human population. The Luxury Effect (the positive relationship between urban biodiversity and socioeconomic status) has been broadly demonstrated, but with much variation. We seek to identify the causes of this variation in the Luxury Effect by analysing potential drivers of bird diversity with a meta-analytical approach. These include precipitation, human population density, wealth level (GDP) and income inequality at different scales (national and city-level). We derived effect sizes of the relationship between socioeconomic status and bird diversity from a standardized literature search, and performed a hierarchical meta-analysis to investigate factors driving the Luxury Effect by including population density, economic variables and precipitation, and their interactions, as moderators. There was overall evidence for the Luxury Effect. Furthermore, precipitation was a key driver with the Luxury Effect being stronger in more arid cities. Population density negatively affected the relationship between wealth and bird diversity. The Luxury Effect was more pronounced in cities in countries with more equal societies when precipitation was lower. The Luxury Effect represents environmental injustice, and should thus be addressed within a context of sustainable development of cities. The strong effect of precipitation suggests equitable management of urban areas, as well as the provision of water resources, may ensure wide availability of urban biodiversity to both wealthy and poor residents in arid regions. Nonetheless, reducing inequality and social disparities in cities remains a challenge.

Synopsis

Exploring socioeconomic factors driving the Luxury Effect to improve environmental justice and promote urban biodiversity

Twitter handle

@IreneRegaiolo

187

Bottom-up approaches to bird conservation in vineyards are effective and may enhance ecosystem services

Mattia Brambilla ORCID iD[1], Francesco Gatti[2], Giacomo Assandri[3], Emanuela Granata[4], Corrado Alessandrini[1], Paolo Pedrini[4]

[1]Milan University, Department of Environmental Science and Policy, Milan, Italy. [2]Iolas -Associazione per lo Studio e la Conservazione delle Farfalle, Ponte Nizza (PV), Italy. [3]ISPRA, Ozzano Emilia (BO), Italy. [4]MUSE, Trento, Italy

Abstract

Vineyards represent a striking example of the consequences of agricultural intensification on biodiversity, ecosystems and landscapes. Top-down approaches have largely failed in delivering benefits for biodiversity in vineyards. In recent years, we have investigated drivers of avian communities and single species of particular interest or concern in several wine regions in northern Italy and then implemented bottom-up initiatives with local winegrowers to adopt management protocols targeted at promoting biodiversity, with virtually no additional costs for farmers. We identified both landscape and management factors relevant to bird species and communities and associated ecosystem services. Research results suggested that ground vegetation and relative management may play a key role for birds and the supply of ecosystem services. We then proposed an alternated management of ground vegetation in the inter-rows and demonstrated its benefits on birds (and butterflies) using a three-year BACI experiment, while taking into account landscape effects. We measured overall species richness per transect (also for butterflies), and the richness and abundance of different avian guilds. Alternate management triggered an increase in the number of bird and butterfly species per transect, also promoting the richness and abundance of functional insectivores, and the abundance of seed eaters. From a landscape perspective, the maintenance of specific traits among vineyards promotes regulating ecosystem services, by supporting insectivores and seed eaters and reducing soil erosion, as well as cultural ecosystem services, by enhancing opportunities for nature-based recreation (also through an increase in the number of target species for birders) and maintaining aesthetic and heritage values.

Synopsis

Simple management measures and landscape elements increase bird richness and abundance, and the supply of ecosystem services.

188

Tropical forest birds differ in acoustic-space competition-avoidance strategies

Agata Staniewicz ORCID iD, Emilia Sokołowska ORCID iD, Michał Budka ORCID iD

Adam Mickiewicz University, Poznań, Poland

Abstract

Acoustic signals are of critical importance to songbirds, who rely on them for mate attraction and territorial defence. Interference caused by sounds that overlap in frequency and time can disturb or mask the signal detection and lower a species' reproductive success. Tropical forests are a particularly sound-rich environment, where birds compete for acoustic space not only with a large number of other bird species, but also with other vocal taxa such as insects and amphibians. While species differ in their song spectral properties, duration and composition, the limited acoustic space may lead to evolution of behavioural strategies aimed at minimising competition. Using playback experiments we tested whether wild songbirds in Kibale Forest, Uganda, use temporal or spectral separation to avoid competition for acoustic space. We focused on two passerine species with different song spectral ranges: the grey-backed camaroptera (Cisticolidae) with a broad-spectrum song, and the scaly-breasted illadopsis (Pellorneidae), which produces a narrow-spectrum song. We found that the scaly-breasted illadopsis produced significantly fewer songs in the periods of white noise matching its song frequency range than both in the periods of silence or frequencies either above or below its song range. Yet, in case of the grey-backed camaroptera, there was no significant difference in the number of songs produced in each of the treatments. Our results suggest that competition avoidance strategies are species-specific and may be related to both the spectral frequency range of the species and its ecology.

Synopsis

In a tropical forest, songbirds with narrow-frequency spectrum songs are more likely to avoid spectral and temporal sound overlap.

Twitter handle

@AgataStaniewicz

189

Environmental constraints can explain clutch size differences between urban and forest blue tits (*Cyanistes caeruleus*): insights from an egg removal experiment

Mark Pitt ORCID iD, Pablo Capilla-Lasheras ORCID iD, Norah Salem S Alhowiti, Claire Branston ORCID iD, Eugenio Carlon, Jelle Boonekamp ORCID iD, Davide Dominoni ORCID iD

University of Glasgow, Glasgow, United Kingdom

Abstract

Urban environments are expanding globally, presenting novel ecological challenges to which species might not be well adapted. Understanding whether species responses to urban living are adaptive or maladaptive is critical to predicting the future impacts of urbanisation on biodiversity. Urban breeding birds exhibit reduced reproductive investment (clutch size) compared to neighbouring non-urban populations. However, whether this reduction is an adaptive response or due to physiological constraints is unclear. Here, we investigated the ability of urban and forest blue tits (*Cyanistes caeruleus*) to lay new eggs following an egg removal manipulation. Consistent with the expectation that constraints limit clutch size, egg removal did not induce urban females to lay replacement eggs. Meanwhile, forest birds laid approximately two replacement eggs after egg removal. Additionally, we found that the size of replacement eggs from forest females declined over the lay sequence, a pattern not observed in urban clutches. Hatchlings from experimental nests were lighter in both habitats, with lighter hatchlings having reduced survival. Furthermore, as urban blue tits did not lay replacement eggs, egg removal resulted in a brood reduction in the city and nestlings from urban experimental nests had higher survival than those from urban control nests. Overall, our results suggest cities place constraints on egg production in urban birds. Urban females may experience energetic or nutrient limitations that restricts egg formation and/or exacerbates the trade-off between survival and egg production. Additionally, females may be misjudging urban habitat quality and produce a clutch too large to be sustained in the city.

Synopsis

Environmental constraints may explain why urban blue tits produce smaller clutches than their forest counterparts

Twitter handle

Mark__Pitt

190

The Eurasian African Bird Migration Atlas – documenting migration and movements using ringing and tracking data

Stephen Baillie ORCID iD[1], Samantha Franks ORCID iD[1], Wolfgang Fiedler ORCID iD[2]

[1]British Trust for Ornithology, Thetford, United Kingdom. [2]Max Planck Institute of Animal Behavior, Centre for Animal Marking "Vogelwarte Radolfzell", Radolfzell, Germany

Abstract

The recently published Eurasian African Bird Migration Atlas (https://migrationatlas.org) provides vital information for bird conservationists and ecologists. At its core the Atlas is an online tool documenting the movement patterns of some 300 bird species based on over 100 years of ringing data from the EURING databank, together with tracking data from Movebank. The Atlas draws on data from all major European Ringing Schemes and the core project team involves researchers from nine European countries. We outline how these data have been analysed to provide a robust picture of the migration patterns of different bird species and populations using large-scale and long-term ring recovery data, with tracking data providing detailed movement information for a more limited sample of individuals and populations. The Atlas is based around maps showing the overall migratory connectivity patterns of different regional populations, how these patterns vary according to different seasons, temporal variation in movements throughout the annual cycle and patterns according to causes of recovery. There are also a range of infographics documenting the structure of the species datasets and potential biases in time and space. We show how the Migration Atlas outputs can be combined to understand avian movement patterns, and that for most species the available data provide a robust picture of bird migration. Within the Atlas project as a whole these species-specific recovery analyses are linked to more detailed analyses of migration timing, migratory connectivity, impacts of illegal killing and long-term changes in movement patterns.

Synopsis

The @_EURING Eurasian African Bird Migration Atlas https://migrationatlas.org documents the movements of 300 bird species

Twitter handle

@StephenRBaillie

192

Individual variation in extreme phenotypes in Snow Bunting, an Arctic cold specialist

Sachin Anand[1,2,3,4], Audrey Le Pogam[1,2,3,4], Oliver Love[5], François Vézina[1,2,3,4]

[1]Department of biology, chemistry and geography, University of Quebec at Rimouski, Rimouski, Canada. [2]Groupe de recherche sur les environnements nordiques BORÉAS, Rimouski, Canada. [3]Quebec Centre for Biodiversity Science, Rimouski, Canada. [4]Centre for Northern Studies (CEN), Rimouski, Canada. [5]Department of Integrative Biology, University of Windsor, Windsor, Canada

Abstract

Climate change, particularly the rapid warming of Arctic regions, is expected to significantly affect cold adapted species. However, only a few studies have considered the direct effects of increasing temperature on the thermal biology of cold-adapted species. This is alarming as these animals might have a limited capacity to release heat at warmer temperatures.

Snow buntings are small songbirds known for their extreme cold endurance. Recent research from our group suggests that the species' extreme cold endurance may result in a weak capacity to tolerate moderate heat, possibly because of their adaptations for survival most of the year at sub-zero temperatures. Therefore, a negative relationship between cold endurance and heat tolerance could be expected at an individual level. To test this, from January 2023, I am measuring cold endurance (summit metabolism) and heat tolerance in wild buntings throughout winter. Concurrently, I am also measuring 20 outdoor captives throughout the year to evaluate how seasonal acclimatization influences the relationship between performance at the extreme of their thermoregulatory spectrum. All individuals are also implanted with a temperature-sensitive passive integrated transponder to record body temperature during measurements.

Expected results: I expect to find a negative relationship between cold endurance and heat tolerance at the individual level, which would mean that natural selection could favour a phenotypic shift away from being a cold specialist to being able to perform in increasingly warmer temperatures. This is one of the first studies to consider the effect of climate change on the thermal biology of cold-adapted species.

Synopsis

Relationship between heat endurance and cold tolerance in snow buntings, an Arctic cold-specialist

Twitter handle

@a_sachin1

194

Phylogenetic relationships of immune function and oxidative physiology with sexual selection and parental effort are sex-specific in birds

Péter László Pap[1], Csongor I. Vágási[1], Veronika Bókony[2], Janka Pénzes[1], Krisztián Szabó[3], Nóra M. Magonyi[4], Gábor Á. Czirják[5], Orsolya Vincze[6]

[1]Babeș-Bolyai University, Cluj Napoca, Romania. [2]Lendület Evolutionary Ecology Research Group, Plant Protection Institute, Centre for Agricultural Research, Eötvös Loránd Research Network, Budapest, Hungary. [3]Department of Ecology, University of Veterinary Medicine Budapest, Budapest, Hungary. [4]Doctoral School of Biology and Sportbiology, Faculty of Sciences, University of Pécs, Pécs, Hungary. [5]Department of Wildlife Diseases, Leibniz Institute for Zoo and Wildlife Research, Berlin, Germany. [6]Institute of Aquatic Ecology, Centre for Ecological Research, Debrecen, Hungary

Abstract

Sexual differences in physiology are widely regarded as potential proximate mechanisms that underlie sex differences in mortality, life history, and disease risk of vertebrates. However, little is known about the causes of sex-specific variation in physiology. Sexual selection and parental workload are two key components suggested to shape sex differences in physiology, yet empirical evidence for this hypothesis is mixed to date. We tested this theory by phylogenetic comparative analyses separately in male and female birds, based on 13,300 physiological measurements collected in the field from 2,052 individuals of 116 and 106 European species, respectively. We predicted lower immune capacity and stronger oxidative imbalance in males of species with stronger male sexual selection (greater sexual dichromatism and more frequent social polygyny) and higher male parental effort. For females, we predicted weak or no effect of male sexual selection on female physiology but lower immune capacity and higher oxidative imbalance in species where females invest more in parental care. We found that in males the degree of dichromatism, polygyny and male parental effort correlated negatively with multiple immune indices, and one measure of oxidative physiology (total glutathione level) correlated positively with polygyny score. Female immune and oxidative physiology were unrelated or weakly related to either male sexual selection or female parental effort. We conclude that sexual selection and parental effort are important factors influencing immune (although not oxidative) physiology in male but not in female birds, supporting earlier claims that males largely suffer the physiological costs of sexual selection alone.

Synopsis

Sexual selection and parental effort are important factors influencing immune physiology in male but not in female birds.

Twitter handle

196

Long-term changes in the movement patterns of European migrants

Kasper Thorup ORCID iD, Tom S. Romdal

Natural History Museum of Denmark, Copenhagen, Denmark

Abstract

There is great need for assessing and understanding how populations react to global change. Baseline data are needed for detecting such changes but few historical data sets exist. Ringing and re-encounter data have been systematically collected for more than 100 years back in time and can provide information on changes in movement and migration patterns. Based on data from the Eurasian African Bird Migration Atlas, we present changes in migration patterns over time for species with good spatial and temporal coverage. Our main focus is on migration distance but also on latitudinal and longitudinal changes. We restrict our analyses to birds recovered dead, analysing both the full data set and the subset of birds ringed during breeding and recovered during winter. For example, for the white stork *Ciconia ciconia* wintering is now more often recorded in Southwest Europe than before 1970 when more individuals were recorded in South and East Africa. Furthermore, the proportion of storks recorded as being hunted are now less than 2% compared to almost 30% in the early 20th century. The work describes the observed changes but necessarily leaves many open questions regarding causes. As such it provides a basis for future research on relating changes in migration patterns to climate and land use changes.

Synopsis

Based on The @_EURING Migration Atlas https://migrationatlas.org, we document long-term changes in movement patterns of migrants

Twitter handle

@BirdMigrLab

199

Changing offspring production in a warming world: a case study of reed warblers

Lucyna Halupka ORCID iD, Marta Borowiec ORCID iD, Grzegorz Neubauer ORCID iD, Konrad Halupka ORCID iD

University of Wrocław, Wrocław, Poland

Abstract

We studied a colour ringed population of Eurasian Reed Warblers in two study periods: 1980s (1980–83) and in the current century (2005–12) in SW Poland. Ambient temperatures during the breeding season increased by 1.5oC between the two study periods. In response to higher spring temperatures birds started breeding earlier, but the end of breeding remained unchanged which resulted in the lengthening of breeding season of the whole population. We wanted to check whether individual females also stayed longer at the breeding grounds (this was not obvious due to high breeding asynchrony) and whether this affected their productivity. We found that breeding seasons of individual females were indeed longer in the current century than in the 1980s. Annual production of fledged young was much higher in recent years: in the 2000s females produced 75% more fledglings annually than females in the 1980s (2.8 vs 1.6, respectively). Furthermore, the proportion of females raising second broods increased from 2.7% to 23.6% between the first and the second study period. At the same time the share of females that did not produce any young annually decreased from 48.1% to 15.5%. We conclude that climate change may prolong reproductive seasons in some species (mainly multi-brooded ones) resulting in higher productivity. Identifying causes and consequences of changes in the duration of breeding seasons may be essential to predict demography of populations under changing climatic conditions.

Synopsis

NA

205

Adjustment of an Arctic seabird to the changing environment

Martyna Syposz ORCID iD[1], Sebastian Descamps[2], Jerome Fort[3], David Grémillet[4,5], Dorota Kidawa[1], Tomasz Wawrzyniak[6], Hallvard Strøm[2], Dariusz Jakubas[1], Katarzyna Wojczulanis-Jakubas[1]

[1]University of Gdansk, Gdansk, Poland. [2]Norwegian Polar Institute, Fram Centre, Stakkevollan, Tromso, Norway. [3]Littoral Environnement et Sociétés (LIENSs), UMR 7266 La Rochelle University, La Rochelle, France. [4]CEFE, Univ Montpellier, CNRS, EPHE, IRD, Montpellier, France. [5]FitzPatrick Institute of African Ornithology, DST-NRF Centre of Excellence, University of Cape Town, Capetown, South Africa. [6]Institute of Geophysics, Polish Academy of Sciences, Poland, Poland

Abstract

Climate change results in shifts in environmental conditions around the world, with an uneven spread across Earth's regions. Especially affected is the Arctic environment that has been changing at an unprecedented rate, with a temperature rise of twice the global average. This results in changes in ocean biochemistry, biological productivity and phenological onsets. Arctic animals need to respond to the new environment either by shifting their distribution or adjusting their physiology and behaviour. This response will determine if the species are going to survive in the Anthropocene.

Little Auk (Alle alle), as the most abundant Arctic seabird, it is a key part of the polar ecosystem. It is also the smallest of the High Arctic seabirds, well-adapted to live in extreme cold with its dense plumage, high metabolic rate and nests placed in rock crevices. Using long-term dataset (2001-2022) from three sites located in Arctic, we investigated the effect of climate change on the hatching date of Little Auks, showing that higher temperatures predicted an earlier hatch date. Additionally, we analysed data collected by miniature geolocating devices deployed on seabirds, and inspected how environmental variables affected the arrival date at the colony site. While Little Auk exhibits a certain degree of flexibility in adjusting to a changing climate in its phenological onsets, we further show how this affects the breeding parameters. Our project provides a new insight into the changes happening in the Arctic, through better understanding of their effect on a key polar resident, the Little Auk.

Synopsis

Adjustment of an Arctic seabird, Little Auk, to the changing environment and its consequences.

Twitter handle

@martyna_syposz

211

RFID-based weighing units shed light on body mass development after fledging, which affects the timing of natal dispersal and juvenile survival

Bettina Almasi ORCID iD[1], Franziska Wolf[1], Lara De Gianni[1], Alexandre Roulin ORCID iD[2]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]University of Lausanne, Lausanne, Switzerland

Abstract

The period after leaving the parental nest is associated with high mortality in many bird species. During this time, the juvenile birds become independent of their parents, have to hunt for themselves and then gradually leave the parental home-range. It is therefore not surprising that the body condition of the juvenile birds when they enter this phase of life influences their chances of survival, dispersal behaviour and the likelihood of returning to the population as breeding birds. However, less is known about how body condition develops in the first weeks after leaving the parental nest and how this affects behaviour and survival later in life. Using a newly developed RFID-based weighing system, we tracked the weight development of 210 juvenile barn owls (*Tyto alba*) from 71 broods from three years in the period after leaving the parental nest. We investigated the effects of intrinsic (sex, corticosterone profiles) and extrinsic factors (habitat composition, prey availability and weather) on weight development before and after fledging, on the timing of fledging and on the timing of leaving the parental home range and consecutive survival and recruitment probabilities. Habitat composition around the rearing site affects prey availability, which in turn affects the body condition of juveniles; in addition, survival in the first year is negatively affected by body condition. These results highlight the importance of habitat compositions around the rearing site.

Synopsis

The importance of habitat composition for juvenile body mass development and first year survival in barn owls (Tyto alba).

212

Investigating the main mortality reasons of the European Red Kite population by high-resolution GPS telemetry tracking

Rainer Raab ORCID iD[1], Ivan Literák[2], Jendrik Windt[3], Eike Julius[1], Rainhard Raab[1], Maximilian Raab[1], Verena Straußß[1,4], Shane Sumasgutner[1], Péter Spakovszky[1], Jochen Steindl[1], Manuel Wojta[1], Eva Indruchová[1], Alexander Bek[1], Marek Dostal[5], Boris Maderič[6], Ján Svetlík[6], Stef van Rijn[7], Alfonso Godino[8], Juan Arizaga[9], Melvin Bach[10], Bettina Wilkening[11], Ana Bermejo[12], Javier De La Puente[12], Antoni Muñoz[13], Ubbo Mammen[14], Patricia Mateo Tomás[15,16], Diego Villanúa Inglada[17], Patrick Scherler[18], Martin Grüebler[18], Urs Kormann[18], Dušan Rak[19], Manuela Löwold[20], Wolfgang Fiedler[21], Thomas Pfeiffer[22], Winfried Nachtigall[23], Ernesto Alvarez[24], Manuel Galan[24], Christian H. Schulze[25], Lubomír Peške[26], László Haraszthy[27], Martin Kolbe[28], Bernd Nicolai[28], Eike Steinborn[28], Hynek Matušík[29], Karel Makoň[30], Jakub Mráz[31], Vladimír Pečeňák[6], Jean-Yves Paquet Paquet[32], Alexander Resetaritz[33], Zdeněk Vermouzek[34], Fabienne David[35], Aymeric Mionnet[35], Aurelie de Seynes[35], Romain Riols[35], Nicolas Lorenzini[35], Samuel Talhoet[35], Torsten Marczak[36], Nayden Chakarov[37], Jörg Westphal[38], Carole Attie[39], Miklós Vaczi[40], Martin Sprötge[41], Matthias Haase[42], Sascha Ritter[42], Marta Olalde Fernández[43], Susanne Åkesson[44], Caka Karlsson[44], Katharina Klein[45], Max Steinmetz[46], Moritz Mercker[47], Hannah Böing[1]

[1]TB Raab Ltd., Deutsch-Wagram, Austria. [2]Department of Biology and Wildlife Diseases, Faculty of Veterinary Hygiene and Ecology, University of Veterinary Sciences Brno, Brno, Czech Republic. [3]Institute of Wildlife Biology and Game Management, Department of Integrative Biology and Biodiversity Research, University of Natural Resources and Life Sciences Vienna, Vienna, Austria. [4]Research Institute of Wildlife Ecology, Department for Interdisciplinary Life Sciences, Vetmeduni Vienna, Vienna, Austria. [5]Department of Biology and Wildlife Diseases, Faculty of Veterinary Hygiene and Ecology, University of Veterinary Sciences Brno, Czech Republic, Brno, Czech Republic. [6]Raptor Protection of Slovakia, Bratislava, Slovakia. [7]Deltamilieu Projecten, Culemborg, Netherlands. [8]AMUS (Acción por el Mundo Salvaje), Badajoz, Spain. [9]Department of Ornithology, Aranzadi Sciences Society, Donostia, Spain. [10]WIND-projekt Ingenieur- und Projektentwicklungsgesellschaft mbH, Rostock, Germany. [11]ENERTRAG SE, Schenkenberg, Germany. [12]SEO/BirdLife, Madrid, Spain. [13]Grup Balear d'Ornitologia i Defensa de la Naturalesa (GOB-Mallorca), Palma, Spain. [14]ÖKOTOP Halle, MEROS (Monitoring Raptors und Owls in Europe), Halle, Germany. [15]Biodiversity Research Institute (University of Oviedo-CSIC-Principality of Asturias), Mieres, Spain. [16]Center for Functional Ecology (CFE), Coimbra University, Coimbra, Portugal. [17]Navarra Environmental Management (GAN-NIK), Pamplona, Spain. [18]Swiss Ornithological Institute (SOI), Sempach, Switzerland. [19]ANITRA System s.r.o., Praha, Czech Republic. [20]Mitteleuropäische Gesellschaft zur Erhaltung der Greifvögel Deutschland (MEGEG DE), Hosenfeld, Germany. [21]Max Planck Institute of Animal Behavior, Radolfzell, Germany. [22]-, Weimar, Germany. [23]Förderverein Sächsische Vogelschutzwarte Neschwitz e.V, Neschwitz, Germany. [24]GREFA, Madrid, Spain. [25]Division of Tropical Ecology and Animal Biodiversity, Department of Botany and Biordiversity Research, University of Vienna, Vienna, Austria. [26]-, Praha, Czech Republic. [27]Pro Vértes, Csákvár, Hungary. [28]Rotmilanzentrum am Museum Heineanum, Halberstadt, Germany. [29]-, Březolupy, Czech Republic. [30]DESOP - Záchranná stanice živočichů, Plzeň, Czech Republic. [31]-, Lomnice nad Lužnicí, Nádražní, Czech Republic. [32]Département Études Natagora, Namur, Belgium. [33]ÖKOTOP Halle, Halle, Germany. [34]Czech Society for Ornithology, Praha, Czech Republic. [35]LPO France, Paris, France. [36]-, Bützow, Germany. [37]University Bielefeld, Faculty of

Biology, Bielefeld, Germany. [38]Kreis Lippe, Detmold, Germany. [39]Conservatoire d'espaces naturels de Corse (CEN Corse), Borgo, France. [40]Fertő-Hanság Nemzeti Park Igazgatóság, Sarród, Hungary. [41]Planungsgruppe Grün GmbH, Bremen, Germany. [42]Grüne Umwelt e. V., Sülzetal, Germany. [43]Arabako Foru Aldundia - Diputación Foral de Álava, Álava, Spain. [44]Lund University, Lund, Sweden. [45]natur&ëmwelt a.s.b.l., Kockelscheuer, Luxembourg. [46]Naturschutzsyndikat SICONA, Olm, Luxembourg. [47]Bionum GmbH, Hamburg, Germany

Abstract

The LIFE EUROKITE project aims to reduce the anthropogenic causes of mortality of the red kite. To effectively protect European species such as the red kite, a detailed understanding of anthropogenic and non-anthropogenic influences, especially the causes of mortality, is required. Within the inter-European LIFE EUROKITE project, we study the anthropogenic causes of mortality by applying high-resolution GPS telemetry tracking that allows fast and exact locating of dead birds. A standardized protocol for the European-wide assessment of morbidity and mortality of raptors has been developed and the mortality reason for each individual is consequently determined by performing necropsy procedures.

Data of 2,252 tagged red kites from 14 European countries is currently available in the LIFE EUROKITE data base through data exchange with (cooperation-) partners of the project. By 12/01/2023 more than 904 red kites have already died (not including transmitter failures). From 793 analysed cases it has been proven that 129 tagged red kites have died from poisoning. 664 tagged red kites have died from other anthropogenic and natural causes such as predation, collision, electrocution, shooting or disease. Several intrinsic and extrinsic predictors that may lead to specific causes of death are examined.

We used the "integrated Step-Selection Function (iSSF)" to learn the behaviour of tagged red kites and predict the species-specific probability of anthropogenic mortality factors of red kites across countries and regions in Europe.

Synopsis

Reduction of the anthropogenic causes of mortality of the red kite by using high-resolution GPS telemetry tracking

Twitter handle

@life_eurokite

215

Alien bird species decrease taxonomic and functional, but not phylogenetic, diversity of invaded bird communities

Fabio Marcolin ORCID iD[1], Dan Chamberlain ORCID iD[2], Pedro Segurado ORCID iD[1], Luis Reino ORCID iD[3,4]

[1]Centro de Estudos Florestais (CEF), Instituto Superior de Agronomia, Universidade de Lisboa, Lisbon, Portugal. [2]Dipartimento di Scienze della Vita e Biologia dei Sistemi, Università di Torino, Turin, Italy. [3]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, Vairão, Portugal. [4]BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairão, Vairão, Portugal

Abstract

Introduced alien species has direct and indirect effects on native communities, leading to local biodiversity loss and biotic homogenization. This is particularly evident in urban and agricultural areas, where human disturbance may favour alien birds, posing an additional stressor on native bird communities. We assessed: i) the impact of alien birds on taxonomic, functional and phylogenetic diversity (TD, FD and PD respectively) of bird communities inhabiting a highly human-modified landscape; and ii) the effect of landscape composition and configuration on these diversity metrics. We surveyed 189 randomly distributed point counts (stratified sampling: urban, agricultural and forest areas) across the Tagus Estuary area (Portugal). We tested whether TD, FD and PD indices were significantly different between non-invaded and invaded bird communities. To assess the effect of landscape composition and configuration on these indices, we ran linear mixed-effect models (GLMM). We found that only TD and FD were significantly different between the two communities, with non-invaded communities retaining higher TD and FD. Generally, the indices for both communities were negatively affected by human-modified areas (e.g. agriculture and urban areas) and enhanced by forest areas and landscape heterogeneity. Our results, thus, suggest that the occurrence of alien birds negatively affects TD and FD (but not PD) of bird community assemblages, but that this impact is stronger in human-modified landscapes. Therefore, since the conservation of biodiversity in anthropogenic habitats is a worldwide challenge, we should prioritize research efforts to assess the effects of alien species establishment on communities inhabiting those habitats.

Synopsis

Alien birds have stronger impact on diversity of bird communities in more human-modified landscapes

Twitter handle

FabioMarcolin89

216

Constructing a "Genoscape" for the common stonechat complex: using genomic markers to understand how its migration connects

Tianhao Zhao[1], Kristen Ruegg[2], Yury Anisimov[3], Magnus Hellström[4], Heiner Flinks[5], Martin Küblbeck[6], Xiaolu Jiao[7], Friederike Woog[8], Andrea Bours[9], Depin Li[10], Juan Carlos Illera[11], Gang Song[7], Fumin Lei[7], Staffan Bensch[12], Miriam Liedvogel[13], Wieland Heim[14], Bregje Wertheim[1], Barbara Helm[14]

[1]University of Groningen, Groningen, Netherlands. [2]Colorado State University, Fort Collins, USA. [3]Baikalsky Nature reserve, Irkusk, Russian Federation. [4]Ottenby Bird Observatory, Kalmar, Sweden. [5]NA, Suedlohn, Germany. [6]Max-Planck-Institut fuer Biologische Intelligenz, Seewiesen, Germany. [7]Institute of Zoology, Chinese Academy of Science, Beijing, China. [8]Stuttgart State Museum of Natural History, Stuttgart, Germany. [9]Max Planck Institute for Evolutionary Biology, Plön, Germany. [10]Dali University, Dali, China. [11]University of Oviedo, Mieres, Spain. [12]Lund University, Lund, Sweden. [13]Max Planck Institute for Evolutionary Biology, Wilhelmshaven, Germany. [14]Swiss Ornithological Institute, Sempach, Switzerland

Abstract

The common stonechat complex (previously known as Saxicola torquata) comprises small passerine insectivores distributed over Asia, Europe, and Africa. Across their range, stonechats show similar appearances and habitat preferences yet differ widely in migratory status and breeding altitudes. However, it has been difficult to understand how different geographical breeding populations migrate. In particular, in Eurasia, several different taxa co-occur on wintering grounds, including occasional vagrancy events, but display ambiguous phenotypical contrasts for identification. We are developing a “Genoscape” approach on the stonechat taxa to investigate the patterns of migratory connectivity of the common stonechat. The Genoscape is based on mapping genomic variation from different geographical breeding populations and developing simplified, high-resolution SNP (single-nucleotide polymorphism) assays to characterize migratory movements and connectivity. Applying this genotyping assay to individuals from non-breeding regions allows us to infer their migration routes. In our project, we collected tissue samples of 244 stonechat individuals from 15 different geographical breeding populations throughout three continents, spanning eight previously recognized species or subspecies. We conducted genome re-sequencing on Illumina or equivalent platforms to 15-20x depth. These resources will be used to develop 96-SNP assays for genotyping unknown individuals and more breeding populations that haven’t been included in the data set in order to: 1) clarify how different geographical populations migrate across the Eurasia continent; 2) identify the origin of vagrant Asian stonechat individuals in Europe; and 3) infer the historical expansion histories and the evolutionary shift of migratory behavior among these taxa.

Synopsis

Advancing the stonechat migration study to a Genoscape level over three continents.

Twitter handle

@johnsas_k (Tianhao Zhao)

219

Lowered capacity of a nocturnal predator (Strix aluco) to detect prey under experimental noise and light pollution

Arianna Passarotto ORCID iD[1,2,3], Chiara Morosinotto[1,2], Patrik Karell[1,2]

[1]Evolutionary Ecology Unit, Department of Biology, Lund University, Lund, Sweden. [2]Department of Bioeconomy, Novia University of Applied Sciences, Raseborg, Finland. [3]Department of Zoology, University of Seville, Seville, Spain

Abstract

A global trend for sprawling urbanization has led to ever increasing noise- and light-pollution in natural environments. These anthropogenic stressors have been shown to greatly impair the audio-visual perception of wildlife, with consequences for habitat use, activity rhythms, and various types of behaviour. Particularly nocturnal predators are thought to be strongly impaired in their ability to successfully detect and capture prey, with potentially dramatic consequences for their fitness. However, due to a lack of experimental tests, only little is known about the magnitude of the effects of noise- and light-pollution on predator performance. To fill this knowledge gap we exposed Tawny Owls (Strix aluco) to visual and acoustic prey cues under experimentally manipulated noise and light environments to assess the impact of noise- and light-pollution on prey detection. We found that in the absence of noise or light stimuli, owls mostly relied on hearing to detect their prey, while in the presence of acoustic noise, owls' ability to locate prey considerably decreased. This indicates that the ability of owls to successfully detect and capture prey is contingent on environments that are free of acoustic noise. Moreover, when owls were exposed to artificial light, they mainly used sight to locate prey, which, in anthropogenic environments, may determine hunting success. Overall our findings suggest that both noise pollution and artificial light affect nocturnal hunting behaviour by modifying the ability to detect prey. Lower detection abilities might decrease hunting success and fitness, and eventually lead to a shift in space use.

Synopsis

Noise and light pollution negatively affect the abilty to detect prey in Tawny Owls (Strix aluco).

223

Ageing in nature: examining lifelong changes in movement and social behaviour of griffon vultures

Marta Acácio ORCID iD[1], Nili Anglister[1], Gideon Vaadia[1], Kaija Gahm[2], Roi Harel[3], Ohad Hatzofe[4], Ran Nathan[5], Noa Pinter-Wollman[2], Orr Spiegel[1]

[1]Tel Aviv University, Tel Aviv, Israel. [2]University of California, Los Angeles, USA. [3]Max Planck Institute of Animal Behavior, Radolfzell, Germany. [4]Israel Nature and Parks Authority, Jerusalem, Israel. [5]The Hebrew University of Jerusalem, Jerusalem, Israel

Abstract

Movement and social behaviours are key elements of animals' ecology that may change throughout an individual's life. However, most studies oversimplify such behavioural changes to a dichotomy (e.g., comparing juveniles vs. adults), failing to identify non-monotonic changes as individuals age, or the mechanisms through which such age-dependent patterns emerge (e.g., learning or senescence, or differential survival).

Griffon vultures (Gyps fulvus) are a long-lived and social species: they forage in groups, breed in colonies, and congregate in night roosts. In Israel, they are locally endangered and thus the focus of conservation effort. Between 2008 and 2022, we GPS-tracked 319 griffons aged between 0.5 and 20 years old. Using a subset of 135 individuals with sufficient data, we examined how age affected sex- and season-dependent movement probability in three spatio-temporal scales: annual long-distance movements (2000km), and daily medium (20km) and small-scale displacements (1km).

We found a non-linear decline of movement with age in all three scales, revealing three distinct life stages: young age (0-5 years old), with higher probability of movement; adulthood (5-15 years old), with a stabilizing trend in the probability of movement; and old age (> 15 years old), with a pronounced decline in movement. Our results also suggest that individuals change their movement behaviour as they age, indicating a pattern of senescence later in life. Additionally, such lifetime changes in behaviour determine the social interactions between individuals, with potential effects on individual fitness, population dynamics, and ultimately, species conservation.

Synopsis

Lifelong GPS-tracks of griffon vultures show changes in movement behaviour with age, revealing a pattern of senescence later in life

Twitter handle

MartaAcacio

224

Movement patterns and habitat selection of breeding pygmy owls differ between the boreal and the alpine forests

Daniele Baroni ORCID iD[1], Jacopo G. Cecere ORCID iD[2], Sofia Koliopoulos ORCID iD[3], Irene Vertua[4], Massimo Bocca[5], Antti Piironen ORCID iD[1], Toni Laaksonen ORCID iD[1]

[1]Department of Biology, University of Turku, Turku, Finland. [2]Area Avifauna Migratrice, Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Ozzano dell'Emilia, Italy. [3]Department of Life Sciences and Systems Biology, Turin, Italy. [4]Department of Biosciences, University of Milan, Milan, Italy. [5]Mont Avic Natural Park, Aosta, Italy

Abstract

Many secondary cavity nesters are declining in European forests. The lack of basic knowledge regarding their spatial ecology calls for studies aiming to find out the habitat requirements of the species. For the first time, we used miniaturized GPS-tags to study movement ecology of Eurasian pygmy owls (*Glaucidium passerinum*), secondary cavity user showing divergent population trends across Europe. During the breeding seasons of 2021-2022, we collected GPS data from 20 breeding males: 12 from the managed boreal forest in Finland, where there is evidence that the species is declining, and 8 from the Alps in Italy, where it is expanding its range. We found that home ranges are larger than previously assumed and that owls in the Alps have smaller home ranges (90% AKDE 1.42 ± 0.24 km²) than in the boreal forest (90% AKDE 4.68 ± 1.18 km²). Pygmy owls were performing relatively long hunting trips (5.93 ± 1.98 km per day in the boreal forest and 4.66 ± 1.79 in the Alps), and showed different activity rhythms according to the total daylight time. Our results showed a preference for spruce forests in both study areas, for old forest in the boreal region (where there was more young forest in the territories) and for larch forest in the Alps, where moreover the foraging routes were preferentially oriented uphill than downhill. In conclusion, GPS-tracking revealed that pygmy owls consistently need large and unmanaged forests, but also exhibit a certain degree of plasticity to adapt under different environments.

Synopsis

GPS-tracking revealed pygmy owls needs for large and unfragmented forests, both in the boreal region and in the Alps

Twitter handle

https://twitter.com/Danielebaroni14

225

Identifying important sites for migratory waterbirds from a connectivity perspective: a case study in the East Atlantic Flyway

Martin Beal ORCID iD[1], José A. Álves[2], Josh Nightingale[3], Chris Batey[4], Heinrich Belting[5], Pierrick Bocher[6], Malcolm Burgess[4], Taylor Craft[7], Phillip Delaporte[8], Guillaume Gélinaud[9], Jennifer Gill[10], Tomas Gunnarsson[11], Jorge Sánchez Gutíerrez[12], Jos Hooijemeijer[7], Ruth Howison[7], Philip Hunke[13], Heike Jeromin[13], Loic Jomat[14], Hilger Lemke[5], Frank Majoor[15], Christopher Marlow[5], Johannes Melter[16], Ian Nicholson[17], Manuel Parejo Nieto[12], Barry O'Mahoney[18], José Antonio Masero Osorio[12], Esko Pasanen[19], Jorma Pessa[20], Theunis Piersma[7], Frederic Robin[8], Maja Roodbergen[15], Pierre Rousseau[8], Volker Salewski[13], Luis Schmidt[13], Jennifer Smart[21], Lee Tibbitts[22], Sami Timonen[19], Maria P. Dias[1]

[1]cE3c - Centre for Ecology, Evolution and Environmental Changes, Faculty of Sciences of the University of Lisbon, Lisbon, Portugal. [2]Centre for Environmental and Marine Studies (CESAM), Department of Biology, University of Aveiro, Aveiro, Portugal. [3]South Iceland Research Centre, University of Iceland, Laugarvatn, Iceland. [4]RSPB - Royal Society for the Protection of Birds, Sandy, United Kingdom. [5]NLWKN - Betriebsstellen Brake-Oldenburg und Hannover, Hildesheim, Germany. [6]Littoral Environnement et Sociétés UMR LIENSs 7266 CNRS-La Rochelle University, La Rochelle, France. [7]Conservation Ecology Group, Groningen Institute for Evolutionary Life Science (GELIFES), University of Groningen, Groningen, Netherlands. [8]LPO France, Fonderies Royales, Rochefort, France. [9]Univ. de Bretagne Occidentale UFR Sciences et Techniques, Brest, France. [10]University of East Anglia, Norfolk, United Kingdom. [11]South Iceland Research Centre, University of Iceland, Háskólasetur, Iceland. [12]Conservation Biology Research Group, Faculty of Sciences, University of Extremadura, Badajoz, Spain. [13]Michael-Otto-Institut im NABU, Bergenhusen, Germany. [14]National Nature Reserve of Moëze-Oléron, Saint-Froult, France. [15]Sovon Dutch Centre for Field Ornithology, Nijmegen, Netherlands. [16]BIO-CONSULT, Belm, Germany. [17]Humber Wader Ringing Group, York, United Kingdom. [18]NA, Cork, Ireland. [19]The University of Oulu, Department of Ecology and Genetics, Oulu, Finland. [20]The Centre for Economic Development, Transport and the Environment, Oulu, Finland. [21]RSPB - Royal Society for the Protection of Birds, Edinburgh, United Kingdom. [22]US Geological Survey, Alaska Science Center, Anchorage, USA

Abstract

Waterbirds are declining globally, making the effective identification and protection of wetland sites crucial to improving their conservation status. When quantifying site importance, the connectivity of sites created by the long-distance movements of migratory birds is rarely considered. However, for migratory species, conservation action in one part of their range may be compromised by un-mitigated threats occurring elsewhere. Here, we define an approach to quantify site importance based on direct evidence of individual bird movements between sites. Our approach considers the contribution of three different data sources to defining movement networks based on graph theory: metal ring recoveries, colour ring resightings, and electronic tracking. We illustrate the approach by building movement networks and defining important sites for the population of Black-tailed Godwits (Limosa limosa) in the East Atlantic Flyway. To highlight how including bird movements into analyses of site importance adds valuable information, we compare the top sites identified in terms of connectivity to those known from traditional waterbird census data. We also assess the degree of protection already afforded to these top

connectivity sites, to inform future priorities. Our approach can help improve the ecological representativeness of important site networks for migratory waterbirds and thereby contribute towards improving the coordination of conservation efforts for these species.

Synopsis

NA

Twitter handle

NA

227

The iratebirds -citizen science project: A dataset of birds' visual aesthetic attractiveness to humans

Anna Haukka ORCID iD[1], Aleksi Lehikoinen ORCID iD[1], Stefano Mammola ORCID iD[2,3], William Morris[4], Andrea Santangeli ORCID iD[5]

[1]Helsinki Lab of Ornithology, Zoology Unit, The Finnish Museum of Natural History (LUOMUS), University of Helsinki, Helsinki, Finland. [2]Molecular Ecology Group (MEG), Water Research Institute (IRSA), National Research Council (CNR), Verbania Pallanza, Italy. [3]Laboratory for Integrative Biodiversity Research (LIBRe), Finnish Museum of Natural History (LUOMUS), University of Helsinki, Helsinki, Finland. [4]The Finnish Biodiversity Information Facility (FinBIF), Helsinki, Finland. [5]Research Centre for Ecological Change (REC), Faculty of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland

Abstract

Amidst a global biodiversity crisis, shedding light on the factors that make humans like one species or another can inform conservation actions, e.g. by leveraging flagship potential, and help identify threats. A part of how humans perceive other species is due to their aesthetic attractiveness, or lack thereof, to us. We created the iratebirds -citizen science project to understand which bird species are visually more aesthetically attractive to humans. The data are from an internet browser-based questionnaire (iratebirds.app), where people were asked to evaluate their reaction to the appearance of a bird on a linear scale of 1-10 (with hearts as symbols on the scale). The ratings were based on the best-quality photographs from the Cornell Lab of Ornithology's Macaulay Library database which hosts user-submitted photographs of the world's bird species. The final data set covers the raw data as well as modeled visual aesthetic attractiveness scores for 11 319 bird species and subspecies globally, based on 6 212 respondents from tens of home countries. This is the first such attempt to quantify the overall visual aesthetic attractiveness of all the bird species to humans.

Synopsis

NA

Twitter handle

@_annaha

231

Bird migration in a changing world: stopover distributions, selectivity of meteorological conditions and a drastic long-term decline studied by a network of radars in the Middle-East

Inbal Schekler[1], Nir Sapir[1], David Troupin[1], Felix Liechti[2,3], Yoav Levi[4], Yuval Werber[1], Jaclyn Smolinsky[5], Jeff Buler[5]

[1]University of Haifa, Haifa, Israel. [2]Swiss Ornithological Institute, Sempach, Switzerland. [3]Swiss Birdradar Solution AG, Winterthur, Switzerland. [4]Israel Meteorological Service, Bet Dagan, Israel. [5]University of Delaware, Delawere, USA

Abstract

How migrating birds respond to their environment at different timescales and while engaged in different stages of their migration is important for our understanding of bird behavior, ecology, movement and fitness, with consequences for the services these birds provide in different ecosystems, and their conservation. Using data collected over seven years from ten vertical-looking and three weather radars positioned in Israel, we describe 1) how bird stopover distribution is affected by different geographic, habitat and anthropogenic factors, 2) how bird migration traffic rate (MTR) is influenced by meteorological conditions and whether bird behavior differs between the autumn and the spring, and 3) a comparison between our radar work results and those of a study that was conducted in the area three decades ago. We found that bird stopover distributions were primarily affected by geographic and anthropogenic features, with marked differences between the autumn and the spring. Notably, Artificial Light At Night (ALAN) was a highly influential factor, attracting migrants to brightly lit areas. During migration flights, bird MTR was primarily influenced by date and temperature, with additional effects of tailwind and crosswind that nonetheless varied between the two migration seasons, with autumn migrants being more selective of supporting conditions. We found a drastic decline of bird MTR compared to 30 years ago, likely reflecting large-scale cross-taxa decrease in bird populations that travel through the Middle-East.

Synopsis

NA

232

Extra-pair paternity explains cooperation in the pied flycatcher (Ficedula hypoleuca).

Indrikis Krams, Ronalds Krams, Tatjana Krama

Daugavpils University, Daugavpils, Latvia

Abstract

In many social animals, females mate with multiple males, but the adaptive value of female extra-pair mating is not fully understood. Here, we tested whether male pied flycatchers engaging in extra-pair copulations with neighboring females were more likely to assist their neighbors in antipredator defense. We found that extra-pair sires joined predator-mobbing more often, approached predators more closely, and attacked predators more aggressively than males without extra-pair offspring in the neighboring nest. Extra-pair mating may incentivize males to assist in nest defense because of the benefits that this cooperative behavior has on their total offspring production. For females, this mating strategy may help recruit more males to join in antipredator defense, offering better protection and ultimately improving reproductive success. Our results suggest a simple mechanism by which extra-pair mating can improve reproductive success in breeding birds. In summary, males siring extra-pair offspring in neighboring nests assist neighbors in antipredator defense more often than males without extra-pair offspring.

Synopsis

For female flycatchers, extra-pair mating may be an adaptive strategy for enhancing offspring safety and breeding success.

Twitter handle

@IndrikisKrams

239

What makes a host a vector? A comparison of movement, habitat use, and exposure to sources of antimicrobial resistant bacteria of gull species

Mariëlle van Toor ORCID iD[1], Hanna Woksepp[2], Ulrik Lötberg[3], Pontus Wennesjö[2], Susanne Åkesson[4], Jonas Bonnedahl[5,6]

[1]Linnaeus University, Kalmar, Sweden. [2]Kalmar County Hospital, Kalmar, Sweden. [3]BirdLife Sweden, Mörbylånga, Sweden. [4]Lund University, Lund, Sweden. [5]Linköping University, Linköping, Sweden. [6]Region Kalmar County, Kalmar, Sweden

Abstract

Gulls (Laridae) are prominent among the groups of birds that have adapted to utilising anthropogenially altered habitat. These frequently opportunistic birds have adapted to exploit resources both in urban and agricultural landscapes. Their affinity to these environments can however expose gulls to clinically important antimicrobial resistant (AMR) bacteria. While initially restricted to the clinical environment, AMR bacteria are now widespread in the environment, including habitats used by gulls. Particularly waste disposal sites and waste water treatment plants are considered point sources of AMR bacteria. Gulls have been shown to acquire AMR bacteria through such sources, and are even considered indicator species for AMR bacteria in the environment.
But which characteristics affect to what extent different species of gulls are exposed to AMR bacteria, and which traits turn a host into a vector competent at providing AMR bacteria with a secondary entryway into the human population? We here compared several species of gulls breeding in Sweden, and collected data on both their movements using GPS telemetry and estimates of prevalence of AMR bacteria in the respective populations. We compared how the habitat use of the different species affected their exposure to AMR bacteria, and determined the likelihood of these AMR bacteria being dispersed into areas providing an interface with, and a transmission risk to, humans.
Our results not only provide an overview to which degree wild birds are exposed to potentially infectious bacteria from anthropogenic input, but can also inform sampling and monitoring regimes for this threat to public health.

Synopsis

NA

242

The selective effect of winter weather on the morphology of black-throated tits (*Aegithalos concinnus*) depends on winter conditions and is sex-specific

Yue Wang ORCID iD, Qian Hu ORCID iD, Jiliang Xu, Jianqiang Li

School of Ecology and Nature Conservation, Beijing Forestry University, Beijing, China

Abstract

Harsh environmental conditions often impose strong selection on the phenotype of natural populations through impacts on their fitness. In winter, the mortality of birds is usually high due to low food availability but high thermoregulation costs, and only the individuals with certain phenotypes are selected to survive. However, little is known about if the selective effect of winter weather conditions on phenotype in years with harsher weather conditions is similar to that in normal years. We examined the relationships between overwinter survival and morphological traits of a small passerine bird, the black-throated tit (*Aegithalos concinnus*), under winter conditions with and without snowstorms to explore the selective effect of winter weather on their morphology. We found that for male individuals, the bill depth and head length had significant effects on their overwinter survival, but the direction of the effects depended on whether there was a snowstorm in winter. In winters without snowstorms, males with smaller bill depths and greater head lengths survived better, whereas in winters with snowstorms, a reverse pattern was found. These results might be explained by the heat retention hypothesis and the cognitive buffer hypothesis, but their roles were dependent on winter conditions. Furthermore, we did not find any correlation of morphological traits with survival in females. Thus, our results suggest a sex-specific and condition-dependent selective effect of winter weather on phenotypes of black-throated tits.

Synopsis

NA

244

Dietary polyunsaturated fatty acids modulate oxidative stress response to air pollution and immune challenge

Ann-Kathrin Ziegler ORCID iD[1], Johan Kjellberg Jensen[1], Lucía G. Jiménez Gallardo[2], Jenny Rissler[1], Anders Gudmundsson[1], Jan-Åke Nilsson[1], Caroline Isaksson[1]

[1]Lund University, Lund, Sweden. [2]Universidad Complutense Madrid, Madrid, Spain

Abstract

Simultaneous exposure to different stressors may modulate the organismal response to a disturbance. Indeed, anthropogenic stressors, such as pro-oxidant air pollutants, changed food quality and pathogen distribution, often covary in urbanized habitats. Thus, the response to these stressors may vary between individuals. For instance, anthropogenic diets contain different concentrations of ω6- and ω3-polyunsaturated fatty acids (PUFAs). Metabolites derived from ω6-PUFAs are considered pro-inflammatory and oxidative stress enhancing, whereas the opposite response is linked to ω3-derived metabolites. We hypothesize that differential intake of ω6- and ω3-PUFAs modulates the avian oxidative stress state and thereby affects the responses towards pro-oxidants. Here, we manipulated dietary ω6:ω3 ratios and ozone levels in a full-factorial design using captive zebra finches (*Taeniopygia guttata*). We simulated an infection, thereby also the oxidative burst, by injecting lipopolysaccharide. Our results suggest that dietary PUFAs can modulate the oxidative stress response to ozone-exposure in birds. Specifically, in ambient air conditions, birds on ω3-diet birds have a lower ratio of the reduced (GSH) to oxidized (GSSG) form of glutathione in the red blood cells than ω6-diet birds, suggesting increased cellular oxidative stress in ω3-fed birds. However, when exposed to ozone, this effect disappears. Antioxidant capacity was lower in birds fed a ω3-rich diet compared to birds fed a ω6-rich diet and the concentration of glutathione was overall lower in ozone-exposed birds. Immune-challenge increased oxidative damage levels regardless of other factors. Taken together, our results suggest anthropogenic pollutants may interact with other factors, such as diet, modulating their effects on avian health.

Synopsis

NA

247

Molecular screening reveals that wind turbine presence is associated with lower apparent survival in white-tailed eagles

Carina Nebel, Toni Laaksonen

University of Turku, Turku, Finland

Abstract

The expansion of wind power is a common measure of climate action worldwide. In Finland, there are plans to construct multiple new turbines over the next years. However, wind turbines may negatively impact wild animals. A difficulty in assessing how turbines influence populations is the difficulty in estimating their effect on different demographic parameters. While the white-tailed eagle *Haliaeetus albicilla* is a success story of conservation in Finland, it is at threat of colliding with the rotor blades and estimates of demographic effects of wind power construction are needed. The White-tailed Eagle work group has been collecting adult feathers from nests for long-term genetic identification. By using 14 nuclear microsatellites, we have identified individuals at the same nests between years, but also movement between nests, and relate this to the presence of turbines. Our preliminary results indicate that the presence of turbines negatively affects white-tailed eagles by leading to lower apparent survival rates. Future analyses will help us disentangle mortality from displacement and allow us to make predictions about the large-scale impact on the population in Finland.

Synopsis

Can we estimate white-tailed eagle survival from non-invasive genotype data?

Twitter handle

@carinanebel

258

Human perception of bird ecosystem services and disservices in an urban land sharing/land sparing context

Lucía Izquierdo[1], Jukka Jokimäki[2], Piotr Tryjanowski[3], Anna Ramos[1], Juan Diego Ibáñez-Álamo[1]

[1]University of Granada, Granada, Spain. [2]University of Lapland, Rovaniemi, Finland. [3]Poznań University of Life Sciences, Poznań, Poland

Abstract

Current urbanization imposes an urgent need to reconcile urban citizens with nature. Birds are excellent organisms for that purpose as recent evidence suggests that they improve human well-being. However, citizen perception and experiences of urban bird ecosystem services and disservices are essential for this process of (re)connection with nature. Urban areas are developed in a gradient that varies between two extremes: land sharing (small and fragmented green patches) and land sparing (large and continuous green areas). Previous studies have shown significant differences in avian diversity between urban development types, implying possible differences in the ecosystem services and disservices provided by birds. This, added to the fact that people living in these areas can have different habits related with nature, can lead to differences in their perception to ecosystem services and disservices. We carried out 820 face-to-face questionnaires in 9 cities in Europe. We evaluated people's perception of different ecosystem services and disservices as well as some socio-demographic questions. Preliminary results show that citizens have positive attitudes towards birds of their neighborhood, valuing most of their ecosystem services. Surprisingly, we did not find a clear association between urban development type and people's perception of birds. Additionally, we found differences in citizen perception based on housing (e.g. living in a house or an apartment), and other socio-demographic variables. These preliminary results can help to better comprehend human-nature interactions, specifically, citizen perception of birds, which is vital for ecosystem services planning and for reconnecting people with nature in urban areas.

Synopsis

NA

264

Fine-scale environmental drivers of flight altitude in nocturnal migrant birds and conflict with terrestrial windfarms: a predictive approach using marine radar

Hilary Mann[1], Devin de Zwaan ORCID iD[1,2], Phil Taylor[1]

[1]Acadia University, Wolfville, Canada. [2]Mount Allison University, Sackville, Canada

Abstract

Anthropogenic activities are increasingly cluttering the aerosphere, including energy infrastructure such as windfarms, which can interfere with low-flying nocturnal migrant birds. Regional predictions of migration intensity can effectively be overlaid with windfarm location to highlight potential conflict areas. However, the risk of mass collision events is determined not only by the number of migrating birds, but also flight altitude and time spent within a windfarm's zone of influence. Understanding what conditions drive migrating birds to enter low altitude space is imperative to predicting collision risk and informing responsible wind energy development. We positioned marine radar beside terrestrial windfarms in New Brunswick, Canada, and scanned along the vertical axis to measure nocturnal migrant altitude. These data were coupled with weather conditions measured every half-hour to assess environmental drivers of mean altitude, altitudinal range, and 'risk', or the proportion of birds flying within the zone of influence weighted by migrant density, within and among nights during spring and fall migration. Weather conditions explained ~60% of variation in altitudinal shifts and risk. Specifically, proximity to dusk, as well as precipitation events, low humidity, and cooler temperatures drove birds downwards and into the risk zone. In contrast, positive tailwinds at high altitudes relative to the surface encouraged birds to fly at higher altitudes, reducing risk. We discuss prospects for a predictive framework pairing regional nightly migration intensity and fine-scale flight altitude to evaluate collision risk with energy infrastructure.

Synopsis

Ground-based radar highlights environmental conditions that drive nocturnal migrant birds downward into conflict with windfarms

Twitter handle

@birdyhil

268

Sentinel swans to guard the weak link in their chain of migratory stopovers

Bart Nolet ORCID iD[1], Rascha Nuijten ORCID iD[2]

[1]Netherlands Institute of Ecology, Wageningen, Netherlands. [2]Future for Nature Foundation, Arnhem, Netherlands

Abstract

Migrants are threatened worldwide by climate change, overexploitation, and habitat changes. Suitable habitat is of prime importance for migratory birds, particularly for large ones that use energetically expensive flapping flight, such as Bewick's Swans (Cygnus bewickii). During migration Bewick's Swans largely feed on aquatic macrophytes that may disappear when nutrient levels, waves, and turbidity exceed certain thresholds. Macrophyte collapse has been suggested as a reason for the sharp decline of the European Bewick's Swan population during 1995–2015. We used Bewick's Swans fitted with GPS/GSM neck collars including an accelerometer and water sensor to record the occurrence of aquatic foraging in remote stopovers along their migratory route. We concentrated on spring migration, when stopovers are longer than during autumn, and focused on four key sites. In three years, we obtained a total of 51 complete spring tracks of adult female Bewick's Swans. About 90% of the swans showed aquatic foraging in at least two of these key sites, in particular the coast of Estonia and Dvina Bay. While in Estonia, swans predominantly used protected zones, in Dvina Bay swans foraged extensively in areas that are currently not protected. Macrophyte vegetation is threatened by ongoing or planned construction works in the Gulf of Finland and Dvina Bay, and by future oil and gas exploitation in Cheskaya Bay. Our study shows how migrants can be sentinels to guard sensitive areas in order to maintain a chain of suitable stopovers on their migration.

Synopsis

Sentinel swans to guard the weak link in their chain of migratory stopovers

Twitter handle

@BartNolet

271

Impact of climate change on high-elevation birds in the Alps according to ecologically realistic Species Distribution Models

Claudio Celada[1], Diego Rubolini[2], Ojan Appukuttan[2], Gianpiero Calvi[3], Dirk Nikolaus Karger[4], Primož Kmecl[5], Tomaž Mihelič[5], Thomas Sattler[6], Benjamin Seaman[7], Norbert Teufalbauer[7], Johannes Wahl[8], Mattia Brambilla[2]

[1]Lipu/BirdLife Italia, Parma, Italy. [2]Milan University, Department of Environmental Science and Policy, Milan, Italy. [3]Studio Pteryx, Basiano (MI), Italy. [4]Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Birmensdorf, Switzerland. [5]DOPPS-BirdLife Slovenia, Ljubljana, Slovenia. [6]Schweizerische Vogelwarte, Sempach, Switzerland. [7]BirdLife Austria, Vienna, Austria. [8]Dachverband Deutscher Avifaunisten (DDA), Münster, Germany

Abstract

Climate change is a key threat to many species and ecosystems, and climate refugia are a key to conserving them in the face of global change. Many mountain species and habitats are threatened by ongoing warming and shifts in the precipitation regime. With this work, we focussed on four high-elevation bird species showing adaptation to relatively cold climate and tied to high mountain areas in central and southern Europe, rock ptarmigan, water pipit, alpine accentor and white-winged snowfinch. We identified climate refugia for those species in the Alps, by using an extremely large occurrence dataset, ecologically realistic Species Distribution Models (SDMs) and future climatic scenarios (derived from four climate models). We identified in-situ and ex-situ refugia, and compared the distribution of refugia with that of currently existing protected areas. To train models, we used 2901–12,601 independent records for each species, four algorithms and an evaluation process based on extrapolation over distant areas (other mountain regions), performance on independent data, and realism of species-habitat relationships. All four species, with the partial exception of water pipit, will contract their distribution, shifting to higher elevation and losing 17%–59% of their current range. We identified in-situ refugia suitable for at least three species, which are of particular importance for the conservation of alpine birds and associated habitats. 18%–66% of those refugia are included in PAs scattered over different countries (44% on average). Habitat degradation or alteration must be prevented in refugia to preserve alpine species and ecosystems.

Synopsis

We developed ecologically realistic SDMs for high-elevation species, and identified climate refugia for multiple species in the Alps

275

Individual variation in the migratory strategies of a long-lived seabird

Sara Raj Pant[1], Patrik Byholm[2], Natalie Isaksson[3], Ulrik Lotberg[4], Susanne Åkesson[1]

[1]Lund University, Lund, Sweden. [2]Novia University of Applied Sciences, Ekenäs, Finland. [3]University of Highlands and Islands, Thurso, United Kingdom. [4]BirdLife Sweden, Mörbylånga, Sweden

Abstract

Migratory behaviour can display considerable variation between as well as within individuals over time. Such variation underlies carry-over effects on fitness and shapes the response of individuals and, consequently, populations and species to environmental change. Using a multi-annual dataset of GPS-tagged individuals, we investigate the migratory decisions of Caspian terns (Hydroprogne caspia) breeding at different latitudes within the Baltic Sea. We quantify the amount of inter- and intra-individual variation in key spatiotemporal aspects of spring and autumn migration and wintering range movements in relation to local weather and habitat conditions. Further, we relate the timing and outcome of current reproduction to migratory behaviours during the following autumn, and link winter movements and spring migration decisions to reproduction in the subsequent breeding season. Our findings contribute to the growing knowledge on the causes and fitness consequences of individual variation in migratory behaviour in a changing world.

Synopsis

NA

290

Detailed observations of the annual migration routine of a bird rarely observed

Åke Lindström ORCID iD

Dept. of Biology, Lund University, Lund, Sweden

Abstract

The Great Snipe carries out a spectacular migration between its northern breeding sites and African winter grounds. The migration is characterized by a single long non-stop flight in autumn of about 5,000-7,000 km and a similar long flight in spring (Lindström et al. 2016, J Avian Biol). In addition, during their long flights the birds regularly reach spectacular heights of 6,000 to 8,700 m a.s.l. while systematically changing altitude between day and night (Lindström et al. 2021, Curr. Biol. 2021). The latter behaviour was revealed through using multi-sensor loggers, including a pressure sensor and an accelerometer. From the same devices we can also get very detailed information about both the annual and daily routines of flights as well as stopover periods, down to the nearest 5 minutes. This type of data has revealed, among other things, a remarkably constant total amount of migratory flight in a year, varying amounts of feeding activity before the long flights, and how night feeding is adjusted to moonlight. These findings are exciting in themselves, but especially so since the Great Snipe is rarely observed outside the breeding grounds and therefore true behavioural data are lacking.

Synopsis

NA

291

The evolutionary history of “suboptimal” migration routes

Staffan Bensch, Violeta Caballero-Lopez, Charlie Cornwallis, Kristaps Sokolovskis

Lund University, Lund, Sweden

Abstract

About one fifth of the world’s bird species are classified as migrants. Migration is evolutionary very labile, with many examples of migratoriness increasing or decreasing in the time scale of modern ornithology. In contrast, drastic shifts of migration routes to novel winter grounds seem to be a much slower process, resulting in what has been called “suboptimal migration routes”. Here, we examine the evolutionary process of how Palearctic migratory landbirds have expanded their wintering ranges to include both tropical Africa and Asia, a process that must have involved major shifts of migration routes. Of 105 species that have populations wintering in Sub-Saharan Africa, 37 also winter in Asia. By controlling for phylogeny, we show that migrants that winter in both Africa and Asia, more often have populations that are less migratory than species wintering only in Africa. That the most extreme migrants are those that are most unlikely to establish new winter continents seems paradoxical as they already travel the globe, but indicates that the genetic migration program is evolutionary difficult to modify. To resolve the paradox, we propose a model that assumes that changes of winter grounds were not by the long-distance migrant populations per se but through a series of historically intermediate populations that were less migratory from which long-distance migration has evolved secondarily.

Synopsis

Major changes of the winter quarter of long-distance migrants require a series of historic populations that were less migratory

294

Crossing the arid plains of central Eurasia from Europe to India by songbirds

Nikita Chernetsov ORCID iD[1,2], Mikhail Markovets ORCID iD[3], Victor Bulyuk ORCID iD[3]

[1]Zoological Institute RAS, St Petersburg, Russian Federation. [2]St Petersburg State University, St Petersburg, Russian Federation. [3]Biological Station Rybachy, Rybachy, Russian Federation

Abstract

The arid belt of Central Asia east of the Caspian Sea is a major barrier for many migrating songbirds. It has to be crossed by passerines that breed in Siberia and winter in Africa, but also by the species that breed in eastern Europe and winter in southern and south-eastern Asia. Many passerine migrants breeding in Siberia and wintering in Africa avoid crossing the deserts in autumn; instead, they make a detour to the north and northwest and fly north of the Caspian Sea. We have shown that some, but not all, European-Indian migrants (e.g. scarlet rosefinches *Carpodacus erythrinus* and western greenish warblers *Phylloscopus trochiloides viridanus*) in autumn also make a detour and travel towards the east north of the arid belt before crossing in its central or eastern part. Other species, which include e.g. red-breasted flycatchers *Ficedula parva*, Blyth's reed warblers *Acrocephalus dumetorum* and possibly booted warblers *Iduna caligata*, take the shortest route between their (north)east European breeding grounds and Indian winter quarters. These different migratory routes cannot easily be attributed to different foraging ecology and fattening strategies; they might rather be explained by the history of colonization of the forest belt of Eurasia after the most recent glacial event.

Synopsis

NA

297

Variance components of egg pigmentation in the blue tit *Cyanistes caeruleus*

Jon Brommer

University of Turku, Turku, Finland

Abstract

Many passerines lay white eggs speckled with spots (maculation). While the degree of egg pigmentation generally appears be individual-specific, there is also evidence it is affected by maternal and various environmental effects. Egg pigmentation was scored using pictures of blue tit eggs gathered from 2007 onwards in a population in southern Finland. Using pedigree information resolved for extra-pair paternity, within a mixed-model framework (animal model), I show that egg pigmentation is a highly heritable trait that is little affected by environmental variance components. I further explore maternal variance components and the extent to which genetic variance for egg pigmentation is linked to the maternal sex chromosome. Findings highlight the potential of egg pigmentation to evolve in response to various evolutionary pressures.

Synopsis

heritable egg pigmentation in the blue tit

300

The oxidative physiology of moult: three experiments on house sparrows

Attila Marton ORCID iD[1], Attila Fülöp ORCID iD[1,2], Gergely Osváth ORCID iD[1,3], Laura Pătraș ORCID iD[4], Péter L. Pap ORCID iD[1], Csongor I. Vágási ORCID iD[1]

[1]Evolutionary Ecology Group, Hungarian Department of Biology and Ecology, Babeş-Bolyai University, Cluj-Napoca, Romania. [2]Behavioural Ecology Research Group, Department of Evolutionary Zoology, University of Debrecen, Debrecen, Hungary. [3]Museum of Zoology, Babeş-Bolyai University, Cluj-Napoca, Romania. [4]Department of Molecular Biology and Biotechnology, Babeş-Bolyai University, Cluj-Napoca, Romania

Abstract

The trade-offs between different survival-enhancing traits can shape how organisms allocate resources towards growth or survival and ultimately influence their chances of survival and reproduction. The annual moult of body and flight feathers is a recurrent growth stage of adult birds that sits at the crossroad between current self-maintenance and future reproductive success. The investment in the antioxidant defence system in order to avoid oxidative stress is another important mechanism of self-maintenance. However, these two survival-enhancing traits might be in conflict. Yet, this possible trade-off between moulting and oxidative defence has been hitherto neglected. We performed three experiments on house sparrows *Passer domesticus* to test if increasing moult speed or inducing feather growth resulted in higher levels of oxidative stress; and if inducing a mild oxidative stress affected moult speed and feather quality. We found that oxidative physiology is largely unconnected to moult or feather growth. On the other hand, although birds exposed to oxidative challenge faced a depletion of the antioxidant glutathione by the end of the experiment compared with controls, this had only weak effect on the quality of flight or body feathers. Interestingly, both fast-moulting and oxidatively challenged birds exhibited higher body temperatures compared to their respective control groups. This finding suggests that mitochondrial uncoupling that results in heat production might play a role in reducing oxidative costs. We conclude that there is possibly no or only weak survival gambit between moulting and oxidative defence.

Synopsis

Oxidative physiology seems unconnected to moult, but oxidative challenge depleted glutathione reserves and impacted feather quality!

Twitter handle

attilamarton_

304

CONSEQUENCES OF SHORT-TERM INDIVIDUAL VARIATION IN THE COST OF LIVING: AN EXPERIMENTAL STUDY ON WILD GREAT TITS.

Juli Broggi ORCID iD[1], Jan-Åke Nilsson[2]

[1]Museo Nacional de Ciencias Naturales, Madrid, Spain. [2]University of Lund, Lund, Sweden

Abstract

Basal metabolic rate (BMR) is the gold standard energy measure in comparative physiology of vertebrates that has become a relevant parameter in behavioral and ecological studies. However, individual BMR can change in relatively short time in response to a plethora of circumstances, and although it is repeatable and heritable the mechanistic relevance as an adaptive trait remains disputed. One of the main issues that remains debated is the link between individual BMR variation and body condition. We addressed this issue by monitoring a wild population of great tits (Parus major) exposed to a winterfeeding experiment during two consecutive years in a natural forest in southern Sweden. We studied the pattern of variation in BMR together with several physiological parameters related to oxidative stress, antioxidant capacity and nutritional condition, in 47 individual birds measured twice after 4 weeks, within the same winter. Birds decreased their BMR from mid- to late winter, but only under high food predictability conditions. The results remained qualitatively the same independently of body mass, suggesting substantial short-term individual physiological changes other than fat reserve levels, because of winter-feeding exposure. Individual change in nutritional condition, oxidative damage and antioxidative capacity estimated from blood parameters was mostly unrelated to BMR change, at least on the short-time scale studied. Experimentally fed birds may be able to afford a reduction of the overall costs of living in late winter, that may allow them for a higher investment and earlier start of the forthcoming breeding season.

Synopsis

NA

311

Using machine learning for automatic detection of three conservation priority bird species in Okinawa

Veronika Samotskaya ORCID iD, Nicholas Friedman ORCID iD

Leibniz Institute for the Analysis of Biodiversity Change, Hamburg, Germany

Abstract

Bioacoustic methods allowed us to better track the effects of a rapidly changing environment, including the impacts of habitat loss, species introductions, and climate change. Acoustic monitoring could highlight the changes that could be unnoticed by other approaches, for example if a forest appears healthy but several frog and bird species have been lost. For some bird species acoustic monitoring is one of the few reliable methods of reliable detection.

Technological advances have led to development of miniaturized recording and data storage equipment, and acoustic monitoring has become one of the major methods of biodiversity research. Currently many software tools for processing and analyzing large acoustic datasets have been developed, including methods for automated identification of bioacoustic signals. However, there are still not enough studies that use machine learning for species detection in 24-hour soundscape recordings from long-term acoustic monitoring.

In our research, we used the soundscape data collected by The Okinawa Environmental Observation Network in Japan (OKEON) for six years to detect three endangered and culturally important bird species: Okinawa Robin (Larvivora namiyei), Ryukyu Flycatcher (Ficedula owstoni), Okinawa Woodpecker (Dendrocopos noguchii). The 24 OKEON sites are located in both natural and rural habitats, from native tropical forests, to agricultural areas and cities. This allowed us to compare the distributions of these species across different habitats across years and in connection with anthropogenic disturbance.

Synopsis

Acoustic monitoring reveals distributions of endangered species in Okinawa

329

Ecological conditions experienced during reproduction do not affect individual differences in migratory behaviour in a long-lived bird

Marie Claire Gatt ORCID iD[1], Joan Ferrer-Obiol[1], Don-Jean Léandri-Breton[2], Simeon Lisovski[3], Shannon Whelan[2], Scott A. Hatch[4], Chinatsu Nakajima[5], Jacopo G. Cecere[6], Akiko Shoji[5], Kyle H. Elliot[2], Diego Rubolini[1]

[1]Dipartimento di Scienze e Politiche Ambientali, Universita' degli Studi di Milano, Milan, via Celoria 26, I-20133, Milan, Italy. [2]Department of Natural Resources Sciences, McGill University, Montreal, Canada. [3]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Potsdam, Germany. [4]Institute for Seabird Research and Conservation, Anchorage, Alaska, USA. [5]Department of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Japan. [6]Area per l'Avifauna Migratrice (BIO-AVM), Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Ozzano Emilia, Italy

Abstract

Inter-individual variation in non-breeding movements have important implications on population dynamics. Individual decision-making is shaped both by energetic trade-offs in light of experienced environmental conditions and individuals' innate characteristics, such as their genetics, and as expressed in personality. We investigated how external factors and intrinsic individual characteristics shaped non-breeding behaviour in a long-lived, partially migratory seabird, the Black-legged Kittiwake (*Rissa tridactyla*). We experimentally manipulated the ecological conditions during reproduction by providing extra food to breeding pairs (from egg laying until fledging) and tracked movement and activity patterns during the subsequent non-breeding period using geolocators (GLS). Fed individuals advanced their moult progression during the last part of the breeding season and achieved higher breeding success than controls. There were marked inter-individual differences in migratory strategy, with 30 % of individuals (50 out of 164) being non-migratory and remaining close to the breeding colony during the non-breeding period. Extra food provisioning did not significantly affect migratory strategy or activity patterns through the non-breeding period. Migratory strategy was also not affected by individual age or sex. So far, these results suggest that individuals maintain their migratory strategy, buffering against conditions experienced during the breeding season. Our study aims to look further into the innate factors that may shape individual migratory strategies, such as personality and genotypes at genes affecting migratory behaviour.

Synopsis

Exploring how environmental conditions during breeding & innate characteristics shape inter-indiv differences in migratory strategy

Twitter handle

@MarieClaireGatt

330

Assessing the effects of different metal cocktails on avian physiology

Agnès Saulnier ORCID iD, Sylvie Massemin ORCID iD, Astolfo Mata ORCID iD, Anne Boos ORCID iD, Islah El Masoudi, Pascale Ronot, Sandrine Zahn ORCID iD, Josefa Bleu ORCID iD

Institut Pluridisciplinaire Hubert Curien, Strasbourg, France

Abstract

In urban environment, anthropogenic activities lead to emissions of cocktail of pollutants, including metals and metalloids, in variable concentrations depending on the degree of urbanization. Field studies have shown that metal concentrations in the environment and in birds' tissues are often correlated with health impairments, such as higher oxidative stress or immunity deficiencies. Yet, with the multiplicity of environmental stressors in the field, it is difficult to tease apart the effects of metals alone. In addition, laboratory studies often test the effects of one or two pollutants simultaneously, which do not reflect the actual urban exposure: a chronic exposure to multiple metals in sub-lethal concentrations. The aim of our study was to evaluate the toxicity of cocktails of metals representative of urban exposure in different size cities on bird's health. During 2 months, we exposed zebra finches (Taeniopygia guttata) to three different cocktails containing essential and non-essential metals and metalloids (zinc, copper, arsenic, lead, nickel and cadmium) in increasing concentrations. We also had a control group with no exposure to cocktail. We checked bird exposition to the cocktail by measuring the concentrations of metals in bird feathers. Then, we measured the effects of the different cocktails on several parameters including body mass, flight performance, carotenoid-based beak coloration, oxidative damages, hematocrit, metabolism and genic expression of metallothionein, a detoxification protein. Interestingly, probably due to the absence of other constraints that limit trade-offs in energy allocation, no physiological effects were observed even if metal concentration increased in feathers.

Synopsis

Experimental approach to investigate the effect urban-like metal cocktails on bird health in the laboratory using the zebra finch.

Twitter handle

@saulnier_agnes

332

Sex makes the difference: High immune function predicts both high and low local survival probability in Common Blackbirds (*Turdus merula*)

Malin V. Klumpp[1,2], Rosie J. Lennon[2], Angela Schmitz Ornés ORCID iD[1], Arne Hegemann ORCID iD[2]

[1]Department of Biology, University of Greifswald, Greifswald, Germany. [2]Department of Biology, Lund University, Lund, Sweden

Abstract

Large individual differences in survival are widespread even between individuals from the same population. In recent years, it has become apparent that determining underlying physiological mechanisms can help us to understand and predict these differences. For example, the innate immune system may be particularly important for survival in the wild because it provides an immediate defence against pathogens. Therefore, individuals that are able to invest more in immune function are predicted to have a higher probability of survival. However, empirical evidence for a link between innate immune function and survival in free-living birds is still scarce, and results from studies of different species are not always consistent. In this study, we examined several measures of constitutive innate immune function (bacterial killing capacity, haemolysis, haemagglutination, haptoglobin concentration) for their ability to predict annual local survival probability in Common Blackbirds (*Turdus merula*). Contrary to our predictions, haemolysis, haemagglutination and haptoglobin concentrations did not prove to be reliable predictors of local survival probability. However, local survival probability was related to bacterial killing capacity, and the direction of this effect depended on sex. In females, bacterial killing capacity was positively correlated with local survival, whereas the relationship was negative in males. Overall, these results provide limited support for the assumption of a direct relationship between survival and innate immune function, but suggest that different sexes may have different strategies in investing in the immune system to maximize their survival.

Synopsis

NA

333

Multi-scale determinants of intra-guild competition between lesser kestrels and red-footed falcons breeding in the intensive farmland habitats of Northern Italy

Alessandro Berlusconi[1,2], Diego Rubolini[3,2], Giacomo Assandri[4], Gaia Bazzi[4], Jacopo G. Cecere[4], Adriano Martinoli[1], Alessio Martinoli[1], Damiano G. Preatoni[1], Davide Scridel[2], Michelangelo Morganti[2]

[1]Environment Analysis and Management Unit - Guido Tosi Research Group - Department of Theoretical and Applied Sciences, Università degli Studi dell'Insubria, Varese (VA), Italy. [2]CNR-IRSA National Research Council – Water Research Institute, Brugherio (MB), Italy. [3]Department of Environmental Science and Policy, Università degli Studi di Milano, Milano (MI), Italy. [4]Area Avifauna Migratrice, Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Ozzano dell'Emilia (BO), Italy

Abstract

Climate and land-use changes are currently reshaping animal communities, so that some species may expand their ranges and colonise new areas, leading to new ecological interactions among pre-existing species with newcomers. Both lesser kestrel (Falco naumanni) and red-footed falcon (Falco vespertinus) have been recently expanding their breeding range in Northern Italy, the only known area in Europe where these two species breed sympatrically. This system provides an excellent opportunity to investigate intra-guild competition during an initial stage of sympatry. On a broader scale, we assessed niche overlap via Environmental Niche Models based on breeding occurrence data. We observed eco-climatic similarities between the requirements of the two species, as both were strongly associated with intensive arable lands. We detected a high spatial correlation of the species' potential distributions indicating similar ecological niches. At a finer scale, we tested for potential differences in foraging habitat selection and diet through multi-annual observations of foraging individuals and via pellet analysis. According to these results, lesser kestrel and red-footed falcon foraged in areas with similar vegetation structure and consumed a similar spectrum of prey. We also describe the systematic occurrence of kleptoparasitism by red-footed falcon on lesser kestrel by identifying factors determining the probability of attacks and theft success. The attack probability is linked to foraging efficiency of lesser kestrel, while prey dimension is a driver of thefts. Our results thus provide a thorough direct assessment of how global changes are affecting predator communities via direct and indirect competition at the intra-guild level.

Synopsis

NA

334

Inherited differences of migratory phenotypes in two *Acrocephalus* warblers in relation to geomagnetic field parameters

Mihaela Ilieva ORCID iD[1,2], Giuseppe Bianco ORCID iD[3], Susanne Åkesson ORCID iD[3]

[1]1) Department of Biology, Center for Animal Movement Research, Lund University, Lund, Sweden. [2]2) Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia, Bulgaria. [3]Department of Biology, Center for Animal Movement Research, Lund University, Lund, Sweden

Abstract

Depending on species and population, birds have evolved morphological, physiological and behavioural adaptations, encoded in their migratory programs, to enable successful migration along specific routes. Sometimes, even closely-related species may adopt very different migration strategies. We compared two species of European *Acrocephalus* warblers adopting different migratory strategies to reach their wintering grounds in Sub-Saharan Africa by analysing published studies and own experimental data on temporal patterns of activity and fuelling. In addition, we experimentally subjected part of the birds to magnetic field parameters anticipated during autumn migration thought Mediterranean and at their winter destinations in order to explore if the activity and fuelling in these species are under control of geomagnetic cues. During the experiments both species expressed a peak of nocturnal activity just after sunset and increased activity before sunrise. Reed warblers (*Acrocephalus scirpaceus*) were strictly night active, whereas sedge warblers (*A. schoenobaenus*) also showed increased morning activity, possibly associated with unique foraging activity during stopover and longer migratory flights extending into the day. The two species did not differ in overall activity during the experiment, but the active intervals in reed warblers increased over time, while in sedge warblers decreased, probably reflecting similar anticipated migration distances to the wintering grounds, but different migratory strategies. The magnetic field parameters influenced the activity and fuelling in reed warblers, but not in sedge warblers. Our results supported the interspecific differences in migratory strategies observed in the wild and suggest species-specific adaptations in response to magnetic field information.

Synopsis

Reed and sedge warblers differ in their migration activity patterns and in their response to magnetic field information.

340

Acoustic monitoring to improve information on breeding status of secretive species

Thomas Sattler ORCID iD[1], Marc Kéry[1], Aurélien Besnard ORCID iD[2], Pierre Henrioux[3], Tatiana Kuzmenko ORCID iD[1], Ludovic Longchamp[4], Yves Menetrey[5], Pierre-Alain Ravussin[6], Marco Zahnd[7], Sébastien Laguet[8]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]Centre d'Ecologie Fonctionnelle et Evolutive, Montpellier, France. [3]Groupe d'étude sur les rapaces nocturnes de l'Ouest vaudois, Payerne, Switzerland. [4]Groupe ornithologique de Baulmes et environs, Grandson, Switzerland. [5]Groupe Tengmalm Vallée de Joux, L'Orient, Switzerland. [6]Groupe ornithologique de Baulmes et environs, Baulmes, Switzerland. [7]Zürcher Hochschule für Angewandte Wissenschaften ZHAW, Wädenswil, Switzerland. [8]Office national des forêts, co-coordinator of the national network «LPO/ONF Petites Chouettes de Montagne», La Motte-Servolex, France

Abstract

Acoustic methods to study wildlife experience a rapid and global development. In population monitoring, both active (i.e. provoking reactions through playback) and passive acoustic monitoring (i.e. with autonomous recording units) are increasingly applied, especially for species that are difficult to study due to their secretive lifestyle or due to logistical difficulties. Both challenges are encountered when surveying the Boreal Owl (Aegolius funereus) and the Eurasian Pygmy-owl (Glaucidium passerinum) in Western Europe, as they display in wintertime, typically in remote mountain forests. Here, we compare the efficiency of passive vs. active acoustic methods to a) prove the presence of these species, b) for longterm population monitoring and c) to determine breeding status (solitary male, pair, reproducing pair) based on call types. Analysis is based on data from the species-specific French national monitoring involving playbacks (153 transects surveyed since 2017), as well as local nestbox studies (since 1985) and local passive acoustic monitoring in Switzerland. Results from site occupancy analysis show that playback leads to increased detection probability for Eurasian Pygmy-owl, while it leads to a decreased detection for Boreal Owl. Populations of Boreal Owl show high year-to-year fluctuations with substantial long-term decreases at their Southwestern margin of the otherwise mainly boreal distribution. These losses may be related to climate change. Populations of the Eurasian Pygmy-owl are increasing and fluctuate less. We also show how these acoustic tools may help us in the future to gain improved information on yearly breeding status on unprecedented spatial scales.

Synopsis

Active and passive acoustic monitoring are information-rich data for site occupancy analysis and call-type specific breeding status

Twitter handle

@Vogelwarte_scie

345

Groups with a more diverse personality composition have a more egalitarian social structure

Attila Fülöp ORCID iD[1,2,3], Csongor I. Vágási ORCID iD[2], Péter L. Pap ORCID iD[2], Gergely Osváth ORCID iD[2,4], Zoltán Benkő ORCID iD[2,5], Mária Borbély[1], Botond Hajdó[2], Bianka Kocsis[1], Zoltán Barta ORCID iD[1]

[1]ELKH-DE Behavioural Ecology Research Group, Department of Evolutionary Zoology, University of Debrecen, Debrecen, Hungary. [2]Evolutionary Ecology Group, Hungarian Department of Biology and Ecology, Babeş-Bolyai University, Cluj-Napoca, Romania. [3]STAR-UBB Institute of Advanced Studies in Science and Technology, Babeş-Bolyai University, Cluj-Napoca, Romania. [4]Museum of Zoology, Babeș-Bolyai University, Cluj-Napoca, Romania. [5]Romanian Ornithological Society/BirdLife Romania, Cluj-Napoca, Romania

Abstract

Social groups are often composed of individuals with different personalities. Personality composition can affect the way groups are socially organized (e.g., dominance structure), which ultimately might have an effect on group functioning (e.g., social foraging). The dominance structure of groups can vary even within species; some groups can have a more pronounced social dominance hierarchy, while others can be organized in a more egalitarian fashion without a well-defined hierarchy among group members. Interestingly, the reasons responsible for this variation in social organization among groups, and their consequences, are yet poorly understood. Here, we studied on a large sample of 240 individuals and six study replicates whether personality composition of groups influences dominance structure in house sparrows (Passer domesticus), and the effect on social foraging. We established experimental groups with different personality composition and measured (i) the structure of the dominance hierarchy of the groups, based on aggressive interactions between group members, and (ii) producer and scrounger foraging tactic use. Our results show that groups with a more diverse personality composition are organized in a more egalitarian fashion and this has implications on social foraging. Our study provides evidence that the personality composition of groups may play a key role in shaping the organizational patterns of social groups, and may affect the overall performance through social foraging.

Synopsis

Groups with a more diverse personality composition have a more egalitarian social structure with consequences on social foraging

Twitter handle

@AttilaFueloep

347

Interspecific competition for acoustic space - chiffchaff males avoid temporal and spectral masking of their song

Emilia Sokołowska ORCID iD, Agata Staniewicz ORCID iD, Adrianna Muszyńska ORCID iD, Michał Budka ORCID iD

Department of Behavioural Ecology, Faculty of Biology, Adam Mickiewicz University in Poznań, Poznań, Poland

Abstract

Birdsong is one of the most elaborate and important ways of communication in this group of animals. However, some aspects of its evolution are still unknown and current explanations of its drivers remain insufficient. One of the unexplored factors contributing in the evolutionary song development is interspecific competition for the acoustic space – a common resource shared by all animals in a community. In the study we experimentally test two hypotheses explaining possible strategies for avoidance of such competition: (H1) temporal avoidance of spectrally similar signals and (H2) spectral partitioning of acoustic space. We conducted two playback experiments with a territorial, monogamous, migrant, temperate songbird species – the common chiffchaff. To test H1 we played back alternately silence and white noise overlapping the whole frequency band of chiffchaff song, while to test H2 we played back alternately white noises overlapping lower, higher and the same frequency band as chiffchaff song. For both experiments we recorded the response of tested males and compared number of songs produced by them during different treatments. We found that chiffchaff males sing significantly more in silence than in noise which masked their song. When noise varied in spectral characteristics, males sing significantly less during noise which masked the frequency band of their own song than during noise above and below the frequency band of their song. Our study shows that chiffchaff males pay attention to surrounding sounds and modify their singing rate depending on the acoustic competitors, avoiding both temporal and spectral overlapping of their song.

Synopsis

Common chiffchaff males modify their singing rate to avoid both temporal and spectral masking of their song.

Twitter handle

@EmiliaSok_bioac

352

The genomics of avian adaptation and speciation: from oceanic to sky islands

Claudia Martin ORCID iD[1,2], Eleanor Sheppard[2], Alex Suh[2], David Richardson[2], Jan Engler[1], Luc Lens[1]

[1]Ghent University, Ghent, Belgium. [2]University of East Anglia, Norwich, United Kingdom

Abstract

Isolation of populations through colonisation or habitat fragmentation may be a major evolutionary driver of diversification and speciation. Avian models of oceanic and sky island systems provide insight into how colonisation events and gene flow may interact with selection to shape genetic variation at different spatial scales. Using whole genome sequences, we assess incipient speciation in an island endemic passerine, the Berthelot's pipit (*Anthus berthelotii*), and across a young radiation in the fastest evolving avian lineage, *Zosterops*, both over the last 2 million years, to see what evolutionary processes drive divergence. Pairwise comparisons of species populations provide detail on: (1) Population history and divergence timeframes; (2) the strength of selection acting between populations; (3) the rate of accumulation of genomic divergence and (4) identify environmental drivers of divergence and speciation. Using pairwise F_{ST} across the genome, we identify strongly divergent 'genomic islands' among populations and species. We ask whether whole genome sequences suggest similar patterns of ecological adaptation across geographic and temporal scales in avian species evolving in different ecological contexts. Together these analyses provide better understanding of how evolutionary mechanisms shape patterns of genetic diversity and divergence following the establishment of new populations, and how this may lead to speciation.

Synopsis

The genomics of avian adaptation and speciation: from oceanic to sky islands

Twitter handle

@ClaudiaM_Eco

354

Explaining and predicting trans-Saharan bird migration under global change

Christine Howard[1], Thomas Mason[2], Stehpen Baillie[3], Jennifer Border[3], Chris Hewson[3], Alasdair Houston[4], James Pearce-Higgins[3,5], Silke Bauer[2], Stephen Willis[1], Philip Stephens[1]

[1]Durham University, Durham, United Kingdom. [2]Swiss Ornithological Institue, Sempach, Switzerland. [3]British Trust for Ornithology, Thetford, United Kingdom. [4]University of Bristol, Bristol, United Kingdom. [5]University of Cambridge, Cambridge, United Kingdom

Abstract

Global declines in the populations of migratory species have been attributed largely to climate change and anthropogenic habitat change. Unravelling the impacts of threatening processes in driving population declines, however, is a major challenge given the complex annual cycles of migratory species. To identify effective conservation actions, it is crucial that we identify where, when, and how threatening processes impact species' migratory journeys and population dynamics. Here, we describe how a new migration modelling framework – Spatially-explicit Adaptive Migration models (SAMMs) – can simulate the complex behavioural decisions required to migrate across open landscapes varying in character over space and time. We demonstrate how SAMMs conditioned on species' traits, can be used to model the routes and phenology of the migratory journeys of trans-Saharan migratory bird species. Using case study species, including common cuckoo (*Cuculus canorus*), pied flycatcher (*Ficedula hypoleuca*), and red-backed shrike (*Lanius collurio*), we show that the routes and timings of migratory journeys simulated by our models closely match those of tracked individuals. We demonstrate how our approach can identify the magnitude of threats to trans-Saharan migrant species during their migratory journeys, and thus where in those journeys' populations are critically limited. Finally, we show how SAMMs offer a tool to predict how migratory species will need to adapt future migratory journeys in response to changing environmental conditions, and the consequences of not doing so.

Synopsis

Spatially-explicit Adaptive Migration models can aid understanding of bird migration and predict the impacts of environmental change

Twitter handle

@_choward @CEGDurham

356

Long-term monitoring in Metal Pollution: Using Bird Feathers as Indicator

Rute Costa ORCID iD

CESAM, Aveiro, Portugal

Abstract

Trace metals are frequent waste products of industrial processes, often resulting in the contamination of the surrounding environment. The pulp and paper industry are known for the emission of malodorous sulphureous air pollutants such as hydrogen sulphide and methyl sulphides, but, as other industries, they can also release low concentrations of heavy metals originating mainly from energy generation (steam and electricity). Because this are persistent pollutants, with potential for bioaccumulation and for possible effects on wildlife, monitorization should be done regularly.

In this study we used nestlings' bird (Parus major) feathers to monitor metal pollution in a forest environment from a pulp and paper industry in Figueira da Foz, central Portugal, from 2003 to 2021. We manage to collect and analyse data from 4 different years to monitor the levels of metal pollution throughout the time. In the same time frame, the local industry has been committed in establishing more environmentally friendly procedures, with several production technology improvements in order to reduce emissions.

This long-term study presents several inter-annual differences but a clear decrease from mercury levels in the industrial area and an increase in arsenic level in both study areas (industrial and non-industrial). The two study areas presented similar trends in metal levels, which lead us to believe that more factors, like extreme weather events and natural disturbances such as fire, could also be important factors in pollution levels in the area.

Synopsis

NA

357

The relationship between mating systems and spermatoza charactristics in shorebirds

Zsófia Tóth ORCID iD[1,2], Szabolcs Tamás Nagy[3], Jim Briskie[4], Michael Lierz[5], Natalia Karlionova[6], Pavel Pinchuk[7,8], Anastasia Kisliakova[6], Viacheslav Khursanov[9], Tamás Székely[10,1]

[1]University of Debrecen, Department of Evolutionary Zoology and Humanbiology, Debrecen, Hungary. [2]Lund University, Department of Biology, Lund, Sweden. [3]Hungarian University of Agriculture and Life Sciences, Institute of Animal Sciences, Georgikon Faculty, Keszthely, Hungary. [4]School of Biological Sciences, University of Canterbury, Canterbury, New Zealand. [5]Justus-Liebig University Giessen, Clinic for Birds, Reptiles, Amphibians and Fisch, Giessen, Germany. [6]National Academy of Sciences, Institute of Zoology, Minsk, Belarus. [7]APB Birdlife Belarus, Minsk, Belarus. [8]Pripyatsky National Park, Turov, Belarus. [9]NA, Minsk, Belarus. [10]University of Bath, Milner Centre for Evolution, Department of Biology and Biochemistry, Bath, United Kingdom

Abstract

In those species, where females mate with multiple males there is competition among ejaculates from rival males for fertilization. This process, termed sperm competition, is expected to be stronger in those species in which multiple matings are more common than in socially (or genetically) monogamous species. In general, the length of spermatozoa has positive relationship with the ability of fertilization. Therefore we anticipated that spermatozoa are longer in those mating systems where females mating in higher frequency with multiple males.

To investigate this proposition, we compared spermatozoa characteristics in shorebirds. Shorebirds exhibit unusually diverse mating systems that include monogamy, polygamy, polyandry, and/or lek polygamy. We collected spermatozoa in the field from 6 species with cloacal massage and augmented our data using measurements of sperm morphology from 17 shorebird species previously published (n=22 species in total). Afterward, we fixed the ejaculates in 300µl 5% formalin and we created air-dried smears from all samples. We stained the smears with Feulgen procedure, then took photos from smears at 1000X magnification and measured the characteristics of spermatozoa with ImageJ. Consistently with expectations, we found that the total length and the flagellum length increases with the increasing risk of female extra-pair copulation. Also, the midpiece and head length are longer in non-monogamous species than in monogamous ones. However, further samples are needed to control for various potential sources of variation (eg. timing in the breeding season, sperm extraction differences).

Synopsis

NA

358

Advancing spring phenology: the overlooked importance of spring duration and variability for populations dynamics of birds

Martins Briedis ORCID iD[1,2], Steffen Hahn[1], Silke Bauer[1]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]University of Latvia, Riga, Latvia

Abstract

Single phenological measures, like the average rate of phenological advancement, may be insufficient to explain trends in animal populations in the light of climate change. Here, we develop a conceptual model and explore how multiple measures of spring green-up timing – onset of spring, spring duration, and interannual variability in the onset of spring – and their phenological changes interact with one another to drive demographic rates in a hypothetical population. Further, we apply this concept to empirical data and link large-scale phenological change observed across Europe (inferred from NDVI data) with long-term trends of European landbird populations over the last 40 years. Our modelling framework highlights that the effects of advancing spring phenology on bird populations may be buffered by or conversely – amplified, depending on the spring duration and the inter-annual variability in spring onset timing. Similarly, empirical data on changes in landbird populations indicated disproportionately negative trends for species living under strong phenological advancement, but particularly so when combined with short and less variable springs. Furthermore, long-distance migrants and forest species were identified as particularly prone to suffer declines under such phenological conditions. Our findings demonstrate that the consequences of climate change for bird populations depend not only on the rate of phenological advancement and life-history strategies of the species, but also on the broader eco-climatic context of where the phenological changes take place. This includes duration of spring, inter-annual variability in the timing or spring onset and their interplay with the rate at which spring green-up phenology is advancing.

Synopsis

The importance of spring duration and inter-annual variability are often overlooked in climate change studies.

Twitter handle

@biobriedis

368

Spatio-temporal ecological gradients in the Sahelian belt affect non-breeding movements and pre-breeding migration timing of lesser kestrels *Falco naumanni*

Samuele Ramellini ORCID iD[1,2], Giacomo Assandri[3], Ana Bermejo-Bermejo[4], Javier Bustamante[5], Francesca Cagnacci[6], Enrico Calvario[2], Carlo Catoni[7], Jocelyn Champagnon[8], Maria Luisa Damiani[9], Javier de la Puente[4], Federico De Pascalis[1,3], Olivier Duriez[10], Angelos Evangelidis[11], Fernando Garcés-Toledano[12], Fatima Hachem[9], Frédéric Jiguet[13], Lina Lopez-Ricaurte[5], Michelangelo Morganti[14], Jennifer Morinay[3], Philippe Pilard[15], Beatriz Rodríguez Moreno[12], Maurizio Sarà[16], Nicolas Saulnier[17], Nikos Tsiopelas[11], Jacopo Giuseppe Cecere[3], Diego Rubolini[1,14]

[1]Dipartimento di Scienze e Politiche Ambientali, Università degli Studi di Milano, Milano, Italy. [2]Stazione Romana Osservazione e Protezione Uccelli, Roma, Italy. [3]Area Avifauna Migratrice, Istituto Superiore per la Protezione e la Ricerca Ambientale, Ozzano dell'Emilia, Italy. [4]SEO/BirdLife, Bird Monitoring Unit, Madrid, Spain. [5]Estacion Biologica de Doñana (EBD), CSIC, Sevilla, Spain. [6]Animal Ecology Unit, Research and Innovation Centre, Fondazione Edmund Mach, Trento, Italy. [7]Ornis Italica, Roma, Italy. [8]Tour du Valat, Research Institute for Conservation of Mediterranean Wetlands, Arles, France. [9]Dipartimento di Informatica, Università degli Studi di Milano, Milano, Italy. [10]CEFE, University Montpellier, CNRS, EPHE, IRD, University Paul Valéry Montpellier 3, Montpellier, Italy. [11]Hellenic Ornithological Society/Birdlife Greece, Athens, Greece. [12]GREFA, Madrid, Spain. [13]Centre d'Ecologie et des Sciences de la Conservation (CESCO), Muséum National d'Histoire Naturelle, Centre National de la Recherche Scientifique, Sorbonne University, Paris, France. [14]Consiglio Nazionale delle Ricerche – Istituto di Ricerca sulle Acque (CNR-IRSA), Brugherio, Italy. [15]LPO, Arles, France. [16]Dipartimento STEBICEF, Università degli Studi di Palermo, Palermo, Italy. [17]LPO délégation Occitanie, Villeveyrac, France

Abstract

Highly mobile animals are expected to timely schedule their movements to match spatio-temporal variation in resource availability. Afro-Palearctic migratory birds overwintering in the semi-arid Sahelian belt experience a progressive deterioration of resources throughout the dry season, departing for pre-breeding migration when food and water availability are lowest (the so-called Moreau's paradox). We assessed how lesser kestrels *Falco naumanni* dealt with this ecological pattern by analysing non-breeding movements and pre-breeding migration of 87 GPS-tracked individuals, representative of all main European populations (Iberia to Greece) across 117 non-breeding periods. Most individuals were itinerant, especially those from eastern populations, moving across several non-breeding residence areas during the non-breeding period. Individuals were exposed to highly variable (spatially and temporally) vegetation conditions, as assessed by NDVI, reflecting food availability. Birds migrating to the western Sahel (mainly from Iberia) experienced better conditions than those migrating to the eastern Sahel (mainly from the Balkans) but were also subjected to a steeper seasonal decline in NDVI. Lower NDVI was associated with increasing daily movements and broader home-ranges in all populations. Males (but not females) from more eastern populations progressively moved south-westward to buffer deteriorating ecological conditions. Finally, birds exposed to higher NDVI departed earlier for pre-breeding migration and arrived earlier to breeding sites. These findings highlight broad

heterogeneity in experienced ecological conditions during the non-breeding period among both individuals and populations. Such heterogeneity, deriving from Sahelian spatio-temporal ecological gradients, promoted sex-specific movement patterns, and entailed carry-over effects on scheduling of pre-breeding migration and arrival to breeding sites.

Synopsis

Ecological gradients in the Sahel affect non-breeding movements and pre-breeding migration in the Lesser kestrel

Twitter handle

@S_Ramellini

369

Time dependencies across stages of the annual cycle in migratory birds

Vojtěch Brlík ORCID iD[1], Petr Procházka ORCID iD[2], Steffen Hahn ORCID iD[3], Ryan Norris ORCID iD[4]

[1]Department of Ecology, Charles University, Prague, Czech Republic. [2]Institute of Vertebrate Biology, Czech Academy of Sciences, Brno, Czech Republic. [3]Bird Migration Department, Swiss Ornithological Institute, Sempach, Switzerland. [4]Department of Integrative Biology, University of Guelph, Guelph, Canada

Abstract

For migratory animals, the timing of events within periods of the annual cycle can be critical for determining mating success and access to resources. The optimal timing in one stage of the annual cycle may, in turn, depend on timing in the previous period, creating a domino effect that can have implications for individual success and population dynamics. It is possible that these timing links become weak during prolonged stationary non-breeding periods but no multi-species analysis across the annual cycle has been conducted. Here, we used year-round movement data collected from over 2000 individuals in 62 passerine and near-passerine species to examine the timing of events throughout the annual cycle. We found evidence that the strongest timing link was between departure from the non-breeding grounds to arrival at the breeding grounds. The timing of departure from the breeding grounds also predicted non-breeding ground arrival. However, the timing of departure from the non-breeding grounds was only weakly predicted by arrival at the non-breeding grounds. Our results suggest that strong timing links across migratory periods is a general pattern in many species but such timing links break down over the stationary non-breeding period. Our work has important implications for predicting fitness and population dynamics, and how the timing of complex annual cycles may be influenced by long-term environmental change.

Synopsis

Timing of events is tightly linked within the migratory periods but links break down over the non-breeding period in migratory birds

Twitter handle

@VojtechBrlik

370

Non-breeding carry-over effects on the breeding performance of three long-lived migratory seabirds

Diego Vicente-Sastre ORCID iD[1,2], Sergi Pujol-Rigol[1], Theresa Maret[1], Mireia Marrugat[1], Sara Rubio[1], Júlia Torres[1], Jacob González-Solís ORCID iD[1,2], Raül Ramos ORCID iD[1,2]

[1]Universitat de Barcelona, Barcelona, Spain. [2]Institut de Recerca de la Biodiversitat, Barcelona, Spain

Abstract

Migration and reproduction are two crucial processes in the annual cycle of any migratory species since both involve high energy investments. In long-lived species, both processes often interact with each other, i.e., what happens in one stage can affect the next. This phenomenon is known as carry-over effects. We evaluated here the relationship between migratory phenology and breeding success in three *Calonectris* shearwaters that breed in islands and islets across the Mediterranean and Macaronesian water masses, and that overlap in their wintering areas during the non-breeding period. We recorded information on the migratory trips and demography of 367 individuals tracked repeatedly with light-level geolocators. In total, we determined the departure and arrival dates to the colony and to the wintering areas of 1.486 migratory trips (71%, 16%, 13% for *C. borealis*, *C. edwardsii*, and *C. diomedea* respectively). Also, we determined environmental variables of the wintering areas (primary productivity, sea surface temperature, heat waves, bathymetry) that could affect to the subsequent breeding success. Using generalized linear mixed models, we found that previous breeding success was not influenced by the timing of migration. Wintering areas were consistent over time and environmental variables did not influence on the phenology of the individuals significantly. Nevertheless, we found that males arrived earlier to the colony and earlier breeders, those that leave later the wintering areas and arrive earlier to the colony, showed larger probability of successful breeding. Therefore, our results add robust evidences on how inter-seasonal, carry-over effects can impact the demography of long-lived species.

Synopsis

Revealing carry-over effects between the nonbreeding and breeding periods in three long-lived seabird species.

Twitter handle

@ChessBio

377

Cry4-expressing horizontal cells as candidate magnetoreceptors in the avian retina

Rachel Muheim ORCID iD, Atticus Pinzon Rodriguez

Department of Biology, Lund University, Lund, Sweden

Abstract

Magnetoreception of the avian magnetic compass is suggested to be mediated by a photochemical reaction involving spin-correlated radical-pairs in specialized receptors in the avian retina. Cryptochromes have been proposed as the candidate receptor molecules for such a light-dependent magnetic compass, and growing evidence suggests that Cry4 is the most likely candidate receptor in birds. Using immunohistochemistry we identified the localization of Cry4 in the retina of several species of birds, including both migratory and non-migratory birds. We found no Cry4 expression in any of the photoreceptors, but instead in a subset of horizontal cells in the outer plexiform layer. The expression was most pronounced along the outer periphery of the retina where Cry4 was detectable not only in horizontal cell bodies, but also in the bulbous dendrites, which directly connect to the double cones in the photoreceptor layer. This was in contrast to the central retina, including the foveal region, where only the horizontal cell bodies expressed Cry4. Magnetoreception of the light-dependent magnetic compass in birds thereby likely takes place in Cry4-expressing horizontal cells in a ring along the periphery of the avian retina, which has several advantages compared to a localization in the photoreceptors as suggested by others.

Synopsis

Cry4-expressing horizontal cells in the avian retina provide excellent candidate magnetoreceptors for the magnetic compass of birds.

382

Functional Mechanisms for Disturbance Sensitivity of Avian Communities in the Alps and Andes

Ian Ausprey ORCID iD[1,2], Felicity Newell ORCID iD[1,2], Rico Felder[1], Cèlistin Lusier[1], Scott Robinson[2], Raphaël Arlettaz ORCID iD[1]

[1]University of Bern, Division of Conservation Biology, Bern, Switzerland. [2]Florida Museum of Natural History, Gainesville, USA

Abstract

Montane bird communities face novel disturbance regimes associated with agricultural land use change and rapid temperature warming. While species-specific distributional changes associated with anthropogenic disturbance and climatic variation are relatively well-documented, the underlying functional mechanisms remain enigmatic. Here, we synthesize results from intensive field studies of bird communities in the Alps and Andes to fill this knowledge gap. First, we use full community surveys and morphological measurements to show how a suite of 16 functional traits predict species-specific sensitivity to agricultural disturbance and dynamic changes to the ecological niche space occupied by cloud forest bird communities in northern Peru. We then integrate novel biologging technology and dispersal release experiments to emphasize the key roles that eye and wing morphology play in predicting sensitivity to disturbance associated with forest fragmentation. Specifically, we show that species with short-rounded wings and large eyes adapted to the dark forest understory are most sensitive to patch isolation and brightly lit agricultural landscapes. Finally, we use species distribution modelling and intensive radio tracking data to discuss the sensitivity of avifauna in the Alps to temperature warming, with emphasis placed on how the selection of suitable microhabitats and microclimates can buffer species from high temperatures. Collectively, we demonstrate how the integration of intensive field approaches can reveal the functional mechanisms underlying the sensitivity of montane avian communities to global change around the world.

Synopsis

Functional Mechanisms for Disturbance Sensitivity of Avian Communities in the Alps and Andes

Twitter handle

@IAusprey

390

Mechanistic models project bird invasions with accuracy

Diederik Strubbe ORCID iD[1], Laura Jiménez ORCID iD[2], A. Márcia Barbosa ORCID iD[3], Amy JS Davis ORCID iD[4], Luc Lens ORCID iD[5], Carsten Rahbek ORCID iD[6]

[1]Ghent University, Gent, Belgium. [2]Centro de Modelamiento Matemático, Santiago, Chile. [3]4. CICGE - Centro de Investigação em Ciências Geo-Espaciais, Vila Nova de Gaia, Puerto Rico. [4]University of Konstanz, Konstanz, Germany. [5]Ghent University, Ghent, Belgium. [6]University of Copenhagen, Copenhagen, Denmark

Abstract

Invasive species pose a major threat to biodiversity and inflict massive economic costs. Effective management of bio-invasions depends on reliable predictions of areas at risk of invasion, as they allow early invader detection and rapid responses. Yet, considerable uncertainty remains as how to best predict potential invasive distribution ranges. Using a set of mainly (sub)tropical birds introduced to Europe, we show that the true extent of the geographical area at risk of invasion can be determined more accurately with ecophysiological mechanistic models that quantify species' fundamental thermal niches, than with correlative models leveraging species' contemporary native distributions. Potential invasive ranges are primarily constrained by functional traits related to body allometry and body temperature, metabolic rates, and feather insulation. Given their capacity to identify tolerable climates outside of contemporary realized species niches, mechanistic predictions are well suited for informing effective policy and management aimed at preventing the escalating impacts of invasive species.

Synopsis

Mechanistic models project bird invasions with accuracy

Twitter handle

@DiederikStrubbe

400

Developmental temperature affects mitochondrial respiration and morphology in Japanese quail

Maria Correia ORCID iD[1], Elisa Thoral ORCID iD[1], Elin Persson[2], Imen Chamkha ORCID iD[3], Eskil Elmér ORCID iD[3], Andreas Nord ORCID iD[1]

[1]Lund University, Department of Biology, Section for Evolutionary Ecology, Sölvegatan 37, SE-223 62, Lund, Sweden, Lund, Sweden. [2]Lund University, Lund, Sweden. [3]Lund University, Department of Clinical Sciences, Mitochondrial Medicine, Sölvegatan 17, SE-221 84, Lund, Sweden, Lund, Sweden

Abstract

Extreme weather events, such as heat waves and cold spells, are predicted to increase under climate change, which can have significant negative effects on fitness and survival. Such variations in temperature during development can affect growth and subsequent performance in birds, with influence over their long-term temperature tolerance. Developmental temperature can also have direct effects on the ontogeny of the metabolic machinery, including on mitochondrial function, but it is not well understood how this might influence growth and maturation. As mitochondria is responsible for producing the majority of the energy used by the organism, studying how these organelles respond to thermal variations can provide insight into the cellular mechanism underlying key processes such as growth and thermoregulatory capacity, and how these might differ between life-stages. To investigate this, we raised Japanese quail in warm and cold temperatures from hatching until adulthood and measured mitochondrial function in blood cells as well as several morphological features at key developmental time points. After sexual maturity, half of the birds from each group were placed in a common garden at a moderate temperature in order to test whether changes to the mitochondrial phenotype were plastic or programmed by early-life thermal conditions. We found differences between the thermal environments in some mitochondrial respiration rates and morphological features, and an increase in mitochondrial metabolism with age. This can provide insight into how birds are impacted by extreme weather events and what the repercussions are throughout life.

Synopsis

NA

404

Factors driving the breeding microhabitat preferences of two endangered ducks in a shallow lake as revealed by a multidisciplinary approach

İbrahim Kaan Özgencil ORCID iD[1,2], Deniz Mercan[3], Gencer Yaprak[1,2], Gülümser Genç[4,2], Dilan Melisa Özsoy[4,2], Alaz Uslu[2], Melisa Soyluer[1,2], Mustafa Korkmaz[1], Berkay Gülen[5], Metehan Arıkan[5], Esra Mine Ünal[5], Emre Keskin[5], Nur Filiz[6,7], Gülce Yalçın[6,7], Feride Avcı[7], Hilal Kiran[7], Erik Jeppesen[6,7,8,9], Meryem Beklioğlu[6,7]

[1]Department of Biological Sciences, Middle East Technical University, Ankara, Turkey. [2]Simurg Bird Sanctuary, Ankara, Turkey. [3]Department of Biology, Eskişehir Osman Gazi University, Eskişehir, Turkey. [4]Department of Biology, Hacettepe University, Ankara, Turkey. [5]Biotechnology Institute, Ankara University, Ankara, Turkey. [6]Ecosystem Implementation and Research Center, Middle East Technical University, Ankara, Turkey. [7]Limnology Lab, Department of Biological Sciences, Middle East Technical University, Ankara, Turkey. [8]Department of Ecoscience and Arctic Research Centre, Aaruhus University, Silkeborg, Denmark. [9]Sino-Danish Centre for Education and Research, Beijing, China

Abstract

Shallow lakes are crucial habitats for breeding waterbirds including diving ducks, some of which are globally endangered. Understanding factors affecting breeding habitat preferences of these endangered species can allow for more efficient management and conservation planning. In this study, we investigated the breeding microhabitat preferences of two globally endangered omnivorous diving ducks: White-headed Duck (*Oxyura leucocephala*) and Common Pochard (*Aythya ferina*) at Lake Mogan, at a shallow lake in central Türkiye. We used waterbird surveys, water clarity measurements, environmental DNA, satellite imagery, supervised image classification, and generalized linear models to figure out the factors that may be driving the microhabitat preferences of the two duck species, which seem to utilize only some of the visually suitable sites in the lake. We found that higher abundances of the study species utilized areas with (i) high macrophyte submerged macrophyte coverage (ii) high water clarity (iii) high benthic macro-invertebrate food abundance (iv) lower fish biomass (v) high reed percentage and (vi) high reedline complexity. Strength of some of the dependence relationships varied over time with the effects getting stronger towards the end of the breeding season. Our results indicate that the two endangered duck species utilize refuges with certain ecological features, which constitute only a small fraction of the study lake's surface area. Our findings can be used to guide the management and conservation efforts aiming at preserving such refuge areas and thus the study species.

Synopsis

Multiple biotic and abiotic factors shape breeding macrohabitat preference of White-headed Ducks and Common Pochards

Twitter handle

@bio_kaan

422

Trophic mismatches in pied flycatchers? Long-term data on food-dynamics, diets and fitness

Christiaan Both

University of Groningen, Groningen, Netherlands

Abstract

Climate change leads to a progressive advance in spring phenology. Advances may differ across trophic levels, resulting in trophic mismatches in which birds often breed too late to profit from a narrow food peak in spring. However, links between food availability, diet choice and fitness are seldom studied over long periods of time. Here I present 16 years of data on caterpillar dynamics, nestling diets and fitness consequences in a Dutch pied flycatcher population. I show that caterpillars are their primary prey, and seasonal changes in nestling diets are mostly determined by caterpillar phenology and not so much caterpillar abundance. Average annual population fitness was unrelated to average mismatch with caterpillars, but between year variation in the strength of selection on breeding date was strongly correlated with caterpillar phenology. Therefore, mismatches seem to more strongly affect the evolutionary dynamics than population dynamics in this system

Synopsis

NA

423

The determinants of migratory connectivity: a pied flycatcher common garden experiment & range-wide tracking

Koosje Lamers[1], Janne Ouwehand[1], Marion Nicolaus[1], Jan-Åke Nilsson[2], Christiaan Both[1]

[1]University of Groningen, Groningen, Netherlands. [2]Lund University, Lund, Sweden

Abstract

Migrant songbirds may be particularly vulnerable to climate change due to their complex annual cycle, and a major puzzle piece still missing in our understanding of how they may adjust their annual timing schedules, are the wintering grounds. Many migrant species display migratory connectivity: breeding populations winter in different parts of the wintering range. However, wintering sites are hypothesized to constrain the timing of spring departure, because their food conditions vary seasonally depending on rainfall, which may arrive at different moments at different wintering sites. Wintering sites can thus potentially impact timing and evolutionary adaptation to climate change, but what determines variation in wintering sites remains unknown.

In a two-pronged approach by tracking pied flycatchers from (1) the width of the breeding range, and (2) a common garden experiment, we test whether between-population variation in wintering sites is determined genetically and/or by environment and investigate the links between migratory time-schedules and wintering and breeding sites. In a range-wide effort, we tracked pied flycatchers (Ficedula hypoleuca) from Spain, the UK, the Netherlands, Sweden, Norway and Russia. In addition, over the course of a five-year long experiment, we translocated pied flycatcher females and eggs from the Netherlands to Sweden, hereby creating a free-living population of birds of Dutch, half-Dutch, and Swedish descent in our Swedish study population. We now compare the migratory journeys and destinations of this natural experiment and common garden experiment to answer what drives between-population variation in wintering sites.

Synopsis

What causes migrant bird populations to winter at different sites? Experimental evidence from a wild bird common garden.

Twitter handle

@KoosjeLamers:

Acceptance type: Plenary

427

Revolutions in bird migration research

Thomas Alerstam

Lund University, Lund, Sweden

Abstract

New methods and techniques have repeatedly brought about revolutionary improvements in understanding and knowledge about bird migration. Such major and rapid advances in knowledge were associated with e.g. the introduction of the method of bird ringing/banding, with the start of systematic field observations of visible migration, with experimental studies of caged migratory birds and with studies using radar, etc. During recent decades the research field has been dominated by the revolutionary advances associated with tracking studies of individual birds made possible by the new electronic techniques (satellite-based radio telemetry, light-based geolocators, and use of GPS and miniature electronic sensors). As a consequence, the knowledge about the lives of migratory birds and the structure of their migratory flight plans throughout the annual cycle is exploding. In addition, the new molecular genetic methods promise to provide a deepened understanding of the regulation and evolution of migratory behaviour. I will try to sketch a brief historical perspective on the development of the bird migration research field leading up to the ongoing revolution based on electronic techniques, giving examples of old and new research questions, solved and unsolved.

Synopsis

NA

428

Social Behaviour and Social Networks of Birds: From Individuals to Population Processes

Ben Sheldon

University of Oxford, Oxford, United Kingdom

Abstract

Almost any aspect of bird life histories involves a social interaction of some form, from mating, parenting, migrating to foraging, and dealing with the risks of predators. Social arrangement of birds ranges from long-term stable social groups, often consisting of close kin, to large, ephemeral groups, with composition turning over rapidly. Much of the focus on social behaviour has been on species in long-term stable social groups, but many important social processes occur in other species.

In this lecture I will describe work that aimed to characterise the social structure of wild tits in Wytham Woods, near Oxford, using large-scale automated observation methods. I will explain how using a social network approach enabled us to test a range of ideas about the importance of social structure in these birds, ranging from mate selection and food discovery, to the spread of novel behaviour and the emergence of stable cultural differences within different parts of the population.

Synopsis

NA

429

Parental care in birds: from sexual conflict to cooperation

Katarzyna Wojczulanis-Jakubas

University of Gdansk, Gdansk, Poland

Abstract

Since parental care in birds is considered to be costly and males and females have different reproductive potential, their parenting performance has long been viewed in the context of sexual conflict: if bi-parental care (prevailing breeding system in birds) is to be provided, the common effort being exhibited is rather the question of a fragile interplay between the two parents, with their contribution being conditional in respect to the partner's performance. Nevertheless, sexual selection does not explain all the patterns of parental care being observed, especially coordinated performance of partners in their parental activities. In fact, growing number of studies demonstrates that avian parents may adjust their parental activities in a way that may positively affect the breeding outcome of the pair. This, in turn, suggests that cooperation of avian parents may also be an evolutionary force shaping parental care in birds, at least as strong as sexual selection.

In this talk, I will consider a variety of patterns of parental coordination and discuss them in the context of sexual selection and partner cooperation. I also highlight the importance of the environment in shaping the pattern of parental coordination. Doing so, I will particularly focus on seabirds, an ecological group that has been greatly neglected in studies on parental care, while apparently exhibiting cooperative performance of the breeding partners.

Synopsis

NA

430

The Internet of Wings

Martin Wikelski

Max Planck Institute of Animal Behavior and University of Konstanz, Konstanz, Germany

Abstract

The collective wisdom of the Earth´s animals provides an immense bio-treasure of unprecedented information for humankind. Learning from animals in the ´Internet of Animals´ can help us forecast global zoonotic disease spreads or safeguard food resources while monitoring in situ every corner of the planet. To protect and understand the ecosystem services provided by animals, we need to monitor individual animals seamlessly on a global scale using animal-borne tracking tags.

The ICARUS initiative, including Movebank and the digital Movebank Museum (MoMu), an international bottom-up, science-driven technology development of small, cheap and autonomous sensing devices for animal movement and behaviour is aiming towards this: wearables for wildlife. The resulting big data should largely be available open source (with some important restrictions to safeguard animals) and the data analyses can be democratized by using MoveApps, a non-coding web-based analysis environment linking programmers, modellers and statisticians with ecologists, amateurs, conservation managers and citizen scientists. Together we can work towards better understanding, monitoring, predicting and protecting life on our planet.

Synopsis

NA

431

Preventing ecological traps in conservation: lessons learned from long-term monitoring programs

Inês Catry

Research Centre in Biodiversity and Genetic Resources, Porto, Portugal

Abstract

The recognition of the rapid ongoing biodiversity loss has been leading to increasing conservation efforts. To maximise conservation success, it is crucial to evaluate when interventions are likely to be effective. Nonetheless, conservation actions are often poorly evaluated and based on short-term evidence, which might preclude the detection of constraints and may create long-term conservation traps with major implications for the conservation of threatened populations. Artificial nest provisioning is one conservation tool widely used in the management of secondary cavity-nesting species. Conservation actions aiming at increasing nest-site availability have been sometimes mentioned to act as ecological traps, for example, by attracting birds to unsuitable foraging habitats, unsuitable nest microclimates or unsuitable population densities, among others (for example, by increasing predation and competition or by modifying the structure of the community).

In my talk, I will show how the implementation of conservation measures can present some unexpected challenges for the conservation of target species, highlighting the value of long-term monitoring to establish and adapt conservation efforts. Finally, I will discuss how conservation measures can promote the unsustainable need to perpetuate the implementation of conservation measures and the challenges we face to secure funds to sustain the long-term viability of conservation-reliant species.

Synopsis

NA

432

Climate adaptation and speciation in Ficedula flycatchers

Anna Qvarnström

Uppsala University, Uppsala, Sweden

Abstract

As climate change accelerates natural populations, and especially those living in habitats affected by altered land use, face risk of extinction. The long-term persistence of such populations depends on their ability to phenotypically adapt either through plastic responses (for example dispersal) or through genetic responses (that is evolutionary rescue). To increase the likelihood of evolutionary rescue we need to better integrate concepts from evolutionary ecology into strategies of conservation or management of wildlife for the future.

In this talk, I argue that studies on birds play a central role in this integration for several different reasons. One important such reason is our ability to measure detailed demographic parameters of individual birds in long-term population studies under natural conditions. This means that we can study genetic evolution irl and extrapolate the gained knowledge to less well studied species of birds due to large-scaled sequencing efforts of this charismatic group of organisms. In many bird species breeding in the northern hemisphere, the negative effects of climate change include phenological mismatch between the peak in prey availability and the peak in offspring's need of food. Recent studies of Ficedula flycatchers have revealed that pied flycatchers are more robust to this mismatch compared to collared flycatchers despite large similarities in niche use. This difference in robustness is, at least partly, explained by nestling pied flycatchers having a more plastic metabolic rate. I will discuss how these findings can be extrapolated into predictions about other species' ability to adapt to climate change (or not).

Synopsis

NA

433

Ecology & Evolution in the Urban Realm: What's Past is Present, what's Present is Future

Marta Szulkin

University of Warsaw, Warsaw, Poland

Abstract

By 2050, 7 out of 10 people will be living in urban areas. Urban space is thus of intrinsic interest to humans worldwide, biologists included. It is also an environment with radically altered ecological dynamics relative to original natural habitat.

In the first part of my talk, I will examine the profound effects of urbanisation on wildlife, specifically – passerine birds. I will report on avian phenotypic trait variation (and its evolutionary implications) when measured across multiple replicated urban-rural contrasts in Europe. I will also discuss the impact of urbanisation and associated solid waste pollution on the extended phenotype of urban passerines. Finally, I will report quantitative estimates of the effect of impervious surfaces such as concrete or asphalt on avian fitness using data collected in an Eastern European capital city.

In the second part of my talk, I will highlight how urban ecology and evolution – a relatively new and exciting field of research - can be constructively used to move forward our understanding of biology in the Anthropocene: specifically, by improving our understanding of socio-economic processes shaping urban eco-evolutionary dynamics, but also by improving the resilience of cities in the wake of climate change. I will close-off by accentuating the need for large-scale research on nestboxes as breeding cavities in the context of extreme weather events further accentuated by the urban heat island effect.

Synopsis

NA

442

Raptors in a changing world: Understanding the response of predators to increasing urbanization

Petra Sumasgutner

Konrad Lorenz Research Centre, Core Facility for Behavior and Cognition | University of Vienna, Vienna, Austria

Abstract

Urban development is increasing across the globe and poses a major threat to biodiversity, which is often relatively low in human-modified landscapes. More people live in urban than in rural areas globally, and the urbanization trend is faster in Africa and Asia than in any other region of the world. Avian predators are amongst the most vulnerable to urbanization, but a few species – usually small to medium sized raptors – have persisted and contribute substantially to functional diversity in urban habitats. To date, the majority of urban raptor research has occurred in North America and Europe, but findings from one region may not necessarily translate to populations of the same or similar species across the world. In Northern Systems, specialist avian predators such as Peregrine Falcons and Black Sparrowhawks show a positive response to urbanisation, while small mammal predators, such as Eurasian Kestrels show a negative response, likely due to a lack of suitable, diurnal prey. However, in the South, an African metropolis hosts a large population of Crowned Eagles and becomes a relevant refugia for a large-bodied species that is elsewhere declining, creating valuable opportunities for public engagement and urban conservation. In this talk I will focus on the responses of raptors to increasing urbanization, providing examples from across the globe based on long-term data of individually colour-ringed and GPS-tracked populations to better understand the key resources which attract raptors to urbanized areas, and explore how the decision to settle in urbanized areas can affect individual health, productivity and survival.

Synopsis

Raptors in a changing world: Understanding the response of predators to increasing urbanization

Acceptance type: Poster pitch presentation

44

Speed and contrast effect on the visual perception of rotary motion by birds.

Constance Blary ORCID iD[1,2], Francesco Bonadonna ORCID iD[1], Elise Dussauze[1], Simon Potier ORCID iD[3,4], Aurélien Besnard[1], Olivier Duriez ORCID iD[1]

[1]CEFE, Univ Montpellier, CNRS, EPHE, IRD, Montpellier, France. [2]Agence de l'environnement et de la Maîtrise de l'Energie, Anger, France. [3]Lund University, Lund, Sweden. [4]Les Ailes de l'Urga, Marcilly-la-campagne, France

Abstract

Birds are able to discriminate between two objects with different rotation speeds, as well as between clockwise and counter-clockwise rotating objects. However, differentiating a static object from a slowly rotating one (perception of stationarity) may be challenging for birds. Furthermore, the contrast between the object and its background could also have an effect, by decreasing the perceived speed (Thomson effect). We thus conducted an experiment on Rock Doves (*Columba Livia*) to assess their ability to discriminate between a stationary and a rotating object, mimicking a miniature wind turbine, depending on the speed of rotation and the contrast between the object and its background. We found an effect of both speed and contrast. At low speed (3 rotations per minute) doves were not able to discriminate the stationary object from the rotating one. When the contrast was low, half of the birds tested were no longer able to discriminate the two objects, regardless of the speed. The perception of an object as stationary while it is slowly rotating, or when the contrast between the object and its background is low, has already been observed in humans, but this is the first time in birds. These results could be highly important for conservation purpose, especially in relation to bird collisions with wind turbines. The perception of stationary wind turbine blades by birds while they are rotating could be a cause of mortality.

Synopsis

Slowly rotating wind turbines blades are perceived as static by Rock Doves.

84

MIGRALION & MIGRATLANE programmes: large-scale multi-source data acquisition and modeling to characterise the use of maritime & coastal areas by birds & bats

Sophie de Grissac ORCID iD[1], Olivier Duriez[2], Jocelyn Champagnon[3], Frédéric Jiguet[4], Aurélien Besnard[2,5], Vincent Delcourt[6], Nicolas Delelis[6], David Grémillet[2], Amedee Roy[1]

[1]France Energies Marines, Marseille, France. [2]Centre d'Ecologie Fonctionnelle et Evolutive (CEFE - UMR 5175), Montpellier, France. [3]Tour du Valat, Arles, France. [4]Muséum National d'Histoire Naturelle, Paris, France. [5]EPHE-PSL, Paris, France. [6]Biotope, Mèze, France

Abstract

The current accelerating development of offshore wind farms along the French coasts raises new concerns for the preservation of biodiversity. In particular, it highlights a lack of knowledge regardind the use of these areas by birds and bats: migration flows, flight altitudes and the functionality of marine areas for marine and terrestrial migratory species.

To meet these knowledge challenges, the French Office for Biodiversity (OFB) launched two very large-scale research programmes aiming at collecting multi-source data covering both sea basins:

- MIGRALION project in the Gulf of Lion, Mediterranean Sea (2021-2025)
- MIGRATLANE project for the Atlantic facade including Channel and North-Sea (2023-2027)

These ambitious programmes will acquire relevant data through a large variety of means and technologies:

- Telemetry and biologgers on seabirds and migratory terrestrial birds
- Acoustic surveys from coastal and offshore sites & from vessels;
- At-sea surveys by boat with visual observations, on-board radars & acoustic recorders;
- Aerial at-sea surveys with visual & digital observations
- Ornithological and meteorological radars from the coast;

These datasets will be cross-processed and analysed thanks to an innovative and specifically developed method for multi-source data integration and modelling.

We present this holistic approach that will provide unprecedented spatiotemporal information on the migration of species along and across the French maritime spaces, including functional areas, preferential routes, flows of individuals, temporality of migratory events, behaviour, and flight altitudes. These data will shed light on the threats faced by the populations and, ultimately, will help to inform and improve the implementation of public policies of offshore infrastructures development.

Synopsis

NA

93

Near-term forecast of peak migratory events

Baptiste Schmid ORCID iD[1], Tom Carrard[2,3], Lukas Guddmundsson[3]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]Swiss Ornithological Institute, sempach, Switzerland. [3]ETH, Zürich, Switzerland

Abstract

Near-term forecasts of bird migration inform days ahead on the occurrence of peak migratory events. Knowing the timing of peak events enables is a first step towards taking actions to reduce risks of migratory birds. For example, windmills could be turned off, and light emission reduced.

We trained a statistical model to associate peak migratory events with weather conditions using six years of bird-radar data registered in Sempach, Switzerland. We further investigated the dependency of peak migration events on the spatio-temporal organization of weather variables (precipitation, temperature, atmospheric pressure). For this, we identified peak events (above the 90% quantile in migration intensity for each season and year), and looked at the difference between the weather conditions during these peak events and the average weather conditions.

The performance of the hindcast varied between season and from year to year, usually underestimating the number of birds during peak migratory events. Nevertheless, clear spatio-temporal patterns were identified for each season, with high pressure and favourable winds for a northward migration in spring, and a transition from lower to higher pressure within three days preceding autumnal peak migratory events. Such patterns reflect the spatio-temporal dynamics of the environmental conditions that birds select for their migratory flights, and reveal the typical influence of weather conditions on migration, as captured by near-term forecasts.

Synopsis

What weather conditions promote peak migration events? 👍🌦️🐥📡 @baptischmi @Vogelwarte_scie #EOU2023 #ornithology #aeroecology

Twitter handle

@baptischmi

116

Effect of incubation temperature on the thermal sensitivity of mitochondrial respiration during early-life development in Japanese quail

Elisa Thoral ORCID iD[1], Maria Correia ORCID iD[1], Eskil Elmér ORCID iD[2], Imen Chamkha ORCID iD[2], Andreas Nord ORCID iD[1]

[1]Lund University, Department of Biology, Section for Evolutionary Ecology, Sölvegatan 37, SE-223 62, Lund, Sweden. [2]Lund University, Department of Clinical Sciences, Mitochondrial Medicine, Sölvegatan 17, SE-221 84, Lund, Sweden

Abstract

Thermal conditions experienced during early-life in birds have strong phenotypic and physiological effects in hatchlings and juveniles. Thus, an increase in the incubation temperature of eggs leads to accelerated embryonic growth and reduced neonatal metabolic rate while reduced incubation temperature delays growth and increases metabolic rate. However, the reduction in growth rate in low incubation temperature is often less than predicted from the temperature drop alone, but the mechanisms underlying this counter-gradient adaptation are poorly understood. Generally, incubation temperature-effects on physiology have been interpreted as adaptive environmental matching of developmental and adult environments, but this remains speculative since there are no studies linking incubation temperature to the thermal sensitivity of embryos. To study the mechanisms underlying counter-gradient adaptation of embryonic development, we measured the mitochondrial metabolism in heart and liver, two highly metabolic tissues, of 13-day old Japanese quail embryos incubated at 36, 37.5 or 39°C. Then, to test the environmental matching hypothesis, we measured the thermal sensitivity of mitochondrial metabolism of embryos from different incubation temperatures. The results of this project will help to understand the capacity of embryos to respond to a thermally-variable environment during development. This is a first step towards revealing the mechanisms by which developmental temperature programs temperature tolerance in adult birds.

Synopsis

Effect of incubation temperature on the mitochondrial thermal sensitivity during early-life development in Japanese quail

Twitter handle

@ElisaThoral

122

The effects of environmental variation along an urban – forest gradient on Blue Tit life history traits.

Claire Branston, Conor Haugh, Pablo Capilla-Lasheras, Rachel Reid, Paul Baker, Kate Griffiths, Stewart White, Davide Dominoni

University of Glasgow, Glasgow, United Kingdom

Abstract

Urbanisation is occurring globally at a rapid rate, with 68% of the global population predicted to reside in an urban area by 2050. Urbanisation creates new species assemblages and environmental conditions, thus leading to novel selection pressures. In this study, we first quantified environmental variation along a 20-site urban-forest gradient, from the city centre of Glasgow to Oak (Quercus spp.) forests in Loch Lomond National Park, UK. We measured environmental variables, including temperature, rainfall, light pollution, land cover, habitat composition (including native foliage availability) and human population density. Using a mixed modelling approach, we then investigated the links between differences in environmental variation and habitat composition with Blue Tit (*Cyanistes caeruleus*) life history traits along this urban-forest gradient. Preliminary results point to native foliage availability as a key driver of differences in both phenology and reproductive success of this species. Given the predicted future increase in urban land cover, it is important to understand the impact of these novel environmental conditions on species to understand how populations may respond to urban sprawl.

Synopsis

NA

Twitter handle

@ClaireBranston

132

Strategies for crossing an ecological barrier: the Mediterranean Sea as a case study

Paul Dufour ORCID iD[1,2], Olivier Duriez[1], Jocelyn Champagnon[2], Stephan Tillo[2], Frédéric Jiguet[3]

[1]CEFE, Univ Montpellier, CNRS, EPHE-PSL University, IRD, Montpellier, France. [2]Station Biologique de la Tour du Valat, Arles, France. [3]CESCO, Muséum National d'Histoire Naturelle, Paris, France

Abstract

Over decades, it has been unclear how migratory birds cross major ecological barriers such as seas or deserts. With the advancement and miniaturisation of tracking technologies, it has become possible to explore the strategies adopted by terrestrial migrants of almost all sizes when confronted with such obstacles. Recent studies have thus demonstrated the exceptional capacity of some songbirds to seek out favourable conditions at extreme altitudes when crossing such barriers.

If the Sahara Desert is a well identified barrier for many migrants, which have developed specific crossing strategies, the crossing of large marine areas remains less understood. Our knowledge of how migratory birds modify their journeys in the face of sea crossings is thus limited to the study of few species in different geographical contexts.

In the MigraLion project, we have deployed GPS and multisensor loggers on 32 migratory species breeding on the Mediterranean coast of southern Europe, ranging from Greater Flamingo Phoenicopterus roseus to Western Orphean Warbler Curruca hortensis. With these data, we study how migratory birds cope with crossing the Mediterranean Sea along their migratory journey. We will investigate for patterns common to several taxonomic groups in their crossing strategies (e.g., phenology, altitudinal and flight speed) and present new results about the environmental variables influencing these strategies.

Synopsis

Crossing strategies of the Mediterranean Sea of a wide range of species

Twitter handle

@PaulDufour80

143

Air pollution in birds: how do soot-like particles deposit in the avian lungs depending on temperature?

Susana Garcia Dominguez ORCID iD, Linnéa Jönsson, Andreas Nord ORCID iD, Jenny Rissler ORCID iD, Caroline Isaksson ORCID iD

Lund University, Lund, Sweden

Abstract

Air pollution is one of the largest environmental threats to the health of humans and probably wildlife. Traffic-generated particulate pollutants, such as soot, are abundant in cities and, once inhaled, they can cause respiratory and cardiovascular diseases, as well as cancer, in humans. The further into the respiratory system these particles deposit, and the larger the deposited concentration, the more dangerous these particles become for an individual's health. Unlike our respiratory system, the avian respiratory system is equipped with air sacs, which allows a highly efficient unidirectional air flow, adapted to support the high energetic demands of flying. Therefore, birds may be especially sensitive to this type of pollution, yet very little is known about particle deposition in the avian lungs, and how this deposition changes with particle size and ambient temperature. To elucidate this, we individually exposed 60 zebra finches (*Taeniopygia guttata*) to soot-like particles, at two different sizes (50 and 100 nm) and at two different temperatures (5 and 25°C). Individuals were sacrificed right after (n = 50) or 2 weeks after exposure (n = 10). As predicted, particle deposition in the lungs showed that higher deposition occurred with smaller particles, and in colder temperatures, but significantly decreased in birds sacrificed 2 weeks after exposure. By understanding how particle deposition and clearance occurs in the avian respiratory system, we can better predict the toxic effects of such particles in birds. In turn, this knowledge can contribute to more rigorous health protection measures in urban environments.

Synopsis

NA

152

Effects of fasting on mitochondrial metabolism in breeding king penguins

Nina Cossin-Sevrin ORCID iD[1], Céline Bocquet[2], Camille Lemonnier[2], Pierre Bize ORCID iD[3], Jean-Patrice Robin ORCID iD[2], Katja Anttila ORCID iD[1], Suvi Ruuskanen ORCID iD[4], Vincent Viblanc ORCID iD[2]

[1]Department of Biology, Univeristy of Turku, Turku, Finland. [2]Institut Pluridisciplinaire Hubert Curien, UMR 7178, Université de Strasbourg, CNRS, Strasbourg, France. [3]Swiss Institute of Ornithology, Sempach, Switzerland. [4]Department of Biological and Environmental Science, University of Jyväskylä, Jyväskylä, Finland

Abstract

In many avian species fasting is an inherent part of their life cycle. Adult penguins experience fasting periods during their breeding cycle as both parents must alternate incubation and brooding shifts on land while their partner forage at sea. For breeders, the success of fasting does not only influence their own condition and survival, but the chick's survival as well, and therefore their fitness. Unraveling the physiological mechanisms underlying adults' fasting success can therefore provide information to understand variation in fitness. Previous studies in king penguins (*Aptenodytes patagonicus*) have shown that the whole-organism metabolic rate decreases across the fasting stages. However, mitochondrial metabolism has been recently raised as a promising proxy of animal performance as it allows evaluating the balance between the energy production and its constitutive damaging sub-products (leading to oxidative stress). Here, we investigated changes in mitochondrial metabolism in breeding adult king penguins fasting during incubation. We measured mitochondrial respiration rates in red blood cells obtained in males and females at the beginning (day 3 on land) and end (day 10) of their incubation shift. We will discuss how changes in mitochondrial metabolism can allow penguins to cope with prolonged fasting period, and how insights on mitochondrial metabolism may help to better understand the cellular constraints shaping the performance and fitness in natural bird populations.

Synopsis

Insights on how changes in mitochondrial metabolic help king penguins to cope with prolonged fasting

Twitter handle

@CossinNina

153

Distinct stopover use during outbound and return movements of a short-distance migrant grassland bird

Ana Teresa Marques ORCID iD[1,2,3], Rita Ramos[1,2,3,4,5], Emmanuel Lourie[6], Hany Alonso[7], Ricardo Correia[8], João Paulo Silva ORCID iD[1,2,3]

[1]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, Vairão, Portugal. [2]BIOPOLIS Program in Genomics, Biodiversity and Land Planning, Vairão, Portugal. [3]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Instituto Superior de Agronomia, Universidade de Lisboa, Lisboa, Portugal. [4]School of Environmental Sciences, University of East Anglia, Norwich, United Kingdom. [5]Departamento Biologia, Faculdade de Ciências, Universidade do Porto, Porto, Portugal. [6]Movement Ecology Lab, Department of Ecology, Evolution and Behavior, Alexander Silberman Institute of Life Sciences, Jerusalem, Israel. [7]Sociedade Portuguesa para o Estudo das Aves (SPEA), Lisboa, Portugal. [8]Helsinki Lab of Interdisciplinary Conservation Science (HELICS), Helsinki, Finland

Abstract

Stopovers are key to ensure successful migration and animal survival, by providing resting areas and refuelling opportunities. Our study species is the little bustard (Tetrax tetrax), a medium sized grassland bird, described as a partial migrant in the Iberian Peninsula. Here we compare the frequency and duration of stopovers used during outbound and return movements, from and to breeding grounds, at the beginning of the hot Mediterranean summer and mostly in the beginning of Autumn, respectively. Data was collected from the migration of 59 birds tagged with GPS devices between 2009 and 2020. The areas used as stopovers were identified and mapped with Brownian bridge models. We analysed 130 migration tracks (84 outbound and 46 returns), all performed during the night period, and a total of 194 stopover sites (146 during outbound movements and 48 during returns). When comparing both type of displacements, return trips occurred in more flexible dates and were performed faster. Stopovers occurred frequently in both movements (2.2 stopovers in outbound moments and 1.4 in return movements), despite the relatively short distances travelled (78 km in average). Birds used stopover sites more frequently during the outbound displacements (79% of movement had stopovers vs 59% in the return movements) and during longer journeys. Stopovers were located mainly in croplands (both irrigated and non-irrigated), hence promoting habitat connectivity between breeding and post-breeding areas is a key conservation measure and should be considered in future management and conservation plans of the little bustard.

Synopsis

Little bustards used stopover sites more frequently during the outbound displacements

Twitter handle

@steppebirdsMOVE

156

Anthropogenic noise lowers prey detection in acoustic predators: an experiment on developing juvenile Tawny Owls (*Strix aluco*)

Giuseppe Orlando ORCID iD[1,2], Arianna Passarotto ORCID iD[2,3,4], Chiara Morosinotto ORCID iD[2,3], Davide Dominoni ORCID iD[1], Patrik Karell ORCID iD[2,3]

[1]School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, Glasgow, United Kingdom. [2]Evolutionary Ecology Unit, Department of Biology, Lund University, Lund, Sweden. [3]Department of Bioeconomy, Novia University of Applied Sciences, Raseborg, Finland. [4]Department of Zoology, University of Seville, Seville, Spain

Abstract

Noise pollution is one of the most pervasive footprints of urbanisation and human activity. Ambient noise levels are increasing worldwide due to anthropogenic activities connected to transport, industrial and recreational purposes. Consequently, animals relying on hearing must deal with these changes in ambient sound levels to fulfil vital activities, like hunting. Previous studies show that anthropogenic noise strongly impacts several behavioural responses in many species, but studies have largely focused on diurnal species. Moreover, how noise affects species throughout their ontogeny is still limited. To fill these gaps, we experimentally exposed captive Tawny Owls (*Strix aluco*) to anthropogenic noise during different phases of growth. Tawny Owls are nocturnal predators largely relying on hearing to locate prey at night. Our findings show that noise lowers the rate of prey detection and increases the time needed to locate the prey regardless of the age the owls were tested. Although the aural sensitivity of the owls improved when they were adults, hunting efficiency was still affected by noise. Moreover, when younger, the owls displayed a higher rate of head-bobbing, which however was not associated to the noise treatment. Our study provides new insights about the detrimental effects of noise pollution on animal behaviour, showing that noise disrupts prey detection in both juveniles and adults. Our results also suggest that high anthropogenic noise might impair owl hunting behaviour already from a young age, affecting juvenile survival and recruitment. Future studies should examine how these results may be relevant for individual fitness and population dynamics.

Synopsis

Anthropogenic noise lowers the rate of prey detection and increases the time needed to locate the prey in Tawny Owls.

Twitter handle

@beppe_orlando96

184

Personality is not influenced by internal parasites in a songbird Parus major

Salamatu Abdu[1], Micheal Chimento[1], Mina Ogino[2], Gustavo Alarcón-Nieto[1], Lucy Aplin[1,3], Hanja Brandl[1], Damien Farine[2,3]

[1]Max Planck Institute of Animal Behaviour, Radolfzell, Germany. [2]University of Zurich, Zurich, Switzerland. [3]Australian National University, Canberra, Australia

Abstract

Animal personality is well-established, with evidence for repeatable differences in behaviour among individuals being found across a range of species. However, personality may be confounded by internal parasites. Internal parasites are ubiquitous in the environment, however we know little about their effects on the personality of birds. Firstly, differences in behaviour can predispose some individuals to be more likely to acquire parasites. Secondly, parasites are well-known to influence behaviour, which could confound measures of behaviour. It is therefore crucial to understand whether parasites can have an effect on the consistent individual differences in behaviour. In this study, we investigate the effect of internal parasites – Isospora sp. and Serratospiculum amaculata – on the personality of a model system for studies of personality in birds: the great tit (Parus major). We measured exploratory behavior by conducting assays by introducing 174 birds into a standardized novel environment, and by retrieving faecal samples from each bird that were subsequently screened for internal parasites. We found that neither Isospora sp. nor S. amaculata had an effect on our measured exploration scores, suggesting that these measures are robust. This provides important support for animal personality assays reflecting individual differences in behaviour that are robust to other internal factors.

Synopsis

Exploratory behaviour in great tits is not influenced by internal parasites

Twitter handle

@salkeet

198

The influences of individual quality and environmental factors on reproduction and survival in a sedentary bird of prey.

Roman Bühler ORCID iD[1], Thomas Riecke[1], Robin Séchaud[1], Kim Schalcher[2], Alexandre Roulin[2], Bettina Almasi[1]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]University of Lausanne, Lausanne, Switzerland

Abstract

Investigating what causes differences in reproductive success and survival is essential for understanding eco-evolutionary processes and population dynamics. Reproduction and survival are closely linked, and reproductive costs may translate directly to survival perspectives of individuals. Both reproduction and survival may depend on individual quality (e.g. experience, body condition) as well as environmental variables (e.g. habitat composition, food availability, weather). We used a dataset of 556 breeding barn owls of 5 years to investigate how individual quality and environmental variables influence reproduction and survival. Using a hierarchical capture mark recapture model, we tried to explain the number of eggs, fledglings, and apparent survival as a function of individual factors and prey availability. While we couldn't detect any effect of parent quality or prey availability on the number of eggs, we did see an effect of laying date and female body condition on fledglings produced. Females who laid earlier in the season and showed lower body condition during the nestling period produced more fledglings. Female survival increased with increasing number of fledglings produced and was positively affected by increased prey availability during the pre-laying period. Male survival was positively affected by experience and prey availability during early winter and negatively affected by increased prey availability during the pre-laying period. These results suggest that male and female react sensitively to prey availability during specific periods. For females, the most important period seems to be the time before oviposition, while for males the availability after reproduction, i.e. in early winter, is crucial.

Synopsis

NA

245

Bird Watchers' Preferences Creates Analytical Challenges for Interpreting Presence-Only Data

Wesley Hochachka ORCID iD

Lab of Ornithology, Cornell University, Ithaca, USA

Abstract

Bird watchers have preferences for some species relative to other species, for example when bird watchers try to observe rare species. One consequence of these preferences may be biases in the rates at which observations of different species are reported to bird observation portals, when these data are collected in the form of presence-only observations of single species and other forms of incomplete lists (i.e. lists that do not record all species that were observed). In my presentation, I will show that bias in the probability of reporting exists across the globe within incomplete-list data. My evidence is from comparisons of the rates of reporting of species in incomplete lists, relative to a baseline of complete-checklist data from a single data source, eBird. Species reported at low rates on complete checklists were reported at similar rates in incomplete lists; however, species commonly reported in complete lists were substantially less likely to be reported in incomplete lists. This pattern of variation in bias is found both across species, and within individual species across their ranges. Other factors, in addition to rarity, may also cause biases in the rates at which bird watchers report species within incomplete lists. Biases that are not constant across all of the available data create major challenges for the analysis and interpretation of records from incomplete lists. Correcting for variation in reporting biases in incomplete-list data likely requires the availability of external data from complete lists, ideally used in models that integrate incomplete- and complete-list data.

Synopsis

When bird watchers are able to choose whether or not to report a species, they produce data that are biased in complex ways.

267

Monitoring quantity and quality of bird feeding and factors affecting to the feeding

Aleksi Lehikoinen, Purabi Deshpande, Tuomas Aivelo, Anna Haukka, Katja Rönkä, Rose Thorogood

University of Helsinki, Helsinki, Finland

Abstract

Feeding of birds is a common habit in many European and North American countries especially during winter. Earlier studies have shown that supplementary feeding can have both positive and negative impacts on species influencing e.g. on survival and reproduction of birds. However, potential changes in quantity and quality and factors affecting this have rarely been investigated even though feeding can have large scale population impacts. Our main questions were (i) have feeding intensity changed in the long-term and are there spatial differences including comparison between urban and rural areas?, (ii) has the quality of the provided food changed in time?, and (iii) what factors may have caused potential changes in the feeding activity? Here we present combined survey and questionnaire information from Finland. Our preliminary results indicate that amount of feeding sites has decreased especially in urban areas since 1987. The quality of the food has changed considerably: amount of sun flower seeds, fat and peanuts has increased where as provision of cereal has decreased. Rat problem and regulations by the authorities seem to be main reason in the urban areas why people have stopped feeding.

Synopsis

Number of bird feeding sites has decreased in Finnish urban areas since 1987 likely due to rats, but quality of food have increased

Twitter handle

@AksuLehikoinen

286

Multimodal signaling in Great Tit nestlings under different daylight conditions

Pawel Podkowa ORCID iD[1], Kinga Buda ORCID iD[2], Adrian Surmacki ORCID iD[1]

[1]Department of Avian Biology and Ecology, Adam Mickiewicz University, Poznan, Poland. [2]Department of Behavioural Ecology, Adam Mickiewicz University, Poznan, Poland

Abstract

Nestlings' detectability is based on their vocalization, movement, and gaping. Parent-offspring communication is multimodal, using both acoustic and visual channels, and its evolution is a complex process. The research demonstrates that parental feeding activity depends on mouth coloration, so low light levels in cavities may limit color perception, thus hindering the feeding process. Under dim lighting conditions, parents need more time to assess nestling begging properly, which may reduce provisioning efficiency. This study aimed to test whether increased light conditions significantly affect the visual components of begging in great tit nestlings. We assumed that different luminosity in nestboxes might affect the use of different communication channels between parents and offspring. Considering the proximate mechanisms of signaling, we expected that, in changing lighting conditions, nestlings could exploit innate parental signal preferences in different ways. Specific communication channels may depend on the energy costs of given signal propagation within different lighting conditions. We expected that, if possible, nestlings would promote more profitable signals in particular light conditions (e.g., more orange flanges coloration in a bright environment). Besides, we expected lauder begging in the dark compared to bright nest boxes. We assumed that the change in signaling might be flexible and occur within a couple of days. We measured the response of 8 and 12 days-old nestlings of Great Tit.
The study was financially supported by the Polish National Science Center, no. 2020/37/N/NZ8/01345.

Synopsis

Does daylight change affect multimodal signaling in Great Tit parent-offspring communication?

Twitter handle

@ClimbUpScience

293

Does color morph variation in metabolic physiology and oxidative stress match morph-specific life-history strategies?

Chiara Morosinotto[1,2], Antoine Stier[3,4,5], Suvi Ruuskanen[3,6], Natacha Garcin[3], Patrik Karell[1,2]

[1]Novia University of Applied Sciences, Raseborg, Finland. [2]Lund University, Lund, Sweden. [3]University of Turku, Turku, Finland. [4]University of Lyon, Villeurbanne, France. [5]University of Strasbourg, Strasbourg, France. [6]University of Jyväskylä, Jyväskylä, Finland

Abstract

Understanding to what extent phenotypes vary in their physiological traits and their associations to life history strategies may help to better understand how animals are adapted to their environment and how they can cope with changing conditions. Melanin-based color polymorphism is a phenotypic trait closely associated with physiological characteristics and fitness, which in tawny owls (*Strix aluco*) is highly heritable and strongly associated with adult survival. Pheomelanic (brown) tawny owl adults raise heavier offspring, suggesting higher parental effort and/or faster growth of brown offspring, but have shorter lifespan than grey ones. Moreover, brown morphs show faster rate of telomere shortening than the grey morph, but only after reaching adulthood. To further explore the potential physiological mechanisms being involved in such trade-offs, we aimed at characterizing markers of metabolic physiology (thyroid hormones and mitochondrial density) and oxidative stress (reactive oxygen metabolites) between brown and grey tawny owls, both at the nestling and adult stages. While there was no significant effect of color morph on thyroid hormones or mitochondrial density, brown chicks had higher oxidative damage levels than grey ones. Conversely in adults, mitochondrial density was higher in brown individuals, without a significant impact on oxidative stress levels. Morph-specific differences in physiological traits are thus life-stage dependent but seem to match morph-specific life-history strategies since the higher oxidative stress observed in brown nestlings could result from their faster growth, while the higher mitochondrial density of brown adults could help in supporting their higher reproductive effort.

Synopsis

Color morph-specific differences in physiological traits are life-stage dependent but match morph-specific life-history strategies

Twitter handle

@DrKimor

303

Weather conditions affect the strategy and route selection of Red Kites surmounting vast waters of Mediterranean Sea

Jan Škrábal[1], Rainer Raab[2], Ivan Literák[1]

[1]University of Veterinary Sciences Brno, Brno, Czech Republic. [2]Technisches Büro für Biologie Mag. Dr. Rainer Raab, Deutsch-Wagram, Austria

Abstract

Countless number of bird species annually engage in migratory movement, looking for suitable winter or breeding destinations. During such a behaviour, individual birds are forced to surmount various forms of natural barriers and face variable environmental conditions that directly affect their decisions. Wind represent one of the most important factor that affects decisions of migratory birds. For soaring birds, such as Red Kites (*Milvus milvus*), ability to benefit from variable dynamics of airflow is crucial, as their physiology causes high energetic costs of powered flight. The main challenging environmental obstacles for Red Kites migrating from central Europe to winter in southern Europe represents the crossing of vast open waters of Mediterranean Sea. During such a journey, Red Kites have to rely primarily on favourable wind conditions as the presence of thermals is rather rare above the areas of Mediterranean Sea. We investigated sea-crossing behaviour of 20 Red Kites from central European population, tagged with GPS/GSM loggers and tracked in intervals as frequent as possible regarding the battery state (one fix per interval from 1s to 15 min), to assure the continues collection of data. We found that weather conditions play a major role in migratory route choice and in timing when to depart over an open sea. Furthermore, while sea crossing, Red Kites benefit not only from favourable tailwind but also from side wind. It seems that this interaction of winds or presence of wind shear allows them to reach high elevation in absence of warm uplifts.

Synopsis

NA

Twitter handle

314

Stopover selection during Sahara Desert crossing in Western Marsh Harriers using the Normalised Difference Vegetation Index

Šimon Krejčí ORCID iD[1], Emilio Guirado[2], Jan Škrábal[1], Ivan Literák[1]

[1]Department of Biology and Wildlife Diseases, Faculty of Veterinary Hygiene and Ecology, University of Veterinary Sciences Brno, Brno, Czech Republic. [2]Instituto Multidisciplinar para el Estudio del Medio 'Ramón Margalef', Universidad de Alicante, Alicante, Spain

Abstract

Migratory birds are forced to overcome various obstacles during their migration to and from their wintering areas. The ability to cross these obstacles dependents on fitness and energy maintenance of migrants. As usual, birds need stopovers during their migration. Areas with available vegetation can be crucially important for birds heading to wintering quarters or migrating back to breeding areas. One of many challenging environmental obstacles for migratory Western Marsh Harriers (Circus aeruginosus) is the crossing of the Sahara Desert, where they have to overcome areas with lack of vegetation in combination with harsh atmospheric conditions. We investigated Sahara-crossing behaviour of migratory Western Marsh Harriers originating from southern Sweden, Belgium, The Netherlands, Czech Republic and Slovakia using GPS/GSM telemetry data from 2007 to 2023. We described main crossing routes of birds originating from different populations through Sahara Desert and investigated their stopovers during crossing areas with aridity index 0 – 0.2 (hyper-arid and arid zones). We calculated Normalised Difference Vegetation Index with Sentinel-2 satellite data, which is a proxy of the net primary productivity of vegetation at the stopover positions and compared them with randomly generated positions in areas of the same aridity level in vicinity. Finally, we investigated differences between the greenness of the vegetation where the Western Marsh Harriers prefers to stopover during the Sahara crossing. Our findings highlight the importance of the scarce green areas in the trans-desert migration and open the door to the stopover habitats protection.

Synopsis

NA

319

Population genetics of Eurasian golden eagles

Ekaterina Karabanina ORCID iD, Gerhardus Lansink, Suvi Ponnikas, Laura Kvist

University of Oulu, Oulu, Finland

Abstract

Golden eagle *(Aquila chrysaetos)* is a widely recognized raptor species whose distribution range spans across the Northern Hemisphere. Being apex predators, golden eagles had been seen as pest predators of livestock and game animals and, therefore, were heavily persecuted for centuries. As a result of shooting and poisoning, the species dramatically declined and disappeared from many parts of its distribution during the 19th-20th centuries. Even though, legal protection and conservation programs allowed populations to start recovering, golden eagles are still endangered on national levels across the Holarctic. For a better conservation effort, information on population structure and the level of genetic diversity is important. While European, Japanese, and North American golden eagles have been well-studied, little is known about the populations in Russia and most of Asia. In this project we used a combination of mitochondrial (mtDNA control region) and nuclear (microsatellites) genetic markers to study large-scale phylogeography of golden eagles in the Northern Hemisphere, with a focus on Eurasia. We estimated basic genetic diversity parameters and checked for the presence of population genetic structure, using museum specimen from previously unstudied areas of the species' distribution such as Russia and Central Asia. In addition to comparison of geographical groups, we looked into temporal variation between golden eagles from during and after the bottleneck, presenting the first evidence of genetic loss in this species as a result of a human-caused population bottleneck of the end 19th – beginning of the 20th centuries.

Synopsis

Museum collections help to unravel population structure and temporal changes in golden eagles across Eurasia.

Twitter handle

Wildlife genomics research group: @WildlifeGenUoO

361

Nonbreeding sites and behaviour of European bee-eaters in SW Africa

Joanna Wong ORCID iD, Martins Briedis, Steffen Hahn

Swiss Ornithological Institute, Sempach, Switzerland

Abstract

It is thought that long-distance migrating European bee-eaters Meriops apiaster from different European breeding colonies utilize either a western or eastern migratory route based on a migration divide between 10-15°E, and overwinter either in western or southern Africa.

Geolocation of breeding birds from a recently established eastern German population previously indicated that these bee-eaters use a new main non-breeding region in the southern Democratic Republic of Congo/northern Angola region, but previous data was collected from few individuals. Here, we compile the results from 69 individuals tracked across 10 years from this population, and describe the consistency in the use of this non-breeding area across time. Using activity and air pressure data, we also present the seasonal variation in diurnal activity patterns during the nonbreeding period and verify if bee-eaters increase the frequency of foraging flights in preparation for migration. Our study confirms the importance of the newly-discovered DRC/Angola non-breeding region to migrating northern European bee-eaters, and relates their foraging activity to migration.

Synopsis

NA

Twitter handle

@jo_wng

367

Population decline in a high-elevation bird species suggests high sensitivity to changing snowmelt phenology and habitat composition

Christian Schano ORCID iD[1,2], Tyler Hallman ORCID iD[3], Fränzi Korner ORCID iD[1]

[1]Swiss Ornithological Institute, Lucerne, Switzerland. [2]University of Zurich, Zurich, Switzerland. [3]Queens University of Charlotte, Charlotte, USA

Abstract

Mountain ecosystems are highly seasonal, harsh environments due to the high variation in abiotic factors such as temperature and snow cover. High-alpine specialists are generally well-adapted to this seasonality and the prolonged snow cover durations of mountain ecosystems. The integrity of these ecosystems however, is threatened by climate change because disproportionate warming induces rapid shifts in snowmelt phenology and particularly challenges cold-adapted species like high-alpine birds. Despite a multitude of potential ecological stressors such as changes in vegetation structure, habitat composition, and the spatial segregation of breeding and foraging habitats, the population dynamics of alpine bird species are often poorly understood. We modelled relative population change in a high-alpine avian specialist, the white-winged snowfinch, based on standardized monitoring data during two breeding bird atlas periods (1990s, 2010s) in Switzerland. We found snowfinches to have declined stronger at elevations below 2000 m and at sites with low grassland cover. Population decline was most pronounced at sites with fast snowmelt, suggesting snowfinches to be highly susceptible to warming temperatures and changes in snowmelt phenology. We suggest the snow cover-dependent suitability of foraging habitats and their connectivity towards nesting sites as potential causes for the observed population declines.

Synopsis

High-alpine specialists: Snowfinches are highly sensible to changing snowmelt phenology and habitat composition

Twitter handle

@christianschano

371

Waterbird contamination by endocrine disruptors

Céline Arzel ORCID iD[1], Amalie Ask[1], Tomasz Ciesielski[2], Alexandros Asimakopoulos[2], Junjie Zhang[2], Prescillia Lemesle[2], Sunniva Frøyland[2], Elise Lunde[2], Sajjad Vakili[1], Juho Jolkkonen[3], Tapio Eeva[4], Stefan Björkman[5], Christian Sonne[6], Scott Shaffer[7], Suvi Ruuskanen[3], Markus Öst[8], Jonas Waldenström[9], Aurélie Davranche[10], Martin Hansen[6], Veerle Jaspers ORCID iD[2]

[1]University of Turku, Turku, Finland. [2]Norwegian University of Science and Technology - NTNU, Trondheim, Norway. [3]University of Jyväskylä, Jyväskylä, Finland. [4]university of Turku, Turku, Finland. [5]University of Helsinki, Helsinki, Finland. [6]Aarhus University, Aarhus, Denmark. [7]San José State University, San José, USA. [8]Åbo Akademi University, Turku, Finland. [9]Linnaeus university, Kalmar, Sweden. [10]Lammi Biological Station, university of Helsinki, Lammi, Finland

Abstract

Contaminants produced by human activities are found all over the globe due to atmospheric and oceanographic movements. As a result, humans, wildlife and our environment are exposed to multiple contaminants worldwide. The exposure effects of these contaminant cocktails on human and wildlife health is of increasing concern within a one health perspective. Among these contaminants, endocrine disrupting chemicals (EDCs) may cause a large array of adverse effects. Birds are considered model bioindicators of environmental health. EDCs affect their behaviour, fecundity, growth, survival, disease resistance, sex determination, and other components of life history. Among birds, ducks are of particular interest to examine EDCs exposure and its effects because ducks are widespread, well monitored, and their ecology and physiology are well known. They also use surface water with different levels of contamination like marine waters, and agricultural and urban wetlands. Moreover, in recent years, an increased sex ratio bias towards males has been observed in several duck species. In this context, the DISRUPT project (sites.utu.fi/disrupt/) investigates the exposure and biological effects of EDCs in breeding female ducks, and their eggs and ducklings. We have established that Finnish breeding female ducks are contaminated by a mixture of EDCs including per- and polyfluoroalkyl substances (PFASs), among which some of emerging concern, phthalates, benzophenones, bisphenols, benzotriazoles, benzothiazoles, parabens and heavy metals such as lead (Pb). We also have shown a maternal transfer of EDCs from hens to their eggs. Our results have implications in the context of observed hatching failure and avian influenza outbreaks.

Synopsis

Finnish breeding female ducks are contaminated by Endocrine Disrupting Chemicals which they transfer to their eggs. Implications?

Twitter handle

@CelineArzel

379

Can infection intensity predict immune function?

Jekaterina Bengtsson ORCID iD, Tamara Emmenegger ORCID iD, Rosie J. Lennon, Arne Hegemann ORCID iD

Lund University, Lund, Sweden

Abstract

Infections are ubiquitous in nature and all animals face them at some point in life. Previous studies have shown that chronic avian haemosporidian infections could have significant effects on their hosts' life histories and also drive the selection in wild bird populations. The prevalence of these parasites has been studied comprehensively in many passerine hosts. It is not uncommon for individuals to carry mixed infections of several genera. Although studies have investigated physiological effects of infections, they have only measured infection status (infected or un-infected) rather than infection intensity. Therefore, additive effects of co-infections, as well as the relationship between infection intensity and immune function, are still poorly understood.

Here, we used qPCR to quantify blood parasite infection intensity in a local population of the common blackbird (*Turdus merula*) and related these estimates to their hosts' immune function. We predict birds with higher parasitaemia to also have lower immune function. Repeated samples from the same individuals enables us to shed light on whether immune parameters increase or decrease during peak infection. We additionally predict mixed co-infections of *Haemoproteus*, *Plasmodium* and *Leucocytozoon* to interact with the host's immune function more than single infections.

Understanding the relationship between immune function and infection intensity could not only provide important insights into host physiology, but also have ecological relevance. The changing climate might also affect the prevalence, diversity, and distribution of haemosporidian parasites. With more avian hosts becoming exposed to infections, we want to understand how such infections interact with host immune function.

Synopsis

Understanding the relationship between immune function and infection intensity could give important insights into host physiology.

Twitter handle

@KateBengtsson

388

A trade off between feather growth rate and feather stiffness in tropical and temperate songbirds

Kryštof Horák[1,2], Marie Adámková ORCID iD[1,2], Iván de la Hera ORCID iD[3], José Pérez-Rigueiro ORCID iD[4], Francisco Javier Rojo ORCID iD[4], Ondřej Kauzál ORCID iD[1,5], Oldřich Tomášek ORCID iD[1], Tomáš Albrecht ORCID iD[1,6]

[1]Institute of Vertebrate Biology, Czech Academy of Sciences, Brno, Czech Republic. [2]Department of Botany and Zoology, Faculty of Science, Masaryk University, Brno, Czech Republic. [3]Evolution and Conservation Biology Research Group, Department of Biodiversity, Ecology and Evolution, Faculty of Biology, Complutense University, Madrid, Spain. [4]Department of Materials Science, Technical University of Madrid, Madrid, Spain. [5]Department of Ecology, Faculty of Science, Charles University, Prague, Czech Republic. [6]Department of Zoology, Faculty of Science, Charles University, Prague, Czech Republic

Abstract

Bird feathers are the most complicated skin derivative in vertebrates. Feathers have essential function in thermoregulation, colouration, mate choice or flight. The quality and mechanical properties of wing feathers are essential for flight capabilities. Mechanical properties of feathers can be measured relatively easily using a bending test under laboratory conditions. Combined with measurements of feather growth rates, this information gives an insight into the specific trade-off between feather growth rate and mechanical properties of feathers. In this study, we compare the stiffness and growth rate of wing feathers in a dataset of 394 individuals of 129 songbird species from temperate and tropical zones (Czech Republic, Cameroon). Species included in the analysis differ significantly in their migratory behaviour, with resident species, short- and long-distance migrants that travel thousands of kilometres in their annual migratory journey being represented. All tropical species, on the other hand, are sedentary, which offers an interesting comparison allowing to reveal differences in feather investment between tropical and temperate songbird species.

Our analysis across passerine species revealed a possible trade-off between feather stiffness and growth rate. As expected, species with longer migration distances exhibit stiffer feathers that grow for longer periods of time. After filtering out the effect of migration distance, tropical species exhibit lower feather stiffness compared to their temperate relatives, but faster wing feather growth. This indicates a specific adaptation of long-lived tropical bird species, which involves an invesment in rapidly growing wing feathers at the expense of their mechanical properties.

Synopsis

A trade-off between feather growth rate and their stiffness: Tropical birds grow feathers faster but less stiff than temperate ones.

398

Egg mimicry not the sight of a brood parasite is the cue for parasitic egg rejection

Gabriela Štětková ORCID iD[1,2], Michal Šulc ORCID iD[1], Václav Jelínek ORCID iD[1], Anna Hughes ORCID iD[3], Marcel Honza ORCID iD[1]

[1]Institute of Vertebrate Biology, Czech Academy of Sciences, Brno, Czech Republic. [2]Department of Ecology, Faculty of Science, Charles University, Prague, Czech Republic. [3]Department of Psychology, University of Essex, Colchester, United Kingdom

Abstract

Many studies have experimentally shown that hosts that saw a cuckoo at their nest during parasitism reject parasitic eggs more often than hosts that did not see it. Most previous work has, however, simulated brood parasitic events by exposing a stuffed parasite near a host's nest. Responses to the presence of a real parasite have not yet been adequately studied under natural conditions. We therefore video recorded great reed warbler (*Acrocephalus arundinaceus*) nests and investigated whether they are more likely to reject a parasitic egg if they see a parasitizing common cuckoo (*Cuculus canorus*) at their nest compared with a situation when the parasite approaches the host nest unnoticed. Contrary to previous knowledge, we showed that seeing a cuckoo at the nest did not increase the rejection rate of parasitic eggs, even if hosts saw the cuckoo repeatedly. We also measured mimicry of all cuckoo eggs and found that only the colour difference between cuckoo and host eggs is a crucial cue for defence against brood parasitism, but not seeing the cuckoo female at the nest. We discuss the importance and reliability of the sight of a brood parasite at the nest and suggest that this cue may not be as important as previously thought.

Synopsis

NA

Twitter handle

403

Drivers of the recovery of the Red-backed Shrike *Lanius collurio* breeding population in Belgium

Jean-Yves Paquet ORCID iD[1], Arnaud Laudelout ORCID iD[1], Alain De Broyer[1], Thibaut Goret[2]

[1]Natagora, Namur, Belgium. [2]Parc National de l'Entre-Sambre-et-Meuse, Couvin, Belgium

Abstract

After a strong decline during the 20th century, the Red-Backed Shrike *Lanius collurio* breeding population has been recovering in Southern Belgium, where the species is at the north-west margin of its range. The Belgian population of this Bird Directive Annex 1 species is still on the rise for the last ten years, in contrast with the global European trends and with the population trends of most other farmland species in Belgium. Here, we explore how the changes in its main habitat, extensive hay meadows bordered by hedgerows or bushes, could explain this positive local situation. Agri-environment schemes targeting this habitat are well accepted by farmers in grassland-dominated areas. Moreover, Red-Backed Shrike has been the target of restoration projects inside the Natura 2000 site network (LIFE funding). Repeated local inventories of Red-Backed Shrike breeding territories were used to assess the relative effect of specific habitat measures. Increase in specifically managed areas is 1,5 to 3 times larger than the average rate observed in Wallonia over the same timeframe, suggesting some effectiveness of the conservation measures, at least at the local scale. The role of other drivers behind this dynamic (especially climate-driven condition improvement at the margin of the range) are discussed.

Synopsis

Stronger increase of Red-Backed Shrike breeding population in specifically managed grassland areas in Belgium

Twitter handle

@JYPaquet

poster

Swimming asleep: characterization of sleep during paddling in Canada geese (*Branta canadensis*)

Andrea Ferretti ORCID iD, Niels Rattenborg

Max Planck Institute for Biological Intelligence, Avian Sleep Group, Seewiesen, Germany

Abstract

Sleep is a behavioral state that is an important part of the biology of all organisms investigated so far, though our understanding of its function remains limited. Even though several species show drastic cognitive and physiological impairments subsequent to periods of extended sleep deprivation, in some life-history stages the need for sleep seems to be deleterious for the fitness of the individual, which would benefit from an extreme extension of the waking phase. This is the case of many bird species during migration or reproduction, as well as during challenging foraging situations. Although little is known about if and how they obtain sleep in such ecological contexts, previous studies have suggested several possibilities. For example, several birds show a drastic reduction in sleep during migration and non-stop foraging flights, as shown in great frigatebirds. Interestingly, this species is also able to sleep on the wing. Despite being able to sleep while soaring and gliding, frigatebirds never slept while flapping their wings, raising the question of whether sleep during active locomotion is even possible in birds. By using a combination of behavioral and accelerometer data, in this study we show for the first time that sleep behavior (eye closure) occurs during active paddling in Canada geese (*Branta canadensis*). Our findings suggest that sleep might also be possible during other stereotyped movements, such as flapping in migrating birds.

Synopsis

NA

Acceptance type: Poster presentation

12

Diversity of migration in the European blackcap (*Sylvia atricapilla)*

Lucy Mitchell ORCID iD

UHI North Highland, Thurso, United Kingdom

Abstract

Bird migration is changing, in response to climate and habitat change. Altered migratory routes may cause populations to experience changing demographics and new phenotypes to establish. Particularly for small passerines, understanding changes in migration is challenging, because of a lack of appropriate technology. The European Blackcap Sylvia atricapilla, which typically overwinters in the southern Mediterranean or north Africa, has started to regularly overwinter in the U.K. These birds come from breeding populations across Europe - identified through ringing recoveries and, recently, geolocators. Yet small sample sizes mean we lack information on the different migratory phenotypes and their relative abundance. We will present results from a pilot project carried out in Autumn 2021, using miniature VHF tags, deployed onto migrating Blackcaps at bird observatories on the east coast of the UK. Tags are deployed at automated VHF receiver ('Motus') locations to detect migration departure directions. These data identify the direction of travel of the individual from the location, inferring the bird's phenotype. Feather samples (collected for stable isotope and DNA signatures) along with morphological measurements will relate departure behaviour to physical and genetic differences between phenotypes. Identifying the variety of Blackcap migratory routes converging in the UK will increase our understanding of the evolution of new routes within a species, which is important for understanding how species generally can produce short term responses to environmental change.

Synopsis

Using Motus VHF technology to assess diversity of migrating Blackcaps in the UK.

Twitter handle

@lucyjayneryan

13

Revealing patterns of daylight birds migration using East Asians multi air traffic surveillance radars.

Hansung Lee ORCID iD

Raytheon, Fullerton, USA

Abstract

Daytime birds migration algorithm remains an elusive concept, as we have continuously tracked Birds migration. In particular, GPS signals on existing migratory birds and Weather Radar were very limited in the ability to continuously track a wide range of migratory flights.

Using data from 10 birds migration Radar samples which detected on the long-range air traffic control radar and identified by pilot.

We extract Radar data to analyze the effects of terrain (surface altitude/river/sea, etc.) and weather condition (cloud, wind direction/speed, temperature, geopotential height) on birds migratory flight path/altitude/speed (latitude, longitude, altitude, velocity with a period of 2 seconds). statistically analyzed the effect of terrain/weather on migratory bird flight.

This first continuously data analysis using the East Asia network of long range air traffic surveillance radars demonstrates the wealth of information available and its potential for investigating bird migration, with aviation.

The daytime flight of migratory birds was found to show very similar characteristics to the daytime visual flight rules (VFR) of humans pilot. In particular, it was found that some samples had a time difference of 3 months, but the routes were congruent. (The range error of the radar was 6FT, showing a very good detection rate.) In addition, the correlation between bird migration altitude and weather continuously captured was statistically analyzed by our team. Even if migratory birds flew the same route, we found that the altitude differed by 3,000 ft.

Synopsis

We extract Radar data to analyze the effects of terrain and weather condition birds migratory flight path/altitude/speed.

27

A multi-level approach to the effects of alien eucalypt plantations on forest bird assemblages

Fernando García[1], Emilia Trueba[1], María Vidal[1], Adrián Regos ORCID iD[1,2,3], Jesús Domínguez ORCID iD[1]

[1]Department of Zoology, Genetics and Physical Anthropology, University of Santiago de Compostela, Santiago de Compostela, Spain. [2]Forest Science Center of Catalonia, Solsona, Spain. [3]BIOPOLIS, Program in Genomics, Biodiversity and Land Planning, CIBIO, Vairão, Portugal

Abstract

Eucalypt plantations expanded vertiginously since the mid-20th century in several regions of the world, with potential impacts on biodiversity by the replacement of valuable habitats and habitat fragmentation. Nowadays, in the fragmented forest landscape of SW Europe, these exotic plantations comprise an increasingly important fraction of the matrix surrounding natural forest fragments. This scenario could compromise the persistence of native populations at multiple scales and alter key ecological relationships among forest birds and their environment. In this study, we propose a multi-scale and multi-facet approach to explore the biotic changes of forest bird community associated with habitat transformation caused by large-scale eucalypt plantations. We compared bird communities among native forests and eucalypt plantations through analysis at both local and landscape levels. A total of 240 bird point counts, each 10 min long, were carried out in the study area: 130 in deciduous forests and 110 in eucalypt plantations. We use a multi-model inference approach to assess the relative effect of local-scale habitat structure (measured in situ) and landscape composition, configuration and functionality (measured through time series of satellite images) on bird abundances in both types of forests. Our results show dramatic differences in both the bird abundances and richness between native forests and eucalypt plantations, being especially marked for forest specialist species with average values of 3.36 ± 1.27 species/10 min and 5.1 ± 2.41 birds/10 min in native forests and 1.31 ± 1.11 species/10 min and 1.66 ± 1.62 birds/10 min in eucalypt plantations.

Synopsis

NA

28

Breeding phenology in a high-elevation habitat: Can weather conditions in winter and spring explain variation in the length of the breeding season?

Carole Niffenegger[1], Sabine Hille[2], Christian Schano[1], Fränzi Korner-Nievergelt[1]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]University of Natural Resources and Life Sciences, Vienna, Austria

Abstract

High-elevation habitats typically experience strong interannual variability in environmental conditions, resulting in pronounced differences in timing of snowmelt and vegetation green-up. Several studies have shown that the onset of breeding correlates with environmental conditions although the degree to which species can match breeding to the environment varies among species and habitats.

We explore the relationship of breeding phenology with environmental conditions in a high-elevation habitat in the Swiss Alps. We calculated the length of the breeding season and the breeding intensity based on observations from a citizen science database. To investigate the relationship between weather conditions and the breeding phenology, we correlate snow cover and temperature in winter and spring with the length of the breeding season across an elevational gradient. The length of the breeding season is linked to population productivity, as a longer breeding season often correlates with higher reproductive output. Therefore, our results may help to understand the potential effects of changing environmental conditions on the population trend of birds breeding at high elevations.

Synopsis

Breeding phenology in a high-elevation habitat: What we can learn from long-term citizen science data

Twitter handle

@carole_andrea_

32

The genetic architecture of inbreeding depression in the lekking black grouse

Rebecca Chen[1], Carl Soulsbury[2], Kees van Oers[3], Joseph Hoffman[1]

[1]Bielefeld University, Bielefeld, Germany. [2]University of Lincoln, Lincoln, United Kingdom. [3]Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands

Abstract

Sexual selection in black grouse (*Lyrurus tetrix*) is multidimensional, where females choose mates based on a combination of morphological and behavioural traits as well as sexual ornaments. Past research on black grouse has found inbreeding depression - the reduced fitness of offspring of related parents - in traits such as chick mass and territory holding ability. However, inbreeding depression in sexual traits remains relatively unexplored. Moreover, the risk of inbreeding is increasing in black grouse populations across Central Europe, as many face local declines due to habitat fragmentation and degradation. Population genetic theory assumes that inbreeding depression occurs due to the expression of deleterious recessive mutations when they are identical by descent. Despite this well-established theory, much is yet unknown about the relationship between genome-wide levels of homozygosity, the deleteriousness of mutations, and fitness consequences. With the increase in affordability and accessibility of next-generation sequencing techniques, genome-wide levels of homozygosity can be inferred and realized inbreeding statistics can be calculated. Additionally, whole genome resequencing techniques allow us to estimate individual-based genetic load, a measure of the proportion by which fitness is decreased compared to an optimum genotype, including present and potential future loss in fitness caused by (partially) recessive deleterious mutations. In this study, we investigate the genetic architecture of inbreeding depression in sexual traits using whole genome resequencing of 190 black grouse males and the inference of deleterious alleles. Our findings shed light on the specific mutations responsible for inbreeding depression using a classic lekking system.

Synopsis

What mutations are responsible for inbreeding depression in black grouse?

Twitter handle

@rebeccas_chen

33

Contrasting effects of shooting disturbance on the movement and behaviour of sympatric wildfowl species

Aimée McIntosh ORCID iD[1], Luke Ozsanlav-Harris[1], Stuart Bearhop[1], Geoff Hilton[2], Jessica Shaw[3], Larry Griffin[2,4]

[1]University of Exeter, Penryn, United Kingdom. [2]Wildfowl and Wetlands Trust, Slimbridge, United Kingdom. [3]NatureScot, Stillgarry, United Kingdom. [4]ECO-LG Ltd, Dumfries, United Kingdom

Abstract

Hunting control is a common management approach to mitigate human-wildlife conflict, but the indirect consequences are often overlooked. Chronic disturbance can reduce fitness and redistribute populations of target and non-target species. In recent decades goose-agricultural conflict has intensified due to substantial increases in abundance and shifts towards foraging in agricultural areas. On Islay, Scotland conflict culminated in shooting Greenland barnacle goose (Branta leucopsis) to reduce damage to agricultural grassland. We contrast the impact of shooting disturbance on the movement, behaviour and habitat selection of the target species (Greenland barnacle goose) and a vulnerable non-target species (Greenland White-fronted goose, Anser albifrons flavirostris) using biologging devices.

We found no significant changes in daily movement, behaviour or habitat selection in response to shooting disturbance suggesting that current management restrictions may be effective. By contrast, Greenland barnacle geese (target species) significantly increased daily movement and altered preference in foraging site selection to areas of low disturbance in response to shooting disturbance.

By assessing the impact of shooting disturbance on both a target and non-target species we were able to assess the efficacy of the current shooting management scheme. In particular we identify potential concerns (including redistribution of conflict, and unobserved fitness effects) and provide recommendations for the future coordination and monitoring of the shooting management strategy. We emphasises the importance of considering the behavioural and movement responses of wildlife to shooting disturbance during the development of species management strategies.

Synopsis

Response to shooting disturbance is greater in target species Branta leucopsis than non-target species Anser albifrons flavirostris

Twitter handle

@McIntosh_Aimee

40

Trace elements in Feathers in Eurasian Curlews (*Numenius arquata*) of a small and endangered population

María Vidal ORCID iD, Andrea Gestoso, Fernando García, Jesús Domínguez ORCID iD

Universidade de Santiago de Compostela, Santiago de Compostela, Spain

Abstract

Inorganic contaminants such as trace elements are major pollutants, due to their natural and anthropogenic origins, and high levels of metals may be of particular concern in declining or threatened populations. Birds play an important role as bioindicators, indicating specific environmental change such as contamination with chemicals or marine pollution. Bird's feathers are useful non-invasive indicators of metal contamination.

The Iberian Peninsula harbours an "Endangered" population of the Eurasian Curlew (*Numenius arquata*). This Iberian population have suffered a contraction of its breeding range and have declined to very low levels. Actually, it is located in Galicia (NW Spain) and ranged from 2007 to 2022 between 3 and 5 couples.

We performed Al, As, Cd, Cr, Cu, Hg, Mn, Pb, Se and Zn measurements on feathers collected in the nests (n = 33) from 2009 to 2022. Metal concentrations decreased in the order: Al > Zn > Cu > Mn > Hg > Se > Pb > Cr > As > Cd. Levels of Al were consistently higher than other metals across all samples. Mean concentrations of Zn and Cu also were high compared with other metals. Seven samples showed levels of Cr, Zn, Se and Hg above, or very close to, toxic thresholds reported in other studies.

Given the current population status of Iberian Eurasian Curlews, which now sits precariously at the brink of extinction, it´s urgent to determine if any of these elements pose a threat for the conservation of the species.

Synopsis

NA

Twitter handle

41

Kentish Plover (*Charadrius alexandrinus*) at NW Iberian beaches: post-breeding use and disturbance by human activity

Andrea Gestoso, María Vidal ORCID iD, Jesús Domínguez ORCID iD

Universidade de Santiago de Compostela, Santiago de Compostela, Spain

Abstract

The Kentish Plover (*Charadrius alexandrinus*) is in decline in a large part of its range, including the Iberian Peninsula, due to the increased pression from tourism on the coastal area. In this context, the Portuguese and Spanish populations had shown a decline of -49 % and -52 % respectively in the last two decades. It is well established that human presence can cause disturbance to shorebirds in a variety of ways, especially during the non-breeding season. For instance, disturbances can reduce foraging budget, increase energetic costs, limit access to profitable areas, and promote the risk of predation of shorebirds. To estimate how the impact of human presence affects post-breeding birds, we studied the response variability of north-western Iberian plovers to different types of disturbance events. 282 birds were sampled from October to December 2021. A total of 591 disturbance events were recorded, 40.9 % of which involved a bird response. Most disturbances were carried out by walkers and walkers with dogs, most of them unleashed (89.1 %) and large (43.8 %). Main bird responses involved walking (58.1 %), walking and flying (25.3 %) and only flight (16.6 %), with a global mean displacement time of 31.2 ± 3.08 s. A GLM model showed that month and type of agent were determining factors of the Kentish Plover response. Walkers accompanied by dogs triggered an additional increase in the time spent in displacement, suggesting that dogs had and additive effect on the birds´ response.

Synopsis

NA

45

Associations of circadian clock and personality genes with level of landscape urbanization in a common waterbird

Amelia Chyb ORCID iD[1], Radosław Włodarczyk ORCID iD[1], Joanna Drzewińska-Chańko ORCID iD[1], Jan Jedlikowski ORCID iD[2], Piotr Minias ORCID iD[1]

[1]Department of Biodiversity Studies and Bioeducation, Faculty of Biology and Environmental Protection, University of Łódź, Łódź, Poland. [2]Faculty of Biology, Biological and Chemical Research Centre, University of Warsaw, Warsaw, Poland

Abstract

For a growing number of bird species urban areas become a novel colonization ground. A wide range of studies shows pronounced phenotypic differences between individuals from urban and nonurban populations, but behavioral divergence is probably most apparent. Urban individuals are often characterized by reduced anxiety, elevated aggression, increased sedentariness and altered circadian rhythm. However, mechanisms underlying the associations between bird behavior and urbanization remain little explored. Here, we report the results of differentiation at circadian clock and personality genes among birds breeding in the areas of varying urbanization level. For this purpose, 160 blood samples were collected in eight paired urban and rural populations of the Eurasian Coot *Fulica atra* in Poland. We identified polymorphisms in five candidate genes, which were previously reported to associate with behavioral traits and circadian rhythm, and which may play a role in the urbanization processes. Most importantly, we found significant associations between urbanization and polymorphisms in CREB1 gene, which is a transcription factor involved in pathways regulating animal circadian rhythm. The polymorphisms were located in the 3'-UTR region, and thus are likely to post-transcriptionally affect the level of the CREB1 gene expression. Our results provide support for the genetic background of behavioral adaptations of birds to urbanization and underpin the need for further investigation into mechanisms underlying urbanization processes.

Synopsis

NA

46

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

Marta Maziarz ORCID iD[1], Richard K. Broughton ORCID iD[2], Przemysław Chylarecki ORCID iD[1], Grzegorz Hebda ORCID iD[3]

[1]Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland. [2]UK Centre for Ecology & Hydrology, Wallingford, United Kingdom. [3]University of Opole, Opole, Poland

Abstract

Progressive climate change is a global emergency. Although urgently needed, it is challenging to understand the consequences of the long-term weather change on species living in intricate ecological networks. This is because direct impacts of weather on species may have also indirect effects on other organisms through their interspecific relationships.

Host-parasite interactions are common interspecific relationships existing between birds and the invertebrates inhabiting their nests. Like many other organisms, birds and the nest-dwelling ectoparasites are both reliant on suitable weather conditions for successful reproduction. As such, ambient temperature and rainfall may affect both the hosts and their ectoparasites, and the interactions between them. The activity of other nest-dwelling invertebrates, such as predatory ants, may also depend on weather and shift the host-parasite interactions by reducing the abundance of ectoparasites within bird nests.

To better understand the implications of climate change, we investigated weather effects on host birds and the cohabitants of their nests. We explored (i) the impact of ambient temperature and rainfall on the prevalence and abundance of blowflies *Protocalliphora* spp. in Wood Warbler *Phylloscopus sibilatrix* nests. (ii) We tested whether the presence of ants reduces nest infestation with blowflies under a range of ambient temperatures, and (iii) whether the changes in blowfly infestation influence the survival and growth of Wood Warbler nestlings.

The results show how weather conditions may shift the interactions between birds and the invertebrates inhabiting their nests, and provide valuable information on possible implications of the long-term weather change.

Synopsis

Weather & ants can shift interactions between songbirds (hosts) & blowflies (ectoparasites) in primeval Białowieża Forest, Poland.

Twitter handle

@Maziarz_Marta

48

Sleep comfortable – low flea loads in excavated holes

Grzegorz Hebda ORCID iD

University of Opole, Opole, Poland

Abstract

Hole-nesting birds use holes for breeding, but they also use them as places for roosting. Conditions of breeding or roosting in natural holes differ in many aspects from those found in nest-boxes, in terms of microclimate, safety, nest material disappearance and parasite load. High flea loads are common in birds' nests in nest-boxes, constitute a serious problem for birds as their presence in big numbers negatively affects bird breeding performance and condition of adults. Fleas are also typical found during non-breeding season in nest-boxes, especially not-cleaned, creating potential risk for individuals that decide to roost there. I surveyed excavated holes in managed forests in south-western Poland during all seasons of the year, extracting hole-dwellers such as fleas. I measured several tree hole characteristics, that may affect flea load, above all presence of nest material. I indicate that both prevalence and intensity of flea infestation of tree holes was very low, what`s more fleas species were often related to mammals, not birds. Together with previous findings obtained mostly from decayed holes occupied by breeding Tits, I conclude that low flea load is a typical feature for tree-holes and fleas constitute no problem for the hole-nesting birds that decide to breed or roost in tree holes.

Synopsis

Fleas constitute no risk for birds in excavated holes

56

Does agricultural management promote Swiss agricultural priority birds? A spatial approach.

Noëlle Klein ORCID iD[1,2], Adrienne Grêt-Regamey ORCID iD[2], Felix Herzog ORCID iD[1], Philippe Jeanneret ORCID iD[1], Maarten van Strien ORCID iD[2], Antoine Adde ORCID iD[3], Sonja Kay ORCID iD[1]

[1]Agroscope, Zurich, Switzerland. [2]ETH Zurich, Zurich, Switzerland. [3]University of Lausanne, Lausanne, Switzerland

Abstract

Large parts of biodiversity in Europe have been shaped by agriculture. However, the intensification of agriculture has severely affected biodiversity, as many species depend on extensive land use and mosaic structures. Payment-based biodiversity promotion programmes have been introduced across Europe to combat biodiversity loss at different spatial scales. Yet, as agricultural land decreases, the conflict between efficient food production and habitat quality for biodiversity in agricultural landscapes increases. One approach to resolving this conflict and conserving priority species could be to adapt agricultural management regionally. In this Swiss-wide study, we investigated the direct effects of agricultural management on the indicator species group birds using a life-cycle-assessment method (map A). In addition, we used stacked species distribution models for agricultural priority species to estimate their theoretical distribution potential (map B). Using spatial hotspot analyses, we determined significant hotspots and cold spots for both maps and assessed their spatial overlap. The result is a high-resolution Switzerland-wide spatial analysis of the potential of agricultural land management to support agricultural priority species. Our results show areas with high or low potential for agricultural priority birds, combined with the impact of the respective agricultural land management on birds. This allows for spatially explicit comparisons between regions or land management practices, to identify areas where land management should be adapted to foster bird species. Developing these kind of methods and maps can help regionally optimize agricultural land use to contribute halting biodiversity loss in farmland.

Synopsis

Regional adaptation of agricultural land use could help foster priority birds

Twitter handle

@Noelle__Klein

61

What chasing shorebirds can teach us about thermoregulation–predation risk trade-offs

Jorge Gutiérrez ORCID iD[1], Teresa Catry[2], María Espinosa-Colín[1], José Masero[1], José Pedro Granadeiro[2]

[1]University of Extremadura, Badajoz, Spain. [2]University of Lisbon, Lisbon, Portugal

Abstract

Animals often face a trade-off between food acquisition and predation/disturbance avoidance. Yet the extent to which this trade-off is affected by modulating factors such as thermal risk and foraging opportunities has been largely overlooked. Here, we examined the influence of temporal and environmental gradients on the flight initiation distance (FID, the distance at which animals flee from an approaching human-simulated predator) and escape mode (flying/low risk versus running/low cost) in 16 species of shorebirds foraging on tidal flats of the Bijagós Archipelago, Guinea-Bissau. We measured escape responses throughout the low tide period during wet and dry seasons and simultaneously recorded microclimate variables and occurrence of heat-reduction behaviour (ptiloerection). Furthermore, we measured corticosterone metabolites (CORTm) from droppings in red knots *Calidris canutus* to assess whether ptiloerection is associated to a physiological stress response to hot conditions. Overall, birds tolerated a closer approach at higher environmental temperatures and when showing ptiloerection. They also had shorter FIDs during the dry season and towards the start/end of the low tide period. FIDs also increased with body mass and decreased in areas with more human presence. In red knots, individuals showing ptiloerection had higher levels of CORTm, demonstrating a link between physiological and behavioural stress coping responses to heat events. Our results suggest that heat-stressed shorebirds take greater risks. They also indicate that shorebirds adjust risk taking to tidal and seasonal cycles, generally reducing FIDs when the energetic costs of escape are expected to be large.

Synopsis

Heat stress increases risk taking in foraging shorebirds

Twitter handle

@_JSGutierrez

65

Nest site selection by Wood Warblers *Phylloscopus sibilatrix* and ants in a primeval forest: evidence of interspecific attraction?

Richard K Broughton ORCID iD[1], Luca Pietro Casacci ORCID iD[2], Grzegorz Hebda ORCID iD[3], István Maák ORCID iD[4], Gema Trigos-Peral ORCID iD[5], Magdalena Witek ORCID iD[5], Marta Maziarz ORCID iD[5]

[1]UK Centre for Ecology & Hydrology, Wallingford, United Kingdom. [2]Department of Life Sciences and Systems Biology, University of Turin, Turin, Italy. [3]Institute of Biology, University of Opole, Opole, Poland. [4]Department of Ecology, University of Szeged, Szeged, Hungary. [5]Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland

Abstract

Interspecific attraction could influence the nest site selection of birds and other animals, including invertebrates inhabiting bird nests. Interactions between birds and ants using the same nests are rarely studied and poorly understood. Birds nesting near ant colonies could promote ant colonisation of the bird nests and offer mutual advantages, such as ants providing nest sanitation or defence for the birds, while ants might benefit from raising their own broods in the warmer conditions of bird nests.

We investigated the interactions between Wood Warblers *Phylloscopus sibilatrix* and ants that both raised their broods within the same nest structures. We explored whether cohabitation of birds and ants resulted from interspecific attraction between the two groups via nest site choice. We tested several hypotheses, including: whether the occurrence of ant broods within bird nests was non-random; whether cohabitation could be explained by overlapping nest site choice by birds and ants; and/or if cohabitation resulted from the ants' attraction to bird nests, especially during cool and wet weather, enabling the ants to raise their own broods in a warmer microclimate.

Our results show little overlap in the nest-site choice of birds and ants, but a non-random occupation and one-sided attraction of ants colonising the bird nests. We also show an increasing attraction of bird nests to ants during poor weather, suggesting that ants were seeking out the warmer bird nests. We suggest that similar associations may be frequent in cooler regions of the World, where nest-building birds and nest-dwelling invertebrates co-occur widely.

Synopsis

Ants seek out the warm nests of songbirds in which to rear their own larvae.

Twitter handle

@woodlandbirder

68

Impacts of traffic infrastructure on urban birdcommunities

Martha Maria Sander ORCID iD, Dieter Thomas Tietze ORCID iD

NABU (BirdLife partner in Germany), Berlin, Germany

Abstract

With increasing urbanization and related loss of biodiversity, it has become increasingly important to understand the determinants of biodiversity in cities and to learn how we can maintain existing habitats and improve their quality for birds. Detrimental effects of urbanization on birds such as noise and light pollution have frequently been reported, but comparatively little is known about the connection between different types of traffic infrastructure and their impacts in urban environments. We provide an overview of the existing knowledge about bird responses to traffic-related stressors and preliminary results of our field study in the breeding season 2023. We investigate the effects of traffic infrastructure on bird communities in cities by recording bird diversity across diverse linear infrastructures in several Central European cities. In each of the transects, we collect data on vegetation structure and other habitat parameters and measure noise pollution as well as traffic. Analyses of the causal relationships between habitat and traffic parameters will be used in follow-up studies to suggest improvements to the existing infrastructures in urban environments for the urban bird community.

Synopsis

NA

Twitter handle

@MarthaMariaSan

70

Long-term inverse fluctuations of sexual ornament size and population density

Gergely Hegyi ORCID iD[1], Márton Herényi ORCID iD[2], Miklós Laczi ORCID iD[1], Gábor Markó ORCID iD[3], Gergely Nagy ORCID iD[4], Balázs Rosivall ORCID iD[1], Eszter Szöllősi[1], János Török ORCID iD[1]

[1]Eotvos Lorand University, Budapest, Hungary. [2]Hungarian University of Agriculture and Life Sciences, Gödöllő, Hungary. [3]Hungarian University of Agriculture and Life Sciences, Budapest, Hungary. [4]Institute of Ecology and Botany, Vácrátót, Hungary

Abstract

Shifts in sexual ornamentation constitute conspicuous examples of phenotypic change in natural populations. Mean ornament expression at the population level may reflect evolution and influence sexual selection. But ornament change may also be a by-product of coordinated individual movements. Information on long-term ornament dynamics in natural populations is exceedingly rare. Looking at a third century (33 years) of male forehead patch size data from a collared flycatcher population, we observed a strong waveform pattern. Between-year change in mean ornament size was explained most strongly by plasticity and differential recruitment, with minor roles for differential immigration and survival selection. There was a strikingly opposing pattern in population density, with smaller mean ornament sizes seen in periods of larger density. Weather and macroclimatic variables showed no such nonlinear patterns and were weak predictors of ornament dynamics. Changes in density explained changes in ornament size due to their effects on within-individual changes, but the causal link seemed relatively weak. Finally, pairing date selection on forehead patch size was non-linearly related to changes in density, with larger patches favoured mainly in periods of stable density. The strong inverse patterns of density and ornamentation may originate from local environmental effects that jointly influence the number and mean phenotype of birds in the study area and apparently also impinge on sexual selection.

Synopsis

NA

73

Improved experimental design can increase problem-solving success in great tits

Ernő Vincze ORCID iD[1,2], Ineta Kačergytė[1,3], Juliane Gaviraghi Mussoi[1,4], Utku Urhan[1,5], Anders Brodin[1]

[1]Lund University, Department of Biology, Lund, Sweden. [2]University of Pannonia, Centre for Natural Sciences, ELKH-PE Evolutionary Ecology Research Group, Veszprém, Hungary. [3]Swedish University of Agricultural Sciences, Ecology Department, Uppsala, Sweden. [4]University of Auckland, Faculty of Science, Biological Sciences, Auckland, New Zealand. [5]Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands

Abstract

Innovative problem solving is an ability that can help the animals cope with environmental change, such as urbanization. The great tit (Parus major) is a successful urban exploiter that has shown great problem-solving abilities in several studies. We tested the problem-solving ability of great tits from urban and rural habitats in two food extraction tasks, one easier and one more challenging. We had four experimental groups, between which we made small changes in the experimental design to improve our protocol. We did not find any significant difference between the problem-solving success and latency of urban and rural great tits in any of our experimental groups. However, problem-solving success significantly differed between experimental groups. Our third experimental group had a significantly lower success rate (41.7%) than the other three groups (80 to 100%) in the easier task, and the last two groups had significantly higher success rates (62.5 to 70%) than the first two groups (23.5 to 50%) in the more difficult task. This shows that even slight changes in the experimental design can affect the results, which adds to the discussions regarding the reproducibility problem present in the field of animal cognition. Furthermore, the high problem solving rates suggest that innovativeness may play a role in great tits coping with the challenges of environmental change.

Synopsis

NA

83

Dawn singing in mountain woodland songbirds

Julia Paterno

Swiss National Park, Zernez, Switzerland. University of Basel, Basel, Switzerland

Abstract

The onset of dawn singing is known to be species-specific. However, effects of environmental conditions along an elevational gradient have not been studied at fine spatial scales. We investigated differences in song start relative to sunrise of the six most common song bird species in mountain woodlands of the Swiss National Park (European robin Erithacus rubecula, song thrush Turdus philomelos, mistle thrush Turdus viscivorus, chaffinch Fringilla coelebs, coal tit Periparus ater, and alpine tit Poecile montanus montanus) as a function of elevation, aspect, temperature, moon phase, Julian date and road noise. All species sang earlier after warmer, brighter nights and on western slopes. They showed a trend of singing earlier at noisier sites, with strongest effects for the chaffinch. Alpine tits started singing earlier at higher elevations, but later with ongoing season. In contrast, song thrushes started singing earlier relative to sunrise as the season progressed. While both species start their first brood in April, only the song thrush has a second brood. Thus, song thrushes may need to continue singing early with ongoing season. Additionally, there could be a difference in breeding phenology depending on elevation, especially for the alpine tit which may start breeding later at higher elevations and thus sing earlier during the considered time period. This will be the focus of our research in spring 2023.

Synopsis

NA

85

Major histocompatibility complex class I variability of the common tern (*Sterna hirundo*) in Europe

Ana Galov ORCID iD[1], Veronika Lončar ORCID iD[1], Jelena Kralj ORCID iD[2], Piotr Minias ORCID iD[3], Radoslaw Wlodarczyk ORCID iD[3], Željko Pavlinec ORCID iD[2], Simon Piro ORCID iD[4], Christof Herrmann[5], Iztok Škornik ORCID iD[6], Davorin Tome ORCID iD[7], Gyula Kovács ORCID iD[8], Bálint Preiszner ORCID iD[9], Péter Szinai ORCID iD[10,11], Stefano Volponi ORCID iD[12]

[1]Faculty of Science University of Zagreb, Zagreb, Croatia. [2]Croatian Academy of Sciences and Arts, Zagreb, Croatia. [3]Department of Biodiversity Studies and Bioeducation, Faculty of Biology and Environmental Protection, University of Łódź, Łódź, Poland. [4]Vogelwarte, Zoological Institute and Museum, University of Greifswald, Greifswald, Germany. [5]Agency for Environment, Nature Conservation and Geology Mecklenburg- Vorpommern, Hiddensee Bird Ringing Scheme, Güstrow, Germany. [6]Sečovlje Salina Nature Park, Soline Pridelava Soli d.o.o., Portorož, Slovenia. [7]National Institute of Biology, Ljubljana, Slovenia. [8]BirdLife Hungary South-Balaton Local Group, Balatonlelle, Hungary. [9]Balaton Limnological Research Institute, Eötvös Loránd Research Network, Tihany, Hungary. [10]Balalton-felvidéki National Park Directorate, Csopak, Hungary. [11]Bird Ringing and Migration Study Group of BirdLife Hungary, Budapest, Hungary. [12]Italian Institute for Environmental Protection and Research, Roma, Italy

Abstract

The common tern (*Sterna hirundo*) is a colonial migratory bird of the gull family (Laridae) that breeds in colonies or solitarily in the Northern Hemisphere, while spending the winter in the warmer regions of the Southern Hemisphere. Its freshwater nesting habitats include riverbanks and gravel islands, but terns also nest in estuarine and marine habitats like low-lying coasts or small uninhabited islands with sparse vegetation. Although it is listed as „least concern“ on the IUCN list, it has shown population declines in several European countries due to habitat destruction and human disturbances. The major histocompatibility complex (MHC) plays a crucial role in the adaptive immune response of vertebrates and represents an effective adaptive genetic marker in population genetics studies due to its extreme polymorphism. In particular, MHC class I genes are key for animal defence against viral infections. In this study, we analysed 273 bp of exon 3 of MHC class I genes with the aim to assess the adaptive genetic diversity of common tern populations from five European countries using targeted next generation sequencing. We successfully genotyped 271 tern samples and identified a total of 191 alleles, including 70 novel ones. We found three to eight alleles per individual. The most common allele was found in 51.7% of the samples. In the analysis of samples assigned to three groups (northern, southern marine and southern inland), the total number of alleles found per group was 113, 98 and 135, respectively, and only 47 were shared among them.

Synopsis

NA

88

Causes of variation and sexual conflict in adult body mass of the Alpine swift

Michela Dumas ORCID iD[1], Sophia St. Lawrence ORCID iD[1], Giulia Masoero ORCID iD[1], Pierre Bize ORCID iD[2], Julien Martin ORCID iD[1]

[1]University of Ottawa, Ottawa, Canada. [2]Swiss Ornithological Institute, Sempach, Switzerland

Abstract

Body mass may reflect energy stores and how much can be invested in reproduction and survival. Here, we use 20+ years of data to investigate the sources of variation in adult body mass and associated fitness consequences in an aerial insectivorous bird with bi-parental care, the Alpine swift (*Tachymarptis melba*). We first investigated the effects of weather using a sliding window analysis approach and report a positive effect of temperature and a negative effect of rainfall on adult body mass. We then used a quantitative genetic approach to assess the heritability of body mass in both sexes as well as the cross-sex genetic correlation. Heritability of adult body mass was moderate and different from zero in both sexes, suggesting the potential for evolution of mass, while the positive cross-sex genetic correlation suggests the possibility for evolutionary constraints. Finally, we assessed the sex-specific selection acting on standardized body mass using multiple fitness proxies. We provide evidence of directional selection on body mass: heavier mothers and fathers contribute to earlier laying dates. We also show stabilizing selection for females and diversifying selection for males in relation to the weighted proportion of surviving fledglings. Overall, these results suggest that while adult body mass may be able to respond to environmental change and evolve, genetic constraints would result in similar changes in both sexes or an overall absence of response to selection. Indeed, this potentially explains the weak (1%) sexual dimorphism in body mass observed in Alpine swifts.

Synopsis

Body mass is positively genetically correlated & under antagonistic selection between the sexes in the weakly dimorphic Alpine swift

Twitter handle

michela_dumas

95

Avian condition derived from feather growth is higher in more complex forests

Bram Catfolis ORCID iD, Tosca Vanroy ORCID iD, Kris Verheyen ORCID iD, Lander Baeten ORCID iD, An Martel ORCID iD, Frank Pasmans ORCID iD, Diederik Strubbe ORCID iD, Luc Lens ORCID iD

Ghent University, Gent, Belgium

Abstract

Sylvicultural practices are increasingly directed at forest conservation, restoration and sustainable management. Increasing forest structural complexity is known to promote a higher diversity of ecological niches, contributing to forest resilience against climate change impacts. The impact of forest structural complexity on individual organisms, however, is less well known. Therefore, we assessed how structural complexity impacts individual nutritional condition of forest birds by using feather growth bar widths as a proxy of the relative access of individuals to food resources and coinciding energy costs. We set up a network of 19 forest plots in Belgium, forming a gradient from low to high forest structural complexity, and sampled two homologous tail feathers of 248 great tits (Parus major). We measured the average width of all visible growth bars and additionally screened for the presence of very narrow bars in individual growth trajectories. Using mixed effects models, we show that birds living in structurally more complex beech forests attain a better nutritional status, indicated by wider growth bars. This is likely due to a higher and more stable availability of food resources and more sheltered habitat. Furthermore, we demonstrate the important role of an improved tree - and herbal layer. To better understand the influence of forest structural complexity on the overall performance of forest birds, these results will be complemented with individual bird stress levels (derived from feather corticosterone concentrations) and their correlation with other condition and health parameters.

Synopsis

Complex forests are crucial for improving bird fitness. What can we learn from feather traits?

Twitter handle

@BCatfolis

98

Multi-scale habitat associations in UK willow tits Poecile montanus

Paul Bellamy ORCID iD, Will Kirby, Simon Wotton

RSPB Centre for Conservation Science, Sandy, United Kingdom

Abstract

In the UK, Willow tit Poecile montanus, has undergone population declines and range contraction over the past 25 years and understanding its local habitat needs and landscape requirements are necessary for targeting conservation action. We used a combination of local field collected data and national data sets to identify important features at scales from individual use within home ranges to 2km squares across UK. At the individual scale we used foraging locations within home ranges from radio tracked birds alongside vegetation composition and structure measures, at the local area scale we censused breeding birds alongside detailed mapping of landcover within 1km radius of study sites, at the national scale we looked at measures of abundance from national Willow tit survey within 2km squares alongside climate and landcover variables. Features related to Willow tit abundance or use changed across scales from vegetation structure at the smallest scale to climate at larger scales, though there were some common factors between scales and data sets. Detailed vegetation structure could be used to identify habitat management and creation options while larger scale factors can target the most suitable areas to apply these to.

Synopsis

We examine vegetation and environmental factors affecting willow tit occurrence from territory to national scale in UK

Twitter handle

@pebellamy

100

Identifying conservation measures most beneficial for bird responses to climate warming

Leonie Jonas[1], Elie Gaget[1], Martin Jung[2], Jon Brommer[1]

[1]University of Turku, Turku, Finland. [2]International Institute for Applied Systems Analysis, Laxenburg, Austria

Abstract

Climate change is one of the main challenges for conservation. Rising temperatures will have increasing negative impacts on biodiversity. Many bird species respond by shifting their distribution ranges or persisting in local microrefugia, but other anthropogenic pressures such as land fragmentation can negatively affect these responses. Protected areas are a vital conservation tool and play an important role in helping birds respond to climate warming by acting as migration corridors, stepping stones or buffers. Thus, they are expected to facilitate distribution shifts at the cold distribution edge or to promote species persistence at the warm distribution edge. However, an increasing literature body highlights that not all protected areas support bird responses to the same extent. Here I show, that the most important variable for improving bird responses to climate warming in protected areas are the management actions implemented within them. Protected areas often differ in conservation actions with actions typically varying from species- to habitat-focused and from active to passive measures. I use extensive European bird surveys (i.e. International Waterbird Census) and the EU LIFE database, documenting management actions and financial means of 1,450 Natura 2000 areas, to evaluate the effectiveness of varying conservation actions. Identifying effective management actions supporting bird response to climate warming will help to establish climate adaptation strategies ensuring long-term biodiversity conservation.

Synopsis

NA

104

Connectivity and survivability of a fragmented Meadow Pipit population

Fabian Anger[1], Marc Förschler[2], Nils Anthes[1]

[1]Institute of Evolution and Ecology, University of Tübingen, Tübingen, Germany. [2]Department of Ecosystem Monitoring, Research and Conservation, Black Forest National Park, Freudenstadt, Germany

Abstract

Birds of agricultural landscapes show strong declines across Europe and populations get more and more fragmented. The Meadow Pipit is an example for a strongly declining bird species mainly restricted to extensively used grasslands. Meadow Pipit populations in Europe declined by more than 50% during the last four decades.

Our aim was to identify potential drivers for the ongoing decline in a fragmented, isolated and declining Meadow Pipit population in the Northern Black Forest (Germany). We used nest searching to assess the reproductive success, colour-ringing to investigate return rates and dispersal and genetic analyses to check for genetic connectivity between isolated populations across Central Europe.

Reproductive success in our study population differed between subpopulations and years and second broods seemed to be crucial for a sufficient reproductive success. About 52% of the adult birds and 21% of the nestlings returned to the study area in the subsequent year indicating no increased mortality during migration or in wintering grounds. Adult birds showed high site fidelity while young birds showed high natal dispersal and settled at grassland patches up to 13 km apart from their birthplace. Young birds therewith had an important role in the connectivity between habitat patches and in resettling abandoned habitat patches. Results from the genetic analysis are pending.

We conclude that the subpopulations in our study area form a panmictic population. Our results suggest that habitat availability might be the limiting factor for the population size in our study population.

Synopsis

NA

105

Effects of light pollution on bird migration: a radar-based case study at the coast of Croatia

Simon Hirschhofer[1,2], Peter Ranacher[2], Sanja Barišić[3], Davor Ćiković[3], Maja Bjelić[4], Robert Weibel[2], Louie Taylor[3], Vesna Tutiš[3], Barbara Vodaric[5], Barbara Helm[1], Baptiste Schmid[1]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]University of Zurich, Zurich, Switzerland. [3]Croatian Academy of Sciences and Arts, Institute for Ornithology, Zagreb, Croatia. [4]Public Institution Nature Park Vransko Lake, Biograd na Moru, Croatia. [5]Croatian Meteorological and Hydrological Service, Zagreb, Croatia

Abstract

Light pollution has been shown to affect birds detrimentally in multiple ways. It adds to harm from climate change and habitat loss that particularly affect migratory birds. We aim to identify behavioural responses of migratory birds to light pollution through radar-based comparisons between highly illuminated and dark areas.

In spring, many Palearctic migrants cross the Mediterranean Sea when returning from their wintering grounds. Some make landfall in Italy and later cross the Adriatic Sea towards Croatia. In contrast to other southern European countries, extensive stretches of coast in Croatia experience almost natural night-time light conditions, alternating with heavily light polluted stretches.

We will deploy four bird radars BirdScan MR1 at the Croatian coastline in spring 2023. BirdScan operates a vertically scanning, rotating antenna that can retrieve altitude, air speed and flight direction of individual birds. Two pairs of radars will be installed, positioned to cover a maximum difference between high and low levels of light pollution.

By comparing these sites, we will test the hypothesis that on a regional scale, birds approaching the coastline are lured by light. On a local scale, we expect birds to show behavioural changes that imply disorientation, such as increased variability in flight directions, lower air speeds and a change in flight altitudes, compared to birds that fly over dark coastal regions. Understanding the birds' responses to artificial nightlights is a first step towards mitigating harm from light pollution.

Synopsis

Effects of light pollution on bird migration: a radar-based case study in Croatia. @Vogelwarte_scie @uzh_geo #aeroecology #EOU2023

Twitter handle

@Hirsimi

106

Altitudinal shifts in bird communities under climate change in Europe

Joséphine Couet ORCID iD[1], Emma-Liina Marjakangas ORCID iD[1], Andrea Santangeli[2], Aleksi Lehikoinen ORCID iD[1], John Atle Kålås ORCID iD[3], Åke Lindström[4]

[1]Finnish Museum of Natural History, Helsinki, Finland. [2]Research Center for Ecological Change, Helsinki, Finland. [3]Norwegian Institute for Nature Research, Trondheim, Norway. [4]Department of Biology, Biodiversity unit, Lund, Sweden

Abstract

Climate change is pushing species ranges and abundances towards the mountain tops. Although many studies have documented local altitudinal shifts, knowledge of general patterns at larger spatial scales, such as a whole mountain range, is scarce. Studying altitudinal shifts in wildlife is conservation relevant because mountain regions often represent biodiversity hotspots and are among the most vulnerable ecosystems. We studied bird abundance shifts within one mountain range (Scandis) and found a clear pattern of uphill shift in the mean altitude of bird abundance, with an average speed of 0.9m per year. Altitudinal shift was also strongly related to species' longevity: short-lived species showed more pronounced uphill shifts than long-lived species. At a finer scale, the speed of the shift can be influenced by different environmental factors (e.g. topography). It is important to highlight areas with faster shifts in order to potentially adapt locally conservation measures. To assess the influence of environmental factors, such as slope, aspect and latitude, we will next study bird abundance shifts across multiple European mountain ranges (Scandis, Alps, Pyrenees, UK highlands). We hypothesize that uphill shifts are faster in South-Eastern slopes in higher latitudes as those slopes appear more exposed to global warming due to their sun exposition. Our results from these two scales underscore the wide-ranging and varying impacts of climate change and will inform decision makers about the potential vulnerability of species, such as species with slow life histories which appear less able to timely respond to rapidly changing climatic conditions.

Synopsis

Altitudinal shifts of bird communities in Scandinavian mountains & topographical effect

Twitter handle

@CouetJosephine

107

Strong fidelity to non-breeding sites but not to the breeding area in a migratory shorebird

Eunbi Kwon ORCID iD, Bart Kempenaers ORCID iD

Max Planck Institute for Biological Intelligence, Seewiesen, Germany

Abstract

The criteria migratory birds use to make settlement decisions likely vary depending on life-history and the annual cycle. Measures of dispersal or site fidelity at different stages can inform about the drivers behind those settlement decisions. In this study, we tracked the movements of long-billed dowitchers (*Limnodromus scolopaceus*) that breed along the arctic coasts of north America and Russia and winter in the southern US and Mexico. We caught 48 dowitchers on their nest in Alaska in 2019 and equipped them with a 2 g Solar Argos PTT-100 satellite transmitter. By identifying their 'core-use areas' (i.e., 50% utilization distribution) at residency areas during fall migration, wintering, spring migration, and the subsequent breeding season, we show that dowitchers are faithful to their fall stop-over and winter residency sites, but not to their breeding area. The core-use area of individuals overlapped on average 12% across two consecutive years for fall stop-over sites (SD = 14.4%, range = 0–40.6%, N = 14), and 55% for wintering residencies (SD = 19%, range = 15.2–85.7%, N = 13). In contrast, site fidelity to the breeding area (within 5 km from the 2019 nest site) was 16.6% for males and 0% for females (N = 18 and 11, respectively). Dowitchers dispersed on average 174 km between subsequent breeding sites (SD = 135 km, range = 0.3–730 km, N = 31). Dowitchers made prospecting visits to different areas within the breeding range before settling at a nesting site, suggesting that breeding settlement is opportunistic.

Synopsis

Migratory shorebirds are faithful to fall stop-over and wintering sites but become explorers to find a new mate or nest site.

Twitter handle

eunbkwon

111

Habitat use of urban nesting Yellow-legged Gulls in a coastal Croatia during the breeding season

Biljana Ječmenica ORCID iD[1], Jelena Kralj ORCID iD[2], Louie Thomas Taylor ORCID iD[3], Luka Jurinović ORCID iD[1]

[1]Croatian Veterinary Institute, Zagreb, Croatia. [2]Croatian Academy of Sciences and Arts, Zagreb, Croatia. [3]Association Biom, Zagreb, Croatia

Abstract

Gulls are an opportunistic group of seabirds that can adapt to different food availability. They are capable of exploiting a variety of marine and terrestrial food sources from natural or artificial origins like fishing ports, dump sites and agricultural land. The Yellow-legged Gull (Larus michahellis) inhabits urban areas in many Mediterranean countries. In Croatia, the Yellow-legged Gull is a common species breeding mainly on uninhabited islands and islets in the Adriatic Sea but in the last two decades, they also started to breed in coastal towns. To understand urban gull behavior and habitat use during the most demanding time, the breeding period, a study of gull movement was done in a small urban colony in a coastal town of Croatia. Ten adult breeding Yellow-legged Gulls (five females and five males) were caught during the late incubation period on building rooftops, using walk-in traps on the nest. Each bird was ringed, measured and fitted with GPS-GSM solar power transmitters.

We analysed the characteristics of foraging trips (duration, length and distances) as well as the difference between habitat use for foraging and roosting between individuals and sexes. The results showed individual differences in the relative importance of dump sites, urban, agriculture and marine habitats.

Synopsis

NA

119

New agricultural lands in the Middle East and North Africa as stopover sites for migrating birds.

Marcin Tobółka ORCID iD[1,2], Lara Blumenstiel[3,4], Joanna T. Bialas ORCID iD[1], Łukasz Dylewski ORCID iD[1], Zuzanna Jagiełło ORCID iD[1], Artur Siekiera[5], Joachim Siekiera[5], Andrea Flack ORCID iD[3,4,6]

[1]Department of Zoology, Poznań University of Life Sciences, Poznań, Poland. [2]Konrad Lorenz Institute of Ethology, University of Veterinary Medicine Vienna, Vienna, Austria. [3]Collective Migration Group, Max Planck Institute of Animal Behavior, Konstanz, Germany. [4]Department of Biology, University of Konstanz, Konstanz, Germany. [5]Chespa, Chorula, Poland. [6]Centre for the Advanced Study of Collective Behaviour, University of Konstanz, Konstanz, Germany

Abstract

Increasing human population demands an increase in food production. Countries or regions with low Food Security Index must import food or introduce new food production methods adjusted to local water conditions. One such method is the centre-pivot irrigation system, which was introduced firstly in North America, and later implemented successfully in countries of the Middle East and North Africa (MENA). Besides agricultural production, they constitute vegetated (green) areas in the middle of deserts attracting many birds during the breeding and non-breeding period. We examined their potential role as stopover sites for migrating juvenile white storks in 2016-2019, following 184 individuals from the eastern migratory subpopulation using GPS-GPRS transmitters. We hypothesised that such an environment could be a chance for late migrants (hatched later in the breeding season) who need to refuel more during migration to wintering grounds in Sahelian Africa. Based on migration tracks of 89 individuals who crossed the Bosporus, we documented 32 stopover events of 18 individuals in centre-pivot irrigation fields in MENA. Although we did find a clear pattern of such behaviour, some individuals showed a trend toward using artificial/natural stopover sites, suggesting habitat preference. Assuming that the climate in this area is changing rapidly and the socio-economic changes in countries of MENA are under intensive change, we expect to observe a great change in the accessibility of habitats in the near future which might affect the migration pattern of long-distance soaring birds in the Euro-African migratory system.

Synopsis

White storks use new agricultural lands in the Middle East and North Africa as stopover sites during autumn migration

Twitter handle

@marcintobolka

123

Size and immune function as predictors of predation risk in nestling and newly fledged jackdaws

Christian Aastrup ORCID iD, Jan-Åke Nilsson, Dennis Hasselquist, Arne Hegemann

Lund University, Lund, Sweden

Abstract

Prey choice by predators may be based on the potential prey's condition, increasing the predation risk for substandard individuals. While most predation studies rely on post-predation observations, we studied young jackdaws before predation took place to determine if size and innate baseline immune function may predict predation risk by goshawks during the nestling and early fledging phases. For five breeding seasons we measured body mass, structural body size, and four innate immune indices 2–4 times when nestlings were 12–29 days old. We were able to determine which individuals had been depredated by recovering rings with a metal detector in a goshawk territory close to the jackdaw colony. Before day 12, nestling mortality was entirely due to starvation, whereas between day 12 and fledging, mortality was mainly due to predation. Nestlings with smaller size and low lysis titer and haptoglobin concentrations were at a higher risk of being depredated before fledging. Directly after fledging, individuals with short wings were preferentially depredated, with no effects of body mass, tarsus length, or any of the immune indices measured at day 29 (i.e., shortly before fledging). Lower immune function and smaller size in depredated nestlings, may reflect these individuals are of poor individual quality and/or lag behind in development. We hypothesise that hunger makes these nestlings sit closest to the entrance hole and hence become the first to be depredated. For fledglings, our results suggest that poor flight ability makes individuals with short wings the easiest targets for avian predators.

Synopsis

NA

125

Sensitivity of terrestrial birds to wind energy infrastructure in mainland France

David Vallecillo[1], Oliver Duriez[2], Aurélien Besnard[2], Alexandre Millon[1]

[1]Institut Méditerranéen de Biodiversité et d'Ecologie marine et continentale, Aix-en-Provence, France.
[2]Centre d'Ecologie Fonctionnelle et Evolutive, Montpellier, France

Abstract

Wind energy is a key component of the global energy policy aiming to reduce atmospheric carbon emissions. Today, the impact of wind energy infrastructures on avian mortality and habitat availability remains patchy and insufficient to inform future deployment that would minimise the impact on population dynamics. The objective of the VULNEO research program is to characterise the theoretical sensitivity of breeding and wintering community terrestrial birds to wind farms in mainland France. We propose a prioritisation method based on the definition species sensitivity scores combing a set of metrics. One metric related to the potential risk of collision by taking into account morphological and behavioural traits. Two metrics related to the risk of species extinction due to life history traits related to reproductive strategy (long-lived species/short-lived species) and to habitat selection (specialist species/generalist species). And finally, two metrics related to conservation status and national responsibility (proportions of national breeding and wintering population sizes to European population size). From this assessment will be derived sensitivity maps highlighting areas with major sensitivity of the bird community to wind farm development, and where political decisions will be taken on the basis of the European Commission's recommendations for wind farm planning. Vulnerability maps (overlaying the sensitivity maps with distribution map of wind turbines) will also be provided in order to pay special attention to areas already densely occupied with wind farms, and where significant cumulative effects could occur.

Synopsis

NA

127

Mercury contamination in wild birds in Latvia. Are the beaver ponds to blame?

Antonija Rimsa ORCID iD[1], Maris Strazds[1], Anda Abola ORCID iD[2], Rita Veilande[2]

[1]Institute of Biology, University of Latvia, Riga, Latvia. [2]Institute of Atomic Physics and Spectroscopy, University of Latvia, Riga, Latvia

Abstract

We studied presence of mercury in eggshells and egg membranes of wild birds in Latvia, mainly focusing on the Black Storks (Ciconia nigra). For comparison, we measured mercury in egg remains of White Stork, European Roller, Grey Heron, Osprey, White-tailed Eagle, Eagle Owl, Lesser Spotted Eagle, Goshawk and Common Buzzard.

We used atomic absorption spectrometer with Zeeman correction LUMEX RA-915M and its attachment for pyrolytic analysis PYRO-915+ to detect the total mercury concentration in samples. Pyrolytic combustion allows direct measurements without specific pre-treatment procedures, diminishing possible sample contamination and providing almost instant results. Altogether 562 samples (collected mostly between 2003-2022) have been analyzed.

Number of analyzed samples for each bird species varies significantly, however, the differences between the species indicate possible sources of mercury contamination. The highest values were found in White-tailed Eagle and Eagle Owl, both top predators, and in Black Stork and Grey Heron, while Osprey and land-feeding raptors had notably smaller concentrations. The less contaminated eggs were those of White Stork and European Roller.

As for the Black Stork, mercury levels did not provide any straightforward links to survival of the chicks. However, all of the highest concentrations were associated with failed breeding. Apart from possible sources of mercury contamination, we shall discuss fluctuation of mercury concentration over time, as well as other aspects discovered during this study, such as thinning of eggshells and other possible factors that impact Black Stork breeding success.

The research was supported by the Latvia Council of Science Project No. lzp-2020/1-0005.

Synopsis

NA

134

Foraging pressure and behavior of cormorants and grey herons at fish farms

Camilla Ekblad ORCID iD, Toni Laaksonen ORCID iD, Antti Ovaskainen, Veijo Jormalainen ORCID iD

University of Turku, Turku, Finland

Abstract

Fish farming is an important livelihood worldwide. In Finland, fish farming is conducted mainly offshore along the coast and in the inland since the 1970s. Since then, the populations of cormorants (*Phalacrocorax carbo*) and grey herons (*Ardea cinerea*) have grown significantly in the area. These birds are foraging in the fish farms despite precautions in the form of covering nets, potentially causing significant financial losses in some areas. By surveillance cameras, we investigated the predation behavior and pressure of cormorants and herons in fish farms at different times of the day and the year. The pressure varied considerably between farms and even between culture bags in the same farm. The herons were fishing in bags containing fish fry by standing on the covering net, mainly in the dusk and the dawn, with cases of more than 30 birds fishing simultaneously on the same net recorded. In extreme cases they were seen eating several hundred fish in one day. The cormorants foraged mainly solitarily or in small groups and were seen to swallow fish of considerable size. Both species were in some places able to climb into the bags despite nets. Different protective nets were most effective against different species, and to avoid losses, the net type should be chosen on farm level regarding to the species mainly visiting the particular farm.

Synopsis

NA

140

APPARENT SURVIVAL AND POPULATION TURNOVER IN THE LESSER SPOTTED EAGLE: A COMPARATIVE ANALYSIS USING DIFFERENT MARKERS

Freddy Rohtla, Ülo Väli ORCID iD

Estonian University of Life Sciences, Tartu, Estonia

Abstract

Survival and turnover rates determine population dynamics, especially for long-living species. We analyse these characteristics and their dynamics over 25 years in a population of a medium-sized raptor, the Lesser Spotted Eagle. Data were collected using 1) coloured plastic leg rings; 2) GPS tracking and 3) genetic analysis of shed feathers collected from nest sites. We will compare the results obtained with different markers for both sexes and discuss whether a combination of markers is necessary to gain a comprehensive and objective understanding of the demographic status of the population.

Synopsis

NA

142

Survival, dispersion and home range of reintroduced Italian Grey Partridge (Perdix perdix italica) for the LIFE Perdix project

Alberto Sorace[1], Gaia De Luca[1], Chiara Gabbrielli[2], Paolo Montanaro[1], Davide Senserini[2], Daniel Tramontana[2], Stefania Volani[1], Marco Zaccaroni[3], Francesco Riga[1]

[1]ISPRA, Roma, Italy. [2]FEDERCACCIA, Roma, Italy. [3]UNIVERSITÀ DI FIRENZE, Firenze, Italy

Abstract

A main objective of LIFE Perdix is the reintroduction of Italian Grey partridge to the Special protection area “Valle del Mezzano” (IT4060008). Before their release to the wild, some animals have been submitted to anti-predation behavioural training (showing them hawks and a taxidermied fox).

In August and September 2021, a total of 5,250 birds (90 days old) were reintroduced; 43 birds were equipped with collar radio tags. On 30th June 2022, only 2 birds were still alive, four of them disappeared (probably due to the battery discharge), and 21 were dead (18 preyed by raptors, 2 by foxes, for 11 it was not possible to assess the cause of death).

The survival rate was very low (14.63%), and the mean survival of the birds was 128,70 days, without statistically significant differences between sexes. However, birds treated with anti-predation training survived longer (Mantel test = 8.437, p= 0.004).

The average dispersion from the release fence was 759.54 m (±625.21SD; max 3,029.31 – min 75.29) with no significant differences between sexes or fences. The average values of home ranges were MCP 18.80 ha, KDE95% 118.91 ha and KDE 50% 22.70 ha for males and 24.98 ha, 86.86 ha and 16.25 for females. No significant sex-related differences were observed.

In spring, we performed two playback counts to assess male density: from 7th to 18th March 2022 we surveyed 1.830 plots, finding 182 males (2,04 male /100 ha); from 2nd to 16th April we surveyed 1.813 plots, finding 171 males (1,90 male /100 ha).

Synopsis

Reduced survival of reintroduced Italian Grey partridge to the Special protection area “Valle del Mezzano” for LIFE Perdix

146

Smaller Australian raptors have greater urban tolerance

Taylor Headland ORCID iD[1], Diane Diane Colombelli-Négrel ORCID iD[1], Corey Callaghan ORCID iD[2], Shane Sumasgutner ORCID iD[3], Sonia Kleindorfer ORCID iD[4,1], Petra Sumasgutner ORCID iD[4]

[1]Flinders University, Adelaide, Australia. [2]University of Florida, Davie, USA. [3]Technical Office for Biology Raab, Deutsch Wagram, Austria. [4]University of Vienna, Grünau/Almtal, Austria

Abstract

Urbanisation is occurring around the world at a rapid rate and is associated with negative impacts on biodiversity. Examining the behavioural response profiles of wildlife to urbanisation helps differentiate between species that do or don't show adaptive responses to changing landscapes and hence are likely or not likely to persist in such environments. Species-specific responses to urbanisation are poorly understood in the Southern Hemisphere, particularly for raptors, despite their high diversity in the Southern Hemisphere and critical role within ecosystems as bioindicators of environmental health. Here, we explore this knowledge gap, using community science data sourced from eBird to investigate the urban tolerance of 24 Australian raptor species at a continental scale. We integrated eBird data with a global continuous measure of urbanisation, artificial light at night (ALAN), to derive an urban tolerance index, ranking each species from positive to negative responses according to its tolerance of urban environments. We then gathered trait data from published literature to assess whether certain traits (e.g. body mass, habitat type, nest substrate, feeding guild, and migratory status) are associated with urban tolerance. Out of the 24 species analysed, 13 species showed tolerance profiles for urban environments, and 11 species showed avoidance profiles for urban environments. Body size was negatively associated with urban tolerance, as smaller raptors had greater urban tolerance than larger raptors. The results of this study provide impetus to conserve native habitat and improve urban conditions for larger-bodied raptor species to conserve Australian raptor diversity in an increasingly urbanised world.

Synopsis

The most urban tolerant Australian raptor species are smaller, with larger species opting to avoid urban landscapes

Twitter handle

@TaylorHeadland

149

Geographical change in diel activity of predators with photoperiod in seabird colonies near the Arctic Circle

Nicholas Huffeldt[1,2], Floris van Beest[3], Haley Kenyon[4,5], Jóhannis Danielsen[6]

[1]Lund University, Lund, Sweden. [2]Greenland Institute of Natural Resources, Nuuk, Greenland. [3]Aarhus University, Roskilde, Denmark. [4]Queen's University, Kingston, Canada. [5]University of Colorado Boulder, Boulder, USA. [6]Faroe Marine Research Institute, Tórshavn, Faroe Islands

Abstract

Diel activity of avian predators can structure prey communities temporally. Yet, little is known about how diel activity of communities of avian predators changes geographically under different photoperiods. Here, we test the hypothesis that the continuous light during polar summer reduces differences in predation between the brightest and darkest phases of the diel cycle compared to at subpolar latitude where the sun goes below the horizon. We conducted observations and experiments at seabird colonies below the northern polar circle in the Faroe Islands (62 °N) and above the polar circle in Greenland (74 °N). We found support for the hypothesis as activity of primarily avian predators was greater during the brightest compared to the darkest phase of the diel cycle below the Arctic Circle, but similar across these phases during the continuous light of polar summer. Our results emphasize the influence of light cycles on the diel activity of birds and suggest that species that use the dark phase of the diel cycle to escape predation can lose this advantage during polar summer.

Synopsis

Diel activity of predators in seabird colonies changes with daylength: a comparison between Greenland and the Faroe Islands.

Twitter handle

@nphuffeldt

157

Avian bioindicators of land-sharing and land-sparing urban development in Europe

Anna Ramos Chernenko ORCID iD[1], Mario Díaz ORCID iD[2], Federico Morelli ORCID iD[3], Yanina Benedetti ORCID iD[3], Jukka Jokimäki ORCID iD[4], Marja-Liisa Kaisanlahti-Jokimäki[4], Tomás Pérez-Contreras ORCID iD[1], Enrique Rubio[5], Philipp Sprau[6], Jukka Suhonen ORCID iD[7], Piotr Tryjanowski ORCID iD[8], Juan Diego Ibáñez-Álamo ORCID iD[1]

[1]Department of Zoology, Faculty of Sciences, University of Granada, Granada, Spain. [2]Department of Biogeography and Global Change, Museo Nacional de Ciencias Naturales, Madrid, Spain. [3]Czech University of Life Sciences Prague, Faculty of Environmental Sciences, Community Ecology & Conservation, Prague, Czech Republic. [4]Nature Inventory and EIA-services, Arctic Centre, University of Lapland, Rovaniemi, Finland. [5]Departament of Biodiversity, Ecology and Evolution, Universidad Complutense de Madrid, Madrid, Spain. [6]Department of Biology, Ludwig-Maximilians-University Munich, Munich, Germany. [7]Department of Biology, University of Turku, Turku, Finland. [8]Department of Zoology, Poznán University of Life Sciences, Poznán, Poland

Abstract

Urbanization is usually detrimental for bird diversity, but there is room for designing more bird-friendly cities through models of urban development. Land-sharing/LSH (extensive-urbanization) and land-sparing/LSP (intensive-urbanization) are extreme models of such urban development. Recent evidence using complex evaluations of community composition and landscape organization suggest that LSH urban areas can harbor more diverse bird communities than LSP areas. However, simpler and more straightforward ways to assess urban development-bird diversity relationships could be more useful for wildlife conservation and human wellbeing planning. Here, we identify effective avian indicators associated to each of these two urban development models in Europe. We performed censuses in nine cities from seven European countries and quantified LSH and LSP urban bird species during the breeding and wintering seasons. We then used the indicator value method to identify the avian indicators for LSH and LSP urban areas. We found that house sparrows (*Passer domesticus*), Eurasian collared doves (*Streptopelia decaocto*) and European greenfinches (*Chloris chloris*) are bioindicators of LSH areas. In contrast, the common chaffinch (*Fringilla coelebs*) was identified as bioindicator for LSP areas. We discuss additional seasonal differences in indicator species and specificity results (e.g. 0.724 for chaffinches) to analyze causes of variation of avian bioindicators among European cities. Most of the LSH/LSP indicators are resident species with territorial behavior. Our findings provide multi-species indicators of LSH/LSP urban areas useful for urban planners, scientists and citizens interested in promoting more bird-friendly cities.

Keynotes: urban bird indicators, human-induced environmental change, land-sharing/extensive-urbanization, land-sparing/intensive-urbanization

Synopsis

NA

162

The impact of invasive herbaceous weeds on the taxonomic, functional and phylogenetic diversity of birds via their reproductive traits

Emilia Grzędzicka ORCID iD

Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Kraków, Poland

Abstract

Some weeds introduced as crops or biomass fuel can later become invasive. The example plants are the Caucasian hogweeds *Heracleum* sp., the usefulness of which has been studied for about 70 years, most recently as a source of carbon for battery technology. These plants are one of the most problematic invasions in Europe. The study aimed to investigate the impact of hogweeds on bird diversity via possible modification of their reproductive traits in homogenised habitats. The research was conducted in south-eastern Poland in 2020–2021 on 74 sites arranged as 37 pairs of surveying points (*Heracleum*, control). The presence of invaders decreased the Shannon diversity index and species richness of birds. With a peak of vegetation (June – July) late compared to the bird breeding season, invasion favoured species with single broods and faster, synchronous hatching. The changes in other reproductive traits (i.e., incubation, nestling and fledging periods) showed that birds shortened and accelerated the breeding season near invaders. Sedentary species and short-distant migrants more often occupied *Heracleum* sites. Functional diversity index of birds based on studied traits and Faith's phylogenetic diversity decreased near invasion. The shorter the nestling and fledging periods, the lower the phylogenetic diversity index of birds only in invaded sites. The research showed that utility crops can affect bird assemblages at least at the phenotypic level if neglected like Caucasian hogweeds. Traits and diversity indexes are valuable tools to study birds when population studies using nests and mist-netting of birds are impossible.

Synopsis

Invasive weeds decrease diversity indexes of birds via their reproductive traits

Twitter handle

NA

163

Wintering habitat selection of the Eurasian stone-curlew (*Burhinus oedicnemus*) in Southwest Iberia revealed by high-resolution movement and remote-sensing data

João Gameiro ORCID iD[1,2,3], Eirini Tripidaki[1,2,3], Francesco Valerio[1,3], Carlos Pacheco[1,2,3], Ana Teresa Marques[1,2,3], João Paulo Silva[1,2,3]

[1]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, 4485-661, Vairão, Portugal. [2]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Instituto Superior de Agronomia, Universidade de Lisboa, 1349-017, Lisboa, Portugal. [3]BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairão, 4485-661, Vairão, Portugal

Abstract

Human-dominated landscapes hold high levels of biodiversity but are under rapid change. Understanding how animals move and where they perform their year-round vital activities at a fine scale is crucial to make recommendations on land-use management in these complex ecosystems.

Here, we combined high-resolution movement and remote-sensing data to describe the wintering habitat of a rather elusive farmland bird, the Eurasian stone-curlew Burhinus oedicnemus. Following 12 GPS-tracked birds on 3 winter seasons, we investigated the selection of wintering roosts and feeding areas in Southwest Iberia, using land-use, topographic, and remote-sensing variables from both optical and radiometric sensors with a resolution up to 10m (Sentinel 1 and 2 Satellites). Overall, we found that birds selected roosts and feeding areas differently. In both cases, birds selected low-inclined runoff areas with low vegetation, but roosts were located in the less productive or drier/rocky portions of open crops or grasslands, and often near roads or anthropogenic areas. On the other hand, feeding grounds occurred in areas with homogeneous tree cover, mainly in olive plantations. A deeper look on olive groves shows they are not selected equally: stone curlews preferred traditional plantations (6-7m between trees) over intensive or super-intensive (hedge-like) plantations. When using the latter, birds stayed on the edges or in dirt-roads within the plantations. By capitalizing on high-detailed environmental variables provided by remote-sensing, this study provides novel insights on how stone-curlews selects different biotopes within a complex agricultural landscape.

Synopsis

Wintering habitat selection of Eurasian stone-curlews revealed by high-resolution movement and remote-sensing data

Twitter handle

@Mr_Gameiro

164

Evidence of a nationwide decline of the Montagu's harrier (*Circus pygargus*) linked to an agricultural policy shift

João Gameiro ORCID iD[1,2,3], Ana Teresa Marques ORCID iD[1,2,3], Luís Venâncio[1,3], Américo Guedes[4], José Pereira[4], Luís Ribeiro[4], Francisco Moreira[1,2,3], Pedro Beja[1,2,3], Beatriz Arroyo[5], João Paulo Silva[1,2,3]

[1]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, 4485-661, Vairão, Portugal. [2]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Instituto Superior de Agronomia, Universidade de Lisboa, 1349-017, Lisboa, Portugal. [3]BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairão, 4485-661, Vairão, Portugal. [4]PALOMBAR - Conservação da Natureza e do Património Rural, Antiga Escola Primária, 5230-232, Uva, Portugal. [5]Instituto de Investigación en Recursos Cinegéticos (IREC), Ronda de Toledo, 12, 13071, Ciudad Real, Spain

Abstract

European farmland birds are becoming increasingly threatened due to agriculture intensification. One species particularly affected by these changes is the Montagu's harrier *Circus pygargus*, a ground nesting raptor highly reliant on cereal crops in Western Europe. France and the Iberian Peninsula hold a significant proportion of the European population, but little is known about the recent conservation status of Montagu's harriers in Portugal.

Here we reveal that the national population has declined by 76-88% in 20 years, with only 120 breeding pairs estimated in 2021, and has suffered a contraction on its distribution range by more than 60%. This decline is associated with agro-policy changes occurring in the country in the last decades, with an abandonment of cereal farming in detriment of beef production. With most of the extant cereal fields being converted to fodder crops, this creates a twofold phenological mismatch between Montagu's harrier breeding and crop harvesting. First, fodder crops are preferred for nesting sites over cereal crops when birds settle, but are harvested earlier in the season (compared to cereals), before hatching. Then, birds attempting to breed again will lay on cereal crops, which will now also be harvested at the early stages of incubation/rearing. These mismatches are further aggravated in drought years when crops are cut even sooner. A revision of agriculture policies is paramount to restore the viability of Montagu's harriers in Portugal.

Synopsis

Evidence of a nationwide decline of the Montagu's harrier (Circus pygargus) linked to an agricultural policy shift

Twitter handle

@Mr_Gameiro

165

Reduced habitat niche at a range border decreases adaptation potential to forest transformations in a pine forest specialist – a Crested Tit

Yehor Yatsiuk ORCID iD, Asko Lõhmus ORCID iD

Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

Abstract

Crested tit is an example of a forest specialist, inhabiting coniferous forests – important timber production areas in Europe. It occupies plantations and transformed stands, but preference for natural old pine stands have been shown in many areas. We studied its habitat niche in two systems: range optimum in Estonia and several isolated populations at the southern range border in eastern Ukraine. Combining own field data and published information, we show that in Estonia birds rich generally higher densities and occupy wider range of conditions in terms of stand types, age and biomass-related stand characteristics. Here, historical high presence and connectivity of coniferous forests may have allowed birds to readily occupy plantations and transformed stands on drained bogs, but degradation of peatlands may impose future decrease of suitable habitats. In Ukraine, fragmentation of forests and past reduction of forest area has led to isolated populations with varying densities. Birds occupy narrower range of stand types, prefer older age-related stand characteristics but with lower spacing of trees. Preference for old natural pine stands increases toward more isolated populations. Here, on a forest-steppe transition, pine forests face risks associated with climate change: increasing risk of wildfires and problems with pine regeneration. The consequences of vast war-related fires in 2022 and expected future increase in logging intensity are likely to impose these marginal populations to new fluctuations. We discuss the importance of precautionary management and some possible changes in silvicultural management practices.

Synopsis

Habitat niche of a Crested Tit in Estonia and eastern Ukraine - adaptation for forest transformations

Twitter handle

@yyatsiuk

178

Differences in proportion between plumage phenotypes of the feral pigeon (*Columba livia*) in four cities from Transylvania (Romania)

Valentin Adrian Kiss[1], Liviu Razvan Pripon[2]

[1]University of Antwerp, Department of Biology, Behavioural Ecology and Ecophysiology (BECO), Antwerp, Belgium. [2]Independent Researcher, Cluj-Napoca, Romania

Abstract

The feral pigeon is one of the birds which has the highest colour variation. It is known that this variation is correlated with the changes in human community structure. Melanin-based phenotypes vary between urban and rural areas, according to some studies, and it frequently correlates with other phenotypic traits like immunity, behaviour, or reproduction. The purpose of this study was to assess the status of melanin-based phenotypes in contrast with the blue bar phenotype in feral pigeons living in urban areas in Transylvania. We collected photographic data in four cities: Braşov, Sibiu, Cluj-Napoca, and Arad, located in every cardinal point of the region. The photos were analyzed by counting and categorizing each individual based on their plumage phenotype into three groups: melanic birds (spread and T-pattern), paler birds (blanc and brown) and blue bar. We were able to count more than a thousand individuals (N=1070) and our results show that the abundance and frequency of the blue bar phenotype vary by city. Also, that melanic birds outnumber the other phenotypes including the blue bar in Transylvania. Melanic phenotypes are more abundant in high-altitude cities like Braşov. In Arad, which is situated in the lower planes of west Transylvania there are almost as many blue bars as the melanic phenotypes. We conclude that the blue bar phenotype is not one of the dominant phenotypes and varies across Transylvania. This variation may be influenced by the local climate and altitude of each city.

Synopsis

Differences in the proportion of plumage phenotypes of the feral pigeon in four Transylvanian cities

Twitter handle

@valentinkiss07

186

Blackcap populations adapt their migratory behaviour to environmental changes - over a 40-year study in the southern Baltic region

Agnieszka Ożarowska ORCID iD[1,2], Włodzimierz Meissner ORCID iD[1], Grzegorz Zaniewicz ORCID iD[1]

[1]Ornithology Unit, Department of Vertebrate Ecology and Zoology, Faculty of Biology, University of Gdańsk, Gdańsk, Poland. [2]Bird Migration Research Station, Faculty of Biology, University of Gdańsk, Gdańsk, Poland

Abstract

Climate change has a major impact on the sizes and distribution of bird populations, the phenology of their breeding/migration and migratory behaviour. During our studies on juvenile blackcaps *Sylvia atricapilla* migrating in the southern Baltic region, we applied constant mist-netting during the migration period and collected standard biometric measurements. These studies covered over 40 years (1967–2009). During this period the number of autumn migrating blackcaps at the study site, particularly short-distance individuals, increased significantly since the end of the 1980s and the beginning of the 1990s. Nowadays blackcaps arrive earlier in spring than 40 years ago, thus when reaching breeding grounds may occupy better quality territories, and consequently may have higher breeding success. In autumn they depart earlier towards wintering grounds, so presumably are more successful when competing with local sedentary individuals at winter quarters. The body condition of migrating blackcaps also changed over these years. From the 1990s onwards, it was distinctly higher than in the middle of the 1960s. There was no change in the stopover length at the study site and the majority of migrants stayed there for only 1 or 2 days. Blackcaps advanced autumn migration start, which may allow them to match their phenology with seasonal berry crop availability during the premigratory fattening and/or en-route. So far, we have learnt that the Blackcap populations adapt their migratory behaviour to environmental changes due to global climate change, and their adaptive response seems sufficient to match these changes.

Synopsis

NA

193

Identifying optimal air filters to collect airborne eDNA for bird monitoring

Kasun Bodawatta ORCID iD[1], Agnete Madsen[1], Christina Lynggaard[1], Matthew Johnson[2], Tobias Frøslev[3], Kristine Bohmann[3]

[1]Globe Institute, University of Copenhagen, Copenhagen, Denmark. [2]University of Copenhagen, Copenhagen, Denmark. [3]Global Biodiversity Information Facility, Copenhagen, Denmark

Abstract

In a time where ecosystems are threatened due to increasing climatic change and anthropogenic pressures, it is crucial to ensure successful and effective biodiversity monitoring practices. Metabarcoding of environmental DNA (eDNA) has proved to be a powerful, non-invasive, and effective method to conduct biodiversity surveys across a multitude of habitats. However, the current widely used eDNA sample types, such as water and invertebrate derived DNA (iDNA), do not effectively capture bird diversity. One novel solution for this was recently unveiled: metabarcoding of airborne eDNA. However, the use of airborne eDNA for vertebrate surveys is still in its infancy and requires optimisations and developments. The most basic step in the use of airborne eDNA is the collection of bioaerosols. Here, it is yet to be explored whether - and how - the choice of air filters influences accumulation of airborne eDNA and detections of taxa. To investigate this, we collected bioaerosols with three classes of air filters with varying airflow rates and particle size retention. Bird DNA concentrations and taxa yielded by each filter type will be compared using quantitative PCR and metabarcoding using two primer sets targeting mitochondrial bird markers. We predict that the optimal filter type will yield higher bird DNA concentrations and detect higher diversity of bird species. Findings of this study will identify the optimal air filters for sampling of airborne eDNA to characterise bird communities, while aiding in the development of the airborne eDNA field, which can be adapted by conservation programs to monitor terrestrial biodiversity.

Synopsis

Improving novel metabarcoding of airborne eDNA to characterise bird communities.

Twitter handle

KBodawatta

195

Changes in the urbanised populations of Common Wood Pigeon and Eurasian Collared Dove in Hungarian settlements over the last 30 years

László Bozó[1], András István Csathó[2]

[1]Eötvös Loránd University, Department of Systematic Zoology and Ecology, Budapest, Hungary.
[2]independent researcher, Battonya, Hungary

Abstract

The Common Wood Pigeon (Columba palumbus) has large populations in the European cities. However, the urbanisation of the species in the Hungarian villages and small towns is happening recently. We summarized our observations on the urbanised populations of the species in the southeastern part of the country from the past three decades. Additionally, we also collected hunting data, as well as we also surveyed the breeding population of the Eurasian Collared Dove (Streptopelia decaocto) to look at the relationship between the two species. Formerly Wood Pigeon was the bird of the outskirts, where its population has since not decreased. Then in the past years, it has appeared in towns and villages too. The first urbanised breeding pairs appeared in the early 2010's, and nowadays already considerably sized populations can be found. This rapid growth has had a negative impact on the Eurasian Collared Dove's population, which to these days has significantly declined. The Wood Pigeons were more common in the central parts of the settlements, which are typically woodier due to urban parks, while the Eurasian Collared Dove was mainly found in peripheral areas. The phenomenon is similar to what happened to the European Turtle Dove (S. turtur) and the Eurasian Collared Dove at the beginning of the 20th century: Turtle Dove disappeared from the settlements due to the competition with the latter one. Hunting data also support these changes in the population sizes. The increase in the population of the Wood Pigeons may cause significant agricultural problems.

Synopsis

Negative impact of the increasing urban population of the Common Wood Pigeon on the Eurasian Collared Dove's population

200

Leveraging microclimates and ecophysiological traits to predict the potential range expansion of a ubiquitous avian invader, the common waxbill (Estrilda astrild).

Marina Sentis Vila[1], Cesare Pacioni[1], Luis Reino[2], Luc Lens[1], Diederik Strubbe[1]

[1]Ghent University, Ghent, Belgium. [2]CIBIO, University of Porto, Porto, Portugal

Abstract

Invasions by exotic species are one of the main drivers of biodiversity loss and rank among the top threats to the economy and human well-being. Preventing the introduction of invaders is considered the most effective, and thus, predictions of invasion risk are crucial for invasive species risk assessment and prevention. Currently, such forecasts are typically based on correlative approaches that link species occurrence data with long-term climate averages to characterize and extrapolate native-range climatic niche characteristics to new areas. These models however often fail to predict the full extent of avian invasions. Alternative frameworks that use climate data to approximate the microclimates experienced by individuals with their biophysical capacity to generate or dissipate heat exist, but are limited by our current understanding of how birds can thermoregulate when confronted with novel environments. Here, we use the invasion of Iberia by Afrotropical common waxbills (Estrilda astrild) as a case study to test how thermoregulatory capacity affects the invasion success and individual condition of introduced birds. We test the hypothesis that (sub)tropical species such as waxbills are characterized by comparatively low metabolic rates and that populations in climatically more suitable areas exhibit better health conditions than populations at niche margins. We do this by assessing variations in metabolic rates and phenotypic stress proxies such as body condition, fluctuating asymmetry and feather fault bars across a climatic gradient in invaded Portugal. We discuss how integrating microclimate dynamics with variation in thermoregulatory capacity affects the accuracy of so-called 'mechanistic' forecasts of invasion risk.

Synopsis

NA

201

AviSample Network metadata repository: An online platform for the reuse of avian samples

Petr Procházka ORCID iD[1], Vojtěch Brlík ORCID iD[2], Pavel Pipek ORCID iD[2,3], Kate Brandis ORCID iD[4], Nikita Chernetsov ORCID iD[5], Fábio J. V. Costa ORCID iD[6], L. Gerardo Herrera Montalvo ORCID iD[7], Yosef Kiat ORCID iD[8], Richard B. Lanctot ORCID iD[9], Peter P. Marra ORCID iD[10], D. Ryan Norris ORCID iD[11], Chima Nwaogu ORCID iD[12,13], Petra Quillfeldt ORCID iD[14], Sarah T. Saalfeld[9], Craig A. Stricker ORCID iD[15], Robert L. Thomson ORCID iD[16], Tianhao Zhao ORCID iD[17]

[1]Institute of Vertebrate Biology, Czech Academy of Sciences, Brno, Czech Republic. [2]Department of Ecology, Faculty of Science, Charles University, Prague, Czech Republic. [3]Czech Academy of Sciences, Institute of Botany, Průhonice, Czech Republic. [4]Centre for Ecosystem Science, School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, Australia. [5]Ornithology Lab, Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russian Federation. [6]Instituto Nacional de Criminalística, Polícia Federal, Brasília, Brazil. [7]Estación de Biología Chamela, Instituto de Biología, Universidad Nacional Autónoma de México, San Patricio, Mexico. [8]Israeli Bird Ringing Center, Israel Ornithological Center, Society for the Protection of Nature in Israel, Tel-Aviv, Israel. [9]U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, USA. [10]Department of Biology and the McCourt School of Public Policy, Georgetown University, Washington, USA. [11]Department of Integrative Biology, University of Guelph, Guelph, Canada. [12]A.P. Leventis Ornithological Research Institute, University of Jos Biological Conservatory, Laminga, Nigeria. [13]FitzPatrick Institute of African Ornithology, DST-NRF Centre of Excellence, University of Cape Town, Cape Town, South Africa. [14]Department of Animal Ecology & Systematics, Justus Liebig University, Gießen, Germany. [15]U.S. Geological Survey, Fort Collins Science Center, Denver, USA. [16]FitzPatrick Institute of African Ornithology, DSI-NRF Centre of Excellence, University of Cape Town, Cape Town, South Africa. [17]Groningen Institute for Evolutionary Life Sciences, University of Groningen, Groningen, Netherlands

Abstract

Tissue samples are frequently collected to study various aspects of avian biology, but these samples are often not used in their entirety and are stored by the collector. The already collected samples provide a largely overlooked opportunity because they can be used by different researchers in different biological fields. Broad reuse of samples could result in multispecies or large-scale studies, interdisciplinary collaborations, and the generation of new ideas, thereby increasing the quality and impact of research. Sample reuse could also reduce the number of new samples needed for a study, which is especially pertinent to endangered species where sample collection is necessarily limited. Importantly, reusing samples may be mutually beneficial for both the researchers providing samples and those reusing them. To facilitate the reuse of avian samples worldwide and across research fields, we introduce the AviSample Network metadata repository. The main aims of this metadata repository are to collate and provide access to descriptions of available avian tissue samples. Currently, the repository contains information on more than 29000 avian samples of 432 species across the globe. We hope that the AviSample Network metadata repository will encourage sample reuse, and provide the opportunity for new studies and collaborations between ornithologists across the globe.

Synopsis

AviSample Network metadata repository provides access to descriptions of available avian tissue samples to facilitate their reuse.

Twitter handle

@rytikerttunen

213

Probe, peck, step, and intake rates of Black-tailed Godwits in self-selected grasslands as a window on their food sensing and handling mechanisms

Renée Veenstra[1], Timo Keuning[1], Jeroen Onrust[1], Matty Berg[2,1], Theunis Piersma[3,1]

[1]Rijksuniversiteit Groningen, Groningen, Netherlands. [2]Vrije Universiteit Amsterdam, Amsterdam, Netherlands. [3]NIOZ, 't Horntje (Texel), Netherlands

Abstract

Agricultural intensification has altered grassland habitat in the Netherlands, causing a decline in the populations of meadow birds through various mechanisms. However, how it affects the foraging ecology of adults remains unclear. For income breeders such as Black-tailed Godwits (Limosa limosa limosa), body reorganization after arrival on the breeding grounds is likely to affect reproductive timing and success. In March 2022 we studied foraging behaviour of Black-tailed Godwits in the interval between arrival and egg-laying in response to environmental conditions in self-selected agricultural meadows in South-West Friesland. In 13 fields with (dispersed) foraging flocks, using HD video, probe, peck, step and intake rates were measured. In addition, at the feeding sites we collected data on food abundance, soil moisture content and resistance, and vegetation height and density. All flocks were found on extensively managed fields. Although the godwits showed constant intake rates, probe and step rates were significantly higher in dryer than in moist fields. This indicates that godwits need to adjust foraging effort to attain a certain intake rate, which generates ideas about the sensory biology involved in the subterranean detection and capture of earthworm prey, and what affects handling before ingestion of a localized prey.

Synopsis

NA

214

Using accelerometry to study the behavioural ecology of elusive species: experiment for the first classification of several behaviours in steppe birds

Carolina Bravo ORCID iD[1], Natalia Revilla[2], João P Silva[3,4], A Teresa Marques[3,4], François Mougeot[1], Beatriz Arroyo[1], Pedro L Peiró[1], Mario Fernández-Tizón[1], Vincent Bretagnolle[5], Santiago Mañosa[6], David Giralt[2], Francesc Sardá-Palomera[2], Manuel B Morales[7], Gerard Bota[2]

[1]Instituto de Investigación en Recursos Cinegéticos, Ciudad Real, Spain. [2]Centre de Ciència i Tecnologia Forestal de Catalunya, Lleida, Spain. [3]Universidade do Porto, Porto, Portugal. [4]Universidade de Lisboa, Lisboa, Portugal. [5]UMR 7372 Centre d'Etudes Biologiques de Chizé, Villiers-en-Bois, France. [6]Universitat de Barcelona, Barcelona, Spain. [7]Universidad Autónoma de Madrid, Madrid, Spain

Abstract

Understanding how individuals respond to anthropogenic environmental changes is crucial for their conservation. Current technological advances provide unprecedented opportunities for researchers to monitor and study bird behaviour. Tri-axial accelerometry has been proven to be a powerful tool to study animal behaviour. Emergent tracking technologies, such as GPS and 3D accelerometers (Acc), allow the acquisition of movement information on aspects of species' ecology that might be key for their conservation. Steppe birds, such as Little bustards (Tetrax tetrax), Pin-tailed and Black-bellied Sandgrouse (Pterocles alchata and P. orientalis) and Eurasian Stone Curlews (Burhinus oedicnemus), are endangered bird species in Europe that need conservation attention, but their elusive behaviour makes difficult to observe free-ranging individuals to study many aspects of their ecology. Here, we present an experiment conducted on these steppe birds to identify the Acc signatures of different behaviours (i.e., foraging, resting, alert, lying) using automated camera recordings and machine learning. This experiment provides the first classification of several behaviours from Acc data in these species. The method developed in this experiment will allow the study of their fine-scale behavioural responses to changing environmental conditions and provide new knowledge on the strategies they adopt in response to agricultural intensification. The results have practical applications to address an array of conservation issues and open a new window for research on elusive steppe birds.

Synopsis

Presentation of an experiment for the first classification of several behaviours from accelerometer data in steppe birds

217

Role of magnetic sense in breeding dispersal of pied flycatchers *Ficedula hypoleuca*

Kristaps Sokolovskis ORCID iD, Tapio Eeva ORCID iD, Toni Laaksonen ORCID iD

Department of Biology, University of Turku, Turku, Finland

Abstract

It has been shown repeatedly that birds can perceive spatially varying components of earth's magnetic field and are very likely using this information when navigating in migratory flights. However, to what extent different components of the magnetic field come in to play in each of the three navigational phases (Long-distance, Narrowing-in/homing, Pinpointing-the-goal), as well the role of the navigation in dispersal, are still unclear. We investigate long-term data on breeding dispersal of a pied flycatcher population in relation to temporal variation in magnetic inclination. In addition, we present results of a 2023 pilot experiment on whether pied flycatchers use magnetic sense to return to their breeding site after displacement.

Synopsis

NA

Twitter handle

k_sokolovskis

218

Enhancing monitoring and transboundary collaboration for conserving migratory species under global change: the priority case of the red kite

Brady J. Mattsson[1], Patricia Mateo-Tomás[2,3], Adrian Aebischer[4], Sascha Rösner[5], Florian Kunz[1], Eva Schöll[1], Susanne Åkesson[6], Davide de Rosa[7], Duncan Orr-Ewing[8], David de la Bodega[9], Miguel Ferrer[10], Christian Gelpke[11], Jakob Katzenberger[12], Grzegorz Maciorowski[13], Ubbo Mammen[14], Martin Kolbe[15], Alexandre Millon[16], Aymeric Mionnet[17], Javier de la Puente[9], Rainer Raab[18], Stanislav Vyhnal[19], Guido Ceccolini[20], Alfonso Godino[21], Gabriela Crespo-Luengo[22], Jose Angel Sanchez-Agudo[22], Juan Martínez[23], Juan José Iglesias-Lebrija[23], Ester Ginés[24], Maria Cortés[25], Juan I. Deán[26], Ricardo Gómez Calmaestra[27], Marek Dostál[19], Eike Steinborn[15], Javier Viñuela[28]

[1]Institute of Wildlife Biology and Game Management, Department of Integrative Biology and Biodiversity Research, University of Natural Resources and Life Sciences Vienna, Vienna, Austria. [2]Biodiversity Research Institute (University of Oviedo-CSIC-Principality of Asturias), Mieres, Spain. [3]Center for Functional Ecology (CFE), Coimbra University, Coimbra, Portugal. [4]Independent researcher, Fribourg, Switzerland. [5]Faculty of Biology, Department of Conservation Ecology, Philipps-University Marburg, Marburg, Germany. [6]Department of Biology, University of Lund, Lund, Sweden, Lund, Sweden. [7]ARDEA-Associazione per la Ricerca, la Divulgazione e l'Educazione Ambientale, Naples, Italy. [8]Centre for Conservation Science, Royal Society for the Protection of Birds, Scotland, United Kingdom. [9]SEO/Birdlife, Madrid, Spain. [10]Doñana Biological Station, Spanish National Research Council (CSIC), Seville, Spain. [11]Independent researcher, Singlis, Germany. [12]Dachverband Deutscher Avifaunisten DDA e.V., Münster, Germany. [13]Department of Game Management and Forest Protection, Poznań University of Life Sciences, Poznań, Poland. [14]ÖKOTOP Halle, MEROS (Monitoring Raptors und Owls in Europe), Halle, Germany. [15]Rotmilanzentrum, Halberstadt, Germany. [16]Aix-Marseille Univ, CNRS-IRD-Avignon Univ, Institut Méditerranean Biodiversité Ecologie marine et continentale (IMBE), Technopôle Arbois-Méditerranée, Aix-en-Provence, France. [17]Ligue pour la protection des oiseaux (LPO), Outines, France. [18]TB Raab Ltd., Deutsch-Wagram, Austria. [19]University of Veterinary Sciences Brno, Brno, Czech Republic. [20]Associazione CERM Centro Rapaci Minacciati, Rocchette di Fazio (GR), Italy. [21]AMUS (Acción por el Mundo Salvaje), Badajoz, Spain. [22]Grupo de Investigación en Biodiversidad, Diversidad Humana y Biología Animal, Universidad de Salamanca, Salamanca, Spain. [23]GREFA (Grupo de Rehabilitación de la Fauna Autóctona y su Hábitat), Madrid, Spain. [24]Servicio Provincial de Agricultura, Ganadería y Medio Ambiente, Gobierno de Aragón, Zaragoza, Spain. [25]Centro de Recuperación de Fauna Silvestre de La Alfranca, Gobierno de Aragón, Pastriz (Zaragoza), Spain. [26]Sociedad de Ciencias Naturales Gorosti, Pamplona, Spain. [27]Subdirección General de Biodiversidad Terrestre y Marina, Dirección General de Biodiversidad, Bosques y Desertificación, Ministerio para la Transición Ecológica y el Reto Demográfico, Madrid, Spain. [28]Instituto de investigación en recursos cinegéticos (IREC; CSIC-UCLM-JCCM), Ciudad Real, Spain

Abstract

Calls for urgent action to conserve biodiversity under global change are increasing, and conservation of migratory species poses special challenges. In the last two decades the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and other policies have been credited with positive outcomes for the conservation of migratory species. Lacking, however, are efforts that integrate

ecological information throughout the annual cycle for examining strategies to conserve migratory species at multiple scales through international coordination in the face of global change. We fill this gap through a case study examining the ecological status and conservation of a migratory raptor and facultative scavenger, the red kite (Milvus milvus), whose current breeding range is limited to the temperate zone of Europe and is mainly associated with agricultural landscapes that provide foraging habitat. Based on our review, conservation actions have been successful at recovering red kite populations within certain regions. Populations however remain depleted along the southern-most edge of the geographic range where many migratory individuals from northern strongholds overwinter. This led us to an integrated strategy that emphasizes international coordination involving researchers and conservation practitioners to enhance the science-policy-action interface. We identify and explore key issues for conserving the red kite under global change, including enhancing conservation actions within and outside protected areas, recovering depleted populations, accounting for climate change, transboundary coordination, and adaptive management. The integrated conservation strategy is sufficiently general such that it can be adapted to inform conservation of other highly mobile species subject to global change.

Synopsis

Importance of international coordination among researchers and practitioners for conserving migratory species: case of Milvus milvus

Twitter handle

@bmattsson

221

Life history of world's oldest known Arctic Skua (*Stercorarius parasiticus*)

Elina Mäntylä ORCID iD[1], Kari Mäntylä[2], Jukka Nuotio[2], Kimmo Nuotio[2], Matti Sillanpää[2]

[1]University of Turku, Turku, Finland. [2]Pori Ornithological Society, Pori, Finland

Abstract

The arctic skua (*Stercorarius parasiticus*) is one of the most long-lived bird species. In 2010, we captured in Finland an adult, female arctic skua which had been ringed as a nestling in 1987. We also tagged it with a colour ring in 2010. The bird has last been seen in July 2022 at the age of 35 years, making it most likely the oldest known arctic skua of the world. It is now also the oldest ringed bird in Finland. It has bred on the same island on the coast of Satakunta, Finland from at least 1995. During this time, we have ringed 17 of its nestlings. At least five of these offspring we observed to have fledged and were ready for autumn migration. One offspring has returned to breed on a nearby island from 2020. In 2010–2011 the female bird carried a light-level measuring geolocator, the data of which revealed that it had spent the non-breeding season in the Canary Current area on the west coast of Africa. The breeding site fidelity of the species, and especially this individual, has provided us valuable long-term information of arctic skuas in Finland. For now, the Finnish breeding population has been stable but warning signals from other European colonies tell that the situation could deteriorate in the near future.

Synopsis

The breeding site fidelity of world's oldest arctic skua, 35 years, has provided valuable information of its fitness and migration

Twitter handle

@elinamantyla

226

Preferences for the colour of artificial nest material in a Great Tit (Parus major)

Adrian Surmacki ORCID iD, Piotr Zduniak ORCID iD

Adam Mickiewicz University, Poznań, Poland

Abstract

Tits (Paridae) are known to use anthropogenic materials for nest building. Mechanisms governing such behavior remain unclear. In this study we performed an experiment in which Great Tit females could choose between four colours of artificial nest material to use it as a nest lining. The study was performed in a woodland population of Great Tits nesting in nest boxes (n = 28). Equal amounts of red, yellow, blue and white samples of acrylic fibers ("artificial fur"), were distributed evenly in the study area prior to the nest building period. The use of each colour was assessed from photographs taken during egg laying and incubation periods and expressed as a percentage of the nest area covered with a given colour. Acrylic fibers were found in 82% of nests (n = 23). We found significant differences in the amount and frequency of fibers of different colors used to build the nest lining. Females preferred red fiber more than yellow and blue ones. However, presence of preferred fibers did not correlate with clutch size, breeding success and provisioning rate. We discussed possible reasons and consequences of the pattern found.

Synopsis

Great Tits like to add some colour to their nests

Twitter handle

@AdrianSurmacki

229

What people perceive to be versus what is actually there. Feral pigeons' perception by humans in relation to their actual phenotypes frequency and abundance in four Romanian cities.

Liviu Razvan Pripon[1], Valentin Adrian Kiss[2]

[1]Independent researcher, Cluj-Napoca, Romania. [2]University of Antwerp, Faculty of Science, Department of Biology Behavioural Ecology and Ecophysiology (BECO), Antwerp, Belgium

Abstract

People frequently come into contact with feral pigeons in urban settings. Additionally, feral pigeons exhibit a variety of patterns and colors. In this study, we wanted to find out whether or not people's perceptions of what they saw were accurate. To do this, we conducted 33 questionnaires to residents of Brașov, Sibiu, Cluj-Napoca, and Arad. Participants were asked to choose one of two images based on aesthetic value and to explain their choice in these questionnaires. Additionally, we requested that several volunteers photograph pigeons in these four cities. We used 14 images from each city, counted the pigeons, and divided the images into three categories: melanic phenotypes, blue-bar, and pale phenotypes. We discovered that blue-bar was the most frequently chosen form. The most frequent justification given was "I am more familiar with this image" (49%), indicating that this is the image that most people are used to. The blue-bar form is therefore thought to be the most common. The blue-bar form was not the most frequent or even the most abundant, according to our counting. The average frequency was f = 75% with low values in Brașov (f = 28.5 %). The mean abundance was A = 3.98 individuals/visual field, representing an average of 20.8% birds in a particular visual field. Since there is little to no correspondence between what people perceive and how birds actually appear, we came to the conclusion that there is a collective mental form that is projected onto visual perception.

Synopsis

NA

230

ASSESSING SPILL OVER RISK OF AVIAN MALARIA IN ILLEGALLY TRADED WHITE-WINGED PARAKEETS

ALFONSO MARZAL ORCID iD[1,2], Sergio Magallanes ORCID iD[3], Teresa Salas-Rengifo[4], Jaime Muriel ORCID iD[5], Daniel Vecco ORCID iD[2,6], Cesar Guerra-Saldaña[2], Luis Mendo[7], Vladimir Paredes[7], Manuel González-Blázquez ORCID iD[8], Luz García-Longoria ORCID iD[1], Alazne Díez-Fernández ORCID iD[1]

[1]University of Extremadura, Badajoz, Spain. [2]Grupo de Investigaciones en Fauna Silvestre, Universidad Nacional de San Martín, Tarapoto, Peru. [3]Estación Biológica de Doñana (EBD-CSIC), Seville, Spain. [4]Servicio Nacional de Áreas Naturales Protegidas por el Estado, Lima, Peru. [5]Instituto de Investigación en Recursos Cinegéticos (IREC), CSIC-UCLM-JCCM, Ciudad Real, Spain. [6]URKU Estudios Amazónicos, Tarapoto, Peru. [7]Área de Gestión de Fauna Silvestre, Autoridad Regional Ambiental, Gobierno Regional de San Martín,, Tarapoto, Peru. [8]Museo Nacional de Ciencias Naturales, Madrid, Spain

Abstract

Illegal and poorly regulated wildlife trade can threaten biodiversity, spread infectious diseases, and result in considerable animal suffering and mortality. Parrots (Family: Psittacidae) have the largest proportion of endangered species among all birds worldwide, with 27% of the 379 parrot species in the world are threatened to some degree of extinction. One of main factors provoking these population declines is the unsustainable poaching of psittacines for legal and illegal trade, which can have serious implications for conservation, animal welfare, and biosecurity, including the potential spread of infectious diseases. In this study we molecularly examined the prevalence and genetic diversity of haemosporidian parasites to assess spill over risk in illegally traded white-winged parakeets in San Martín region (Peru), a Tropical Andes Biodiversity Hotspot region with the highest conservation priority worldwide. We found a high number of white-winged parakeets infected with *Plasmodium relictum* GRW4, a malaria lineage provoking population decline and even extinctions of native avifauna when introduced beyond its natural range. These outcomes show the potential risk of malaria spread in translocated species by illegal wildlife trade.

Synopsis

Illegally traded white-winged parakeets may spread pathogenic malaria worldwide

Twitter handle

@AlfonsoMarzal

234

Ongoing major collapse of the Portuguese little bustard breeding population threatens the species of extinction in the short term

João Paulo Silva ORCID iD[1,2,3], Ana Teresa Marques ORCID iD[4,5,3], João Gameiro ORCID iD[4,5,3], Carlos Carrapato[6], Hugo Sampaio[7], Rita Alcazar[8], Carlos Godinho[9], Ana Delgado[10], Gonçalo Elias[11]

[1]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, Vairão, Portugal. [2]2 CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Instituto Superior de Agronomia, Universidade de Lisboa, Lisbon, Portugal. [3]BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Vairão, Portugal. [4]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Vairão, Portugal. [5]CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Instituto Superior de Agronomia, Lisbon, Portugal. [6]ICNF Direção Regional da Conservação da Natureza do Alentejo, Évora, Portugal. [7]SPEA, Sociedade Portuguesa para o Estudo das Aves, Lisbon, Portugal. [8]LPN Liga para a Proteção da Natureza, Lisbon, Portugal. [9]LabOr, Laboratório de Ornitologia, Évora, Portugal. [10]None, Castro Verde, Portugal. [11]Aves de Portugal, Castelo de Vide, Portugal

Abstract

The little bustard is a grassland bird that is threatened by agricultural intensification and conversion. The Iberian Peninsula is regarded as a stronghold for the species in Europe but has been experiencing a steep decline over the last decade. The first Portuguese national survey took place between 2003-06 revealing a population with a good conservation status and overall high breeding densities, including areas with the highest breeding densities known for the species. This led to the establishment of a network of Special Protection Areas (SPAs) in 2008. The 2016 survey showed a 47% reduction of the population, with greater losses inside than outside SPAs. This decline resulted from the loss in habitat quality due to changes in grassland management towards cattle, along with an expansion of the overhead powerline infrastructure. Outside SPAs there was a substantial expansion of irrigation followed by the conversion to permanent crops, resulting in a total loss of habitat. The survey of 2022 showed an overall decline of 78% compared with the 2003-06 estimates, and a 58% decline since 2016 (6 years). Presently, the species has become extinct from all areas not covered by SPAs and from two additional Important Bird Areas, along with a recent decline of 37% within SPAs. The conversion to permanent pastures for beef production and hay fields have expanded and intensified over the last years. With no effective actions been taken to reverse the situation, the little bustard is moving towards extinction in the short term in Portugal.

Synopsis

Major and ongoing collapse of the Little bustard population in Portugal threatens the species of extinction in the short term.

Twitter handle

@jpcampbellsilva

236

Prevalence, diversity and hematological effect of haemosporida parasites on the Common Starling *Sturnus vulgaris* population in Latvia

Antonija Rimša[1], Steffen Hahn[2], Raffaela Schmid[2], Aija Ilgaža[3,1], Mārtiņš Briedis[1,2], Oskars Keišs[1]

[1]Institute of Biology, University of Latvia, Riga, Latvia. [2]Swiss Ornithological Institute, Sempach, Switzerland. [3]Faculty of Veterinary Medicine, Latvia University of Life Sciences, Jelgava, Latvia

Abstract

This study examined microscopically and compared blood smear samples, obtained in 2020, 2021 and 2022 from Common Starling breeding population in Latvia. The parasitaemia level of haemosporida from genus *Plasmodium*, *Haemoproteus* and *Leucocytozoon* was compared between the infected samples, and the proportion of leukocytes and young erythrocytes between infected and non-infected samples was compared. Infected samples in 2020 constituted 15.7% (or 16 of 102 PCR tested samples), in 2021 the number of infected samples decreased to 5.6% (or 6 of 108 PCR tested samples), in 2022 the proportion of infected samples further decreased to 2.9% (or 3 out of 102 PCR tested samples). Out of all 210 samples that were PCR tested in 2020 and 2021, 0.95% were infected with *Leucocytozoon*, 1.9% with *Plasmodium* and 7.6% with *Haemoproteus* haemosporidian parasites. An increased proportion of leukocytes was observed in the blood of the infected birds. No association was observed between the genus of Haemosporida and the level of parasitaemia, as well as between the proportion of young erythrocytes and the infection status of the bird.

Synopsis

Level of haemosporida - Plasmodium, Haemoproteus and Leucocytozoon was analysed in blood of Starlings (Sturnus vulgaris) in Latvia

Twitter handle

@kulervo

237

Understanding patterns of terrestrial habitat use in Dublin's wintering waders

Steph Trapp[1], Ewan Weston[2], Kendrew Colhoun[3], Xavier Harrison[1], Stuart Bearhop[1]

[1]University of Exeter, Penryn, United Kingdom. [2]-, -, United Kingdom. [3]KRC Ecological Ltd, -, Ireland

Abstract

Dublin Bay hosts globally important populations of overwintering shorebirds, which has led to its designation as a Biosphere reserve. However, rapid urbanisation and rising demand for development is putting ever-increasing pressure on intertidal and terrestrial habitats in and around the city. In this project, we are using tracking data from four species of shorebird to measure spatial and temporal patterns of winter habitat use, and to identify the environmental and anthropogenic drivers of these patterns, as well as potential downstream consequences. We aim to investigate how individuals may differ in their movement behaviour and habitat selection when suitable habitat is patchily distributed across an urban or semi-urban landscape, and what impacts these differences may have on fitness.

So far we have deployed 47 GPS tags on redshank, 67 on oystercatcher, 33 on black-tailed godwit, and 47 on curlew, and colour-marked a total of 752 birds across three estuaries in north County Dublin. All species have shown use of intertidal and terrestrial habitats during the winter, with considerable variation in home range sizes between individuals. Some individuals appear to use grassland habitats for nocturnal foraging, while others make extensive and far-ranging use of terrestrial habitats for foraging at high tide during the day, sometimes travelling several miles into the city. A detailed knowledge of habitat use, movement behaviour and connectivity between sites will be critical for future planning and development in Fingal, if the full range of habitats required by these protected species is to be conserved.

Synopsis

NA

240

Changes in phenology of the laying dates and clutch size of the Common Starling Sturnus vulgaris in Latvia 1925–2022

Valts Jaunzemis ORCID iD[1], Ainārs Auniņš[2], Elza Zacmane[1], Mārtiņš Briedis[3], Viesturs Vīgants[1], Ance Priedniece[1], Antonija Rimša[1], Māris Jaunzemis[1], Oskars Keišs[1]

[1]Laboratory of Ornithology, Institute of Biology, University of Latvia, Riga, Latvia. [2]Faculty of Biology, University of Latvia, Riga, Latvia. [3]Department of Bird Migration, Swiss Ornithological Institute, Sempach, Switzerland

Abstract

We analyzed historic ringing records, nest card records and observations in sample plots of Common Starling in Latvia since beginning of the Latvian Bird Ringing scheme since 1925 and compared the data of 2020–2022. Wolfgang Schneider in his monograph “Der Star [Starling]” (1972) showed that clutch size of Starling is decreasing comparing two periods 1951–1958 vs. 1959–1971 in his sample plot near Leipzig, Germany. By analyzing 3052 full clutches in Latvia we did find slightly the opposite trend in our data ($r=0.13$; $p<0.0000$), but our sample are skewed towards modern data – total of 657 clutches in 2020–2022. At the moment there are still archival data to explore – to increase the sample size of historic clutch size. The same data pool yielded 537 cases, where date of laying the first egg is known. Regression showed that Starlings in Latvia are laying earlier their first egg for the period 1963–2021 ($r=-0.60$; $p<0.000$; $n=537$). If this has any effect on the survival of the offspring in the nests and in postbreeding period, remain questions for further study.

Synopsis

NA

250

How to make virtual species less virtual?

Katarzyna Malinowska ORCID iD, Katarzyna Markowska ORCID iD, Lechosław Kuczyński ORCID iD

Population Ecology Lab, Poznań, Poland

Abstract

The virtual ecologist approach is a useful tool in ecological research, as it allows testing different methodological aspects of species distribution models. However, the simulation methods used to date lack solutions that provide high biological realism and account for spatiotemporal variation. Therefore, we developed a method for generating biologically relevant virtual species by mimicking original data. The framework consists of the following steps: 1) fitting a model to real monitoring data, 2) simulating a virtual species from that model while retaining the most important features of the original system (such as abundance-environment relationship or spatial and temporal autocorrelation), 3) sampling, 4) applying a statistical method (here Generalised Additive Mixed Model and 5) evaluation. The procedure was repeated 1000 times to generate distributional characteristics of parameters. The effectiveness of the presented approach was tested on large-scale (Poland) and long-term (20 years) bird abundance monitoring data, using Whinchat (Saxicola rubetra) as a case study. We showed that the designed method replicates well the properties of the original system. The research was supported by the National Science Centre, Poland (grant no. 2018/29/B/NZ8/00066).

Synopsis

NA

253

Development of individual migration strategies in a songbird: an experimental approach

Morrison Pot ORCID iD, Marcel Visser, Henk van der Jeugd

Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands

Abstract

Migration is a spectacular adaptation to seasonality that includes massive movements and epic performances on a global scale. The fact that juvenile songbirds are able to navigate towards population-specific wintering grounds they have never visited before without guidance from experienced conspecifics has inspired generations of scientists. Experimental work has shown that songbirds genetically inherit a migratory program from their parents to migrate into a population-specific direction and distance at the right time of the year, using directional information from the sun, the stars and the Earth's geomagnetic field. Although we have gained extensive knowledge about the cues songbirds can use to navigate, experiments have mainly been performed using individuals showing migratory behaviour in captivity. To understand how migration is truly performed and how environmental variation encountered during early life may shape future migrations requires experiments with free-flying wild songbirds. In my PhD project we use novel tracking technology to perform orientation experiments with wild songbirds. More specifically, we use a modern approach to one of the most classic series of experiments in the field of bird migration: Albert Perdeck's large-scale displacement experiments, to understand how Common Starlings *Sturnus vulgaris* develop individual migration strategies.

Synopsis

NA

254

Agricultural management and environmental pollution with materials of anthropogenic origin - study on the nest material of the Red-backed Shrike Lanius collurio in Western and Eastern Poland

Martyna Gajzmer[1], Marcin Beszterda[1], Zbigniew Kwieciński ORCID iD[1,2], Klaudia Szala ORCID iD[1], Artur Goławski ORCID iD[3], Piotr Zduniak ORCID iD[1]

[1]Department of Avian Biology and Ecology, Adam Mickiewicz University, Poznań, Poland. [2]Institute of Biology, University of Szczecin, Szczecin, Poland. [3]Faculty of Sciences, Siedlce University of Natural Sciences and Humanities, Siedlce, Poland

Abstract

Agriculture has been one of the main human activities since the beginning of civilization. The intensity of farming influences the size of its impact on the natural environment. The issue of excessive use of chemical plant protection products and fertilizers leading to a decrease in biodiversity and soil quality is most often raised. On the other side, the problem of environmental pollution with anthropogenic materials, commonly referred to as litters, is much less frequently discussed.

One of the methods of monitoring environmental pollution by anthropogenic waste is the use of birds as bioindicators. The aim of the study was to assess the degree of contamination of the Red-backed Shrike nests with materials of anthropogenic origin occurring in agricultural areas used intensively (W Poland) and extensively (E Poland). The study was carried out in the breeding season 2021, after which 121 shrike nests were collected. Analysis of the nest material showed the presence of anthropogenic materials in 82.1% of them. Although the prevalence of litter in nests did not differ significantly between areas with different agricultural practices (intensive: 84.7%, 95% CL: 75.3–91.6; extensive: 74.1%, 95% CL: 53.7–88.9), the number of waste per nests in intensively used areas was higher (61.3, 95% CL: 59.6–62.9) than in areas used extensively (38.0; 95% CL: 35.7–40.4). This indicates that the farmland management affects the degree of littering.

Synopsis

NA

255

Does structural habitat management provide functional breeding habitat? A test with the Red-backed shrike

Suzon Rondeaux[1], Hans Van Dyck[1], Nicolas Titeux[2]

[1]UCLouvain, Louvain-la-Neuve, Belgium. [2]Luxemburg Institute of Science and Technology, Belvaux, Luxembourg

Abstract

Human land-use is a fundamental element to consider for understanding habitat selection in birds, as it may affect the correlation between the cues they use to select their habitat and the quality of that habitat. Planning species conservation management is usually based upon restoring structural habitat (e.g. vegetation types). However, structural habitat may deviate from the functional habitat encompassing all ecological resources (i.e. consumables and utilities) needed by the target organism. This is key to the resource-based habitat concept, which defines habitat in a functional, bottom-up way from the perspective of a particular organism. Here, we address a structural vs. functional habitat approach in the case of the Red-backed Shrike (Lanius collurio L., 1758), a migratory grassland bird in Europe. In this integrated field study, we focus on semi-natural grassland habitats created by different management regimes and their consequences for shrike habitat selection and reproductive success. Over three breeding seasons (2020-2022), we assessed attractivity and quality of different grassland habitats, tracking c. 200 shrike territories yearly. We investigated structural habitat variation through regular monitoring of management practices, hedge network and nest substrate, as well as nest-site microclimate. As all three years had extreme and contrasting weather conditions, our study is able to account for the influence of meso-climatic variation. We also assessed the link between structural and functional habitat based on field surveys assessing predation rate, insect prey offer and prey use, through a behavioural lens looking at shrike hunting behaviour and nest provisioning.

Synopsis

Structural vs. functional habitat: the case of the red-backed shrike

256

Eggshell pigmentation in postreproductive sexual selection of red-backed shrike *Lanius collurio*

Klaudia Szala ORCID iD[1], Marcin Tobółka[2,3], Adrian Surmacki[1]

[1]Department of Avian Biology and Ecology, Faculty of Biology, Adam Mickiewicz University, Poznań, Poland. [2]Department of Zoology, Poznań University of Life Sciences, Poznań, Poland. [3]Konrad Lorenz Institute of Ethology, University of Veterinary Medicine Vienna, Vienna, Austria

Abstract

There are many hypotheses about the functional significance of avian eggshell colouration. One of these is the sexually selected eggshell colouration (SSEC) hypothesis proposed in 2003. It assumes that the eggshell pigmentation is an honest signal of female's condition. The signal receiver is male that adjusts accordingly his own parental care. The SSEC hypothesis was already tested on a number of species with protoporphyrin-pigmented eggshells, but most of them were cavity-nesting species, and the results are equivocal. The aim of our study was to test the SSEC hypothesis on a species that lays protoporphyrin-pigmented eggs and builds open cup-nests.

As our model species, we selected the red-backed shrike *Lanius collurio*. The study was carried out in 2020-2022 in farmland in Western Poland. We measured the eggshell pigmentation using calibrated digital photography. Basing on the multiple biometric measurements, we calculated condition index for adults and nestlings. The males' investment was rated basing on approx. 1.5-hour recordings that were collected twice during the nestling period using GoPro cameras. In total, we gathered data for 36 nests.

According to the SSEC hypothesis, females in better conditions should lay more pigmented eggs, raise nestlings of better quality, and their partners should invest more in the offspring. These predictions were verified basing on data collected in the field and the results will be presented during the conference.

Synopsis

Eggshell pigmentation in postreproductive sexual selection of red-backed shrike Lanius collurio

Twitter handle

@Klaudia_Szala

262

Mandarin duck in Warsaw in 2016-2022: population development and habitat preferences.

Fatima Hayatli ORCID iD[1,2,3], Łukasz Wardecki[2,3], Dawid Sikora[4], Krzysztof Kajzer[3], Jan Rapczyński[5,3], Karol Karczewski[3,5], Radosław Włodarczyk ORCID iD[1]

[1]Department of Biodiversity Studies and Bioeducation, Faculty of Biology and Environmental Protection, University of Lodz, Lodz, Poland. [2]The Polish Society for the Protection of Birds – OTOP, Warsaw, Poland. [3]The Warsaw Ringing Team TRIDACTYLUS, Warsaw, Poland. [4]Institute of Forest Sciences, Bialystok University of Technology, Bialystok, Poland. [5]Forestry Student Scientific Association, Ornithological Section, Warsaw University of Life Sciences, Warsaw, Poland

Abstract

The first brood of Mandarin ducks in the wild in Poland was found in 2001 in The Royal Łazienki Park, Warsaw. Presence of mandarin ducks in this location was the result of the intentional introduction of six individuals (three pairs) as ornamental birds at the end of the 1990s. This wild population gradually increased up to 100 individuals during the next 12 years. The Royal Łazienki Park was the only place where females with chicks were observed regularly during that time. From 2013 onwards, a systematic increase in the number of breeding pairs began that was linked with colonization of new water bodies within the city. Regular counts of birds performed in years 2016–2022 revealed an increase from 75–80 pairs in 2016 up to 100–120 pairs in 2022. The average population growth rate was estimated at 4% per year. Currently, the species inhabits a wide range of water habitats and females with chicks are observed in more than 20 different locations. Most breeding sites, apart from the Royal Łazienki Park, were observed in recreation areas (parks with artificial ponds: 35.7% in 2021 and 40.5% in 2022). The territories located in natural habitats were connected with Vistula riverbed. They constituted 16.7 and 13.5 % of all territories in 2021 and 2022 respectively. Interestingly, all females, even in natural habitats were using artificial feeding as an important food supply. The greatest distance between the breeding site and The Royal Łazienki Park was 14.1 km.

Synopsis

The population of Mandarin Ducks in Poland is developing, but these birds are mostly still observed in urban areas.

Twitter handle

@FatimaHayatli

263

Are all siblings the same? Preferential infection with blood parasites in jackdaw nestlings

Anna George, Tamara Emmenegger ORCID iD, Christian Aastrup ORCID iD, Arne Hegemann ORCID iD

Lund University, Lund, Sweden

Abstract

Avian blood parasites are a widespread and common vector-transmitted parasite among wild birds. These protozoan parasites can cause acute and chronic infections in individuals at different life stages, with important effects on life-history trade-offs for both the bird and the parasite. In many bird species, infections with blood parasites happen already during the nestling period, when biting insects have easy access to their unfeathered skin. Little is known, however, about how the vectors choose which hosts to bite, and with respect to nestlings within a brood, which nestlings are more likely to become infected.

In this project, we examine the presence of infection with three blood parasite genera (Plasmodium, Leucocytozoon and Haemoproteus) in a nestbox population of jackdaw (Coloeus monedula) nestlings. Using this data, we determine if differential occurrence of infection exists in nestlings within a brood and between different broods, and answer the questions, do all nestlings or none in a brood tend to be infected? Are nestlings with particular size-related characteristics preferentially infected? Does this differ with parasite genus?

Understanding more about the link between parasites, vectors and bird hosts could lead to interesting insights into host-parasite relationships and the selective pressures acting on hosts and parasites, that help to shape their species' evolution, as well as the epidemiology of this disease.

Synopsis

NA

265

Spatial aggregation in breeding birds: habitat filtering, social information or functional response to predation?

Michal Wawrzynowicz, Lechoslaw Kuczynski ORCID iD

Adam Mickiewicz University, Poznan, Poland

Abstract

The decision where to settle is critical for successful reproduction and survival, so animals have developed various strategies to optimise habitat selection. As a result, an uneven spatial distribution of individuals arises — a pattern which in extreme cases can take the form of a clear spatial clustering. This may be due to habitat filtering; however, other forces may also play a role, like dispersal limitation or biotic interactions, e.g. the use of social information, or predatoravoidance. In birds, aggregation of territories (or nests) can have a positive effect on fitness due to, e.g. the dilution effect or collective nest defence, but on the other hand, it can have a negative effect if the predator responds functionally, for instance, by increasing its search effort in the area where it has managed to find a prey.

Thus, one can predict that birds, when making habitat selection decisions, actively respond to the structure of predator communities by adjusting the level of spatial clustering.

Hence, we hypothesised that the spatial distribution of territories/nests depends on the density of a functionally responsive predator. This hypothesis is tested using large-scale and long-term wildlife monitoring data associated with spatiotemporal environmental information.

The research was supported by the National Science Centre, Poland (grant no. 2018/29/B/NZ8/00066).

Synopsis

NA

Twitter handle

269

ROSE-RINGED PARAKEET'S WINTER COMMUNAL ROOSTING IN ATHENS GREECE

Pavlos Andriopoulos ORCID iD, Anna Elpida Karellou, Margarita Arianoutsou ORCID iD

National and Kapodistrian University of Athens, Athens, Greece

Abstract

Rose-ringed parakeet (*Psittacula krameri*) has been ranked as one of the most successful invasive bird species, with established alien populations in several European countries, including Greece. While during the breeding season Rose-ringed parakeets are dispersed in pairs, in wintertime they roost communally. An initial survey to locate all Rose-ringed parakeet roosts in Athens metropolitan area was performed in winter 2016-2017. Five communal roosts uniformly allocated 6,3 km to 8,3 km apart from each other, that hosted about 400 birds, were identified. The roost sites were similar in several aspects: the parakeets selected solely Eucalyptus trees to roost, at locations near busy highways and railways, either by the sea or next to inland surface waters. The first parakeets arrived at the roosts less than an hour before sunset and the last ones gathered there just a few minutes after sunset. Upon arrival and for about half an hour after sunset they kept on calling. As the observable parakeet activity when roosting lasts less than two hours, it is more challenging than expected to locate the roost sites. The uniform spatial distribution, the similar characteristics between the roost sites and the tight time pattern of the parakeet's activity when roosting, may serve as a basis to design efficient Rose-ringed parakeet roost sites surveys in the future.

Synopsis

NA

Twitter handle

270

The intrasexual variation in the moult strategy of flight feathers of lekking species - Great Snipe Gallinago media

Marta Witkowska ORCID iD[1], Pavel Pinchuk[2], Włodzimierz Meissner[1], Natalia Karlionova[3]

[1]University of Gdańsk, Gdańsk, Poland. [2]National Park 'Pripyatsky', Turov, Belarus. [3]National Academy of Sciences of Belarus, Minsk, Belarus

Abstract

Adult Great Snipes moult their flight feathers on breeding grounds, prior to long-distance migration towards wintering grounds in Africa. Here we provide the preliminary results on the strategy of moulting primary feathers by male and female Great Snipes, obtained on breeding grounds of the East-European, lowland population of this species. In the whole studied period, from the second half of May till the first half of August, we were able to encounter birds in three different moult stages: 1. moult not started; 2. active moult; 3. moult suspended. The number of individuals in a given stage of moult varied in different periods of this study, with a number of actively moulting individuals, as well as those with suspended moult increasing in time. Although the frequency of individuals without any signs of ongoing moult was decreasing in time, such individuals were still present in the first half of August. There was no difference in the frequency of different moult stages between males and females in general. However, the UZ model indicated that males started moulting almost two weeks earlier compared to females (mean starting date for males: 7th of June; for females: 21st of June), with almost 30 times faster duration of this process. Our results complement the knowledge on flight feather moult strategy in Great Snipe, acquired previously on the wintering grounds, and highlight the intrasexual differences in this process, resulting most probably from different parental duties of males and females of this lekking species.

Synopsis

NA

Twitter handle

@she_birds

272

Population density and endoparasite load in a well-adapted urban exploiter

Weronika Pietrzak[1], Aleksandra Szymańska[1], Amelia Chyb ORCID iD[2], Maciej Kamiński ORCID iD[2]

[1]Faculty of Biology and Environmental Protection, University of Lodz, Łódź, Poland. [2]Department of Biodiversity Studies and Bioeducation, Faculty of Biology and Environmental Protection, University of Lodz, Łódź, Poland

Abstract

Creating urban populations of high numbers and high density is considered to be one of the major features of urban exploiter species. However, such conditions might facilitate the transfer of pathogens from one individual to another, leading to deterioration of body condition and fitness of hosts. We examine the effect of population density on endoparasites prevalence in feral pigeon *Columba livia domestica* – a well-adapted urban species which is notorious for dwelling in great abundance and extreme population density. We use a McMaster counting chamber to quantify the endoparasite egg load in fecal samples individually collected from pigeons captured in high and low population density in the Łódź city (central Poland). Results of the screening study suggest that high and low population densities differ in terms of endoparasites fauna composition, prevalence and infestation rate, as the individuals from high population densities tend to be infected more often and to have a higher endoparasite egg load. On the other hand, screening results show no association between blood haemoglobin concentration (an index of physiological condition) and the total number of eggs in a sample. It might indicate that feral pigeons are able to mitigate the negative effects of endoparasites presence. The associations between population density and fitness-related traits deserve wider investigation in urban ecology studies.

Synopsis

NA

273

The study of bird migrations at the Capital: Ankara in Türkiye

Arzu GURSOY-ERGEN ORCID iD[1], Ayşenur AKGUN ORCID iD[1], BURAK TATAR ORCID iD[2], C.CAN BILGIN ORCID iD[3]

[1]Ankara University, Faculty of Science, Ankara, Turkey. [2]General Directorate of Nature Conservation and National Parks, Ankara, Turkey. [3]Middle East Technical University, Department of Biological Sciences, Ankara, Turkey

Abstract

Although the wetland richness of Central Anatolia (Turkey) is relatively limited, the basin formed by Lake Eymir and Mogan is very important for birds due to its high biological diversity. With a population of around 5 million, this area near the capital: Ankara is home to thousands of breeding and passage migrant species. The aim of the study is to show the importance of the Eymir Ringing Station on migration through the Black Sea/Mediterranean route.

The ringing studies were carried out on the eastern edge of Eymir Lake (38.827° N 32.845° E) between 2018-2022. Birds caught with mist-nets, all birds were ringed, and measured according to SE European Bird Migration Network standards. A total of 9147 birds of 83 species were ringed in 5 years, 2627 in the spring and 6520 in the autumn. The percentages of retrapped and control birds were respectively 24.71% and 5.75% in spring and 14,25 % and 1.83% in autumn. The most numerous species was the Sylvia atricapilla both in spring (947) and autumn (3850). During spring, the three most common species were Phylloscopus trochilus (293), Phylloscopus collybita (209) and Luscinia megarhynchos (103) while in autumn the dominate species were P.trochilus (299), Passer domesticus (296) and Muscicapa striata (205).

Two S.atricapilla were recovered in Israel while one in Lubnan. Curruca curruca ringed in Estonia and Erithacus rubecula ringed in Romania were caught in Eymir Station. Two individuals belonging to the nightingale breeding population in the area were caught 6 and 7 years after ringing.

Synopsis

With a population of around 5 million, Eymir near the capital:Ankara is home to thousands of breeding and passage migrant species

Twitter handle

fond of spending time in the field

274

Why do birds incorporate anthropogenic materials into their nests?

Juan Diego Ibáñez-Álamo[1], Zuzanna Jagiello[2], S. James Reynolds[3], Jenő Nagy[4], Mark C. Mainwaring[5]

[1]University of Granada, Granada, Spain. [2]Poznan University of Life Sciences, Poznan, Poland. [3]University of Birmingham, Birmingham, United Kingdom. [4]University of Debrecen, Debrecen, Hungary. [5]Bangor Univrsity, Bangor, United Kingdom

Abstract

Many bird species incorporate anthropogenic materials (e.g. sweet wrappers, cigarette butts, fishing line, plastic strings) into their nests. These human-made objects can provide important benefits to birds such as serving as reliable signals to conspecifics or protecting against ectoparasites but they can also impose crucial costs like deadly entanglements or low insulative properties. From an ecological perspective, several hypotheses have been proposed to explain the use of anthropogenic nest materials by birds but no previous interspecific study have tried to identify the evolutionary underlying mechanisms behind this behaviour. First, we performed a systematic literature search to compile all current available information on the topic. Second, we run phylogenetically informed comparative analyses to examine the interspecific variation in the use of anthropogenic materials among species and tested for the influence of several ecological and life-history traits. Our results indicate that this apparently novel behavior is much more widespread than initially expected. We identified plastics as the most common human-made objects in avian nests. Finally, we found that sex dimorphism and nest type significantly influence the use of these materials by birds. We will discuss the implications of such findings and those areas where further attention is most urgently warranted in this burgeoning research field.

Synopsis

NA

276

Impact of river dams on wintering waterfowls in Central Anatolia/Türkiye under the Climate Change

ARZU GURSOY-ERGEN ORCID iD[1], ILKER OZBAHAR ORCID iD[2]

[1]Ankara University, Faculty of Science, Ankara, Turkey. [2]Nature Research Society, ANKARA, Turkey

Abstract

River basins are dynamic ecosystems that connect diverse habitat types through the exchange of nutrients, resources and individuals along the watercourses. The central Anatolian region is very limited in terms of natural wetlands. Since the 1950s, many large and small reservoirs have been built on river dams for hydroelectric projects, flood control and drinking water supply in Türkiye. The construction of new dams is expected during the forthcoming decades.

Waterbird Census in Turkey have been carried out since 1967 but regularly organised since the beginning of the 2000s between January 15 and February 15 every year. The proportion of birds counted in natural wetlands increased from 10.16% to 33.88% while the number of birds counted in reservoirs increased from 4.33% to 37.63% between 1967-1999 and 2000-2022. An example; the Aythya ferina numbers decreased from 33.87% to 8.16% in natural wetlands, and it increased from 7.29% to 47.99% in reservoir areas.

Mostly when northern latitudes have cold weather, the waterfowl may prefer to winter in Central Anatolia, or in relatively mild winters, they may stay instead of migrating to the South. Although such constructions cause great disturbances to landscapes and wildlife habitats, a number of high waterfowl are counted in these reservoirs nearly every winter after the 2000s during the Waterbird Census in Central Anatolia.

Long-term population trends reveal the increasing importance of Central Anatolian reservoirs for wintering waterbirds.

Synopsis

Long-term population trends reveal the increasing importance of Central Anatolia for wintering waterbirds

Twitter handle

fond of spending time with birds

277

“Perfect observer” - how often we make mistakes in estimating distances

Julia Barczyk, Grzegorz Neubauer, Marta Cholewa

University of Wrocław, Wrocław, Poland

Abstract

Distance sampling is a common methodology used for estimating density or abundance in ecology. Sampling birds using point counts has become very popular; many of them are conducted worldwide every year. In point count surveys, birds are recorded from a point that is the centre of a circular sampling site. One of the main assumptions of the distance sampling methodology is that distances are measured without errors. Our study aimed to check how well observers assess distances to detected birds. We conducted more than 500 field tests in Białowieża Forest, Poland on various Passerine species, in 2021 and 2022. Our results indicate that the farther a bird is from us, the more likely its distance is assessed incorrectly. The distances estimated for individuals singing beyond 100 meters are most often underestimated. These findings point to difficulties in accurately estimating the location of birds, hence, possible problems with the correct estimation of abundance.

Synopsis

NA

281

Do males penalize unfaithful females in a population with high level of extra-pair paternity?

Balázs Rosivall ORCID iD[1], Helga Gyarmathy ORCID iD[1], Renáta Kopena ORCID iD[2], Fanni Sarkadi ORCID iD[1], Eszter Szöllősi ORCID iD[1], Eszter Szász ORCID iD[1], János Török ORCID iD[1]

[1]Behavioural Ecology Group, Department of Systematic Zoology and Ecology, Eötvös Loránd University, Budapest, Hungary. [2]Evolutionary Ecology Research Group, Institute of Ecology and Botany, Centre for Ecological Research, Vácrátót, Hungary

Abstract

Extra-pair mating behaviour has been observed in 76% of the socially monogamous bird species. This behaviour seems to be evolutionary beneficial for the cuckolding males, because they can increase the number of their progenies without investing energy in their provisioning. A number of potential benefits have been suggested also for the unfaithful females, such as fertility insurance, increased genetic quality or increased genetic diversity of the offspring. However, the cuckolded males clearly suffer fitness loss, because their investment in the offspring will not or will only partly return. The risk of paternity loss varies considerably among species: 1-86% of the broods include extra-pair young. According to the certainty of paternity hypothesis, it may be beneficial for the males that are uncertain about their paternity to decrease their investment into the current breeding event, thereby increasing their survival and future reproductive potential. We tested this prediction in a Hungarian population of collared flycatchers (*Ficedula albicollis*) where, according to an earlier study, 56% of the broods contain extra-pair young. First we cross-fostered chicks two days after hatching among three broods, so that each parent reared offspring from two foreign broods and none from their own. This way, any correlation between feeding rate and extra-pair paternity may be attributed to the males' notion of paternity and not caused by early maternal effects or different behaviour of extra-pair and within-pair offspring. Our results will help to answer the question whether males recognize and penalize their unfaithful partners in populations with high infidelity.

Synopsis

"NA"

282

Stable isotope analysis is a reliable method for identifying migrants and residents in a partially migratory European hoopoe (*Upupa epops*) population in southern Spain.

Mercè Palacios[1], María Herrero[2], Elena Arriero ORCID iD[1], Ana López-Rodríguez[1], Francisco Pulido ORCID iD[1], Juan J. Soler ORCID iD[3], David Martín-Gálvez ORCID iD[1], Manuel Martín-Vivaldi ORCID iD[2]

[1]Complutense University of Madrid, Madrid, Spain. [2]University of Granada, Granada, Spain. [3]Arid Zones Experimental Station, Institute of the CSIC, Almería, Spain

Abstract

Avian migration is one of the most investigated topics in behavioural ecology. Partial migration is of particular interest, since it allows studying differences among migrants and residents, and the persistence of these two behaviours within one population. However, most studies have been conducted on populations of passerines in which the migratory individuals migrate short distances, making it difficult to distinguish them from residents. The European hoopoe is a non-passerine, long-distance migrant that is partially migratory in southern Spain. We expected that the marked differences in wintering latitude found in these hoopoe populations would facilitate reliably identifying migrants and residents.

The aim of this study was to establish a method to identify migrants and residents, and to use it to investigate migration tendencies within a partially migratory hoopoe population. We used stable-isotope ratios of hydrogen in nails and several types of feathers to determine the wintering area of individual hoopoes. This allowed us to determine which tissue samples provided the most reliable information, and to study intrapopulation variation in migration strategy. We found that migrants are more frequent than residents, without an apparent difference between sexes and age groups. Moreover, we found that all flight feathers in adults and moulted secondaries and secondary coverts in juveniles were the most informative feathers for determining migratory status. Our results indicate that stable isotopes are a reliable method for elucidating migration patterns in hoopoes. This system will allow addressing fundamental questions on the genetics, physiology and ecology of avian migration.

Synopsis

Stable isotope analysis: a reliable method for identifying migrants & residents in a partially migratory European hoopoe population

Twitter handle

@Mercepalacios_

283

Haemosporidian parasites and European Robins: lineage specific correlations during autumn migration

Nora Agh[1], Tibor Csörgő[2], Eszter Szöllösi[3]

[1]Behavioural Ecology Research Group, Center for Natural Sciences, University of Pannonia, Veszprém, Hungary. [2]Department of Anatomy, Eötvös Loránd University, Budapest, Hungary. [3]Behavioural Ecology Group, Department of Systematic Zoology and Ecology, Eötvös Loránd University, Budapest, Hungary

Abstract

Though Haemosporidian blood parasites might strongly affect the different life-history traits of the birds, the role of these parasites in migration is less studied. Here we tested whether a relationship exists between *Haemoproteus* or *Plasmodium* infection and body condition or the timing of autumn migration of European Robins (*Erithacus rubecula*). We found that infection status had no effect on the body mass and fat scores of the individuals, however infected juveniles arrived later than parasite free individuals from the same age group. When we analysed the effects of the three most common parasite lineages separately, we found that the direction of the relationship between parasite prevalence and body condition or timing of autumn migration differed between the different lineages. Our results therefore emphasize that lineage-specific effects of parasites during migration may exist.

Synopsis

NA

Twitter handle

NA

285

Agri-environment schemes alter colonization-extinction dynamics and mitigate the population decline in the corn bunting, an endangered farmland bird

Urs G. Kormann ORCID iD[1], Francesca S. Fehlberg[1,2], Michael Schaub ORCID iD[1], Paul Mosimann-Kampe[3], Stephan Stebel[3], Simon Birrer ORCID iD[1], Matthias Vögeli ORCID iD[1]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]School of Ocean Science, Bangor University, Bangor, United Kingdom. [3]Büro für Landschaftspflege und Faunistik, Ins, Switzerland

Abstract

Ecological compensation areas (ECAs) are a widely applied policy tool to halt the decline of farmland birds, but the effect on long-term population dynamics of endangered bird species remains unclear. Here we assessed changes in breeding habitat type associations of the emblematic corn bunting (Emberiza calandra) from 1995 until 2020 in Switzerland's largest remaining population. By combining long-term breeding bird surveys with temporal series of aerial photography, we tested how territory occupancy dynamics varied over time among various types of ECA and non-ECA and with conspecific density across multiple spatial scales. The study population declined by 81% during the 26-year study period. This decline was strongest for territories on arable land and pastures, resulting in a shift in habitat use from arable land to the ECAs flower strips and extensively managed meadows. Dynamic occupancy models indicated that this shift was likely driven by habitat-specific temporal trends in colonization rates, which remained constant or even increased over time in both ECA types but decreased on non-ECA farmland. In parallel, extinction rates were lowest in the ECA flower strips, but time-invariant. Importantly, conspecific density strongly increased colonization and attenuated extinctions. Our results underscore the importance of perennial flower strips in proximity to existing populations for the conservation of corn buntings in Switzerland, and more broadly the importance of spatially targeted AES for the conservation of farmland birds. This study exemplifies how long-term monitoring schemes coupled with dynamic occupancy modeling can improve AES by informing species-specific conservation measures and biodiversity-friendly farmland management.

Synopsis

Agri-environment schemes alter colonization-extinction dynamics and mitigate population decline in corn bunting

Twitter handle

@urskorme

296

Using long-term data series to design adequate protected areas that ensure the conservation of inconspicuous small petrel species

Andrés De la Cruz ORCID iD[1,2], Jorge Pereira[2], Vitor Paiva[2], Jaime Ramos[2], Nuno Oliveira[3], Hany Alonso[3], Camilo Saavedra[4], José Antonio Vázquez[4], Isabel García-Barón[5], José Manuel Arcos[6], Gonzalo M. Arroyo[1]

[1]University of Cadiz, Puerto Real, Spain. [2]University of Coimbra, Coimbra, Portugal. [3]Sociedade Portuguesa para o Estudo das Aves, Lisbon, Portugal. [4]Spanish Institute of Oceanography (IEO-CSIC), Vigo, Spain. [5]AZTI Marine Research, Pasaia, Spain. [6]SEO/BirdLife, Barcelona, Spain

Abstract

Seabirds are among the most threatened vertebrates worldwide. Marine Protected Areas (MPAs) are widely used tools for their conservation and management. The delimitation of protected areas is challenging, especially when the species are small, elusive, and inconspicuous, as few data are usually available to properly assess their distribution at-sea. Therefore, currently designated MPAs may not effectively cover key areas for small seabirds, particularly during the migrating and wintering seasons.

Ensemble species distribution models (ESDMs) were used on a 15-year time-series dataset of at-sea census along the Atlantic Iberian arc to predict the distribution of the European smallest seabird, the European storm-petrel (Hydrobates pelagicus), and compare it with declared marine Special Protection Areas (SPAs).

The occurrence of European storm-petrel was related with the sea surface temperature, and with small distances from the coast over the continental shelf.

The most important area for the European storm-petrel in the Atlantic Iberian arc was located from west-central Portugal to the north-western coast of the Iberian Peninsula and a secondary key area was located in the Gulf of Cadiz.

Both areas host important SPAs, but insufficient to effectively cover important key areas for European storm-petrels. Our results point towards an extension of marine SPAs in the Atlantic Iberian arc to best achieve effective protection for storm petrels.

Synopsis

NA

305

Survival of Collared pratincoles is affected by wintering climate in Africa

Sandra Hodić[1], Jocelyn Champagnon ORCID iD[1], Pedro Marin Prado[2], Pablo Vera[3]

[1]Tour du Valat, Arles, France. [2]Grupo Ornitológico – Gotur, València, Spain. [3]Servicio de Conservación de Ambientes Acuáticos, València, Spain

Abstract

Afro-Palearctic migrants are in decline across Europe and these declines are of high conservation concern. Wintering conditions in Africa are found to be of great significance for population limitation of long-distance migrants. Wintering conditions may affect population growth through direct effect on survival in wintering grounds but limited studies tested the impact of climatic factors on the survival rate of species because it requires long-term dataset using capture-recapture methods. The collared pratincole is an insectivorous and strictly migratory bird that nests in Europe in grasslands and steppes. It remains very dependent on wetlands for insect feeding. It is found in the savannahs where it occurs in West Africa, mainly in the Sahel. In this study, we used a mark-recapture dataset of 13 years collected on breeding ground in L'Albufera Spain to confirm that survival of collared pratincole varied over years. Then we found that NDVI index (a remotely sensed measures of vegetation based on primary production) in December in West Africa explained 62% of the residual variation in survival with a positive effect of density of vegetation on annual survival probability. Our study suggests that decline of western European population of collared pratincoles is driven by dryer winters in Sahel over the last decades, explaining temporal trend of annual survival probability and consequently, the decline of this western European population. The pratincole is a good candidate as a sentinel of declining Afro-Palearctic migrants.

Synopsis

Survival of Collared pratincoles is affected by wintering climate in Africa

Twitter handle

Jocelyn_tdv

309

Invasive avian malaria in North America— past, present, and future

Angela Theodosopoulos ORCID iD, Olof Hellgren ORCID iD, Staffan Bensch ORCID iD

Lund University, Lund, Sweden

Abstract

Anthropogenic impacts on species ranges are global and pervasive across ecological hierarchies. An emerging issue of increasing relevance is the inadvertent exchange of parasites and other pathogens across species and spatial boundaries (e.g., hitch-hiking via human-mediated translocation). A major knowledge gap exists in our understanding of how parasites are able to expand their ranges both taxonomically and spatially. One species complex that provides an excellent model for studying the genomic architecture of parasite range expansions is *Plasmodium relictum*, an avian malaria-causing parasite. Avian malaria is a mosquito-borne disease caused by *Plasmodium* parasites. Given its cosmopolitan nature (i.e., *P. relictum* being present on every continent except Antarctica) coupled with the high diversity of its avian hosts, *Plasmodium relictum* is an exceptional system for investigations of host-parasite range dynamics. The SGS1 strain of *P. relictum* has a native range encompassing regions in Eurasia and Africa but has recently been documented in North American birds. Invasion potential (and documented success) of the strain provides an opportunity to better understand how parasites evolve as they expand their ranges. We will present data on where SGS1 is currently known to occur in North America, and what bird species it is infecting. Additionally, we are using genomic sequence capture methods to characterize the phylogeography of SGS1 across North America in contrast to its native range. Our goal is to find the source population in its native range, approximate when this introduction happened, and explore how SGS1 might be evolving as it expands its range.

Synopsis

NA

313

Limnology for the ornithologist: effects of Lake Maggiore water level on migratory flows

Silvia Giuntini ORCID iD[1], Clara Tattoni ORCID iD[1], Alessandra Gagliardi[1,2], Alessio Martinoli ORCID iD[1,2], Nicola Patocchi[3], Roberto Lardelli[3], Adriano Martinoli ORCID iD[1], Damiano G. Preatoni ORCID iD[1]

[1]Unità di Analisi e Gestione delle Risorse Ambientali – Guido Tosi Research Group, Dipartimento di Scienze Teoriche e Applicate, Università degli Studi dell'Insubria, Via J.-H. Dunant 3, 21100, Varese, Italy. [2]Istituto Oikos onlus, Via Crescenzago 1, 21034, Milan, Italy. [3]Fondazione Bolle di Magadino, Vicolo Forte Olimpo 3, 6573, Magadino, Switzerland

Abstract

Wetlands are widely recognised as critical stopover locations along migration flyways. We examined how artificially regulated water levels of Bolle di Magadino marshes (Lake Maggiore, CH) affect the stopover of passerine species using CMR data collected at the local ringing station and the migratory traffic rate (MTR) supplied by an avian vertical-looking radar (VLR). Daily time series of water levels, rainfall, and area of flooded habitats were correlated to stopovering bird abundances of 5 target passerine species estimated by CMR and passerine VLR data. We found a significant negative correlation between MTR and flooded area; however, mixed responses emerged from CMR, which showed higher stop-over days frequency for the common reed bunting (*Emberiza schoeniclus*), while the opposite was true for the common chiffchaff (*Phylloscopus collybita*) and the European robin (*Erithacus rubecula*). These findings are consistent with the eco-ethology of the species and will support environmental authorities in defining optimal management of Lake Maggiore water levels including careful considerations on migrating birds.

Synopsis

An aid for managing the level of Lake Maggiore to preserve its role as an important stopover area for migrating birds.

Twitter handle

silviagiuntini2

315

Three forms of the Greenish Warbler complex (*Phylloscopus trochiloides* sensu lato) show different ways of increase in song complexity

Anton Morkovin[1,2], Irina Marova[3], Vladimir Ivanitskii[3]

[1]Conservation Biology Department, Georg-August-University Gцttingen, Goettingen, Germany. [2]Zoological Museum of Moscow State University, Moscow, Russian Federation. [3]Moscow State University, Moscow, Russian Federation

Abstract

We compared the song structure and syntax in Western Greenish Warbler *Phylloscopus trochiloides viridanus*, Two-barred Warbler *Ph. trochiloides plumbeitarsus*, and Green Warbler *Ph. (t.) nitidus*, recorded in Russia in 2018-2022. The Green Warbler has an isolated breeding range in Caucasus, Transcaucasia and Asia Minor; we recorded its vocalization in Krasnodar region and Karachay-Cherkess Republic. Two Green Warbler subspecies have wide ranges in the Eurasian forest belt; we made records in allopatric populations of Moscow and Kaluga regions for *viridanus*, Irkutsk region and Republic of Buryatia for *plumbeitarsus*. All representatives of the Greenish Warbler complex perform discrete songs, made of stable note sequences called song units. We described song structure, population and individual repertoires and spectra-temporal characteristics of their singing. The population repertoire was the largest in *Ph. nitidus*, and the smallest in *Ph. viridanus*. The latter performs mostly long song units, while the former combines them with short and repeated ones. In *Ph. plumbeitarsus*, there was a distinction between different males: some of them performed short and repeated units, while others used mostly longer and not repeated ones. In all forms, most elements were specific to a unit type. On the level of the song sequence, form *viridanus* had the strictest unit order, and *nitidus* the most variable: we suppose it depends on the repertoire size, as the order can be memorized easier in case of a smaller unit repertoire. The repertoire of *viridanus* and *plumbeitarsus* could shrink during their range expansion because of the founder effect.

Synopsis

Song syntax differences in three Greenish Warbler forms - viridanus, plumbeitarsus and nitidus - different ways of song elaboration.

Twitter handle

@Moscow_Birds

316

Modelling spatial variation in West Nile virus risk in Europe using bird and mosquito occurrence data and local climatic conditions

Marianne Rijtma, Henjo de Knegt, Kevin Matson, Fred de Boer

Wageningen University & Research, Wageningen, Netherlands

Abstract

Birds play important roles in the transmission cycles of a number of zoonotic diseases. West Nile virus (WNV), for instance, is a mosquito-borne virus that uses several bird species as amplifying hosts and that can cause disease in humans. The geographical range of WNV is expanding in Europe, and this expansion may continue or accelerate with ongoing anthropogenic changes in climate and land use. Correlative statistical modelling is a powerful approach for identifying ecological factors associated with disease risk and for locating areas with high transmission probabilities and outbreak hazards. For WNV to persist at a certain location, suitable temperatures and the simultaneous occurrence of reservoir competent birds and competent mosquito vectors are required. We used machine learning techniques to predict and map environmental suitability for WNV in Europe. Our model relates historical data on human and equine cases to ecological predictors, i.e., the occurrence of individual European bird species, the probability of presence of the main WNV mosquito vector (Culex pipiens), and local climatic conditions. In addition to distinguishing areas that are suitable for WNV transmission from those that are not, the model can highlight bird species that are tightly associated with WNV outbreaks. Ultimately, this information can be used to shape predictions about the current and future distribution of the virus and to prioritize areas and bird species for surveillance.

Synopsis

Modelling spatial variation in West Nile virus risk in Europe. Can we use birds to predict the next outbreak?

Twitter handle

@MarianneRijtma

317

Daily housework routine: exploring variation in nestling provisioning rates in lesser kestrels *Falco naumanni* breeding in different landscape contexts

Davide Scridel ORCID iD[1], Alejandro Corregidor-Castro ORCID iD[2], Simone Militti[2], D'Aguì Claudia[3], Claudia De Battisti[4], Alessia Masè[3], Alessandro Berlusconi ORCID iD[5], Jacopo Cecere ORCID iD[6], Andrea Pilastro ORCID iD[2], Diego Rubolini ORCID iD[3,1], Michelangelo Morganti ORCID iD[1]

[1]CNR-IRSA National Research Council-Water Research Institute, Brugherio (MB), Italy. [2]Department of Biology, University of Padua, Padua, Italy. [3]Department of Environmental Science and Policy, University of Milan, Milan, Italy. [4]Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Università di Bologna, Bologna, Italy. [5]Environment Analysis and Management Unit - Guido Tosi Research Group - Department of Theoretical and Applied Sciences, Università degli Studi dell'Insubria, Insubria, Italy. [6]Area Avifauna Migratrice, Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Ozzano dell' Emilia (BO),, Italy

Abstract

Individual variation in provisioning rates of chicks has been documented for many bird species, but there has been limited research on how rates vary throughout the day and across different landscapes. We examined variation in hourly provisioning rates in two populations of the lesser kestrel (*Falco naumanni*) settled in different breeding sites and agricultural landscapes. We focused on one of the world's largest urban colonies of the species (Matera, S. Italy) and a small colony in the agricultural area of the Po Plain (N. Italy). By utilizing a combination of camera trapping and field observation techniques, we found remarkable differences in nestling provisioning rates across sites. Birds in Matera had less than half the provisioning rates compared to those in the Po Plain. Indeed, the foraging behaviour in these two colonies is different, as birds breeding in the more urbanized area of Matera had to travel up to 17 km to reach suitable foraging habitats, whereas in the Po Plain most foraging attempts occurred within 3 km of the colony site. Parental effort was also differed between the two populations, with Po Plain females showing a peak in the middle hours of the day whereas males showed a more constant hourly feeding rate. In contrast, no parental differences were detected in Matera. Our findings suggest that the observed variations may depend on differences in body size, parental behaviour, and the landscape context of the breeding location, which could ultimately affect the fitness of offspring across the bird's breeding range.

Synopsis

Consequences of breeding in different landscape contexts for lesser kestrels Falco naumanni

Twitter handle

Davide Scridel is a post-doc a CNR-IRSA National Research Council (Italy) for the LIFE FALKON project (LIFE17 NAT/IT/000586)

323

Breeding behaviour of Central European Red Kites

Marek Dostál ORCID iD[1], Jan Škrábal ORCID iD[1], Rainer Raab[2], Péter Spakovszky[2], Hynek Matušík[3], Ján Svetlík[4], Boris Maderič[4], Karel Makoň[5], Ivan Literák ORCID iD[1]

[1]University of Veterinary Sciences Brno, Brno, Czech Republic. [2]Technisches Büro für Biologie Mag. Dr. Rainer Raab, Deutsch-Wagram, Austria. [3]NA, Březolupy, Czech Republic. [4]Raptor Protection of Slovakia, Bratislava, Slovakia. [5]Animal Rescue Station, Pilsen, Czech Republic

Abstract

The Red Kite (*Milvus milvus*) is a native raptor to Europe, while scattered populations are distributed in North Africa and some individuals in the Near East. Relatively high breeding density occurs in Germany, Switzerland, France and Spain, whereas a small semi-migratory breeding population is expanded in Central Europe. Between 2017–2022, we studied a behaviour and its influences on breeding productivity of 33 adult Red Kites, during their total of 70 successful breeding episodes in Austria, the Czech Republic, and Slovakia. Using satellite telemetry and *in situ* observations, we described in details arrival and departure to and from the breeding territory within a calendar year, the size of home range and habitat selection of breeding birds. Related to that, we analysed an influence of these characteristics on their breeding productivity. The spatiotemporal activities were analysed in ArcGIS Pro and R Studio software. We found a significant impact of the number of previous successful breeding attempts and the date of an arrival to the breeding territory on the higher breeding productivity of kites. A home range size, breeding duration and migratory status (migrants vs. residents) did not affect Red Kites' breeding productivity.

Synopsis

NA

324

Genetic structure of black kites and red kites in Europe and the extent of their hybridisation

Branka Bilbija ORCID iD[1], Ivo Papoušek[1], Vitalii Starenko[1], Marek Dostal[1], Rainer Raab[2], Ivan Literak[1]

[1]Department of Biology and Wildlife Diseases, Faculty of Veterinary Hygiene and Ecology, University of Veterinary Sciences, Brno, Czech Republic. [2]2TB Raab GmbH, Deutsch-Wagram, Austria

Abstract

The Black Kite (*Milvus migrans*) and the Red Kite (*Milvus milvus*) are sympatric European raptors, and their interspecific hybrids can be found in this area. The genetic structure of Kite populations in Europe and the world has been studied only to a limited extent. For the population structure of both Kite species, we analysed hundreds of samples which were collected from 2014 to 2022. Analyses of microsatellite and *cytB* haplotypes were used. We tested 37 microsatellite primer pairs (33 designed in other studies of related raptors, and four developed specifically for this study), of which 15 were successfully amplified. Genetic diversity indices were analysed in ARLEQUIN 3.5.2.2., and STRUCTURE 2.3.4 was used to gain insight into the genetic structure of the population. STRUCTURE 2.3.4 found two clusters (K=2) sorting Black Kite and Red Kites into two different populations, and some hybrids were found as well. Genetic diversity was greater in the Black Kite population, which corresponds to their larger area of distribution. Moreover, we also found Black Kites with a haplotype attributed to the subspecies *Milvus migrans lineatus*.

Synopsis

NA

325

Fine-scale variation of vane morphology across flight feathers of a passerine-type flyer bird (Passer domesticus)

Gergely Osváth ORCID iD[1,2], Dragomir-Cosmin David[3], Andrea Józsa[4], László-Jácint Nagy[2], Drottya Vargancsik[5], Orsolya Vincze[2,6], Ádám Lendvai[7], Péter László Pap[2]

[1]Museum of Zoology, Babeș-Bolyai University, Cluj-Napoca, Romania. [2]Evolutionary Ecology Group, Babeș-Bolyai University, Cluj-Napoca, Romania. [3]Department of Taxonomy and Ecology, Babeș-Bolyai University, Cluj-Napoca, Romania. [4]Evolutionary Ecology Group, Babeș-Bolyai u/niversity, Cluj-Napoca, Romania. [5]Evolutionary Ecology Group, Cluj-Napoca, Romania. [6]Department of Tisza Research, MTA Centre for Ecological Research-DRI, Debrecen, Hungary. [7]Department of Evolutionary Zoology and Human Biology, University of Debrecen, Debrecen, Hungary

Abstract

The vane of flight feathers constitutes the main part of the lifting surface of the wing in birds, and therefore has to withstand aerodynamic forces acting from multiple directions. The aerodynamic load varies along the spanwise and chordwise directions of the wing, and as a possible mechanical response to these forces the structural elements of the vane can vary along these axes. Here we explored how the density of barbs and barbules, the branching angles of barbs, and the width of the vanes vary across and along the feathers of the wing in house sparrows. We found that the structural elements vary across the longitudinal axis of flight feathers, between leading and trailing vanes, and among individual feathers. The density and branching angle of barbs was higher in the trailing vanes than in the leading vanes, and decreased from base to tip on both the leading and trailing vanes. The barb angle and barb density of leading vanes increased from distal to proximal wing feathers, but was nearly uniform across the wing in trailing vanes. Overall, the density of barbules decreased from the distal to proximal feathers. Vane width asymmetry decreased from distal to proximal primaries and increased from the base to the tip. The morphology of the vane appears to be driven by aerodynamic forces and the need to provide appropriate bending behaviour to different wing feathers.

Synopsis

The structure of flight feathers vane varies across remiges in the house sparrow.

Twitter handle

https://twitter.com/GOsvath

326

Fear factor: breeding under contrasting predation regimes in common eiders

Ida Hermansson ORCID iD[1,2], Mikael von Numers ORCID iD[1], Kim Jaatinen ORCID iD[3], Markus Öst ORCID iD[1]

[1]Åbo Akademi University, Turku, Finland. [2]University of Helsinki, Helsinki, Finland. [3]Nature and Game Management Trust Finland, Degerby, Finland

Abstract

Nest predation is the most common reason for breeding failure in birds, but may also have long-term effects on population dynamics. Theory predicts reduction in current clutch value under high nest predation risk, and thus a reduced clutch investment. The impact of nest predation on population dynamics is debated, and spatiotemporal variation in reproductive output is poorly understood. As ground-nesting birds, breeding common eiders face a higher predation risk and Baltic Sea eiders (Somateria mollissima) are rapidly declining - reasons are considered subpopulation-specific. We studied how island geography, predation risk (white-tailed eagle abundance), climate and time trends affected breeding success and clutch size of eiders at two sites, Tvärminne and Velkua, in the archipelago in Finland in 1991-2020. Breeding numbers declined similarly, but fecundity components were negatively correlated across sites. Island forest cover and exposure were the best determinants of early breeding success and clutch size, but their effects were mediated by eagle predation risk. Clutch size increased in Tvärminne, likely reflecting increased breeder quality due to selective disappearance, but decreased in Velkua, which may indicate increasingly compromised food intake. The expected decline in clutch size with increasing eagle predation risk and increase with increasing forest cover was found only at the high-risk site, Tvärminne. We identify that conservation efforts should be targeted at the least exposed forested islands, associated with the highest productivity.

Synopsis

Predation risk and habitat properties shape the breeding success of the common eider in two subpopulations.

Twitter handle

@HermanssonIda3

327

The use of cars by birds during birds of prey attack

Zbigniew Wojciechowski, Agnieszka Wojciechowska

University of Lodz, Lodz, Poland

Abstract

The information was collected between 1998 and 2010 in the city of Lodz and villages located 45-55 km north of the mentioned city in central Poland.

The authors describe four observed cases where birds fled away from attacking goshawk (Accipiter gentilis) and sparrowhawk (Accipiter nisus) successfully using slow-moving cars (40-50 km/h). The observations concern four synanthropic species: 3 passerines and pigeons. This type of strategy may be a new adaptation created in the new conditions of urbanization of the landscape or a modification of the escape using large herbivores. The latter possibility is indicated by two observations from meadows in the Bzura valley (the left tributary of the Vistula) in the second half of the 1970s. They are concerned about the sparrowhawk's attacks on the swallow and gray wagtail. The birds flew between the legs of the walking cows. Both attacks were unsuccessful.

Synopsis

NA

328

Flying hot in cold adapted snow buntings: implications for breeding in a rapidly warming Arctic

Ryan S. O'Connor[1], Oliver P. Love[2], Lyette Régimbald[1], Alexander R. Gerson[3], François Vézina[1]

[1]Université du Québec à Rimouski, Rimouski, Canada. [2]University of Windsor, Windsor, Canada. [3]University of Massachusetts, Amherst, USA

Abstract

Due to climate change, Arctic animals are experiencing unprecedented increases in air temperature (Ta), despite often possessing physiological traits for living in cold climates. Consequently, understanding how Arctic birds will cope with increasing Ta has become an urgent concern. We studied Tb patterns in calm and actively flying outdoor captive snow buntings (Plectrophenax nivalis) implanted with temperature-sensitive tags and exposed to Ta ranging from -15 to 36°C. Calm buntings exhibited a range of modal Tb from 37.7 to 42.6°C. Among actively flying buntings, we found a positive effect of air temperature on body temperature with birds reaching Tb values ≥ 45°C at ambient temperatures as low as 9°C. We also found that buntings with lower modal Tb had, on average, larger hyperthermic responses. Our data demonstrate that snow buntings working under warm conditions frequently approach, and occasionally exceed, Tb levels often considered lethal (i.e., Tb = 45 - 47 °C). Under such scenarios, buntings must increase rates of evaporative water loss and/or reduce activity levels. However, snow buntings have limited evaporative heat dissipation capacities, and therefore, we argue these birds will likely be forced to reduce activity to regulate Tb when experiencing warm conditions on their Arctic breeding grounds. Our results also suggest that buntings with lower set-point body temperatures may experience a selective advantage in a warming Arctic by having a larger spare capacity for hyperthermia. These birds could potentially remain active for longer periods before reaching body temperatures that force them to curb activity.

Synopsis

Hot body temperatures in flying cold adapted snow buntings

Twitter handle

@VezinaLab

335

Temporal trends in the breast colouration of urban and forest great tits.

Lisa Sandmeyer[1], Claire Doutrelant[1], David López-Idiáquez[1,2], Amélie Fargevieille[1], Anne Charmantier[1], Arnaud Grégoire[1]

[1]Centre d'Ecologie Fonctionnelle et Evolutive, Université de Montpellier, CNRS, Montpellier, France.
[2]Department of Ecology and Plant Biology, University of the Basque Country (UPV/EHU), Leioa, Spain

Abstract

Global change has major impacts on several phenotypical traits, and we know that factors such as urbanisation or warming can drive the expression of several morphological and phenological traits. The effects of global change on other fitness-related traits, however, are still poorly known. For instance, whether ornamental colourations, which often act as secondary sexual signals, are driven by new climatic and anthropic pressures has seldom been explored. Here, we tackled this issue by analysing nine years of data from an urban and a forest population of great tits (*Parus major*). We first explored the influence of the urban environment on the brightness and yellow chroma of the great tit breast. Second, we analysed the temporal trends of the colour in the two populations that have faced an increase in temperature and a decrease in precipitation over the study period. Finally, we explored the role of climate as a driver of colour. There were no differences in colouration between the city and the forest, and in both areas, we detected quadratic patterns with time. In particular, while brightness decreased during the first five years and increased in the last four, the opposite was true for chroma. Finally, we did not find any significant association between colour and climate. Our results suggest that in contrast to previous studies, our urban environment and climate in our study area were not driving the colouration of the great tits, and thus that the temporal trends we describe should be explained by other environmental variables.

Synopsis

NA

336

Crop damage and geese managment in The Netherlands

Elena F. Kappers ORCID iD[1], Joris B. Latour[1], Magali Frauendorf[1], Julia Stahl[2]

[1]Altenburg & Wymenga ecologisch onderzoek, Feanwâlden, Netherlands. [2]Sovon Vogelonderzoek Nederland, Nijmegen, Netherlands

Abstract

In recent decades, geese populations have increased significantly in NW Europe. Next to changes in hunting pressure, this increase is mainly caused by the transition of geese wintering areas from traditional wet nature reserves or extensively managed farmlands to intensively managed agricultural areas. As a water-rich country with intensive agriculture and extensive swamps, The Netherlands offers enough space for arctic migratory geese in the winter months, as well as for resident geese populations. However, geese foraging in agricultural areas cause considerable economic damage to agricultural crops and in recent years the compensation for the famers experiencing geese damage has increased sharply. In the Dutch policy on fauna damage, the land user is personally responsible for preventing or limiting geese damage. In order to qualify for a compensation, non-lethal preventive measures are required. Today, a wide range of devices to detect and deter geese are in use, although their effectiveness is often highly variable due to potential habituation to disruptive or disturbing stimuli and strongly depends on the local (environmental) situation.

Here, we present studies that we carried out in The Netherlands to build up on knowledge to limit agricultural damage caused by geese. On one hand, we quantified the complex relationships between numbers of geese, intensity of grazing pressure and grass growth. On the other hand, we investigated the effectiveness of different (combinations of) devices to reduce geese damage and found an additional positive effect of bio-acoustic protection using the BirdAlert system as non-lethal preventive measure to limit crop damage.

Synopsis

Crop damage by geese in The Netherlands: relationships between population size, intensity of grazing pressure and grass growth.

Twitter handle

@altwym

341

Striking convergent evolution in an African canary (Oriole finch) and a Caribbean siskin (Antillean siskin)

Antonio Arnaiz-Villena, Valentin Ruiz-del-Valle, Ignacio Juarez, Roberto Gil-Martin, Fabio Suarez-Trujillo

University Complutense, Madrid, Spain

Abstract

Canaries (*genus Serinus*) and goldfinches / siskins *(genus Carduelis*) are genera which include several evolutive radiations, as tested by phylogenetic analyses of the respective species molecules. The oldest radiations started about 9 million years ago in these genera during the Miocene Epoch. Both *Linurgus olivaceus* (oriole finch, Equatorial Africa) and *Carduelis dominicensis* (Antillean siskin, Hispaniola Island mountains) show a striking plumage and color distribution similarity. Even in close photographs males are difficult to distinguish from each other; *C. dominicensis* shows a slight lighter body built that *L. olivaceus* when having both birds species together. Both are thriving in a tropical habitat (high and middle altitude forest) and it was difficult to believe that they had not relatedness. South American tectonic plate was an island between about 60 and 3 million years ago coming from Africa. We studied both finch evolutive radiations at molecular level using mtDNA . No genetic relationship between these American and African finch species was found. Oriole Finch was discovered to be an ancient canary and Antillean Siskin is a more recent siskin which has became isolated in La Hispaniola Island mountains. The observed changes to a black head a Bacterial resistance of darker plumage in humid climates is a crucial environmental common evolutive pressure; dark head advantage against predators in dense woods is also important as a defense. Finally, analogies and shared ancestral homologies are discussed and defined in these two particular species.

Synopsis

African Oriole Finch (a canary) and phenotipically identical American Antillean Siskin are not genetically related.

Twitter handle

African Oriole Finch (a canary) and phenotipically identical American Antillean Siskin are not genetically related by using mtDNA , Bayesian inference and Maximun Likelyhood analyses.

344

Brood parasitism breaks down the effects of age on reproduction in a long-lived bird

Juan Gabriel Martinez[1], Marta Precioso[1], Mercedes Molina-Morales[1], Jesus Aviles[2]

[1]Departamento de Zoologia, Universidad de Granada, Granada, Spain. [2]Estación Experimental de Zonas Aridas, CSIC, Almeria, Spain

Abstract

A large body of empirical evidence has shown that avian reproductive performance improves with age. Two main mechanisms have been hypothesized to explain such a pattern, namely 1) the improvement of reproductive performance with age and 2) the selective disappearance of the worst performing individuals. However, age effects on reproduction of birds exposed to brood parasitism are poorly known. Here we propose that age-independent patterns of brood parasitism may disrupt potential effects of age on reproduction, and, hence predict that these should be only evident in reproductive features not affected by parasitism (i.e. laying date). We provide a first test of this hypothesis by studying an Eurasian magpie Pica pica population parasitized by the Great spotted cuckoo Clamator glandarius in southern Spain. Age is not related to parasitism likelihood in magpies. We analyse breeding trajectories of 61 magpie females in a longitudinal study of 14 years and use decomposition methods to separate within-individual effects (age-related improvement in reproduction) from between-individual effects (selective disappearance of individuals) to explore a genuine effect of aging. We found that age-related changes in laying date were explained by both selective disappearance of late-breeders and an advancement of reproduction with age. However, other reproductive parameters (egg investment, clutch size and egg volume) did not change with age, although late breeding magpies reduced breeding investment. Finally, female breeding success was unrelated to age, but negatively affected by brood parasitism. Our results suggest that age-independent brood parasitism may obscure age effects on reproduction and fitness in host species.

Synopsis

Brood parasitism disrupts age-dependent reproduction in magpies, though females advance their laying date with age.

Twitter handle

@JuangaMartnez1

349

Is there a lifetime movement syndrome in the Great Tit (*Parus major*)?

Erik Matthysen ORCID iD, Thijs van Overveld ORCID iD, Frank Adriaensen

University of Antwerp, Wilrijk, Belgium

Abstract

Mobility is a key aspect of the lifecycle in most animals, and even more so in birds. Even in non-migratory populations there is pronounced individual variation in movement patterns in different stages of the lifecycle and in different behavioural contexts, such as prospecting, dispersal, home-range sizes and movements to foraging and roosting areas. Even though many of these movement characteristics have already been associated with individual-level traits such as sex, age, condition and personality, few studies have analyzed covariance of movement patterns across the entire lifetime. We hypothesize that covariance of spatial behaviour across contexts may originate mainly from three nonexclusive sources: covariance induced by spatial heterogeneity in the landscape (e.g. linked to the site of birth); intrinsic individual variation that affects multiple behaviours (such as personality or body size); and carry-over effects from one movement stage to the next, for example if familiarization with an area in one stage affects movements in a subsequent stage. We here use data collected in a long-term study of Great Tits in a patchy landscape with small forest fragments. We use natal and breeding dispersal, post-fledging family movements, winter feeder visits, and distances between breeding and roosting sites as proxies for movement in different phases of the lifecycle. We will show to what extent these movement parameters are correlated at individual level and suggest explanations for the presence or absence of such correlations.

Synopsis

NA

350

Understanding how persistent organic pollutants (POPs) determine intra- and inter-individual ecophysiological traits in a European migratory bird, the Alpine swift (*Tachymarptis melba*): novel insights in a long-term perspective.

Roger Colominas-Ciuró ORCID iD[1], François Criscuolo[1], Sandrine Zahn[1], Christoph M. Meier[2], Francesca E. Gray[3], Kalender Arikan[4], Pierre Bize[2]

[1]Institut Pluridisciplinaire Hubert Curien, UMR 7178, Université de Strasbourg, CNRS, Strasbourg, France. [2]Swiss Ornithological Institute, Sempach, Switzerland. [3]University of Aberdeen, Aberdeen, United Kingdom. [4]Hacettepe University, Ankara, Turkey

Abstract

Human activities are imposing major environmental alterations in natural populations and ecosystems. One of them is pollution, which is the introduction of contaminants in natural environments that can alter the health, reproduction, and survival of free-living organisms. Persistent organic pollutants (POPs) are known to remain in the environment and to bioaccumulate through the lifetime of organisms, as well as to increase in concentration with each successive step in the food chain (biomagnification). Therefore, top predators such as birds occupying high trophic levels are used as bioindicators. Virtually, all bird species studied so far were found to be exposed to POPs, and there is growing evidence for their negative effects on reproduction or adult survival. However, there are large discrepancies among studies on the fitness consequences since (i) many are reporting no or little effects of POPs on reproduction, and (ii) the consequences of POPs on survival are rarely reported because most studies are relying on short rather than long-term monitoring. Therefore, our aim is to provide novel insights in a long-term perspective (2017-2021) both intra- and inter-individually, on how POP concentration in preen oil shape ecophysiological traits as telomere and mitochondrial dynamics, fitness and survival in a European migratory bird species (the Alpine swift, *Tachymarptis melba*).

Synopsis

“Persistent organic pollutants in preen oil determine intra- and inter-individual ecophysiological traits in the Alpine swift"

Twitter handle

@colominasciuro

351

Tits of the Hyrcanian forest (Paridae): Taxonomic status and differences from Caucasian, Kopet Dag and European populations.

Grigory Evtukh

Leibniz-Institut zur Analyse des Biodiversitätswandels: LIB, Hamburg, Germany

Abstract

The ancient Caspian Hyrcanian forest is located in an isolated region near the southern coast of the Caspian Sea. It is bordered by the Alborz mountain ridge, Azerbaijan plateau and Kopet Dag mountains.

Birds of Hyrcanian forest are poorly studied, and the taxonomic status of some local forms remains controversial. Tits of the Paridae family are among the most taxonomicly diverse Hyrcannian bird groups. In this region, endemic subspecies of several species have been described as well as the only endemic species of birds - the Caspian tit (Poecile hyrcanus). On average Hyrcanian forms of tits had smaller body size and darker plumage coloration compared to Caucasian and European populations. However, the level of genetic isolation between them is still unclear.

We compared morphology, acoustic parameters of song and mitochondrial genetic data of four tit species from different geographical populations in Hyrcanian forest region, Caucasus region and Europe: Great tit (Parus major), Blue tit (Cyanistes caeruleus), Coal tit (Periparus ater) and Caspian tit. Using the original species and subspecies descriptions as well as new data, we were able to clarify the taxonomic status of Hyrcanian tits' populations and make some conclusions on the evolution of isolated bird populations.

Synopsis

NA

353

Flight efficiency of the thrush nightingale measured in a wind tunnel

Pablo Macías-Torres ORCID iD, Sonja Friman ORCID iD, Christoffer Johansson ORCID iD, Anders Hedenström ORCID iD

Department of Biology, Lund University, Lund, Sweden

Abstract

Migratory birds use powered flight to cover thousands of kilometers between breeding and non-breeding areas every year. This way of locomotion costs energy to the birds, which can be measured as metabolic and mechanical power in a wind tunnel under controlled flight conditions. The ratio between both parameters is defined as the energy conversion efficiency which is fundamental for our understanding of migration as it is a key component for the flight range of a migratory bird based on a given amount of fuel (usually in the form of fat). Until now, the energy conversion efficiency has been assumed to be constant at 23% across different species as well as across flight speeds. Novel methodology has facilitated the measurement of both metabolic and mechanical power in bird flight. We used particle image velocimetry (PIV) to measure wake vortices in the air flow and thereby estimate the mechanical power, while the metabolic power was measured using 13C-labelled sodium bicarbonate method (NaBi), which measures the washout of the carbon pool in the bird´s body during a relatively short flight time. Metabolic and mechanical costs are presented for a long-distance migratory songbird, the thrush nightingale (Luscinia luscinia), flown at different windspeeds at the Lund University wind tunnel. Ultimately, the energy conversion efficiency is to be compared across different migratory bird species and flight speeds, providing expanded knowledge about the migratory flight costs in birds.

Synopsis

NA

Twitter handle

355

Migratory strategies and connectivity of Grey Plover Pluvialis squatarola in the East Atlantic Flyway

Teresa Catry ORCID iD[1], Edna Correia ORCID iD[1], Jorge S Gutiérrez[2,3], Pierrick Bocher[4], Frédéric Robin[5], Pierre Rousseau[6], José Pedro Granadeiro ORCID iD[1]

[1]Centro de Estudos do Ambiente e do Mar, Departamento de Biologia Animal, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal. [2]Departamento de Anatomía, Biología Celular y Zoología, Facultad de Ciencias, Universidad de Extremadura, Badajoz, Spain. [3]Ecología en el Antropoceno, Unidad asociada CSIC-UEX, Universidad de Extremadura, Badajoz, Spain. [4]Laboratory Littoral Environnement et Sociétés UMR LIENSs 7266 CNRS - La Rochelle University, La Rochelle, France. [5]Ligue pour la Protection des Oiseaux (LPO), Rochefort, France. [6]National Nature Reserve of Möeze-Oléron, Ligue pour la Protection des Oiseaux (LPO), Saint-Froult, France

Abstract

Following a pattern shared by other migratory shorebirds in the East Atlantic Flyway, non-breeding populations of Grey Plover show a stable trend in Europe and moderate to strong declines in Africa. Investigating migratory strategies and connectivity of these populations can shed some light on the contrasting trends observed.

We tracked grey plovers from Guinea-Bissau (GB), Portugal (PT) and France (FR), most of which bred at Yamal Peninsula (Russia), suggesting low migratory connectivity in this population.

Birds from GB showed a faster (up to 2.5-fold) northward migration and slower southward migration, while no differences were evident for PT and FR plovers. Northward migration was similar in duration among all sites. Grey plovers followed a skipping strategy, flying medium distance bouts and fuelling along a network of stopover sites. The number of stopovers was similar between migratory periods, but birds from GB stopped more times than other birds.

All birds fuelled at the Wadden Sea in both migratory periods, highlighting the importance of this region. We also identified a high number of other stopover sites in the West coasts of Africa, Iberia and France, as well as along Russia and Scandinavia.

Although grey plovers have been shown to perform non-stop flights of over 7000 kms in the EAAF, only one of our birds flew such a distance. These results suggest either that plovers do not reach optimal pre-migration fuelling in GB, being forced to stop several times along their northward journey, and/or that a skipping strategy may increase migration success.

Synopsis

Skipping migratory strategy and low connectivity in Grey Plovers of the East Atlantic Flyway

Twitter handle

@TeresaCatry

359

Nest cleaning of artificial nests enhances apparent survival of adult house martins

Stephanie Michler, Merline Roth

Swiss Ornithological Institute, Sempach, Switzerland

Abstract

The house martin (*Delichon urbicum*) is a species of conservation concern in many European counties. One efficient conservation measure is to place artificial nests at suitable locations. However, for artificial compared to natural nests, a regular reconstruction of the nest is missing and parasite load may become a problem over time. Accordingly, regular nest cleaning by humans might be necessary. In a co-created citizen science project, we tested how three different easy to implement cleaning methods affected breeding biology and apparent survival of house martins at different colonies with artificial nests over 9 years: (1) removal of nest content, (2) removal and brushing out the inside, or (3) applying a common insect spray additionally to procedure 2. Breeding parameters like clutch size or fledging rate did not differ between the three treatment groups. Apparent survival of yearlings from the three treatment groups was similar, while it was significantly higher for adult birds when they have bred in nests that received the third treatment with the insect spray. The nest cleaning experiment showed that a parasite free environment has the potential to promote the occupation rate of artificial nests by enhancing adult return rates. Therefore, artificial nests should be placed whenever possible at accessible places to enable nest cleaning. Given the general negative impact of insecticides on biodiversity, we recommend the application of insect spray mainly in severely infested nests that are avoided by the swallows.

Synopsis

NA

Twitter handle

362

SPI-Birds: harmonising long-term studies to facilitate collaboration and data re-use

Stefan Vriend ORCID iD[1], Joseph Burant ORCID iD[1], Marcel Visser ORCID iD[1], Antica Culina ORCID iD[1,2]

[1]Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands. [2]Ruđer Bošković Institute, Zagreb, Croatia

Abstract

Long-term individual-based studies of wild bird populations are irreplaceable sources of knowledge on biodiversity, and of the evolutionary and ecological processes that shape it. To understand the generality of these processes, we need to combine data across large temporal and spatial scales. Yet, various research groups record, store, annotate, and process their data in widely different ways, impeding scientific collaborations and syntheses. SPI-Birds (Studies of Populations of Individuals – Birds) was born out of the need to formalise the standardisation and integration of long-term individual-based data on birds. SPI-Birds is a community-driven initiative that connects researchers working on populations of individually marked birds and facilitates data sharing and re-use. Since its inception, SPI-Birds has collated metadata and data from 212 populations of 34 unique species across 99 different study sites around the globe. The aggregated data have since been leveraged in large analyses spanning dozens of populations in diverse environments. In the near term, SPI-Birds aims to grow and branch out into three main directions: i) harmonise long-term data of species and areas currently underrepresented in the database, ii) unify codes used for processing and analysing data, and iii) broaden the user base by developing tools and resources for a range of disciplines, including policy and education. Through this poster, we hope to paint a clear picture of SPI-Birds' current and future activities, as well as showcase the versatility of this large collection of standardised data for addressing key questions on the ecology and evolution of birds.

Synopsis

Showcasing the versatility of SPI-Birds' collection of standardised data for addressing key questions in bird ecology & evolution

Twitter handle

@StefanJGVriend
@SPIbirds

363

Using xenodiagnosis to study a variation in *Borrelia burgdorferi* s.l. infectiousness of great tits

Jens Zarka ORCID iD[1], Dieter Heylen[1], Manoj Fonville[2], Hein Sprong[2], Erik Matthysen ORCID iD[1]

[1]University of Antwerp, Wilrijk, Belgium. [2]RIVM, Bilthoven, Netherlands

Abstract

A crucial factor to predict the persistence and spread of infections in natural systems is the capacity of reservoir hosts to maintain the infection and transmit it to others. This is known to greatly vary within and between -species and through time, although the latter is often less well understood. Here we focus on inter- and intra-individual variation in infectiousness in a natural population, using a great tit-tick-*Borrelia* system as model. Great tits are among the most important reservoirs of *Borrelia garinii*, a bacteria vectored by the common sheep tick, *Ixodes ricinus*, and one of the main causal agents of Lyme neuroborreliosis in humans. We aim to study how the capacity of great tits to transmit these bacteria to feeding ticks varies throughout the bird's life cycle, and whether this patterns of infectiousness differ among individuals.

To determine the infectiousness of a bird we make use of xenodiagnosis i.e. allowing pathogen-free ticks to feed on birds and test for successful bird-to-tick transmission. We are doing this in an individually monitored population, allowing us to repeatedly test the infectiousness of the same individuals and relate this to their age, sex, condition and other factors. To our knowledge this is the first study using xenodiagnosis to monitor *Borrelia* infections in a free-living host population.

In the first annual cycle we screened, so far, over 1700 xenodiagnostic ticks for *Borrelia garinii* collected from 169 individual birds. We will present preliminary results and discuss possible reasons for individual and temporal variation in infectiousness.

Synopsis

NA

Twitter handle

@jenszarka

365

Biological clocks in the wild: how does light at night impact the development of a migratory bird?

Joanna Sudyka ORCID iD[1,2], Sayuri Díaz Palma[1], Juliette Champenois[1]

[1]Institute of Environmental Sciences, Jagiellonian University, Kraków, Poland. [2]Groningen Institute for Evolutionary Life Sciences, Groningen, Netherlands

Abstract

Biological clocks play a key role in maintaining vital functions and are synchronised with environmental cues, primarily light. Artificial light at night (ALAN) is nowadays a major anthropogenic factor disrupting these cues, potentially bringing about negative consequences for wildlife globally. As such it is surprising how little we know about the direct impact of ALAN on physiology and behaviour of wild populations. In particular, night illumination presents a real-life threat to migratory animals. We will show the effects of ALAN exposure early in life of a free-ranging migratory bird: the collared flycatcher (Ficedula albicollis). We experimentally introduced ALAN to nestboxes occupied by flycatchers on the island of Gotland, Sweden. To our surprise, data acquired in the first two seasons indicate that relative to control group (naturally dark at night) nestling experiencing ALAN had higher fledging success and tended to be heavier just prior to fledging, while their structural size remained unaltered. ALAN nestlings also spent more days in nests (from hatching to fledging). We will complement these results with data gathered in the current (2023) breeding season and present behavioural responses to ALAN, video recorded in adults and nestlings. We will discuss potential underlying mechanisms and future plans for this study aiming to comprehend the impact of ALAN on early life history traits depending on circadian clocks in birds.

Synopsis

Surprising effects of artificial light at night on early development of a migratory bird

Twitter handle

@JOSudyka

366

DIFFERENCES IN ACTIVITY PATTERNS OF MALE AND FEMALE COMMON STARLINGS *STURNUS VULGARIS* DURING THE BREEDING SEASON

Elza Marija Zacmane[1], Viesturs Vīgants[1], Oskars Keišs[1], Mārtiņš Briedis[1,2]

[1]University of Latvia, Institute of Biology, Laboratory of Ornithology, Riga, Latvia. [2]Swiss Ornithological Institute, Dept of Bird Migration, Sempach, Switzerland

Abstract

For migratory birds breeding season is one of the most energetically demanding periods of the whole annual cycle. Therefore, investigation of activity patterns during breeding season is especially crucial to better understand the overall activity budgets, seasonal interactions, and far-reaching effects on the individual's fitness. Differences in behavioural aspects between male and female passerines (defence of territory, production of eggs etc.), imply that both sexes must have differences in activity patterns during this period, however little is known about these dissimilarities. Here, by using accelerometer data from state-of-the-art multisensor data loggers (model: GDL3-PAM, Swiss Ornithological Inst.), we analysed activity recordings of a short-distance migratory passerine the Common Starling Sturnus vulgaris (n = 12; male = 5, female = 7) made during the breeding season. Statistical analysis revealed significantly higher activity levels of male birds during the egg laying ($\beta = 560.91$, $t = 6.285$, $p = 0.0001$) and egg incubation ($\beta = 223.01$, $t = 3.091$, $p = 0.01$) periods, however no significant differences between sexes were found during the period before egg laying and after hatching of nestlings. Interestingly, activity levels of birds arriving at the breeding sites later in spring showed to be slightly higher during the first days after arrival. Overall, this study gives insights into the most discrete period of birds' annual cycle as well as highlights the nuanced possibilities of multisensor data loggers.

Synopsis

NA

378

Assessing the fatty acid profile of migratory species that exhibit different fuelling strategies.

Pedro M. Araújo ORCID iD[1], Morgan Lee[1], Ivan Viegas[2], Ana C. Norte[1], Jaime A. Ramos[1]

[1]MARE - UC, Coimbra, Portugal. [2]University of Coimbra, Center for Functional Ecology, Department Life Sciences, Coimbra, Coimbra, Portugal

Abstract

A detailed analysis of fatty acid (FA) profiles and their several properties relating to fuelling strategy, can improve the global understanding on avian migration. In this study we analysed whether and how FA composition differs among several passerine species which migrate using different fuelling strategies (constant fuelling, gradual fuelling, early fuelling, or late fuelling). Our results showed differential FA composition among migratory species according to their fuelling strategies: early fuellers presented higher n-3 FA and gradual fuellers higher monounsaturated FA, that can be directly related to their differential migratory strategies in order to maximize energy use.

Synopsis

Understanding the metabolic adaptations of migratory birds.

Twitter handle

M_Miguel_Araujo

381

Foraging distribution of West African Crested Tern (*Thalasseus albididorsalis*) breeding in Guinea-Bissau

Edna Correia ORCID iD[1], Martin Beal[2], Nelson Gomes[3], Ngoné Diop[4], Francisco Wambar[3], Maria Dias[2], Alfonso Rios[5], Teresa Catry ORCID iD[1]

[1]Centro de Estudos do Ambiente e do Mar, Departamento de Biologia Animal, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal. [2]CE3C, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal. [3]ODZH, Bissau, Guinea-Bissau. [4]Cheikh Anta Diop University, Dakar, Senegal. [5]BirdLife International, Dakar, Senegal

Abstract

West African Crested Tern (*Thalasseus albididorsalis*) is the most numerous breeding tern in West Africa. Yet, as a new species recently split from Royal Tern (*Thalasseus maximus*), it presents a restricted breeding distribution (from Mauritania to Guinea), wherein most individuals breed in Senegal and Guinea-Bissau.

We tracked twenty West African Crested terns breeding in Guinea-Bissau, in the second most important colony of the species (~20 000 breeding pairs). Based on 574 foraging trips, from late incubation to early-chick rearing, we characterized foraging behaviour and identified the most important foraging and resting sites for this population.

Terns foraged mostly in shallow waters, usually not exceeding 10 m in depth, following the coasts of Guinea-Bissau and Senegal, but also towards the west of the colony. The most important foraging areas cover approximately 3500 km^2, in a range of up to 80 km from the colony. Terns travelled greater distances, spending more time foraging during incubation as compared to the chick rearing period. Accordingly, the probability of resting or overnight was higher during incubation. We identified 55 important resting sites at the population level which correspond to exposed sand banks and beaches, suggesting that the availability of these landscape features is key for West African Crested Tern during the breeding season. Our results indicate that this colony would beneficiate from an update of the borders of the existing IBA, namely by including an important area within Senegalese waters, highlighting the need for national and international management efforts for the conservation of this species.

Synopsis

Foraging distribution of West African Crested Tern breeding the second most important colony of the species

Twitter handle

@ednarcorreia

386

As the Starling flies: multi-sensor geolocators reveal unprecedented details of in-flight behaviour of Common Starlings

Ance Priedniece[1], Martins Briedis ORCID iD[1,2], Viesturs Vīgants ORCID iD[1], Oskars Keišs ORCID iD[1]

[1]University of Latvia, Institute of Biology, Laboratory of Ornithology, Riga, Latvia. [2]Swiss Ornithological Institute, Department of Bird Migration, Sempach, Switzerland

Abstract

Multi-sensor geolocators enable a great range of discoveries about adaptations during one of the most challenging periods in birds' life – migration. Migration is typically composed of stopovers when energy is stored and active flight when this energy is consumed, and to minimize the energetic cost of movement, migratory birds may imply various behavioural adaptations and strategies for when in flight.

Here, we describe in-flight behaviour of a short-distance migrant, the Common Starling, using multi-sensor geolocators attached to birds breeding in Latvia between 2020-2022. We used acceleration data to identify migratory flights, light data to distinguish between diurnal and nocturnal flights, and barometric pressure data – to track flight altitudes.

It took ca. 50 hours of flight for the tracked Starlings to complete their annual migration cycle between the breeding sites in the Baltics and wintering areas in the British Isle and back. Migratory distances and flight speeds in autumn and spring migration were similar. Surprisingly, approximately 70% of all flights were nocturnal affirming Starling as predominantly a nocturnal migrant. The longest recorded flight lasted more than 22 hours with maximum altitudes reaching 2500 m a.s.l. Both maximum and average flight altitudes were higher in spring compared to autumn migration, and flight altitudes during the day were typically lower than during the night. Our study provides unprecedented details of in-flight behaviour of Starlings and bring novel insights for how short-distance migrants complete their migratory journeys.

Synopsis

NA

387

The ornithological collection of the Zoological Museum of Babeș-Bolyai University, Cluj-Napoca, Romania: faunistic data from the past and scientific heritage

Zsolt Kovács[1], Edgár Papp[1,2], Janka Pénzes[1,3], Zoltán Benkő[1,4], Gergely Osváth[1,3]

[1]Evolutionary Ecology Group, Hungarian Department of Biology and Ecology, Babeş-Bolyai University, Cluj-Napoca, Romania. [2]Milvus Group Bird and Nature Protection Association, Târgu Mureș, Romania. [3]Museum of Zoology, Babeș-Bolyai University, Cluj-Napoca, Romania. [4]Romanian Ornithological Society/ BirdLife Romania, Cluj-Napoca, Romania

Abstract

The collections at the Zoological Museum of Babeș-Bolyai University, Cluj-Napoca, Romania are among the oldest, most diverse, and historically most interesting natural history collections. The museum houses a large ornithological collection consisting of skins, full taxidermic mounts of birds, eggs, nests and birds' skeletons, which have never been revisited. Here we present the catalogue of the skins and taxidermic mounts of birds deposited or exhibited at the Zoological Museum of Babeș-Bolyai University, Cluj-Napoca, Romania. We identified 2876 specimens, belonging to 489 species from 105 families and 32 orders. The collection includes numerous local and exotic rarities. The information held in this collection can be used as a basis for many valuable ornithological studies. This collection also represents a source of information for the status of the avifauna of the Carpathian basin in the 19th and 20th centuries.

Synopsis

NA

389

Revealing the demographic response of European nightjar (*Caprimulgus europaeus*) to paleoclimate change.

George Day[1], Graeme Fox[2], Helen Hipperson[3], Kate Durrant[2], Dean Waters[1], Terry Burke[3], Jon Slate[3], Kathryn Arnold[1]

[1]University of York, York, United Kingdom. [2]University of Nottingham, Nottingham, United Kingdom. [3]University of Sheffield, Sheffield, United Kingdom

Abstract

An individual's genome provides a window into the evolutionary history of contemporary populations. Pairwise sequentially Markovian coalescent (PSMC) analysis uses information from a single genome to derive ancestral effective population size change over the last ~5 million years. A species' demographic history provides important context to contemporary population genetics and species responses to climate change. Here we apply PSMC analysis to two European nightjar (*Caprimulgus europaeus*) genomes, sampled in Northwest and Southern Europe, with aims of revealing the demographic history of the species in Europe. We successfully reconstructed effective population size over the last 5 million years for two nightjar populations. Our analysis shows that nightjar are responsive to global climate change, with effective population size broadly increasing under stable warm periods and decreasing during cooler spans and prolonged glacial periods. PSMC analysis on the pseudo-diploid combination of the two genomes revealed fluctuations in gene flow between the populations over time, with geneflow apparently ceasing by the last glacial maximum. This pattern or differentiation is in line with the species utilising different refugia during glacial maxima. We suggest that nightjar in Europe may show latitudinal (East-West) genetic structuring as a result of gene flow reduction between different glacial refugia. We recommend the application of PSMC and genetic structuring analysis to samples across the contemporary range of nightjar to fully understand the extent and origins of genetic structure within the species.

Synopsis

NA

Twitter handle

@Borealis_George

391

Changes in wintering sites of the Common Starling Sturnus vulgaris breeding populations from Northern Europe during the last century

Viesturs Vīgants ORCID iD, Alise Ozoliņa, Oskars Keišs ORCID iD

Institute of Biology, University of Latvia, Riga, Latvia

Abstract

Ever increasing evolutionary pressure due to climate change is pushing migratory birds to tune their annual cycles accordingly. Short-distance migrants can respond to the changing climate more rapidly and take advantage of e.g. warmer winter conditions, yet research that would highlight such tendencies among species are still scarce. In this study we tried to investigate how the distance between wintering and breeding sites of the short-distance migrant Common Starling from Northern Europe populations have changed during the last century in correspondence with the warming climate. We analyzed a dataset selected from the EURING database that included starling ring recovery data from nine countries (Finland, Sweden, Norway, Estonia, Latvia, Lithuania, Poland, Germany and Denmark). Our results showed that starling populations from the Baltic States, Scandinavia and Poland tend to have shorter autumn migration distances, but the changes are not statistically significant. However, bird population from Germany showed statistically significant decrease in migration distances since 1950 ($r_s = -0.292$; $p < 0.001$) and for population from Finland since 1959 ($r_s = -0.157$; $p < 0.05$). Wintering site distance changes showed no significant relationship to the annual average temperatures. Overall, this study illuminates one of the many aspects on how changes in climate are affecting migratory species population over time.

Synopsis

NA

Twitter handle

NA

393

Nesting with noisy neighbours or moving to the surrounding area? Coloniality benefits for non-colonial birds.

Gonzalo Muñoz Arroyo ORCID iD, Macarena Castro Casas, Andres de la Cruz Muñoz, Nuria Martín San Juan ORCID iD, Alejandro Perez Hurtado

Coastal Wetlands Conservation Group, Dept.Biology, University of Cadiz, Puerto Real, Cadiz, Spain

Abstract

Associating with colonial species is a relatively widespread strategy in non-strictly colonial bird species, but the trade-off between the costs and benefits of this strategy is not always well understood. Here we analyze a data set of 211 Kentish Plover Kenti nests monitored in 2017, 2018 and 2020 in two saltpans in the Bay of Cádiz. Most of the nests (180; 85.3%) were located associated with colonies of Avocet and Little Tern, while only 31 nests were isolated. Colony-associated nests showed a higher probability of hatching (68.9%) than isolated nests (45.2%). When considering additional factors (site; nesting habitat; year and date of laying), association with the colony remains the main factor in the model (stepping forward GLM), with marginal effect of site (greater probability of hatching in Salina Cetinas vs. Salina Santa María).

Additionally, in 2020 we carried out an experiment with artificial nests with quail eggs, randomly located within the colony (15 nests) and in isolated areas (15 nests). The nests were placed during the period of maximum activity of the colony (experiment, May 17 and 29), and later, once the colony was abandoned (control; August 14 and 26). The probability of survival of the artificial nests located within the colony was significantly higher in the experiment (May) than for the isolated nests, being the opposite results in the control period (August).

Our results suggest that Kentish Plovers benefit from breeding with other colonial species by reducing predation on their nests.

Synopsis

Kentish plovers benefits from nesting with noisy Avocets and Little Terns colonies by reducing nest predation in saltpans

Twitter handle

@munozgonzalo104

394

Global Wader: Identifying knowledge gaps in the tracking of waders/shorebirds

Josh Nightingale ORCID iD[1,2], Martin Beal ORCID iD[3], Gregoire Michel[3,4], Tómas Gunnarsson ORCID iD[1], Theunis Piersma ORCID iD[5,6], Verónica Méndez ORCID iD[1], Maria Dias ORCID iD[3], José Alves ORCID iD[1,2]

[1]South Iceland Research Centre, University of Iceland, Laugarvatn, Iceland. [2]Department of Biology and CESAM—Centre for Environmental and Marine Studies, University of Aveiro, Aveiro, Portugal. [3]cE3c Center for Ecology, Evolution and Environmental Changes & CHANGE - Global Change and Sustainability Institute, Department of Animal Biology, Faculty of Sciences, Universidty of Lisboa, Lisbon, Portugal. [4]Faculty of Science and Technology, University of La Rochelle, La Rochelle, France. [5]Conservation Ecology Group, Groningen Institute for Evolutionary Life Sciences, University of Groningen, Groningen, Netherlands. [6]Department of Coastal Systems, NIOZ Royal Netherlands Institute for Sea Research, Texel, Netherlands

Abstract

Global environmental changes are proceeding at an unprecedented pace, with profound impacts on animal populations and movements. At the same time, the volume of data from electronic tracking of animal movements is increasing exponentially, representing a valuable resource for science and conservation. However, while these data can potentially endure and be utilised indefinitely, several barriers to their long-term usefulness have been identified. In particular, we highlight that these valuable global data often originate from independent efforts by local groups facing scientific, societal and/or financial challenges, and a shortage of centrally-coordinated efforts to safeguard them. Consequently, much data is not stored in future-proof repositories; datasets are often incompletely or inconsistently annotated with easily-understood metadata; and no widely-used register of tracking studies exists. To this end, the Global Wader Tracking Data Project was set up, to create a central registry of tracking studies of waders and shorebirds, and to promote and assist data-owners' archiving of the results of their work for posterity. Here we present a summary of the first months of the project, including an overview of wader-tracking projects undertaken thus far, the proportion of studies that have archived data in durable repositories such as Movebank or others, and the global distribution of published wader-tracking studies. Ultimately, we aim for the Global Wader Tracking Data Project to serve as a taxon-specific exemplar of best-practice data management in 21st Century ornithology.

Synopsis

NA

Twitter handle

@Luscinia_joshua

396

RESULTS OF THE 2022 MID WINTER WATERFOWL AND WATERBIRD COUNT ON THE WARMED WATERS OF BORTNYCHI SEWAGE TREATMENT PLANT (BSTP)

Vitalii Kazannyk[1], Valentyn Serebryakov[2], Igor Davydenko[2]

[1]Taras Shevchenko National University of Kyiv, Ukraine, Kyiv, Ukraine. [2]Taras Shevchenko National University of Kyiv,, Kyiv, Ukraine

Abstract

The regular and soon numerous wintering group of waterfowl and waterbirds had been formed on the territory of Kyiv city agglomeration since 70-s of 20th century. The most numerous gathering within the agglomeration exists on the outflow cannel of BSTP. It's ever warm and rich in food waters always attract waterfowl and many other wetland species. Scientists conduct to monitor birds here over 40 years. Last our observations were done in January 2022. 3393 birds of 17 species were recorded. As usual the most numerous among them were *Anas platyrhynchos* – 2780 (81.9%) birds, *Larus cachinnans* – 331 (9.7%). Large gathering of *Phalacrocorax carbo* was also observed – 189 (5.6%) birds. It is an absolute record for all years of observation. There were no more than 30-40 individuals before. The other common species were less numerous (*Egretta alba, Ardea cinerea, Cygnus olor, Aythya fuligula, Bucephala clangula, Haliaeetus albicilla, Fulica atra, Larus canus*) and it was 2.1% of them among others. A group of rare species consist of *Tachybaptus ruficollis, Anas crecca, Rallus aquaticus, Gallinula chloropus, Alcedo atthis, Remiz pendulinus* – less than 10 birds of each kind were recorded. The total numbers of the birds on this territory in 2022 was the highest for last 5 years of observation. It can be explained with cold weather which was established since first decade of January. As a result the Dnieper River and other water bodies in Kyiv were covered with ice what made wintering water birds to concentrate themselves on warm waters of BSTP.

Synopsis

NA

Twitter handle

Vitalii Kazannyk, Valentyn Serebryakov, Igor Davydenko

399

Long series of data change paradigms: the phenology of spring migration in the western Mediterranean

Anna Garcia-Tortosa[1], Carles Barriocanal ORCID iD[2], Germán López-Iborra ORCID iD[3], David Robson[4], Sara Malagarriga[5], Raül Escandell[6], Santi Catchot[6]

[1]ICTA - UAB, Barcelona, Spain. [2]UB, Dept. Gegraphy, Barcelona, Spain. [3]UA, Dept. Ecology, Alacant, Spain. [4]ICO, Barcelona, Spain. [5]SOM, Barcelona, Spain. [6]SOM, Maó, Spain

Abstract

In recent decades numerous studies have shown a general and significant advance in spring migration in trans-Saharan migratory birds. This is, however, a general trend, since there is a lot of variability between species and populations, and, in addition, different factors (environmental, endogenous) influence. Within the framework of the international project Piccole Isole, the dates of passage of 13 species of the most captured birds between 1995 and 2021 on the island of Air, located in Menorca (Balearic Islands) west of the Mediterranean. The period of April 1 – May 15, when project runs, has been used to calculate the average global annual crossing dates for each species. The data from these standardized campaigns provide very valuable information regarding the ecology of passage and stopover. The trends found using piecewise regression have been evaluated and the results do not support an advance of spring migration as expected either with the pool of selected species as intraspecifically. The annual variability of certain environmental factors such as wind or food availability would play a key role in explaining these fluctuations, and at the same time would not be significant in producing a change in the progress of spring migration. The availability of long data series is allowing us to find new trends in migratory phenology changing some paradigms.

Synopsis

Phenology of spring migration over Western Mediterranean: long time data change paradigms

Twitter handle

@barrioca

401

Extra-pair paternity in urban blue tits and great tits

Irene Di Lecce ORCID iD[1], Charles Perrier[2], Joanna Sudyka[3,4], Marta Szulkin[1]

[1]Centre of New Technologies, University of Warsaw, Warsaw, Poland. [2]CBGP, INRAe, CIRAD, IRD, Montpellier SupAgro, University of Montpellier, Montpellier, France. [3]Institute of Environmental Sciences, Jagiellonian University, Kraków, Poland. [4]Groningen Institute for Evolutionary Life Sciences (GELIFES), Groningen, Netherlands

Abstract

There is increasing evidence of the ecological and evolutionary consequences of urbanization on wild birds. The urban habitat may affect various aspects of their behaviour, life-history, demographics and fitness. For instance, birds of several species breeding in cities show early breeding, reduced brood sizes and lower reproductive outputs compared to their rural conspecifics. Mating behaviour is also likely to be affected by urbanization, because of its impact on daily activity patterns, communication patterns and food availability. Here, we estimated extra-pair paternity in wild blue tits and great tits breeding in nestboxes set along a gradient of ubanization in Warsaw, Poland. We found that extra-pair paternity occurred more likely in nests surrounded by higher ISA (percentage of built-up areas) and higher levels of light pollution (artificial light at night), while it was less likely to occur when NDVI (a satellite-based vegetation index) and tree cover (the percentage of tree cover density of the surface) were higher. Similarly, the proportion of extra-pair offspring per nest was positively associated with ISA and light pollution and negatively associated with NDVI and tree cover. These effects were apparent in blue tits but not in great tits, confirming previous knowledge of the pervasive impact of the urban environment on wildlife and suggesting species-specific or population-specific effects.

Synopsis

NA

405

Fostering the northward breeding range expansion of central-eastern Mediterranean lesser kestrel *Falco naumanni* populations in a climate warming scenario

Michelangelo Morganti[1], Giacomo Assandri[2], Gaia Bazzi[2], Panagiotis Kordopatis[3], Davide Scridel[1], Nikos Tsiopelas[3], Jacopo G. Cecere[2], Diego Rubolini[4]

[1]Istituto di Ricerca sulle Acque-Consiglio Nazionale delle Ricerche, IRSA-CNR, I-20861 Brugherio (MB), Italy. [2]Area per l'Avifauna Migratrice (BIO-AVM), Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), I-40064 Ozzano Emilia (BO), Italy. [3]HOS/Birdlife. Hellenic Ornithological Society /Birdlife International, GR-10437 Athens, Greece. [4]Dipartimento di Scienze e Politiche Ambientali, I-20133 Milano, Italy

Abstract

The lesser kestrel has suffered a dramatic population decline during the last century, mainly due to changes in farming practices and climate change both in Europe and in Africa. Currently, European populations are experiencing a north-east breeding range expansion, a process that is expected to persist in the medium- to long-term under global change forecasts. However, the persistence of recently established small and isolated populations at the northern edge of the distribution range is threatened by both intrinsic (e.g. small population size) and extrinsic (e.g. destruction of nest sites) factors. We.aimed at fostering the resilience of European lesser kestrel populations to climate change by improving the conservation status of breeders settled at the northern-eastern edge of the distribution range. To this end, thanks to funding from the EU LIFE programme (LIFE FALKON LIFE17 NAT/IT/000586), in 2020-2021 we deployed over 400 nest boxes in two main expansion areas (Northern Italy, Northern Greece). In the Po Plain, we also built five nesting towers. Although colonization of nestboxes and nesting towers is expected to take some years, we observed an encouraging trend in the colonization rate up to 2022, when 18 nestboxes (ca. 5%) were used by lesser kestrels for breeding and ca. 12% by other cavity-nesting species (mainly little owls and a few Eurasian rollers). These results suggest that active conservation actions aimed at strengthening local populations at range margins may effectively contribute to improving the conservation status of this cavity-nesting species under climate warming.

Synopsis

NA

407

Availability of suitable habitats and connectivity between populations of threatened eastern Iberian reed bunting (*Emberiza schoeniclus witherbyi*): implications for conservation.

Iván Alambiaga ORCID iD[1], Luís Carrasco ORCID iD[2], Pablo Vera[3], Juan S. Monrós ORCID iD[1]

[1]Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia, Paterna, Spain. [2]Descartes Labs, Inc., Santa Fe, USA. [3]Servicio de Conservación de Ambientes Acuáticos, SAV/Servicio Devesa-Albufera, Ajuntament de València, Valencia, Spain

Abstract

Due to habitat fragmentation and degradation across the globe, connectivity between populations and the availability of suitable areas for many species has been severely affected. This has led to conservation problems for many bird species, including those inhabiting Mediterranean wetlands, a habitat that is estimated to have been reduced by 50% in the last century. In the Iberian Peninsula, the reed bunting (*Emberiza schoeniclus witherbyi*) is one of the most affected taxa by this problem, with its populations having been reduced in recent decades to apparently isolated patches. To obtain useful information for the conservation and management of the species, in the present work we have carried out habitat availability analyses, as well as landscape fragmentation and connectivity for the Iberian populations. The results have allowed us to determine the current connectivity and how the settlement in different wetlands where the species is now extinct would affect this. On the other hand, the study of the availability of suitable areas allowed us to determine the optimal areas for the species and which wetlands would require a restoration process to sustain breeding populations. The conclusions of this study will help to establish priority actions to improve habitat availability and connectivity between populations, and thus improve the conservation status of the taxon.

Synopsis

NA

409

Effect of nature protection and management of grassland on taxonomical and functional bird biodiversity in the flooded river valley (NE Poland)

Jacek J. Nowakowski ORCID iD[1], Beata Dulisz ORCID iD[2], Paweł Knozowski[2], Anna-Maria Stawicka[2], Andrzej Górski[2]

[1]Department of Ecology and Environmental Proetction, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland. [2]Department of Ecology and Environmental Protection, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

Abstract

Our study was aimed at indicating the impact of the diverse use of grassland on the bird species richness and functional diversity in the area of the Natura 2000 network (SBPA: Wizna Marsh – PLB200005), one of the 10 most important refuges of the Montagu's harrier, Spotted Rail, Corncrake, Ruff, Great Snipe, Little tern, Whiskered tern, Black tern, and Aquatic warbler in Poland. The study area (1320.1 hectares) consisted of agriculturally used wet meadows located in the flooded valley of the Narew River. Field surveys of birds occurrence and sampling of invertebrates belonging to the epigeic fauna were conducted in 2019. The variation in bird abundance, taxonomic and functional diversity, the abundance of species from the EU Habitats Directive Annex I, the species from the Red List of Birds in Poland, and the species of European Conservation Concern (SPEC 1-3) were analysed in relation to mowing intensity, the intensity of mineral fertilizer use, liquid manure application, invertebrate diversity, soil humidity, antibiotic contamination and other factors (distance to the river, distance to the forest, presence of shrubs and trees in the border zone of the meadows). The average number of all species recorded (Me=12), species diversity (mean H'=2.19), and the number of breeding species (Me=10) were highest in grasslands protected in the agro-environmental program and extensively used. The main factors limiting bird occurrence from Annex I and SPEC 1 are the intensity of use fertilization, type of fertilisation, number of mowing, and soil antibiotic contamination.

Synopsis

"NA"

410

Protected in the city: Test of the Human Shield Hypothesis in the European Blackbird (Turdus merula)

Zoltán Németh, Noémi Pallás, Judit Szabados, Ivan Alejandro Gonzalez Andazola, Bianka Kocsis

University of Debrecen, Debrecen, Hungary

Abstract

Organisms are increasingly exposed to human-altered environments including urban landscapes where successful survival and reproduction often depend on the quality of the habitat and the structure of the local community. Predators in these communities play a key role in regulating prey populations. The Human Shield Hypothesis predicts that prey species will take advantage of the avoidance of humans exhibited by predators, and show attraction towards, and higher fitness in close proximity of humans. We tested this prediction with the European blackbird in the city of Debrecen, Hungary. We monitored breeding success at two urban and two forested study sites during the breeding seasons of 2018-2021. Blackbirds suffered higher predation rate at forested sites than urban sites. Further, we measured the distances from the nest to the closest building, paved road and sidewalk. Overall, we found a significant positive relationship between the proximity of these anthropogenic features to the nest and the likelihood of nest predation. Finally, we compared provisioning behaviour between urban and forested sites, and found that urban blackbirds provisioned the nestlings less frequently and stayed at the nest longer than their forest counterparts. However, urban parents brought more food during these fewer visits, which eventually led to similar nestling weight across the sites. Our study provides further support to the Human Shield Hypothesis, and emphasizes the important roles humans play in shaping the predator-prey relationships in urban environments.

Synopsis

Blackbirds enjoy higher breeding success in close proximity of humans.

Twitter handle

411

Influence of environmental contamination with fertilizers and antibiotics on physiological condition and sex structure in the population of the red-backed shrike Lanius collurio

Beata Dulisz ORCID iD, Jacek J. Nowakowski ORCID iD, Paweł Knozowski, Anna Maria Stawicka, Andrzej Górski

Department of Ecology and Environmental Protection, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

Abstract

The study focused on the assessment of physiological condition (haematological indices) and body condition (BodyMass/TarsusLength index), as well as sex structure in shrike broods depending on meadow use, fertilisation intensity, soil contamination with antibiotics and availability of potential food. The study was conducted in the Narew valley included in the Natura 2000 network (SBPA: Wizna Marsh –PLB200005). Part of this area consists of meadows included in agri-environmental programs, and part of it is subject to the strong intensification of use in recent decades (fertilization, number of mowings). The study was carried out during the 2015-2020 breeding seasons. A total of 121 nests were analysed, in which biometric data and biological material (blood samples) were collected from 329 chicks, from which glucose levels, haemoglobin level, haematocrit, the proportion of leukocyte types, H:L ratio, and the sex of chicks were molecularly determined. The nestlings have high variability of glucose levels and body condition index (BodyMass/TarsusLength). Males accounted for an average of 51.4% in the broods, but the proportion of males varied significantly from year to year (from 39.1 to 66.3%), and much greater differences were found between nests (from 0 to 100%). Body condition index of nestlings positively correlated with haematocrit and haemoglobin level. We will present the results of testing the relationship between the physiological condition of the chicks and the sex structure in the broods and the level of antibiotic contamination of the soil, intensity of meadows fertilization and meadows use.

Synopsis

"NA"

413

Biocompatible polymeric microparticles are a novel vehicle for the delivery of exogenous hormones in passerines

Katharina Mahr[1], Maria Anzengruber[2], Julia Slezacek[1], Herbert Hoi[1], Franz Gabor[2], Ádám Z. Lendvai[3]

[1]Konrad Lorenz Institute of Ethology, University of Veterinary Medicine, Vienna, Austria. [2]Department of Pharmaceutical Sciences, Division of Pharmaceutical Technology and Biopharmaceutics, University of Vienna, Vienna, Austria. [3]Department of Evolutionary Zoology and Human Biology, University of Debrecen, Debrecen, Hungary

Abstract

In our study we tested whether biocompatible polymeric microparticles are a suitable tool to manipulate hormones in small songbirds. We chose the insulin-like growth factor -1 (IGF-1) as target hormone, because its short half-life and hydrophilic properties pose a challenge in finding a method that allows a sustained, systemic long-term release. Moreover, it receives increasing interest from the research community due to its important role in shaping life-history traits. We subcutaneously injected either IGF-1 loaded polylactic-co-glycolic acid (PLGA) microparticles or dispersion medium (control group) in the interscapular region of captive bearded reedlings (Panurus biarmicus) and collected blood samples for 7 consecutive days plus an additional sampling period after two weeks. To investigate the release kinetics in more detail we complemented these data with an in vitro experiment. Our results show that in vitro, PLGA microparticles facilitate a stable IGF-1 release for more than 15 days, following a burst release at the beginning of the measurement. In vivo, the initial burst was followed by a drop to still elevated levels in circulating IGF-1 until the effect vanished by 16 days post-treatment. This study is the first to describe the use of PLGA-microparticles as a novel tool for exogenous hormone administration in a small passerine. We suggest that this method is highly suitable to achieve the systemic long-term release of hormones and reduces overall handling time, as it requires only one subcutaneous injection.

Synopsis

Biocompatible polymeric microparticles are an innovative and reliable tool to administrate exogenous hormones in passerines

Twitter handle

KatharinaCaeruleus

@KCaeruleus

418

Computer vision meets avian ecology: Classification of blue tit nestling diet from video footage using machine learning

Emma Poliakova, Nicolas Pugeaut, Pablo Capilla-Lasheras, Crinan Jarrett, Davide Dominoni

University of Glasgow, Glasgow, United Kingdom

Abstract

Computer vision in ecology is becoming increasingly popular as an efficient tool to analyse large datasets from wild populations. For instance, automating classification of behaviours from video footage can increase the breadth, duration, and repeatability of ecological studies, and removes the image processing bottleneck. This work presents a machine-learning model to quantify the food provisioning rate of adult blue tits to their nestlings and classify the diet of nestlings. Video cameras were installed in nest boxes to observe adults delivering food items to their nestlings. Food items were labelled as caterpillars, insects, and other invertebrates and used to train a convolutional neural network. After training, the final model was applied to the remaining non-labelled video recordings. In this poster contribution, we will provide details on precision and accuracy of this novel method. The ultimate goal of this work is to automate the classification of food provisioning, and to apply it to study the effects of urbanisation on diet and fitness of blue tits, as well as of other bird species that use nest boxes. The development of this pipeline will largely remove the need for manual analysis, reducing processing time and observer bias. Additionally, automated systems provide a non-invasive way to observe wildlife and avoid the disruption created by catching and sampling individual birds (e.g., for faecal metabarcoding analysis). In the long run, this work can uncover evidence of action needed to aid birds living in our cities.

Synopsis

NA

419

Fire disturbance drives Eurasian steppe bird abundance and richness following post-Soviet changes in fire and grazing regimes

Tejas Bhagwat[1], Tobias Kuemmerle[2], Mahmood Soofi[1], Norbert Hölzel[3], Albert Salemgareev[4], Ingrid Stirnemann[3], Ruzlan Urazaliyev[3], Matthias Baumann[5], Johannes Kamp[1]

[1]University of Göttingen, Göttingen, Germany. [2]Integrative Research Institute on Transformations of Human-Environment Systems, Berlin, Germany. [3]University of Münster, Münster, Germany. [4]Association for the Conservation of Biodiversity in Kazakhstan, Astana, Kazakhstan. [5]Geography Department, Berlin, Germany

Abstract

Grassland ecosystems have evolved with the interactions between fire disturbance and grazing land-use. Avian biodiversity in grasslands is shaped by these regimes. The Eurasian steppe biome contains 10% of the remaining global grasslands, especially in Kazakhstan. The collapse of the Soviet Union in 1991 brought a massive land-use land cover change in Kazakhstan, namely land abandonment, declines in livestock grazing and an increase in steppe biomass. Consequently, a higher fuel availability prompted an unprecedented increase in fire disturbance, making the Kazakh steppe a global fire hotspot. Responses of avian biodiversity to these land-use changes are poorly understood. We harnessed a unique bird abundance dataset covering the entire Kazakh steppe and semi-desert and modelled the response of bird species richness and abundance as a function of fire legacy effects – fire extent, cumulative fire area and fire frequency over eight years, and variation in grazing intensity. Our results reveal that all fire legacy variables are negatively associated with bird richness and overall abundance, but their impact varies with land-cover and grazing intensity. A further species-specific analysis on 22 species reveal more loser species than winners from increased fire disturbance. We conclude that the increase in fire disturbance across the entire Eurasian steppe biome has led to strong bird declines, and changes in abundance patterns and community assembly. Climate change is likely to further increase fire activity. Therefore, to gain back control over wildfires and prevent biodiversity loss, a restoration of the traditional free-ranging grazing systems that evolved long ago on the steppes and were maintained until the collapse of the Soviet Union seems much needed.

Synopsis

NA

421

Flight in Flocks: Surfing in the wake of other birds?

Sonja Friman[1], Siyang Hao[2], Cory Elowe[3], Laura Mendez[4], Raul Ayala[2], Caylan Hagood[4], Dayna Jackson[5], Gabriella Orfanides[6], Evrim Ozcan[2], Jared Ramirez[7], Ian Brown[2], Alexander Gerson[3], Tyson Hedrick[4], Kenneth Breuer[4]

[1]Lund University, Lund, Sweden. [2]Brown University, Rhode Island, USA. [3]University of Massachusetts Amherst, Amherst, USA. [4]University of North Carolina at Chapel Hill, Chapel Hill, USA. [5]Howard University, How, USA. [6]Rochester Institute of Technology, Rochester, USA. [7]University of Southern California, Los Angeles, USA

Abstract

Group flight in a V-formation is a known means to reduce flight costs in larger birds, but it remains unknown if this is the case for flight in bird flocks for small song birds. Here we quantify the energetic cost or benefit of bird flight in vortex wakes, using wind tunnel flight tests with a medium-sized bird, European Starling (Sturnus vulgaris), which is known for flocking flight in huge numbers. The birds are flown solo, with one or more companion birds, and in the wake of an actuated airfoil. Their responses are measured using (i) a camera system to record position and body dynamics with respect to the tunnel and neighbor birds, (ii) a lightweight inertial measurement unit (IMU) to record body motion, and (iii) the 13C-labelled sodium bicarbonate method (NaBi) to record the metabolic cost of flight. By combining kinematics, metabolic and aerodynamic results, we formalize and test hypothesized predictive relationships between wake structure, flight behavior and metabolic energy expenditure. We find that statistically, the starlings' mean relative locations in flights with a companion bird align as in V-formation flight with a lateral offset of around ½ wingspan. The effects of this positioning are further investigated using the IMU and NaBi results.

Synopsis

NA

424

Physiological and morphological consequences of growing up at extreme temperatures

Elin Persson, Andreas Nord

Lund University, Lund, Sweden

Abstract

Climate change has caused an increase in global temperature and an increase in the frequency and intensity of heatwaves. In birds, changes in environmental temperature during the developmental period can directly affect growth, metabolism, and temperature tolerance of the offspring. However, we know little about whether these changes remain in adulthood. This is important to fully understand the fitness effects caused by climate change. For example, if birds adapt non-reversibly to extreme weather conditions experienced in the juvenile stage, they may be maladapted to the prevailing environmental context of their adult ranges. We investigated if any phenotypic consequences of the thermal environment in early life manifested as legacy effects in adulthood. This was achieved by raising Japanese quail under simulated heatwave- and cold conditions until reproductively mature, and in a common garden afterwards. We then measured morphological and thermophysiological responses to variation in environmental temperature, and maximal heat and cold tolerance, halfway through development, once reproductive maturity was reached, and then again after three weeks in the common garden. In this talk, we detail the short and long-term effects of heatwaves and cold snaps on morphology and on the physiological machinery responsible for keeping the birds warm or cool at the extremes of temperature tolerance. This study gives new insights into how developmental priming and plasticity allow birds to cope with increasing temperatures, if phenotypic effects are long-lasting and under which circumstances such responses are adaptive or maladaptive.

Synopsis

NA

426

Spatial risk mapping of zoonotic and wildlife diseases carried by birds and bats across a continent

Xanjie Xu[1], Veronika Laine[1], Katarina Meramo[1], Andrea Santangeli[2], Anbu Poosakkannu[3], Kati Suominen[1], Simon Gaultier[3], Verena Keller[4], Lluís Brotons[5], Arto Pulliainen[3], Thomas Lilley[1], Aleksi Lehikoinen[1]

[1]The Finnish Museum of Natural History, University of Helsinki, Helsinki, Finland. [2]Institute for Mediterranean Studies, Esporles, Spain. [3]University of Turku, Turku, Finland. [4]European Census Council, Sempach, Switzerland. [5]Ecological and Forestry Applications Research Centre (, Cerdanyola del Vallès, Spain

Abstract

Predicting large-scale risk of wildlife and zoonotic diseases requires knowledge of susceptibility and distribution of mobile wild hosts. Species traits, phylogeny and distributions of mobile hosts, and climatic gradients may be entwined drivers for the spatial pattern of relevant zoonotic pathogens at a macroecological scale. Here we tested the extent to which species traits of birds and bats, and local temperature and precipitation explain the variation in zoonotic potential among different mobile host species and different regions across Europe. With these potential predictors, we modelled the species-specific and regional-specific prevalence of 18 most-sampled pathogenic taxa and mapped their pan-European zoonotic risk. Clutch size of bird species was positively associated with the prevalence of tick-borne encephalitis viruses. The prevalence of Coxiella, and Anaplasma showed significantly positive associations with the longevity of host species. Escherichia, Coxiella, Sindbis viruses, and Borrelia spp. were significantly positively associated with the body mass. The prevalence of Trichonomas, Salmonella, and Chlamydia in migratory birds was significantly lower than that in partial migratory and/or sedentary birds. Host species that mainly use forest or human-modified habitats showed a higher prevalence. Pathogen prevalence was also associated with temperature and precipitation but in different directions. Overall, the fitted models provide reasonable predictive power for the prevalence of most studied pathogenic taxa except for two insect-borne viruses. Our modelling framework integrating local climatic conditions, species traits, phylogeny and distribution of mobile hosts can serve as a robust approach for dynamically mapping and projecting disease hotspots under climate change.

Synopsis

NA

434

Paternally-transmitted effects of pollution: new biomarkers of heavy metal exposure in birds?

Lisandrina Mari[1], Sara Calhim[1], Phillip Watts[1], Tapio Eeva[2], Suvi Ruuskanen[1]

[1]University of Jyväskylä, Jyväskylä, Finland. [2]University of Turku, Turku, Finland

Abstract

Among the pressures affecting terrestrial biodiversity, heavy metal pollution presents an increasingly important concern to wildlife health worldwide. Exposure to heavy metals is known to induce a variety of adverse effects on vertebrates by either directly disrupting their physiology or through food chain contamination. Pollution can further elicit molecular effects that can be passed down to the next generations. Birds are extremely valuable bioindicators of pollutant exposure, but most studies have insofar either focused on studying pollution within a single generation or investigated maternal transmission of effects to offspring. Paternal effects constitute as such an overlooked aspect of the impacts of anthropogenic pollution on birds. Our new project focuses on this knowledge gap and aims at characterizing how heavy metals affect sperm molecular traits and quality, and how these in turn affect offspring. We will develop molecular biomarkers of paternal exposure (DNA methylation and telomere shortening) in an experimental approach on a quail model where paternal pollution levels are controlled, and apply them in-situ to metal-exposed populations of wild birds with different life histories and thus, vulnerability to pollution (resident great tits and migratory pied flycatchers). Overall, this project will bring important insights on the role of epigenetic inheritance in the response and adaptation potential of bird populations to anthropogenic pollution.

Synopsis

NA

441

Long-term European bird monitoring projects coordinated by European Bird Census Council

Aleksi Lehikoinen[1], Gabriel Gargallo[2], Sergi Herrando[3], Alena Klvaňová[4], Petr Voříšek[4], Verena Keller[5], Chris van Turnhout[6,7]

[1]Natural History Museum, University of Helsinki, Helsinki, Finland. [2]European Bird Census Council,, Nijmegen, Netherlands. [3]Catalan Ornithological Institute, Natural History Museum of Barcelona, Barcelona, Spain. [4]Czech Society for Ornithology/BirdLife Czech Republi, Prague, Czech Republic. [5]Swiss Ornithological Institute, Sempach, Switzerland. [6]Sovon Dutch Center for Field Ornithology, Nijmegen, Netherlands. [7]Radboud Institute for Biological and Environmental Sciences, Radboud University, Nijmegen, Netherlands

Abstract

Many European countries run bird monitoring schemes which have collected data for several years up to decades. These use standardized field work methods and are carried out by citizen scientists using strict protocols. The European Bird Census Council (EBCC, ebcc.info) is an organization that is gathering different data types on European level in three different projects: 1) Pan-European Common Bird Monitoring Scheme (PECBMS), 2) European Breeding Bird Atlas (EBBA) and 3) EuroBirdPortal (EBP).

The PECBMS (https://pecbms.info/) is based on repeated surveys during the breeding season. Currently PECBMS covers 170 species, 30 countries and data since 1980. Site level data is used to calculate national, regional and European-wide population trends of species.

The EBBA (https://ebba2.info/) has been conducted during two different periods: 1985–1988 (EBBA1) and 2013–2017 (EBBA2). EBBA data covers distribution and abundance estimates of all 596 European breeding species in 50 km x 50 km grids across Europe (50 countries). In EBBA2, there are also modelled probability of occurrences for >200 species in 10 km x 10 km grids.

The EuroBirdPortal (https://eurobirdportal.org/) is an European data repository to aggregate data from online bird recording portals from across Europe (currently 81 partners, 29 countries). The data can be used to describe large-scale spatiotemporal patterns of bird distributions (seasonal distributional changes, migratory patterns, phenology) and their changes over time.

Multi-national datasets and products of these projects are ready to be used for scientific research. Some datasets are openly available on the web and others can be requested https://www.ebcc.info/about-us/contacts/.

Synopsis

European Bird Census Council is coordinating three long-term European bird monitoring projects for research and conservation

Acceptance type: Symposium keynote

2

Changing body size and shape: exploring a highly-aerial migrant response to the changing climate

Giulia Masoero ORCID iD[1,2], Julien Martin[1], Pierre Bize[2]

[1]University of Ottawa, Ottawa, Canada. [2]Swiss Ornithological Institute, Sempach, Switzerland

Abstract

Changes in adult body size have become a flagship response to climate change, but there is still little understanding of the mechanisms driving those changes. Using a long-term database on Alpine swifts (*Tachymarptis melba*) at breeding colonies in Switzerland, we investigated climate-induced changes in adult body size and in nestlings' growth. Adult birds showed an increase in wing and tail length but not in body mass or sternum from 1999 to 2021. Wings are growing faster, linked with an earlier fledging age. All four traits were heritable, with genetic correlations among most of them, but we found no evidence of microevolution. We also found an increasing selection for wing size over the years, as fewer and fewer nestlings with shorter wings recruited as breeders in the population. Our study highlights the importance of plasticity in explaining changes in adult shape and provides an insightful explanation of trait evolutionary constraints.

Synopsis

What is driving body size and shape changes? Insights from a highly aerial migratory species, the Alpine swift.

Twitter handle

@giumasoero

21

Tracking Contaminant Levels in Air from the Back of a Gull: The Landfill Effect

Jonathan Verreault[1], Anaïs Kerric[1], Manon Sorais[1], Marc J. Mazerolle[2], Jean-Francois Giroux[1]

[1]University of Quebec at Montreal, Montreal, Canada. [2]University Laval, Quebec, Canada

Abstract

We previously reported elevated levels of a ubiquitous contaminant class, the halogenated flame retardants (HFRs), in ring-billed gulls (*Larus delawarensis*) nesting in the highly urbanized Montreal area (Canada). We also reported that atmospheric exposure to HFRs determined using miniature passive air samplers (PAS) carried by these gulls was highest in individuals predominantly foraging in landfills. Exposure to HFRs can occur through multiple pathways including diet, inhalation, and ingestion during preening of HFR-laden dust and particles adhering to their feathers. The present study aimed to investigate: (1) the distribution of HFRs in air samples collected within one major landfill in the Montreal area that is frequently visited by ring-billed gulls, and (2) the contribution of different HFR exposure pathways in these gulls. PAS were deployed in six different areas within this landfill (34 days) and on the back of gulls that also were equipped with a GPS datalogger (10 days). HFRs were analyzed in air samples (PAS) as well as in plasma, lung, feather surface, preen oil, liver, and stomach content of gulls. Concentrations of HFRs were found to be evenly distributed within the landfill, which was determined to represent a major exposure source of the HFR polybrominated diphenyl ethers (PBDEs) for gulls visiting it. We further showed, using structural equation models, that exposure of these gulls to PBDEs mainly occurred through inhalation (air) as well as ingestion (preening and diet). We concluded that atmospheric exposure to HFRs should not be underestimated compared to the dietary pathway in urban-adapted omnivorous birds.

Synopsis

Urban-adapted ring-billed gulls are exposed to elevated levels of flame retardant chemicals through the air of landfills

22

Regular prospecting of alternative colonies by actively breeding seabirds

Jelena Kralj ORCID iD[1], Luka Jurinović ORCID iD[2], Željko Pavlinec ORCID iD[1], Sanja Barišić ORCID iD[1], Davor Ćiković ORCID iD[1], Vesna Tutiš[1]

[1]Croatian Academy of Sciences and Arts, Institute of Ornithology, Zagreb, Croatia. [2]Croatian Veterinary Institute, Poultry centre, Zagreb, Croatia

Abstract

Prospecting is an important behaviour in juveniles and failed breeders, and it serves as the basis for informed decisions about future breeding attempts. Actively breeding adults are not considered to prospect, as this behaviour is time and energy costly. Seabirds are in general highly philopatric, which decreases the need for prospecting in successfully breeding birds. However, tracking studies have provided the evidence that actively breeding seabirds do visit conspecific colonies during incubation and chick-rearing. In Croatia, actively breeding Common Terns were prospecting colonies at distances of 9-27 km, and Auduoin's Gulls were prospecting at distances up to 194 km; in both species, prospected colonies were outside of their foraging range. Birds of both sexes were prospectors, and some prospecting trips included overnight stays at the visited colony. Studied populations of both species showed inter-annual changes of breeding patches and breeding losses caused by predation or flooding. Meta-analysis of 31 populations of 14 gull and tern species confirmed prospecting in 85.7% of studied species and showed that prospecting of active breeders is more common in populations with frequent inter-annual changes of breeding patches and among females. Tracking studies designed for different purposes might nevertheless be a good source of information about prospecting behaviour. However, to identify factors affecting patterns of prospecting of adult birds in different environments, more long-term tracking studies with simultaneous monitoring of breeding success are needed.

Synopsis

NA

29

Investigating the drivers and fitness consequences of gut microbiome variation in wild birds

Sarah Worsley[1], Charli Davies[1], Maria-Elena Mannarelli[1], Terry Burke[2], Jan Komdeur[3], Hannah Dugdale[3,4], David Richardson[1,5]

[1]University of East Anglia, Norwich, United Kingdom. [2]University of Sheffield, Sheffield, United Kingdom. [3]University of Groningen, Groningen, Netherlands. [4]University of Leeds, Leeds, United Kingdom. [5]Nature Seychelles, Mahe, Seychelles

Abstract

The vertebrate gut microbiome (GM) represents a complex ecosystem that makes fundamental contributions to host processes. Much of our understanding about the importance of the GM comes from laboratory systems. However, the microbiota of laboratory animals often differs radically from their wild counterparts making it difficult to translate any observed effects to natural populations. As such, studying the extent to which GM communities vary under natural conditions and the consequences of this variation for host fitness, will be crucial if we are to fully understand GM dynamics and the evolutionary significance of the microbiome. We longitudinally characterised GM variation within and across individuals living in a natural population of Seychelles warblers (*Acrocephalus sechellensis*). We show that GM differences are correlated with several key abiotic factors including season and territory quality, as well as host factors such as sex and age. Host immunogenetic variation is also associated with small, but potentially important, differences in GM composition. This is evidenced by the fact that GM composition differs between individuals that survived or died within seven months of being sampled. These results demonstrate that components of the vertebrate GM may be associated with host fitness in the wild. However, further research is needed to establish whether changes in bacterial abundance contribute to, or are only correlated with, differential survival; this will add to our understanding of the importance of the GM in the evolution of host species living in natural populations.

Synopsis

The microbiome is associated with ageing and host fitness components in a wild bird population

Twitter handle

@sarahfworsley1

35

Fitting birds' annual cycle events to seasonal fluctuations in the Afro-tropics

Chima Nwaogu ORCID iD

FitzPatrick Institute of African Ornithology, Cape Town, South Africa

Abstract

The diversity of avian life histories in the Afro-tropics is well acknowledged, but the seasonal processes that may shape such diversity are underappreciated. Our understanding of annual cycles rests mainly on north temperate ornithology, where daylength is considered the key driver of environmental seasonality. This bias drives the notion that Afro-tropical environments which show little annual variation in daylength are 'stable' – an oversimplification of seasonality that may influence our understanding of the selection pressures that shape life histories. Biotic and abiotic factors, including precipitation, temperature, food, mates, hosts, and parasites can fluctuate dramatically, creating tough seasonal conditions to which birds inhabiting the Afro-tropics, permanently or temporarily, must adapt their annual cycles. Drawing examples from our own field data and the limited published accounts, we consider variation in the timing of key annual events, including breeding, moult, and movement patterns, but also in immune function and body mass. Our findings indicate that some events show greater seasonal consistency than others, with the extent of seasonality varying locally and among individuals. Optimizing the avoidance of tough seasons while capitalising on resources provided through the seasonality of lower-level organisms like plants, insects, and parasites may underlie the timing of annual cycle events in wild birds. African year-round and individual-level phenology data are scarce, so identifying the periodic occurrence of annual cycle events over carefully chosen spatio-temporal environmental gradients is crucial for determining their underlying drivers.

Synopsis

Avoidance of tough seasons may differ from capitalising on seasonal opportunities in the timing of the annual cycle of wild birds.

Twitter handle

@ChimaobimNwaogu

39

Conservation of birds traded in East Asian: the role of Artificial Intelligence (AI) in citizen science monitoring

Shan Su[1], Da He Gu[2], Chun-Yu Lai[3], Nico Arcilla[4], Ling-Hua Chung[3], Tai-Yuan Su[3]

[1]International Bird Conservation Partnership, CA, United Kingdom. [2]University of Adelaide, Adelaide, Australia. [3]Yuan Ze University, Taoyuan, Taiwan. [4]International Bird Conservation Partnership, CA, USA

Abstract

The global bird trade has devastating impacts on biodiversity loss, spreads disease, and may threaten national and global biosecurity. The ability to efficiently and accurately identify traded species is crucial for monitoring the trade. However, it remains a key challenge to identify those look-alike species in trade. Therefore, to address this challenge, we proposed and developed an AI-enabled method for bird species classification using vocal information. Hence, this study used acoustic data of 15 morphologically similar Zosterops species that are commonly traded in east and southeast Asia. In this study, we employed the Inception v3 pre-trained model to classify species using vocal information, which including a total of 448 bird song recordings obtained from three main acoustic databases and ambient sound. The data were converted into Mel spectrograms, this process converting the bird recordings into the image form. We then using eight image augmentation methods to enhance the performance of the neural network through training. The data was divided into training (70%) and testing (30%) data, and also set the training parameters for network training. The generated model was validated using the testing data. The results showed that the recall, precision, and F1 score were increased as the amount of data augmentation increased. The best model we obtained achieve the overall accuracy of 88% for identifying the tested species. This study provides a reference to efficiently identify traded look-alike species and provide a potential solution for citizen science research on wild bird trafficking by using vocal information and AI tool.

Synopsis

NA

50

Roles of thyroid hormones in the physiology of avian migration: a phylogenetic comparative analysis

Bin-Yan Hsu ORCID iD[1,2], Shinichi Nakagawa ORCID iD[3], Oscar Vedder ORCID iD[4], Sandra Bouwhuis ORCID iD[2], Suvi Ruuskanen ORCID iD[5]

[1]University of Turku, Turku, Finland. [2]Institute of Avian Research, Wilhelmshaven, Germany. [3]University of New South Wales, Sydney, Australia. [4]Insitute of Avian Research, Wilhelmshaven, Germany. [5]University of Jyväskylä, Jyväskylä, Finland

Abstract

Migration is a prominent behavior and life history trait in many bird species. Over decades, ornithologists have strived to understand the mechanisms underlying variation in migratory strategies. Among other physiological components, thyroid hormones (THs) have been implicated to regulate migration by thyroidectomy and replacement experiments. However, in many species, the annual seasonal change in circulating TH levels does not match with the timing of migration and recent studies suggested that different mechanisms might be at play between autumn and vernal migrations. We recently found higher levels of maternally transferred THs in the egg yolks of migratory birds than in those of residential birds. To further disentangle the potentially complicated relationship between migration and THs, we have therefore compiled a dataset of blood circulating THs across 79 species encompassing 34 families and 15 orders of birds by a systematic literature search. Preliminary inspection of these data suggests higher circulating THs in migratory than in residential species. Using modern Bayesian phylogenetic mixed models, we will present 1) whether blood THs co-vary with migratory tendency or migratory distance and 2) whether variation in seasonal change in blood THs explains variation in migratory tendency. The results from this work will provide insights and stimulate future experimental work to further unveil the mechanistic underpinnings of avian migration.

Synopsis

Roles of thyroid hormones in the physiology of avian migration

Twitter handle

binyannhsu

64

Parallel phylotranscriptomics but not testosterone levels underlie the convergent evolution of aggression in cavity-nesting songbirds

Sara Lipshutz ORCID iD[1], Mark Hibbins[2], Kimberly Rosvall[3]

[1]Loyola University Chicago, Chicago, USA. [2]University of Toronto, Toronto, Canada. [3]Indiana University, Bloomington, USA

Abstract

Evolutionary convergence provides compelling evidence of natural selection, but how proximate mechanisms give rise to behavioral convergence is poorly understood. We examined a repeated behavioral target of natural selection: obligate cavity-nesting. Across five avian families, we find behavioral convergence; cavity-nesting species have higher territorial aggression than their flexible-nesting relatives. Though males had higher aggression overall, nesting strategy was a particularly salient predictor of territorial aggression in females. Species-level aggression was not explained by levels of testosterone in circulation, for either sex. However, there was some correlative evidence that testosterone is associated with higher aggression in female tree swallows, indicating a potential disconnect between the micro- and macro-evolutionary processes linking hormones and behavior. To take a neurotranscriptomic approach, we used phylogenetic models to test whether cavity-nesting is associated with diverse or shared gene regulatory mechanisms. Neurotranscriptomic profiles associated with aggression and nesting strategy were significantly enriched for mitochondrial and metabolic processes. However, we also found many unique signatures associated with each independent evolution of cavity-nesting, suggesting evolution deploys many diverse paths to build an aggressive bird.

Synopsis

Across 10 songbirds, the cavity-nesting strategy is associated with territorial aggression and neurogenomics, but not testosterone.

Twitter handle

jacanamama

74

Birds over Birmingham: Patterns of airspace use by birds above an urban area

Joseph Wayman ORCID iD[1], Daniel White ORCID iD[2], Mohammed Jahangir ORCID iD[2], Michail Antoniou ORCID iD[2], S. James Reynolds ORCID iD[3,4], Jonathan Sadler ORCID iD[1]

[1]School of Geography, University of Birmingham, Birmingham, United Kingdom. [2]School of Engineering, University of Birmingham, Birmingham, United Kingdom. [3]School of Biosciences, University of Birmingham, Birmingham, United Kingdom. [4]The Army Ornithological Society, Birmingham, United Kingdom

Abstract

Airspace is an important habitat for flighted organisms. With advances in technology, it is also a space occupied increasingly by abiotic as well as biotic entities. Therefore, understanding how birds use this space and to mitigate against this abiotic disturbance is becoming ever more important in our modernising world. Capturing high-resolution tracking data for birds is normally achieved through tagging and is thus limited, spatially, temporally and taxonomically. This problem can be partially solved using staring radars that continuously monitor the airspace above a single coverage area. Radars like the one used here (an L-Band staring radar) employ a real-time processor that generates plots of detected targets roughly every 0.25 seconds which then are linked together using standard tracking algorithms to form 3-D tracks that are also attributed a class label which can then provide detailed tracks on individual birds. We obtained bird tracks across eight months in 2021 from a radar surveying the airspace up to the basoaerial layer (up to 1 km) over an urban area consisting of primarily urban and sub-urban features (Birmingham, UK). The radar covered a 90-degree section of airspace out to a range of 5 km. We used the track-level data to assess how airspace use changed throughout 2021. Specifically, we examined changes in activity, altitude, and flight speed of birds across the circadian cycle and between different seasons. Then, combining the track-level data with ancillary data on weather conditions and landscape structure, we assess potential drivers of activity.

Synopsis

NA

76

Energetic savings from roosting inside cavities during winter and summer

Mark Mainwaring[1], Thomas Martin[1], Blair Wolf[2], Bret Tobalske[1]

[1]University of Montana, Missoula, USA. [2]University of New Mexico, Albuquerque, USA

Abstract

Cavities provide breeding and roosting sites for a variety of organisms and are thus a critical component of their lives throughout the year. Occupying natural cavities or artificial nest boxes provides birds with thermal benefits and subsequent energy savings during winter, yet the energy savings made by passerine birds occupying cavities throughout the year are unknown. Here, we used custom-built circuits to quantify the power required to maintain a temperature of 39℃ for spherical models representing the body of a passerine both inside and outside of natural cavities and nest boxes in Montana, USA, during the cold non-breeding season and the hot breeding season. The power required to keep the spheres at 39°C was significantly lower inside natural cavities and nest boxes than outside of them in winter, but not in summer. The power needed was higher in winter than in summer for natural cavities and nest boxes but did not vary between natural cavities and nest boxes, whilst the power needed was higher at night than during the day, particularly in summer. We did not detect significant effects of cavity orientation or canopy cover. Passerine birds therefore gain considerable energy savings by occupying cavities in winter at any time of day, compared to conspecifics roosting outside of cavities, and power savings are available by roosting at night during summer. Natural cavities and nest boxes provided passerine birds with similar energy savings during the cold winter months, suggesting that both cavity types provide similar energy savings.

Synopsis

NA

Twitter handle

NA

82

Combining life-time tracking with experiments to understand factors influencing the development of white stork migration

Iris D. Bontekoe[1,2], Andrea Flack[1,2]

[1]Max Planck Institute of Animal Behavior, Radolfzell, Germany. [2]University of Konstanz, Konstanz, Germany

Abstract

Migrants make decisions regarding the timing, routes and destinations of their movements throughout their life. Yet, depending on lifetime stages, individuals may choose a different migration strategy due to diverging time and energy constraints. We use the white stork (*Ciconia ciconia*; hereafter stork) as a model species to study different factors influencing the migration behaviour, ranging from sub-second level performance and interindividual variation to global long-distance movement and life-time development. Using a long-term, life-time tracking dataset, we examine how migration strategies develop over a stork's lifetime. In addition to this observational approach, we also conduct experiments in the field by, for example, delaying the migration of juvenile storks. Nearly continuous 1Hz GPS trajectories and tri-axial accelerometer data (ACC) provide detailed insights into flight performance and decision-making.

Finally, given that storks are social migrants, we also explore how flight performance is affected by flock composition and by properties of individuals in the flock. With synchronous recordings of high-resolution GPS and ACC data, we study how individual properties affect fine-scale flight performance and broader migration features of individuals and groups. Our research contributes to an improved understanding of the ontogeny of migration, as well as provide novel insights into the importance of individual properties and social factors for migration behaviour.

Synopsis

NA

103

Glucocorticoids and energy expenditure across avian species: insights from macroecological and comparative approaches

Blanca Jimeno ORCID iD

Pyrenean Institute of Ecology, Jaca, Spain

Abstract

Glucocorticoids (GCs) are metabolic hormones that regulate physiological and behavioural responses to environmental change and mediate homeostasis in vertebrates. Despite the assumption that GCs covary with energy metabolism, we lack a mechanistic understanding of how environmental factors modulate GCs through their effect on energy balance, and whether GCs are quantitatively explained by metabolic rate. This is particularly outstanding at broad spatial scales and across species. I will show results from two studies applying a comparative approach to investigate the GC-energy expenditure association at broad scales: In the first one, we used biophysical models to calculate thermoregulatory costs of free-living birds, and explored the link between ambient temperature, cost of thermoregulation and baseline GCs across species. We found a significant, positive association between thermoregulatory costs and baseline GCs, suggesting that energy requirements for thermoregulation fundamentally modulate GCs in the wild. In the second study, we conducted a meta-analysis, selecting studies in which metabolic rate was experimentally increased and GCs were measured simultaneously in endotherms. We found that increases in metabolic rate was associated with increases in GCs in all studies but one, and a strong positive correlation between the increases in both metabolic rate and GCs, a result that leads us to question whether GCs provide information on 'stress' beyond the stressor's effect on metabolic rate. Our work demonstrates that differences in energy expenditure modulate variation in GCs across species and broad climatic gradients, with biophysical models providing a tool to predict the impact of environmental conditions on energy metabolism.

Synopsis

Applying a comparative approach to investigate the GC-energy expenditure association at broad scales.

Twitter handle

https://twitter.com/blanca_jimeno

108

“Green” hydroelectric dams and the plight of Black Storks in Latvia

Maris Strazds

Laboratory of Ornithology, Institute of Biology, University of Latvia, Riga, Latvia

Abstract

Water-generated energy is largely considered "green," in contrast to the use of fossil fuels for generating power. More than 150 small Hydroelectric Power Stations (HPS) were built on small or medium-sized lowland rivers in Latvia, the majority between 1998 and 2002. Prior to the establishment of HPS, most of these streams were priority foraging sites for Black Stork, a species already affected by the vast amount of drainage networks surrounding most of its nests. When precipitation is insufficient, rivers below HPS may dry out completely because the flow is stopped for too long. Although this condition may last only a short period, it is disastrous for fish. When HPS are operating, long stretches below the dam may be unsuitable because of rapidly flowing and muddy water conditions. After start of two HPS operations in 2003, eight out of nine Black Stork nests on those rivers were unsuccessful, and most of these territories have ceased to exist. In 2003 and 2007, the ratio of unsuccessful to successful nests in Latvia exceeded 50%, and since 2012 the proportion of nest failures has fluctuated between 51% and 73%. Data on Black Stork food samples indicate a strong decrease in the average size of prey items and almost complete disappearance of adult frogs. I investigate how these negative developments are related to the disappearance of Black Storks’ most important foraging grounds and discuss what can be done to address the situation.

Synopsis

NA

109

Epigenetic effects of early-life radionuclide stress in natural population of birds

Sameli Piirto ORCID iD[1], Phillip C. Watts ORCID iD[1], Tapio Mappes ORCID iD[1], Eugene Tukalenko[2,1], Suvi Ruuskanen ORCID iD[1,3]

[1]Univeristy of Jyväskylä, Jyväskylä, Finland. [2]Institute for Nuclear Research of National Academy of Science of Ukraine, Kyiv, Ukraine. [3]University of Turku, Turku, Finland

Abstract

Understanding how animals cope with environmental stress is crucial given the widespread human impacts on the biosphere. One mechanism that might facilitate a rapid response to environmental stress is epigenetic regulation of gene expression. DNA methylation is one of several epigenetic mechanisms that respond to environmental cues. Notably, experience of stress in early life might trigger specific methylation profiles with a persistent phenotypic effect. We studied (1) how DNA methylation patterns of birds are influenced by exposure to radionuclide pollution and (2) identified functions of genes affected by methylation such as metabolism and immune response. To study this we collected blood samples from Great tit (Parus major) nestlings from replicated study plots located in the Chernobyl Exclusion Zone (CEZ) in Ukraine. DNA from the samples was sequenced using reduced representation bisulfite sequencing (RRBS). We compared DNA methylation patterns of individuals from uncontaminated plots (experienced only background levels of radiation) and contaminated plots from a radiation gradient. Changes in methylation were mapped to an annotated reference genome to identify gene ontology (function) of impacted loci. Our results help to understand molecular mechanisms that potentially mediate stress in contaminated environments.

Synopsis

NA

Twitter handle

NA

113

Blood parasites in forest birds: Half of the birds are infected

Finja Strehmann ORCID iD[1], Marcel Becker[1], Kim Lindner[1], Juan F. Masello[2], Petra Quillfeldt[2], Yvonne R. Schumm[2], Nina Farwig[1], Dana G. Schabo[1], Sascha Rösner[1]

[1]Philipps-Universität Marburg, Marburg, Germany. [2]Justus-Liebig Universität Gießen, Gießen, Germany

Abstract

Shifts in parasite distribution ranges and novel host-parasite interactions of wildlife may cause new threats on local host species populations or entire communities. Increasing numbers of studies reveal ecological consequences of single host-parasite interactions, such as reduced reproductive success, body condition, or survival. Information on interactions and ecological mechanisms of parasite infections or prevalence in entire host communities is however still scarce. Birds are repeatedly reported to being threatened by emerging diseases and parasites. Yet, understanding general patterns of parasite prevalence in bird communities is vital for the establishment of suitable conservation measures. Over the course of four consecutive years (2019 to 2022), we monitored the patterns of endoparasite infections in a forest bird community in Germany. We sampled 475 bird individuals belonging to 29 species and investigated the prevalence of haemosporidian parasites. We revealed an overall prevalence of 47.4% of haemosporidians, belonging to 52 genetic lineages of the three genera Haemoproteus spp., Leucocytozoon spp. and Plasmodium spp.. While the bird families Turdidae (91%) and Paridae (74%) showed a high prevalence, Certhiidae and Picidae were not infected (0%). A host-parasite network analysis detected a high variability of interactions. With eight lineages detected, lineage diversity was highest in Parus major. Furthermore, we found novel host-parasite interactions. These results point to the need of further investigating geographic distribution ranges of haemosporidian lineages and host-specifity. Our findings highlight the need to establish a monitoring for host-parasite interactions and their consequences to be able to identify changes in such interactions.

Synopsis

Half of the birds in a German forest bird community are infected with haemosporidian parasites.

Twitter handle

finjastrehmann

115

Epigenetic clocks as biomarkers of ageing in non-model species: past, present, and future.

Marianthi Tangili ORCID iD, Simon Verhulst ORCID iD, Per Palsbøll ORCID iD, Hannah Dugdale ORCID iD, Joanna Sudyka ORCID iD

University of Groningen, Groningen, Netherlands

Abstract

An accurate inference of the chronological and biological age of individuals is fundamental to ecology and our understanding of ageing itself, its evolution and the biological processes that affect or even cause it. DNA methylation's (DNAm) key functions in regulating gene expression, cell differentiation and development make it a prime ageing biomarker candidate. In recent years, a growing number of studies have characterized age-related DNAm to develop epigenetic clocks in non-model organisms for applied purposes (commercial, conservation and management), as well as towards gaining insights into ageing, its evolution and its role in nature. However, only a handful of published studies include longitudinal samples that have the potential to point to genomic sites that are truly variably methylated with age within individuals. I will present an overview of how epigenetic clocks have been used so far to access biological ageing in non-model species, and discuss factors affecting how well epigenetic age predicts chronological age. Additionally, I will present results from our project aiming to develop epigenetic clocks as robust predictors of biological age in longitudinal samples of zebra finches (*Taeniopygia guttata*) and jackdaws (*Coloeus monedula*) that will reveal whether environmental manipulations that have been previously found to affect lifespan similarly affect DNAm dynamics and if epigenetic age is linked to other life history traits. Lastly, I will touch on the future of the topic of ecological epigenetics in relation to ageing and, perhaps more importantly, on the exciting potential of employing DNAm measures to assess key traits other than age.

Synopsis

The past, present and future of the use of epigenetics to assess age in non-model species

Twitter handle

@M_Tangili

128

Exploring birds responses to climate change: the role of plasticity and microevolution

Celine Teplitsky ORCID iD

CEFE - CNRS, Montpellier, France

Abstract

Adaptation plays a major role in species persistence in the face of climate change. While the initial focus was largely on changes in phenology, it is now apparent that other traits such as body size or color are responding to climate change. What are these phenotypic trends about? To understand this, we need to evaluate whether the observed responses are adaptive or not and elucidate their origin: is it plasticity or evolution? This is all the more important if we aim to predict adaptive responses as plasticity and microevolution have different pace and limits. Long term monitoring and the use of quantitative genetic methods in wild bird populations have been instrumental in investigating these questions. I will present a couple of examples before highlighting some limits of plasticity and evolution in the broader context of global change.

Synopsis

NA

130

Exploring the links between cognition and reproductive success in free living great tits (*Parus major*)

Laure Cauchard ORCID iD[1], Julien Martin[2], Blandine Doligez[3], Pierre Bize[1]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]Ottawa University, Ottawa, Canada. [3]University of Lyon 1, Villeurbanne, France

Abstract

The ability to innovate (i.e. use novel or modified behaviours to solve a problem) has been found in many taxa and is thought to play a key role in rapid adaptation, accounting for the evolutionary success of some species. Recent studies showed that interindividual variations in problem-solving can be related to mating, reproductive success and survival in natural populations. Yet, whether and how variations in problem-solving are causally linked to fitness or whether a third variable is involved is currently unknown, which is a major knowledge gap in understanding how cognition can help animals to adapt to their changing environments. We followed a monitored wild breeding population of great tits (*Parus major*) and installed infrared cameras inside nest boxes to record food provisioning during rearing (feeding rate, size number and type of preys). We then tested problem-solving ability using a string-pulling task attached to the entrance of nest boxes. We expected innovators to be better able to use their environment, and thus supply their brood at a faster rate and with bigger and/or better preys. We showed that although females were more likely to solve the task, solver males delivered preys at a higher rate and brought more larvae, a particularly nutritious prey, to their chicks, than non-solver males. Path analyses using problem-solving, provisioning and reproductive data showed that both males and females solving status influenced their provisioning performances but identified only one causal link between problem solving status and reproductive success mediated by foraging performance in males.

Synopsis

Are innovative Great tits better to search for food and better at reproducing ?

Twitter handle

https://twitter.com/CauchardLaure

144

The fetish market of Lomé, Togo: An alarming hotspot for the international trade of both common and globally threatened bird species

Olivier Boissier ORCID iD[1], Lin-Ernni Mikégraba Kaboumba[2], Shan Su[3], Nico Arcilla[4]

[1]International Bird Conservation Partnership, Paris, France. [2]University of Lomé, Lomé, Togo. [3]International Bird Conservation Partnership, New Taipei, Taiwan. [4]International Bird Conservation Partnership, Stockholm, Sweden

Abstract

Direct wildlife harvesting is one of the most pressing threats to biodiversity, especially in the tropics. While in Asia the issue of wildlife trade for uses other than food, such as traditional Chinese medicine, has attracted a lot of international attention and scientific study, in Africa the vast majority of research has been focusing on bushmeat hunting and trade, which have led so many of the continent's species to population collapse if not to the brink of extinction. However, comparatively very little light has been shed on the extent and impacts of wildlife trade for traditional uses other than food in Africa. The local use of wildlife, including birds, as fetish is prevalent along the coast of the Gulf of Guinea. Here we report on the fetish market of Lomé, Togo, which is reportedly the largest in West Africa. A comprehensive five-day market survey was conducted in April - May 2022, in addition to faster photographic surveys in July 2021, February and September 2022 and February 2023. A minimum of 64 bird species were found for sale, involving at least 963 individuals on a single survey. Globally threatened species are widely and openly sold. These include Hooded Vulture (CR), Gray Parrot (EN), Black Crowned Crane (VU), Northern Ground-hornbill (VU) and Yellow-casqued Hornbill (VU). All vendors come from Benin. Birds are traded from all neighboring West African countries, and customers likewise travel from abroad to buy carcasses and body parts, making the market a hotspot for international bird trade.

Synopsis

International bird trade at the Lomé fetish market, Togo.

155

Foraging cognition in the city – how parrots thrive in an urban world

Barbara Klump[1], Richard Major[2], Sonja Wild[1], Damien Farine[3], John Martin[4], Lucy Aplin[1]

[1]Cognitive and Cultural Ecology Research Group, Max Planck Institute of Animal Behavior, Radolfzell, Germany. [2]Australian Museum Research Institute, Sydney, Australia. [3]Department of Evolutionary Biology and Environmental Studies, University of Zurich, Zurich, Switzerland. [4]Taronga Institute of Science and Learning, Taronga Conservation Society, Sydney, Australia

Abstract

Living in an urban environment is challenging for wild animals, but also provides novel foraging opportunities and year-round access to human-derived resources. If animals can gain access to these resources through foraging innovations, and these behavioural innovations become established as cultures, they can become an adaptive response to anthropogenic change, but also bear the potential for human-wildlife conflict. In Sydney, Australia, Sulphur-crested cockatoos – parrots native to Eastern Australia - have learned to open household bins to scavenge for food, presenting a unique opportunity to study a socially-learned skill in an environment where hundreds of birds have access to the same foraging task. Through a combination of citizen science and detailed in-person observations, we map the occurrence of this behaviour, its spread over time and its intensity over the course of the seasons. As bin-opening behaviour results in a lot of garbage on the streets, local residents have begun to protect their bins from cockatoo attacks. This leads to a inter-species cultural innovation arms-race, where the socially-learnt bin-opening by cockatoos is countered by socially-learnt – and increasingly effective – bin-protection devices by local residents. Bin-opening is directly linked to foraging resources provided by humans, highlighting that animal cultures can facilitate behavioral responses to anthropogenic change, but can also lead to an inter-species cultural arms-race.

Synopsis

NA

191

Stopping behaviour in two gull species: factors influencing how individuals respond to changes in their environment

Camille Troisi ORCID iD, Alizée Vernouillet ORCID iD, Sophia Knoch, Reinoud Allaert ORCID iD, Luc Lens ORCID iD, Frederick Verbruggen ORCID iD

Ghent University, Ghent, Belgium

Abstract

Response inhibition can be characterised by two components: "going" and "stopping". Yet, there is much variation in how individuals inhibit responses when faced with changes in their environment. Using three different tasks (detour, thwarting, stop-change) we investigated how ecological and intrinsic factors contribute to such differences during early life. We raised 120 herring (*Larus argentatus*) and lesser black-backed gulls (*L. fuscus)* in predictable and unpredictable environments. We found a species difference in a component of the PCA reflecting activity: lesser black-backed gulls were faster in "going" and persisted more at unrewarded behaviour compared to herring gulls, but we did not find any species differences in PCA components reflecting "stopping". This highlights the importance of understanding the role of non-cognitive mechanisms when measuring response inhibition. The results also suggest that despite being closely related, key species differences in life-history strategies, such as migratory behaviour, may have led to the evolution of specific cognitive strategies to deal with the challenges gulls face in their environments.

Synopsis

When the environment changes, lesser black-backed gulls "go" faster than herring gulls, but they do not differ in stopping behaviour

Twitter handle

@CamilleTroisi

197

Seasonal effects of tawny owl plumage coloration on camouflage abilities in a changing climate: an experimental approach

Charlotte Perrault ORCID iD[1], Chiara Morosinotto ORCID iD[2], Jon Brommer ORCID iD[1], Patrik Karell ORCID iD[2]

[1]University of Turku, Turku, Finland. [2]Lund University, Lund, Sweden

Abstract

Climate change is affecting temperature and landscapes, especially in northern latitudes where heavy winters are becoming less common. Those induced changes in the environment can strongly affect animals' ability to camouflage into their local habitat. For predators, efficient camouflage leads to higher hunting success and less detection by mobbing birds, which could be lethal for nocturnal species as it prevents them to rest during daytime. Tawny owls, *Strix aluco*, are colour polymorphic with a brown and a grey morph. The grey morph has higher survival than the brown morph in snowy winters and is known to be more cryptic in snowy landscapes. To assess the climate change impact on tawny owls' camouflage abilities, we studied passerines' mobbing behaviour using stuffed owls in a Finnish forest during the four different seasons. We showed that grey owls are detected slower and have a lower probability to be mobbed during snowy winters compared to brown owls. Then, to see if one of the morphs was more prone to expose itself, we tested the use of space of captive tawny owls in an experimental room. We found that grey tawny owls chose to perch in more hidden places than brown ones, readily exposing themselves. Since grey owls only benefit from snowy winters and brown owls are more prone to expose themselves, warmer winters beseem to affect the detectability of the colour morphs. Thus, changing winter conditions are expected to modify the outcomes of behavioural differences between morphs and the strength of biotic interactions (mobbing).

Synopsis

Tawny owls' camouflage abilities are affected by winter conditions, and thus, climate change.

Twitter handle

@ChaPerrault

203

Linking variation in cognition to behavioral flexibility in the face of global changes

Alexis Chaine ORCID iD

CNRS, Moulis, France

Abstract

Global changes due to anthropogenic impacts have triggered the decline of many species as documented over the past decades. The most rapid responses to anthropogenic changes are likely to be through behavioral plasticity to the degree that organisms can respond to new environmental conditions. Plasticity in complex behaviors likely depends on cognitive abilities which determines how individuals gather and use information about their environment yet empirical information is scarce. Indeed, a growing number of studies have examined behavioral plasticity or variation in cognitive performance in the wild separately, but not the two simultaneously. In this talk, I review examples from the literature on behavioral plasticity in the wild as well as variation in cognitive performance in the wild to begin exploring this key question. I then use work my lab is doing on behavioral strategies, plasticity, and cognition in populations of great (*Parus major*) and blue (*Parus caeruleus*) tits along an elevational gradient in the French Pyrenees to begin tackling these questions. First, I show how birds shift their reproductive strategies and behavior along this elevational gradient in the wild. I then discuss variation in cognitive performance along this gradient and the link between cognitive performance, behavior, and environmental challenges. Using these examples, I propose an approach for future work on linking cognition, behavior, and anthropogenically driven global changes with discussion of key questions when establishing sound experimental design in such studies.

Synopsis

Can we link variation in cognition to behavioral flexibility needed to face global changes?

206

Habitat selection by dispersers: a comparison of prospecting and settlement phases in a long-lived raptor

Florian Orgeret ORCID iD, Martin Grüebler ORCID iD, Patrick Scherler ORCID iD, Valentijn van Bergen ORCID iD, Urs Kormann ORCID iD

Swiss Ornithological Institute, Sempach, Switzerland

Abstract

Understanding how animals select their habitats provides insight into ecological processes, species distribution, and conservation management. However, there is a lack of studies that examine how habitat selection may change during dispersal. In this study, we examined the changes in habitat preferences during natal dispersal of a long-lived raptor species in the Swiss population. We deployed solar-powered GPS-GSM transmitters on 204 nestlings and continuously tracked their movements from fledging to settlement. Using hierarchical generalized additive models, we applied habitat selection functions during the prospecting and settlement phases of dispersal. Our findings revealed that during the prospecting phase, individuals were less responsive to their environment, likely seeking out areas with abundant food. However, during the settlement phase, they were more selective, likely prioritizing habitats suitable for nesting while minimizing competition with conspecifics. Suitable habitats predicted during the settlement phase turned out to be more spatially restricted. Our study highlights the importance of accounting for changes in habitat selection during dispersal to improve the accuracy of spatial predictions. It also highlights the importance of using analytical methods of habitat selection that allow for nonlinear relationships, control for habitat availability, individual variation, and spatiotemporal autocorrelation to provide a more detailed understanding of the habitat requirements of long-lived raptor species during different phases of their life cycle.

Synopsis

Habitat selection shift during natal dispersal of long-lived raptors, highlighting need for improved spatial predictions #redkites

Twitter handle

@FlOrgeret

210

Migratory effort, telomeres, and mitochondrial density

Tiia Kärkkäinen ORCID iD[1,2], Toni Laaksonen[2], Malcolm Burgess[3,4], Alejandro Cantarero[1], Jesús Martínes-Padilla[5], Jaime Potti[6], Juan Moreno[1], Robert L. Thomson[7,2], Vallo Tilgar[8], Antoine Stier[9,2]

[1]National Museum of Natural Sciences, Madrid, Spain. [2]University of Turku, Turku, Finland. [3]RSPB Centre for Conservation Science, Sandy, United Kingdom. [4]University of Exeter, Exeter, United Kingdom. [5]Pyrenean Institute of Ecology, Jaca, Spain. [6]Biological Station of Doñana, Seville, Spain. [7]University of Cape Town, Rondebosch, South Africa. [8]University of Tartu, Tartu, Estonia. [9]University of Strasbourg, Strasbourg, France

Abstract

Long-distance migrants move annually vast distances between their breeding and non-breeding areas in order to benefit from the most suitable habitats and resources all year round. However, long-distance migration is an extreme physical effort that has known effects on individuals' physiology, in particular on metabolism. Migratory species are also known to have faster pace of lives than resident species, prioritizing reproduction over survival, but the physiological factors that might mediate these differences are not well understood. The length of telomeres, the protective caps of linear chromosomes, has been previously associated with lifespan and survival, and can shorten with high metabolic demand. As mitochondria fuel cellular processes underlying whole-animal activities, mitochondrial metabolism is suggested to underlie differences in performance capacity. Thus, these traits have potential to link the pace of life with increased physical effort, such as migratory flight. Using the pied flycatcher (*Ficedula hypoleuca*), long-distance migrant with known differences in migration distance and pace of life across European populations, we examined potential links between migration distance, i.e., effort, telomere length, and mitochondrial density. We found differences across populations, e.g., intermediate migration distance population showing increases in both traits. Thus the differences were not associated with migration distance. Instead, the results suggest that the population differences might stem from local environmental conditions and/or genetic differences, and reflect the current, rather than past energetic demand. These results are however tentative, and more detailed analyses on telomere shortening and mitochondrial metabolism are needed to better illuminate their potential links with migration effort.

Synopsis

Preliminary results on population differences in telomere length and mitochondrial density in relation to migration effort

Twitter handle

@TIMIANKA

222

From first rainfall to future phenological flexibility: early life environmental conditions affect plasticity in the timing of reproduction in hole-nesting passerines

Joseph Burant

Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands

Abstract

Phenotypic plasticity allows animals to adjust the timing of life-history events in response to environmental conditions. Such responses have been widely demonstrated for some variables, such as age and temperature; relatively little is known about phenology changes in response to other drivers. I will investigate how rainfall and temperature experienced in the nest and immediately after fledging, as well as subsequent pre-breeding environmental conditions and age influence within- and among-individual plasticity in lay dates of resident Great Tits (Parus major) and Eurasian Blue Tits (Cyanistes caeruleus), and migratory Pied Flycatchers (Ficedula hypoleuca) breeding in four nest box studies around the Netherlands. Anticipated outcomes: Females exposed to warmer pre-breeding temperatures are expected to have earlier lay dates, as are older females. Natal rainfall and temperature are predicted to interact with age to influence lay date plasticity, with females that experienced high rainfall as nestlings advancing lay dates more strongly over their lives. High levels of natal precipitation may also result in shorter lifespans and reduced fecundity. Rainfall during the nestling period has generally increased through time, while the relative abundance of the focal species has also shifted, suggesting that increased precipitation may have unequal effects on breeding females of different species that subsequently influence community composition. While females plastically adjust the timing of breeding in response to contemporary environmental conditions, I expect that environmental conditions during the natal period also affect phenological plasticity later in life, generating downstream population- and community-level consequences.

Synopsis

Rainfall and temperature experienced in the first months of life shape future plasticity in three species of hole-nesting birds

Twitter handle

@jbburant

228

Exploring the avian microbiome: A review of the field

Elin Videvall ORCID iD

Uppsala University, Uppsala, Sweden. Brown University, Providence, USA

Abstract

There has been a recent surge of interest in animal-associated microbiomes given their important roles in host health and behaviour. Microbiome research in birds has increased rapidly but is still lagging behind that of mammals, despite the enormous potential of avian studies to explore outstanding questions in ecology and evolution. In this review talk of the field, I will start the symposium 'Eco-evolutionary dynamics of avian microbiomes' by providing an introduction to microbiome research in birds. What is an avian-associated microbiome? And why is it important? I will provide examples of how we can sample different microbiomes of birds and highlight some of the fascinating research being conducted to explore these microbial communities.

Synopsis

Exploring the avian microbiome: A review of the field

Twitter handle

@ElinVidevall

233

Lunar correlates in bird flight activity and movement ecology

Gabriel Norevik

Lund University, Lund, Sweden

Abstract

The ongoing technical advancements of miniaturised dataloggers along with the development of innovative approaches to analyse such data have allowed scientists to collect empirical data on smaller avian migrants in an unprecedented scale and detail. Devices that (near)-simultaneously collect data from multiple sensors such as acceleration (in one or more axis) ambient pressure and temperature can provide detailed information regarding the activity pattern of the bird, which may infer about its behaviour throughout the annual cycle. Here, I use multisensory data to demonstrate how the lunar cycle is reflected in the flight activity and migrations of European nightjars *Caprimulgus europaeus*. I will discuss how moonlight and its temporal variation can influence the daily foraging opportunity for nightjars and to what extent this may be reflected in fuelling rates and the timing of migratory flights throughout their annual cycle.

Synopsis

NA

Twitter handle

@GabrielNorevik

246

GeoPressureR: Introduction and case studies

Raphaël Nussbaumer ORCID iD[1], Mathieu Gravey ORCID iD[2]

[1]Cornell Lab of Ornithology, Ithaca, USA. [2]Utrecht University, Utrecht, Netherlands

Abstract

It was recently shown that by matching the measurements of a light-weight pressure sensor with a weather reanalysis dataset, we can derive the position of a device with relatively high precision (10-100km).

This method presents several advantages: (1) it does not rely on calibration and its precision does not vary with time of year, (2) it provides information on short stopovers and thus enables the reconstruction of a full trajectory efficiently, and (3) it allows the accurate tracking of short distant, altitudinal, nocturnal and forest dwelling migrants.

However, applying this method can be complex due to (1) the manual labelization required, (2) handling the large weather reanalysis dataset and (3) visualizing the non-regular probability maps outputted.

To help researchers overcome these challenges, the following suite of tools were developed:

- **GeoPressureR**: core R package providing the basic functions to run analyses.
- **GeoPressureManual**: a user guide describing the successive steps to produce the standard outputs of the method based on an example.
- **GeoPressureTemplate**: a Github repository template to help users kick-start their project with a project folder structure and R scripts.

Geolocation by pressure has already provided promising ecological insights: *Rafnuss/MK-RCRC* described the first short distance intra-african migration highlighting the role of wind to explain seasonal differences in migration speed. *grhyne/SWWA_Pressure* illustrated the critical role of wind support to allow Swainson's Warblers to perform a flight across the Gulf of Mexico. *Rafnuss/Val-Piora-Wheatear* showed the increased precision of altitudinal movement to explain pre-breeding coping strategies with snow.

Synopsis

An introduction to GeoPressureR and examples

Twitter handle

@rafnuss

249

Linking Dispersal Strategies with Population Dynamics: a case example with the eagle owl

Maria Mar Delgado

Biodiversity Research Institute (IMIC; CSIC-OU-PA), Mieres, Spain

Abstract

During the last decades, dispersal studies have mainly focused on the cues used in the first step (i.e. when individuals take the decision to leave their natal site) and the last stage (i.e. when dispersing individuals select a settlement area), while little is still unknown about the intermediate, wandering phase. A greater understanding of this phase can be achieved by approaching it from the perspective of animal movement analyses. Understanding how animals make movement decisions during dispersal is an essential step for predicting the trajectories of population dynamics. This is because the movement behaviour during natal dispersal has important consequences on the dynamics of spatially structured populations, influencing how populations can respond to substantial environmental stress (e.g. human alteration and climate warming) and local catastrophes. Here I will talk about the natal dispersal process of a long-lived species, the eagle owl. By summarizing the results of a 10-year study I will show that, when considering an animal dispersing through a matrix landscape, we have to take into account that, during the travel from the natal to the breeding patch, the movements will be influenced by abiotic and biotic factors. All these factors may generate different movement behaviours and search strategies. Importantly, because dispersal is frequently risky or otherwise costly, individuals may disperse less than ideal for population performance. Following this idea, I will provide some insights into how natal dispersal might influence spatially structured populations' demographic and evolutionary dynamics.

Synopsis

NA

252

Immune defences trade-off against growth and reproductive investments

Tjomme van Mastrigt ORCID iD[1,2,3], Eline Weenink[2,3], Kees van Oers ORCID iD[2,4], Kevin Matson ORCID iD[3], Fred de Boer ORCID iD[3], Henk van der Jeugd ORCID iD[1,2]

[1]Dutch Centre for Avian Migration and Demography, Netherlands Institute of Ecology, Wageningen, Netherlands. [2]Department of Animal Ecology, Netherlands Institute of Ecology, Wageningen, Netherlands. [3]Wildlife Ecology and Conservation group, Wageningen University & Research, Wageningen, Netherlands. [4]Behavioural Ecology group, Wageningen University & Research, Wageningen, Netherlands

Abstract

Host immune defences are key determinants in the spread of infectious diseases through host populations. The immune defences of wild birds fluctuate within and among annual cycle stages, but the factors that drive these fluctuations are not well understood. Trade-offs involving energy are often invoked. For instance, immune defences in breeding adults may be traded off against reproductive investments, while developing offspring may face a trade-off between investments in growth and immune defences. To build a foundation to understand how future environmental conditions might influence disease transmission, understanding these potential mechanisms of immunological variation is essential. Using experimental approaches, we explored these trade-offs in a wild population of pied flycatchers (*Ficedula hypoleuca*). First, we manipulated brood sizes to test whether increased parental provisioning effort reduced innate immune defences in parents. We expected that parents that reared enlarged broods showed reduced immune defences. Second, by supplementing parents before and during egg-laying and subsequently manipulating food intake of their nestlings, we assessed whether pre-laying food availability of adults affected potential trade-offs between innate immune defences and growth in their offspring. We expected that repeatedly depriving nestlings of food would reduce both their growth and immune defences. In addition, we hypothesized that any negative relationship between subsequent catch-up growth and immune defences can be compensated in broods where the adults received supplemented food before and during egg-laying. Our results will explain variation in immune defences of avian hosts, and thereby help identify windows of opportunity for pathogen transmission in wild bird populations.

Synopsis

Immune defences trade-off against growth and reproductive investments in wild pied flycatchers

Twitter handle

@TjommeM

257

Out from the cold: the importance of winter ecology in a changing world

Alex Sutton ORCID iD

Bangor University, Bangor, United Kingdom

Abstract

The thought of winter conjures images of snow, cold, darkness, and generally harsh conditions. At high latitudes and in temperate ecosystems, winter can represent a significant portion of the annual cycle and impose a variety of challenges for organisms. However, despite the potential wide-ranging consequences of winter on individuals, populations, and communities, it is an understudied season. In light of rapid environmental change, it is important to understand how winter is changing and the cascading ecological effects of these changes. I highlight studies investigating the consequences of winter on individuals, populations, and communities and lay out future directions ornithologists should consider to address the historically underrepresented field of the winter ecology.

Synopsis

Winter is historically understudied, but can impact individuals, populations, and communities of birds.

Twitter handle

@Alexsutto

261

The importance of precipitation in shaping avian physiology, behaviour, and demography

Nikole Freeman

Kansas State University, Manhattan, USA

Abstract

Climate change is resulting in shifts in both temperature and precipitation, however, most studies within ornithology focus primarily on the ecological impacts of temperature. As weather patterns across the globe shift, it is imperative that we understand how changes in precipitation impact wild birds and their conservation. Recent developments in our understanding of avian responses to rain and snow, and the mechanisms underlying these responses, highlight the importance of considering precipitation in ornithology. As an introduction to our symposium, I will provide an overview of our current knowledge of the physiological, behavioral, population, and community level responses of birds to precipitation. Additionally, I will identify key knowledge gaps that need to be addressed to provide a better understanding of the impacts of precipitation on avian systems.

Synopsis

Research is biased towards temperature however it is important to also consider the role of precipitation in avian systems

Twitter handle

koleyfree

266

Seasonal utilization by birds of secondary forest in an agricultural landscape in West Africa

Thaddeus Pev[1], Ojodomo Simon[1], Manu Shiiwua[1], Cresswell Will[2]

[1]A P Leventis Ornithological Research Institute, Jos, Nigeria. [2]School of Biology, University of St. Andrews, St. Andrews, United Kingdom

Abstract

Tropical forest fragments are perceived as isolated islands in a hostile matrix of farmlands with negative edge effects. However, these secondary forests can support seasonal assemblages of farmland and forest species. We investigated avifaunal utilization of a secondary forest patch within an agricultural landscape in Nigeria. We considered seasonal and feeding guild variation because the importance of a retained fragment may depend on the seasonal use and resource availability on croplands. Line transects were used to sample birds monthly. We categorized season into; late dry/early (March, April, May), wet (August, September, October) and dry (November, December, February) based on rainfall and vegetation greenness. 8815 birds (179 species, 59 families) of which 12 each were intra-African and Palearctic migrants were recorded. Bird abundance and species richness did not between seasons. Interactions of feeding guide with season showed variation in utilization of the woodland. Abundance of insectivores was higher in the dry and late dry/wet than the wet, while species richness was higher in the dry than the wet. This can be due to the presence of Afro-Palearctic birds during the dry season. Species richness of granivores was higher during the wet than the dry and late dry/wet, which can be due to the ripening and availability of grass seeds during the wet season in the forest. Our results highlight the importance of retained forest patches within agricultural landscapes and the seasonal variation shows that at least some populations shift between woodland—croplands, likely dependent on relative resource availability.

Synopsis

NA

Twitter handle

279

Phenological responses to a warming planet: evolutionary vs. plastic changes

Maria Moiron[1], Céline Teplitsky[2], Birgen Haest[3], Anne Charmantier[2], Sandra Bouwhuis[1]

[1]Institute of Avian Research, Wilhelmshaven, Germany. [2]CEFE, Montpellier, France. [3]Swiss Ornithological Institute, Sempach, Switzerland

Abstract

Understanding the mechanisms by which populations can adapt to changing environmental conditions is crucial for predicting their viability. In the context of rapid climate change, phenological advance is a key adaptation for which evidence is accumulating. Among vertebrates, phenotypic plasticity is known to underlie most of this phenological change, while evidence for micro-evolution is very limited and challenging to infer. In this study, we quantified phenotypic and genetic trends in timing of spring migration using 8032 dates of arrival at the breeding grounds obtained from 1715 individual common terns (Sterna hirundo) monitored across 26 years, and tested whether these trends were consistent with predictions of a micro-evolutionary change and/or phenotypic plasticity in response to environmental conditions at the wintering grounds. Overall, our study provides rare evidence for micro-evolution to underlie (part of) an adaptive response to climate change in the wild, and illustrates how a combination of adaptive micro-evolution and phenotypic plasticity facilitated a shift towards earlier migration in this natural population of common terns.

Synopsis

Microevolution and phenotypic plasticity facilitated a shift towards earlier spring migration in a natural common tern population

Twitter handle

@MariaMoironn

280

An organelle perspective on avian migration: linking mitochondrial number and migratory plasticity

Pablo Salmon ORCID iD, Miriam Liedvogel

Institute of Avian Research "Vogelwarte Helgoland", Wilhelmshaven, Germany

Abstract

The proximate mechanisms underlying migratory performance are still poorly understood. It is well known that migratory animals, in particular birds, go through drastic physiological and phenotypic changes to overcome the costly energetic demands of migration. However, despite that energy is regarded as the common currency of life, fuelling biological processes at every level of organisation and that mitochondria are the organelles responsible for its production, little attention has been paid to mitochondrial traits *per se*. Here, we investigated the plasticity of mitochondrial copy number, as a proxy for mitochondrial function, in relation to migratory behaviour in a well-known study system, the Eurasian blackcap (*Sylvia atricapilla*). We conducted a common garden experiment on wild juvenile males of this species, which were kept in captivity for 9 months, covering their first Spring migration and we measured mitochondrial copy number in three different tissues (muscle, heart, and blood), together with their migratory restlessness (*Zugunruhe*). Our study provides new information on the seasonal plasticity of this unexplored mitochondrial trait in ecologically relevant scenarios, as well as its link with individual performance.

Synopsis

Mitochondrial copy number plasticity and migratory performance in the Eurasian blackcap (Sylvia atricapilla)

Twitter handle

@Pablukas

284

Not the usual suspects: a global review of unconventional challenges and approaches in bird conservation research

Nico Arcilla[1], Maris Strazds[2]

[1]IBCP, Huddinge, Sweden. [2]University of Latvia, Riga, Latvia

Abstract

Birds contend with a range of human impacts, including habitat change, overexploitation, invasive alien species, pollution and environmental contaminants, and climate change, which together comprise the five major drivers of biodiversity decline recognized by the UN's Convention on Biodiversity. Within and in addition to these five major threats, there are a number of unconventional challenges to bird conservation demand investigation and interventions. "Green" energy projects using new technologies and materials may create ecological traps that cause bird mortality or drive habitat destruction that lowers reproductive success, such as wind farms killing raptors, solar panels creating "lake effect" illusions that can result in waterbird mortality, and hydroelectric projects that render wetlands unusable for declining birds including the Black Stork (Ciconia nigra) in Latvia. Reintroductions of formerly endangered species may also have unintended negative impacts, such as in the case of grassland songbird declines correlated with American bison (Bison bison) reintroduction and threatened shorebirds being depredated by reintroduced Peregrine Falcons (Falco peregrinus) in the USA. In Africa, the hunting and trapping of birds for new and expanding markets for traditional medicine, belief-based rituals, and bushmeat are associated with the declines and extinctions of vultures and other raptors (Accipitridae), hornbills (Bucerotidae), and other birds in many countries. Trade in birds as pets in Latin America and for singing competitions in Asia threatens parrots (Psittacidae), white-eyes (Zosteropidae) and other avian taxa. We review a range of lesser-known challenges to bird conservation with attention to quantifying impacts, identifying interventions, and future directions.

Synopsis

NA

288

Bacterial, viral and blood parasite infections as modulators of physiology and behaviour

Arne Hegemann ORCID iD

Lund University, Lund, Sweden

Abstract

Disease is a powerful evolutionary force and all animals face a constant threat of being infected with harmful pathogens including bacteria, viruses, ectoparasites and endoparasites. Such infections can modulate the behaviour and physiology of the host, leading to serve fitness consequences. Animals have developed a range of behavioural and physiological defenses to limit negative impacts of pathogens, and particularly the immune system plays a crucial role in fighting pathogens. In this talk, I will give a couple of examples on how birds behaviourally and physiologically respond to different type of infections. Behavioural responses can include modulations to feeding behaviours, movement patterns, migratory decisions and sleeping behaviours. Physiological responses can include changes to the immune system itself as well as consequences for other physiological processes and systems such as thermoregulation, oxidative balance or telomeres. While there are some common patterns, the exact behavioural and physiological modifications responses to infection depend on the type of pathogen. Furthermore, trade-offs with other behavioural and physiological process are important. As such, infections and their modulatory effects on the physiology and behaviour of birds need to considered as important regulators of life-history decisions. Taking the modulatory effects of infections on the physiology and behaviour into account will allow for a better understanding of ecological and evolutionary patterns, including our abilities to predict population-level developments.

Synopsis

Infections are important regulators of behaviour and physiology and need to be considered when understanding life-history decisions.

306

Susceptibility, resistance, and tolerance across ecological and evolutionary contexts: the makings of super-spreaders and reservoir species?

James Adelman ORCID iD

The University of Memphis, Memphis, USA

Abstract

Wild birds have long been implicated as reservoirs for infectious diseases, both zoonotic and non-zoonotic. Revealing the factors that make some individuals, populations, or species more likely to serve as reservoirs and spread these pathogens, however, remains an ongoing challenge. Confronting this challenge is especially critical as climate and land-use change continue to alter stressors, community assemblages, and other selective pressures acting on birds and their pathogens. This presentation will review recent thinking on these issues as the main themes of the symposium "Understanding birds as hosts: ecology, physiology, and population dynamics in times of global change." I will first define three main metrics of defense against pathogens as: 1) susceptibility (the probability of infection given exposure), 2) resistance (the propensity to clear pathogens once infected), and 3) tolerance (the ability to mitigate damage incurred by a given amount of pathogen). I will then assess recent studies of heterogeneity in these defenses, paying particular attention to ecological and evolutionary patterns that may drive this variation, especially as related to anthropogenic change. I will also highlight recent studies that have begun to link such heterogeneity at the organismal level with population-level dynamics, most notably the ability to transmit pathogens. Finally, I will assess the widest knowledge gaps, and thus greatest potential for future research, in these areas.

Synopsis

Which birds are likely to be disease reservoirs and/or super-spreaders? Reviewing links among ecology, evolution, and physiology.

Twitter handle

@AdelmanJim

385

Is rest-phase hypothermia in the little bird in winter a blessing or a curse?

Andreas Nord ORCID iD

Department of Biology, Lund University, Lund, Sweden

Abstract

Small birds in the northern temperate zone face a converging series of environmental challenges when autumn turns to winter, because it is costlier to stay warm in the cold but short days restrict the time available for resource acquisition. The little bird in winter is believed to rely strongly on rest-phase hypothermia, a controlled reduction in body temperature, to save energy. However, there are few empirical studies of the physiological regulation and energetic significance of hypothermia in northern birds. In this talk, I will begin by providing an overview of the little bird in winter, and then critically examine the assumptions that have formed the research field with reference to a series of new experiments on wild passerines where I connect rest-phase hypothermia to organismal energy turnover and cellular aerobic metabolism. I will show that hypothermia is associated with a range of changes to cellular metabolism that improve energy-producing efficiency of the body. Yet, the reduction in energy expenditure associated with rest-phase hypothermia was always small to moderate despite its depth, especially in severe cold. Surprisingly, individuals that were more hypothermic during the night ran their cellular machinery nearer to maximum and lost significantly more body condition overnight compared to less hypothermic birds. This suggests that rest-phase hypothermic in the little bird in winter may be an emergent consequence of inferior thermogenic or insulative capacity, more than it reflects adaptive downregulation of metabolism. These findings shed new light onto the long-standing enigma of how small birds survive the northern winter.

Synopsis

Small #northern #birds are torpid during #winter nights - because they want to or because it cannot be avoided? #ornithology

Twitter handle

@CyanistesNord

397

Gut microbiome underlying winter adaptations in wild populations of great tits (*Parus major*)

Charli Davies ORCID iD[1], Martta Liukkonen[1], Clémence Furic[1], Alma Crisp[1], Basma Ghazwa[1], Sameli Piirto[1], Antoine Stier[2,3,4], Andreas Nord[5], Suvi Ruuskanen[1]

[1]University of Jyväskylä, Jyväskylä, Finland. [2]Université Claude Bernard Lyon 1, Lyon, France. [3]University of Turku, Turku, Finland. [4]CNRS UMR7178 IPHC, Strasbourg, France. [5]Lund University, Lund, Sweden

Abstract

Winter poses a key environmental challenge to survival in most animals. Combination of cold temperatures, limited resources, and short-day lengths present energetic and thermoregulatory challenges that can detrimentally impact fitness in wild endotherm populations living at high latitudes. By increasing metabolic rate for thermogenesis via mitochondrial aerobic metabolism, endothermic animals cope with decreasing temperatures by maintaining a stable body temperature, but this is energetically costly. One promising mechanism for regulating energy acquisition and heat production is the gut microbiome (GM). By enabling the host to adapt to rapid environmental perturbations, including cold stress, the GM may directly and indirectly contribute to host thermoregulation. To explore whether the GM can act as a mechanism for winter adaptation, we sample wild-caught great tits (*Parus major*) in captive conditions kept under either summer or winter temperatures. We first study the plasticity and causal effects of temperature variation on the GM. Second, to assess whether temperature-induced changes in the GM are linked to thermoregulation we associate GM composition with biomarkers of aerobic metabolism including whole-animal metabolism in cold, and mitochondrial aerobic metabolism. To further elucidate the causal role of the GM on cold adaptation, we perform novel experimental manipulations using antibiotics and reciprocal transplants and measure associated responses on metabolism. Combination of correlative and experimental methods using wild-caught captive individuals allows assessment of the role of GM-mediated adaptation to environmental changes, demonstrating a new route of thermal adaptation in birds.

Synopsis

Gut microbiome can contribute to host cold tolerance in the great tit, demonstrating a new route of thermal adaptation in birds.

Twitter handle

@CharliSDavies

406

Unravelling the physiological adaptations for avian migration: lessons from integrative approaches

Valeria Marasco ORCID iD

Konrad Lorenz Institute of Ethology, University of Veterinary Medicine Vienna, Wien, Austria

Abstract

Migratory birds evolved spectacular adaptations to accommodate their seasonal migratory flights, involving rapid changes in their daily activity patterns and remarkable accumulation and mobilisation of fat stores. The understanding of the mechanisms driving these seasonal shifts in physiological and behavioural states is very important to appropriately identify the potential factors or constraints affecting migratory strategies, including the ability of individuals to migrate as increasing number of studies currently suggest. While it is well recognised that conditions experienced during developmental growth can have dramatic consequences on an individual's life history and fitness outcomes, our knowledge of these long-lasting organisational effects in migratory birds remain limited. In this talk I will focus on our recent research on the migratory Galliform, the Common quail. Experiments involved the employment of different techniques spanning from brain RNA-Sequencing, multi-tissue measurements of oxidative stress, and circulating concentrations of metabolic hormone. Our data suggested functional links between brain gene expression patterns associated with lipid metabolism and behavioural proxy of the migratory state. Furthermore, I will present more recent experiments where we have been manipulating environmental circumstances during developmental growth by exposing birds to brief episodes of food uncertainty to examine potential long-term effects on physiological processes underlying pre-migratory fattening. We will discuss our data on this model system in a comparative context and in light of most recent work across different bird species.

Synopsis

NA

Twitter handle

@V_Marasco

414

Evaluating the dysbiotic impact of urbanisation on the microbiome of birds

Joël White[1], Aimeric Teyssier[2], Erik Matthysen[3], Luc Lens[2]

[1]University of Toulouse, Toulouse, France. [2]University of Ghent, Ghent, Belgium. [3]University of Antwerp, Antwerp, Belgium

Abstract

Urbanisation represents of the most radical form of land use change, which has lead the appearance of specific urban phenotypes in birds, with differences in morphology, physiology and behaviour. It is thus important to identify the processes that enable organisms to survive and reproduce in such altered habitats. The last decades have revealed the importance of the gut microbiome for animal fitness and its potential contribution to host phenotypic plasticity in the face of rapid environmental changes. However, the role of the microbiome in the context of urbanisation has received little attention so far. In this talk, I will present the results of 2 studies examining the effect of urbanisation on the gut microbiota of House sparrows. In both studies, urban sparrows hosted less diverse gut bacterial communities than their rural counterparts, with urban-induced taxonomic and functional alterations. We further examined the influence of diet in explaining such differences by performing an aviary experiment in which urban and rural house sparrows were fed with mimics of urban or rural diets. The experimental diets significantly altered gut microbiota α- and β-diversity and taxonomic composition. Overall, diet-induced shifts resembled initial differences between free-ranging urban and rural hosts. Furthermore, rural diet had a positive impact on urban host body mass but only in hosts with the highest initial gut diversity. Our results highlight the important role of diet in contributing to urban-rural differences in gut microbiota and provide new insights on possible fitness consequences of a urban-induced gut dysbiosis.

Synopsis

Feeding on junk-food leads to dysbiotic gut microbiomes in urban house sparrows

415

History of avian androgenic systems and what it means for behavioral evolution

Matthew Fuxjager

Brown University, Rhode Island, USA

Abstract

Birds have evolved a diverse suite of behavioral traits, including a wide range reproductive tactics that help individuals court mates and compete for resources necessary to breed. Understanding how the physiological mechanisms that underlie these traits influence their diversification has emerged as a major question in avian biology. Here, I discuss this topic from the perspective of the endocrine system, with an emphasis on the evolution of steroid hormone systems and their likely impact on sexual behavior diversification. I focus on the role that comparative phylogenetic methods can play in advancing our appreciation of this topic. As an example, I present research on manakin birds spanning multiple levels of analysis. This work suggests that androgenic hormone systems evolved in a stepwise manner across these birds' history to confer functional changes to androgen signaling systems in select skeletal muscles that actuate elaborate courtship displays. Overall, these findings paint the picture of how ancestral modifications to endocrine functionality might combine with more recent modifications to produce radical changes in behavior.

Synopsis

NA

417

How flight generalists utilize the dynamic properties of the boundary layer

Judy Shamoun-Baranes ORCID iD[1], Elspeth Sage ORCID iD[1], J. Morgan Brown ORCID iD[1,2], CJ Camphuysen ORCID iD[3], Willem Bouten ORCID iD[1]

[1]University of Amsterdam, Amsterdam, Netherlands. [2]Wildlife Conservation Society Canada, Whitehorse, Canada. [3]NIOZ, Den Hoorn, Netherlands

Abstract

Birds tend to fly within the atmospheric boundary layer (ABL), a dynamic environment whose three dimensional properties are strongly influenced by surface conditions. The ABL exhibits diurnal properties which are largely shaped by solar radiation. However, the physical properties of the ABL including horizontal flow and vertical mixing can change rapidly in both space and time. In addition, human activities can strongly alter the properties of the ABL especially at the lowest few hundred meters where most birds fly. How do birds alter their behavior in response to such variations? How do human-landscapes influence flight behavior and energetics of birds? We address these and other related questions through long term, collaborative research on the flight behaviour of gulls. Due to their eco-morphology, gulls are able to use diverse flight modes, enabling them to fly efficiently through a broad range of environmental conditions. We used high resolution GPS tracking and tri-axial acceleration to study flight and flight energetics and modelled the properties of the ABL at high spatial and temporal resolutions. During the breeding season, gulls select daily flight routes along energetically efficient flyways supported by human engineered landscapes and alter their flight modes opportunistically along small landscape features. Over sea gulls also adjust their flight mode and flight altitudes in response to convective conditions. While several examples focus on flight during the breeding season, we also show how the cost of flight varies throughout the annual cycle across different migration strategies.

Synopsis

How a flight generalist uses the dynamic properties of its 3-dimensional aerial environment #biologging #gulls @IBED_uva

Twitter handle

@BaranesJudy

420

The challenges of gaining height in soaring flight reduced by social sampling of vertical airflows

hannah williams

Centre for the Advanced Study of Collective Behaviour, Konstanz University, Konstanz, Germany. Max Planck Institute of Animal Behavior, Konstanz, Germany

Abstract

In flight, vertical movement is everything, whether flapping or soaring, movement in this axis is essential to stay aloft and thus to travel cross-country. But for soaring species, the saptio-temporal variation in the properties of media flow presents challenges for decision-making with implications for movement strategies and space-use; vastly underappreciated in the vertical axis. The columnar bubbling of invisible thermal updrafts presents a particular challenge for movement decisions in soaring flight, increasing the risks when flying low to the ground and for reducing flight costs in unpredictable conditions. Here, I explore the value of social information for movement efficiency where social cues may reveal the availability of lift in the thermal column and the emergent property of a collective may reveal the thermal structure. Using eye-tracking and inertial measurement devices to resolve gaze and various data visualisation techniques, I explore the fine-scale locomotion of soaring species and the social sampling of updrafts by human paraglider pilots and question: how may soaring individuals and their collectives reveal the structure of the updraft?; and can this information be perceived to respond to environmental dynamism optimally? This thinking allows us to quantify the impact of dynamism in the vertical axis on i) movement performance and ii) the adaptive pressure to move cohesively in soaring flight.

Synopsis

Social sampling of vertical airflows for efficient movement in soaring flight

Twitter handle

@DrHannahJW

435

A reflection on the current state of the field of avian ecological epigenetics

Bernice Sepers, Rebecca Chen

University of Bielefeld, Bielefeld, Germany

Abstract

Due to climate change and urbanisation, the natural environment is changing rapidly. Phenotypic plasticity, the process in which a genotype produces a variety of phenotypes under varying environmental conditions, is expected to play a crucial role when organisms attempt to adapt to those changes. Epigenetic modifications are mechanisms that regulate gene expression without changing the primary nucleotide sequence and they are expected to underlie phenotypic plasticity shaped by developmental processes. Such mechanisms include molecular mechanisms like DNA methylation, histone modifications and the involvement of microRNAs. Studies in a variety of taxa have now shown that these mechanisms are important regulators of phenotypic diversity, both within and between organisms, and provide us with important information on aging. As such, epigenetic modifications potentially provide a proximate mechanism for environmental cues to shape phenotypic responses. Potentially, these responses might be inherited across generations, which would allow organisms to adapt to environmental change and facilitate rapid evolutionary change. This has sparked the interest of ecologists, including ornithologists. As there is a large potential for studies on birds to answer many outstanding questions in ecological epigenetics, the number of studies on the causes and consequences of epigenetic variation in birds, also in their natural habitats, is rising. In this review, we will provide an ecologically-oriented overview of the current avian epigenetics knowledge to determine whether the field has met our expectations and to identify critical knowledge gaps. Additionally, we address methodological challenges, ranging from the timing of sampling to appropriate analytical frameworks.

Synopsis

NA

436

Bio-logging 2.0: multisensor data logging brings new understanding of bird flight and migration ecology

Christoph Meier[1], Sissel Sjöberg[2]

[1]Swiss ornithological institute, Sempach, Germany. [2]Lund University, Lund, Sweden

Abstract

Miniature light-level geolocator tags have revolutionized ornithology in the past decade and expanded our knowledge on migration routes and non-breeding ranges even for some of the smallest bird species. Hence, today we know a lot about where birds go and when, but we do not know how they are able to get there. Currently, the next boom of multisensor tags is around the corner as the miniaturization now also allows for tracking of our most common migrants. Tags with a fusion of different sensors, such as barometric pressure, acceleration and magnetic properties add important information of activity, flight behaviours and the context of the environment to the position data. This technical advancement promises discoveries of many novel and unexpected behaviours, and sheds light on how migratory birds accomplish their complex annual cycles. Astonishing examples are the fine scale movement inside thermals, flight patterns correlated with the lunar cycle and diel cycles in flight altitudes where birds climb thousands of meters in a short period of time just to cruise at extreme altitudes throughout the day. Deciphering the reasons for these behaviours is challenging, but observations in the natural context offers the chance for understanding. Ultimately, with multisensor tags, we will gain insight into how birds perform their migration, and how orientation, energetically efficient flight, and social cohesion are achieved. In this symposium we highlight promising examples of recent discoveries and propagate the latest methods suited for multisensor data analysis.

Synopsis

NA

440

Environmental pollution (levels and effects) in Arctic breeding seabirds

Geir Wing Gabrielsen

Norwegian Polar Institute, Fram Centre, Tromso, Norway

Abstract

High levels of persistent organic pollutants (POPs) and mercury (Hg) have been documented in several Arctic breeding seabird species (glaucous gulls, ivory gull and great skuas). Some of the POPs and Hg were observed to be high enough to exceed threshold levels that have been previously estimated for non-target species or populations outside the Arctic. In my presentation I will provide an update of the present knowledge on how health effects can be associated to the exposure to single compounds or a mixtures of POPs found in the Arctic environment. In our studies we have identified effects mainly on the immune and hormone systems. The main goal with our studies has been to better predict or estimate the effects of POPs and Hg in Arctic seabirds at the individual, population, and ecosystem level. Numerous knowledge gaps on the biological effects of exposure have been identified. These knowledge gaps include the establishment of concentration thresholds for individual compounds as well as for realistic cocktail mixtures that in fact indicate biologically relevant, and not statistically determined, health effects for specific species and subpopulations. In recent years we have also documented high levels of microplastic pollution in Arctic breeding fulmars. In my presentation I will also provide new knowledge on the effects of plastic pollution on fulmars. A special focus will be on additives used in plastic productions and their effects on fulmars.

Synopsis

NA

symposium

Climatic conditions and seasonal variations of the vegetation modulate the positive effects of habitat restoration for birds in Burkina Faso

Gabriel Marcacci ORCID iD, Alain Jacot

Swiss Ornithological Institute, Sempach, Switzerland

Abstract

The combined effects of climate change and increasing pressure of anthropogenic activities are primary causes of land degradation and desertification in the Sahel zone. Unsustainable use of natural resources such as deforestation for firewood and overgrazing by free-range cattle exacerbate poverty and pose a major threat to biodiversity, including resident and migratory bird communities. In this context, we work with the Burkinabè NGO 'Tiipaalga' that has established a large network of enclosures, where the natural vegetation is protected from grazing and can recover, with the aim to benefit both local human communities and biodiversity. Using passive acoustic monitoring, we surveyed birds and analyzed the effects of these enclosures on bird communities along climatic and temporal gradients. Specifically, we investigated how seasonal variations of the vegetation affect habitat use by resident and migratory birds within and outside the enclosures. We expect the benefits of the enclosures for bird communities to be stronger in more arid regions and during the dry season, when they provide more resources than degraded habitats in the surrounding landscapes. Indeed, in the enclosures, the vegetation remained more stable than outside and provided a continuous supply of natural resources across the seasons. Here we will provide insights on how this enclosure-induced variation in vegetation structure can be tailored to maximize their positive impacts on avian communities. This study demonstrates the critical importance of habitat restoration for sustainable livelihood and the conservation of birds and can serve as an example for future conservation projects in the Sahel zone.

Synopsis

NA

Twitter handle

Acceptance type: Symposium speaker

19

Interplay between internal and external factors in shaping Barn Owl (*Tyto alba*) movement

Paolo Becciu ORCID iD[1], Kim Schalcher[1], Robin Sechaud[1,2], Bettina Almasi[3], Alexandre Roulin[1]

[1]Department of Ecology and Evolution, University of Lausanne, Lausanne, Switzerland. [2]Agroecology and Environment, Agroscope, Zurich, Switzerland. [3]Swiss Ornithological Institute, Sempach, Switzerland

Abstract

Understanding and predicting how exogenous and internal factors shape behaviour and ultimately breeding success is fundamental in ecological and behavioural research. Advancing animal tracking technology allowed researchers to collect huge amounts of individual movement data across taxa. This provides enormous opportunities to study species as they interact with their physical and social environment, and finally, it allows us to combine ultimate internal drivers (reproduction, feeding, etc.) and external stimuli at high spatial and temporal resolution. Over 5 years, more than 500 breeding barn owls (Tyto alba) were tagged with GPS and GPS-ACC data-loggers, allowing us to study movement behaviour at high spatial and temporal resolution. Here, we show published and preliminary results on how movement behaviour of a colour-polymorphic, nocturnal raptor is shaped by endogenous and exogenous factors. First, we explore the partnership between males and females in chick provisioning which is fundamental to fledging success. We show that although generally males provide more than females, the latter can play a major role when compensating for low male investment or when raising large broods. Second, we show that females prospect other nest boxes while breeding, a behaviour associated with their plumage colouration (eumelanic spots), increasing their chances of having a second clutch and their annual fecundity. Finally, we show how lunar illumination drives morph-specific hunting strike angles, and their success. These study cases highlight the complexity behind individual choices which are caused by both individual characteristics, reproductive duties and ultimately the surrounding environment, such as physical and social factors.

Synopsis

High-resolution movement data can help understand the interplay between internal and external factors in shaping Barn Owl movement.

Twitter handle

@PBecciu

25

Phylogenetic and environmental factors shaping feather and preen gland bacteriome composition and functional properties

Maureen Baars ORCID iD[1], Veronika Gvozdikova Javurkova ORCID iD[1,2], Joana Falcao Salles[1], B. Irene Tieleman ORCID iD[1]

[1]Groningen Institute for Evolutionary Life Sciences, Groningen, Netherlands. [2]Institute of Vertebrate Biology, Brno, Czech Republic

Abstract

Recent studies on symbiotic microorganisms have revealed their essential role in host physiology, health, and fitness. Bacterial communities have been found in the preen gland and on feathers of various bird species. The preen gland microbiome is hypothesized to synthesize preen oil volatile organic compounds (VOCs) and antimicrobial compounds (AMCs) that contribute to the host's antimicrobial defence and can act as chemosignals during communication. To date, the production of VOCs and AMCs in preen oil have only been studied in a limited number of bird species, and little is known about phylogenetic and environmental factors affecting feather and preen gland microbiome composition and its functional properties. Our aim was to determine feather and preen gland bacteriome composition, preen oil VOC profiles, and preen oil antimicrobial activity, in relation to host phylogeny and differences in social (solitary vs social) and physical (habitat humidity) environment. To this end, we have sampled feathers, preen secretions and preen gland exterior swabs from 500+ individuals of 40+ different northwest temperate zone bird species with different degrees of sociality and from a range of habitat humidity conditions. Here, we present our results suggesting that a significant proportion of bacterial communities found in preen gland and feathers are emitters of VOCs and AMCs, respectively. Moreover, we determine the effect of host species identity, sociality, and habitat humidity on the feather and preen gland bacteriomes.

Synopsis

Phylogenetic and environmental factors affecting composition and functional properties of the feather and preen gland bacteriome

Twitter handle

@maureen_baars

37

Factors affecting prospecting behaviour of European rollers *Coracias garrulus* at breeding grounds.

Flavio Monti ORCID iD[1], Sanja Barišić ORCID iD[2], Sebastian Cannarella[3], Davor Ćiković ORCID iD[2], Vesna Tutiš ORCID iD[2], Jelena Kralj ORCID iD[2], Carlo Catoni[3]

[1]University of Siena, Siena, Italy. [2]Croatian Academy of Sciences and Arts, Zagreb, Croatia. [3]Ornis italica, Rome, Italy

Abstract

The breeding period is a demanding and time-constrained phase for migratory bird species. Breeding outcome and duration can interact with the extent and duration of post-breeding movements, resulting in inter-individual differences in space use behaviour ultimately influencing later stages of the annual cycle. We present space-use and home range estimates during the breeding season for 21 European rollers *Coracias garrulus* tracked between 2018 and 2022, in Italy and Croatia. Using high-resolution spatial GPS data coupled with regular nest box monitoring, we analysed differences in space use during the incubation/nestling period *vs* post-breeding period prior to migration, accounting for the breeding outcome (successful *vs* failure). We found that adult movements were strongly reduced during the first phase, while increased in the post-breeding phase, especially for failed breeders. Successful breeders remained in the surroundings of the nest site, while unsuccessful ones tended to visit distant areas (up to 500 km). The breeding outcome did not influence the departure date of autumn migration, suggesting that failed breeders used this period for exploratory movements but not for advancing the onset of migration. Such exploratory movements may be functional to prospect and inform settlement decisions in failed breeders in search of new breeding opportunities and may be particularly important in migratory species, which generally have a limited period to gather information prior to autumn migration. The study demonstrates the need to investigate seasonal movements in different populations and the potential importance of prospecting post-breeding movements for long-distance migratory species.

Synopsis

Factors affecting space use behaviour in European rollers during the breeding season and prospecting movements prior to migration.

53

Measuring exposure of legacy persistent organic pollutants (POPs) in a long-lived migratory bird

Francesca E Gray ORCID iD[1], Roger Colominas[2], Kalender Arikan[3], Christoph M Meier[4], Rory Doherty[5], Davina Derous[1], Pierre Bize[4]

[1]University of Aberdeen, Aberdeen, United Kingdom. [2]University of Strasbourg, Strasbourg, France. [3]Hacettepe University, Ankara, Turkey. [4]Swiss Ornithological Institute, Sempach, Switzerland. [5]Queens Univeristy Belfast, Belfast, United Kingdom

Abstract

Wild birds are frequently exposed to persistent organic pollutants (POPs) that are man-made and can cause ecotoxicity. POP exposure can vary greatly between and within-individuals due to differences, for instance, in life-history (e.g., sex and age) and behaviour (e.g., habitat use and migration). Long-term study populations have often well-known life-history records and individual-level identification. This information makes long-term study populations vital to study both within and between-individual variation in POP exposure. Within-individual variation is largely overlooked when researching POP exposure as it requires the repeated capture of known individuals and uses minimally-invasive measures. Repeated sampling of the same individual allows for controlling of high between-individual variation whilst studying exposure across and within years. Migration is a great example of the difficulty in repeated sampling, with many studies comparing breeding and wintering grounds using between-individual level comparisons. In this study, we utilise the long-term study of 7 colonies of Alpine swift, *Tachymarptis melba*, across Switzerland with over 20 years of individual-level survival and reproductive data. We describe the concentrations of 40 legacy POPs in over 400 preen oil samples taken between 2016 and 2020 and assess the repeatability of POP concentrations with over 100 individuals sampled over at least 2 different years. We discuss the sources of contamination against a multitude of measures including sex, age, timing of sampling (spring on arrival back from migration or late summer before departure for migration), breeding colony and wintering ground location (ascertained using GLS loggers).

Synopsis

Using preen oil as a minimally-invasive measure to study organic pollutant contamination in the long-lived migratory Alpine swift

Twitter handle

@Chess_95

66

Nestling activity and body condition predict skill development and emigration in golden eagles

Matthias Tschumi ORCID iD[1], Svea-Sophie Zimmermann ORCID iD[1,2], Julia Hatzl ORCID iD[1,3], Kamran Safi ORCID iD[4], David Jenny[1], Martin U Grüebler ORCID iD[1]

[1]Swiss Ornithological Institute, Sempach, Switzerland. [2]University of Freiburg, Freiburg, Germany. [3]ETH Zürich, Zürich, Switzerland. [4]Max Planck Institute for Animal Behaviour, Radolfzell, Germany

Abstract

Early life conditions can affect fitness and performance of animals later in life. Altricial animals, in particular, need to gain experience and develop skills in their early life to survive and reproduce in a challenging environment once independent from parental care. However, little is known about how early-life conditions affect skill development and how this affects exploration behaviour and emigration. We used GPS and body-acceleration data of 35 juvenile golden eagles (*Aquila chrysaetos*) to investigate body condition differences in nestling activity (ODBA) and their association with post-fledging activity, timing of fledging, exploratory behaviour, and the timing of emigration. Individuals in good body condition were more active in the nest than individuals in bad body condition. Active nestlings fledged earlier and were also more active in the post-fledging dependence period (PFDP). Furthermore, a higher activity in the early PFDP and a steeper development of activity resulted in a higher number of pre-dispersal excursions and a younger age at emigration. Our results show that activity in the nest can predict the activity after fledging which in turn determines exploration behaviour and timing of emigration. This suggests that developmental differences in the nest carry-over to later life-history stages and that nestling activity informs about skill development and performance later in life.

Synopsis

Nestling activity predicts skill development and emigration in golden eagles #ornithology @Vogelwarte_scie, @julia_hatzl, @Safi_Lab

Twitter handle

@MatthiasTschumi

94

The origin of epigenetic variation in birds

Kees van Oers[1], Melanie Lindner[2], Marcel E. Visser[1], Krista van den Heuvel[1], Bernice Sepers[1]

[1]Department of Animal Ecology, Netherlands Institute of Ecology (NIOO-KNAW), Wageneningen, Netherlands. [2]Department of Animal Ecology, Netherlands Institute of Ecology (NIOO-KNAW), Wageningen, Netherlands

Abstract

Epigenetic mechanisms are those molecular mechanisms that affect gene expression without changes in the DNA sequence. The value of epigenetic mechanisms is increasingly recognized, also in relation to questions in ecology and evolution. However, epigenetic research on birds in their natural habitats is still in its infancy, but is needed to answer questions regarding the origin of epigenetic marks and their role in shaping phenotypic variation and evolution. The flexible nature of epigenetic marks thereby opens up the possibility that such changes are adaptive, while at the same time can be the consequence of environmental variation. This is relevant for a wide range of studies interested in development, phenotypic plasticity, adaptation, aging and senescence. Hence, changes in epigenetic marks can function as switches in order to help an organisms develop, as signals of aging via accumulation of methylation over time, but at the same time may aid organisms to cope with changing circumstances throughout their lifetime. In this presentation, we would like to give an overview of the current status of the origin of epigenetic variation within and between individuals, mainly focusing on DNA methylation and chromatin accessibility across the genome. We use the current status in the literature and data of our great tit system to show examples of how tissue and cell-specific epigenetic patterns may affect phenotypes, how they may change over time and how that relates to changes in gene expression. This will hopefully inspire future studies on a possible role for epigenetic variation in birds.

Synopsis

Studying epigenetics is hot, but where does the variation we observe come from?

Twitter handle

@kKvanOers

110

Earlier springs increase goose breeding propensity and hatching success at Arctic but not at temperature latitudes

Michiel Boom ORCID iD[1,2], Kees Schreven ORCID iD[2], Nelleke Buitendijk ORCID iD[2], Sander Moonen[3], Bart Nolet ORCID iD[1,2], Götz Eichhorn ORCID iD[2], Henk van der Jeugd ORCID iD[2], Thomas Lameris ORCID iD[4]

[1]Insitute of Biodiversity and Ecosystem Dynamics (University of Amsterdam), Amsterdam, Netherlands. [2]Netherlands Institute of Ecology, Wageningen, Netherlands. [3]Wageningen Environmental Research, Wageningen, Netherlands. [4]Koninklijk Nederlands Instituut voor Onderzoek der Zee, Den Burg, Netherlands

Abstract

Intermittent breeding is an important strategy in long-lived species that trade off survival and reproduction to maximize lifetime reproductive success. When breeding conditions are unfavourable, individuals are expected to skip reproduction to ensure their own survival. Breeding propensity (i.e. the probability for a mature female to breed in a given year) is therefore an essential parameter in determining reproductive output and population dynamics, but is not often studied because it is difficult to obtain unbiased estimates. Breeding conditions are especially variable at high latitudes, potentially resulting in a large effect on breeding propensity of Arctic-breeding migratory birds. We applied a novel approach using GPS-tracking data, to determine nest locations, breeding propensity and hatching success of barnacle geese, thereby demonstrating the use of tracking data in estimating these reproductive parameters. Barnacle geese nowadays breed in the Arctic as well as temperate regions, and we studied how breeding propensity and hatching success varied with breeding latitude, onset of spring and timing of arrival. Breeding propensity and hatching success were related to onset of spring at the breeding grounds, but this relationship varied with latitude. At Arctic latitudes (>66°), breeding propensity decreased from 0.9 in early springs to 0.2 in late springs, while at temperate latitudes it varied between 0.6 and 1.0 regardless of spring phenology. While earlier springs due to climate warming are considered to have mostly negative repercussions on reproductive success through phenological mismatches, our results suggest that these effects may be offset by higher breeding propensity and hatching success.

Synopsis

The costs of migration: Arctic migratory geese face higher reproductive uncertainty than temperate breeding resident geese

Twitter handle

@M_P_Boom

137

Exposure of an endangered seabird predator to persistent organic pollutants: assessing levels in blood and relationship with hatching success

Letizia Campioni ORCID iD[1], Bernat Oró-Nolla ORCID iD[2], José Pedro Granadeiro ORCID iD[3], Mónica C. Silva ORCID iD[4], Jeremy Madeiros[5], Silvia Lacorte ORCID iD[2]

[1]MARE - Marine and Environmental Sciences Centre, ISPA- Instituto Universitário, Lisbon, Portugal. [2]Department of Environmental Chemistry, Institute of Environmental Assessment and Water Research (IDAEA-CSIC, Barcelona, Spain. [3]Departamento de Biologia Animal, Faculdade de Ciências da Universidade de Lisboa, CESAM, Lisbon, Portugal. [4]cE3c—Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa, Lisbon, Portugal. [5]Department of Conservation Services, Ministry of the Environment, Flatts, Bermuda

Abstract

Seabirds are upper-level predators in the marine food-webs and as such highly exposed to chemical pollution as that caused by persistent organic pollutants (POP). It is recognized that POPs exert a broad-spectrum of side-effects on birds for instance, interfering with their reproduction, development, and growth which, in the long-term, may enhance risk of population extinction. The Bermuda petrel *Pterodroma cahow* is an endangered pelagic seabird that is recovering from near-extinction with a current population of 156 breeding pairs. Past evidence suggests potential detrimental effects of dichlorodiphenylethane (DDT) and its main metabolites (DDE, DDD) which can be related with the incidence of hatching failure (27%-9%, 2009-2019). Considering the critical conservation status of the species this study aims to determine Bermuda petrel's exposure to legacy POPs, assessing levels (in blood) of 25 organochlorine pesticides (OCPs), 7 polychlorinated-biphenyls (PCBs) and 8 polybrominated-diphenyl-ethers (PBDEs) in relation to bird sex and N and C stable isotopic values. Finally, we test the relationship between different POP families and egg hatchability. DDE was detected in all birds (0.21-9.34 ng/g w.w.), while DDT was found in 29% of the samples. PCBs were the most ubiquitous compounds in terms of detection rate with a mean concentration of 7.87 ng/g w.w. Total PCBs and OCPs concentrations were unrelated either with δ15N and δ13C levels, or with sex. Concurrently, hatching probability was significantly lower when DDE and PCBs concentrations in blood were higher suggesting potential adverse effects on Bermuda petrel reproduction, and implications for its conservation.

Synopsis

First insights in the exposure of Bermuda petrel to legacy POPs during the breeding season

Twitter handle

@letiziacampion1

169

Variation in gut microbiome composition during autumn migration in Charadrii waders

Radoslaw Wlodarczyk ORCID iD[1], Joanna Drzewińska-Chańko ORCID iD[1], Katarzyna Janik-Superson[2], Dominik Strapagiel ORCID iD[3], Dawid Krawczyk[2], Maciej Kamiński[1], Jan Rapczyński[4], Włodzimierz Meissner ORCID iD[5], Piotr Minias ORCID iD[1]

[1]University of Łódź, Faculty of Biology and Environmental Protection, Department of Biodiversity Studies and Bioeducation, Łódź, Poland. [2]University of Łódź, Faculty of Biology and Environmental Protection, Department of Invertebrate Zoology and Hydrobiology, Łódź, Poland. [3]University of Łódź, Faculty of Biology and Environmental Protection, Biobank Lab, Łódź, Poland. [4]Warsaw University of Life Sciences, Ornithological Section, Forestry Student Scientific Association, Warsaw, Poland. [5]University of Gdańsk, Department of Vertebrate Ecology and Zoology, Gdańsk, Poland

Abstract

An increasing number of studies has shown that gut microbiome composition can play significant role in a wide range of processes within an organism. The composition and diversity of gut microbial communities are affected by many factors. Here, we analysed gut microbiome composition in five wader species that differ in stopover site selection and migratory strategy. Our dataset included representatives of long distance sub-Saharan migrants (wood sandpiper Tringa glareola, ringed plover Charadrius hiaticula) and short-distance migrants wintering mainly in western Europe (common sandpiper Actitis hypoleucos, dunlin Calidris alpina, common snipe Gallinago gallinago). Birds were caught during two migratory periods (2020-2021) in three distinct types of habitat: coastal sandy beaches, natural river valley and mudflats at the dam reservoir. In total, we assessed microbiome composition in nearly 140 faecal samples. The analysis of microbial DNA was conducted using a standard Illumina protocol designed for sequencing the variable V3 and V4 regions of the 16S rRNA gene. We found significant differences in microbiome composition among all five wader species; common ringed plover showing the highest alpha diversity of bacteria within our dataset. Microbiome diversity was also higher in adults than juveniles, suggesting that microbiota develops with age. Finally, the diversity of microbial communities was related to habitat type at the stopover site, but this relationship was taxon-specific, as some species showed higher microbiome diversity in coastal versus inland habitats, while the others showed the opposite patterns. Our results help to understand intrinsic and extrinsic factors that shape microbiome variation of migratory birds.

Synopsis

NA

171

Temperature and precipitation are associated with plumage colour complexity in the Paridae.

David López-Idiáquez[1,2], Claire Doutrelant[2], Peter Pearman[1]

[1]University of the Basque Country (UPV/EHU), Leioa, Spain. [2]Centre d'Ecologie Fonctionnelle et Evolutive (CEFE-CNRS), Montpellier, France

Abstract

Sexual, social and natural selection may drive colouration in birds, with some species being dull and inconspicuous, and others flashy. Variation in selection on conspicuousness likely explains much of the natural diversity in complexity of colouration. Nonetheless, the degree to which specific environmental conditions explain variation in colour complexity is little explored. A strong relationship between the environmental conditions and colour complexity would support a role for selection in generating this variation. Climate is linked to resource availability and is, thus, a likely evolutionary driver of colour complexity. Additional non-climatic factors, including predation intensity, the richness of sympatric confamilials, and habitat diversity might also influence selection on colour complexity. We analyse these factors as potential drivers of the colour complexity of both males and females in the passerine family Paridae. We quantified colouration using museum specimens and avian visual models to obtain species-specific colour volumes as a proxy of colour complexity. We collected geographic information on temperature, precipitation, predation intensity, richness of confamilial species, and values for breadth of habitat use across each species range. Our phylogenetic mixed models show that high seasonality of temperature, and annual precipitations associated with more complex colouration. Besides, we find that colouration complexity is higher in species inhabiting areas with intermediate annual mean temperature, in comparison to species in areas of more extreme temperatures. Overall, our results show that climate means and seasonality covary with plumage colour complexity, probably due to the effects of climate on resource availability and competition intensity.

Synopsis

Temperature and precipitation means and seasonality covary with plumage colour complexity in the Paridae.

Twitter handle

@david_idiaquez

204

Predictive modeling of bird migration flows using weather radars

Amédée Roy[1], Thibault Désert[2], Jordi Figueras i Ventura[2], Baptiste Schmid[3], Camille Assali[4], Vincent Delcourt[4], Sophie de Grissac[1]

[1]France Energies Marines, Plouzané, France. [2]Météo France, Toulouse, France. [3]Vogelwarte, Sempach, Switzerland. [4]Biotope, Mèze, France

Abstract

The study of bird migratory movements at the individual level, notably through tracking data, has led to an improved understanding of the migration patterns of many populations. However, these approaches are mostly based on a relatively small number of individuals and are often unable to provide a large-scale and systematic characterization of migration flows. A network of weather radars constitutes therefore a relevant tool for monitoring migration movements, as it enables the survey of the airspace over large areas and the description of horizontal and vertical space uses.

In this study, we have gathered and processed data from 33 S-, C- and X-band weather radars from the ARAMIS network covering 95% of the French territory for describing the flows, spatial location and temporal evolution of bird migratory movements on a national scale over a decade. Moreover, we have implemented a machine learning model in order to predict vertical density flows based on local weather and topography. This model has been evaluated on its ability to predict bird flows up to 2 days in advance.

This approach provides an opportunity to study migration peaks in different regions of France (Mediterranean basin, Atlantic coast, English Channel, North-East) and to bring an overview of their temporal variability. Moreover, it addresses the variability of vertical uses of space as a function of topography and environmental conditions. It is a first step towards a continental approach to forecasting bird migration, which could be further used for a better quantification of bird collisions with anthropogenic infrastructures.

Synopsis

Predictive modeling of bird migration flows using weather radars

207

Energetics of tawny owl colour morphs in response to controlled experimental cold conditions

Patrik Karell ORCID iD[1,2], Chiara Morosinotto[1,2], Nilsson Jan-Åke[1], Jon Brommer[3], Johan Nilsson[1], Peter Eriksson[4], Lars-Ove Nilsson[5], Arianna Passarotto[1,6], Charlotte Perrault[3]

[1]Lund University, Lund, Sweden. [2]Novia UAS, Raseborg, Finland. [3]University of Turku, Turku, Finland. [4]Sågvägen, Fagersanna, Sweden. [5]Lingonstigen, Karlsborg, Sweden. [6]University of Seville, Seville, Spain

Abstract

Ongoing climate change poses threats to wild populations through its impact on demographic vital rates. To cope with these changes in situ, animals need to genetically adapt to the new conditions through natural selection. We have a limited understanding of such climate change driven natural selection despite an urgent need to understand these processes and their underlying mechanisms. Heritable variation in physiological coping strategies may be a mechanism that underlie viability selection under extreme ambient conditions on individual level. Here we test the hypothesis that previously documented winter climate-driven natural selection against the pheomelanic brown tawny owl colour morph is mediated through a morph-difference in physiological coping strategy during harsh winters. Using a controlled experimental set up where we measured oxygen consumption and body temperature regulation in stepwise declining thermoneutral (20C), intermediate (0C) and cold (-15C) ambient temperature conditions, we show that tawny owls increase their oxygen consumption markedly in lower ambient temperatures, but we find no evidence for a predicted elevated oxygen consumption of the brown morph during cold conditions. However, we do find that the grey morph decreases its body temperature more than the brown one in cold conditions, which suggests the morphs have different physiological coping strategies to tackle cold spells. We discuss the potential implications of a delayed response of morph-specific lowered body temperature on oxygen consumption on a longer term and the need to understand additive effects of both energetics and behavioural responses on survival differences under extreme ambient temperatures predicted in a changing climate.

Synopsis

Do morph-specific physiological coping strategies underlie differential survival of tawny owl colour morphs in harsh winters?

Twitter handle

@eccho_owl

235

European Turtle-doves wintering in Africa: tracking movements, habitat and conservation

Susana Requena ORCID iD[1], Hervé Lormée ORCID iD[2], Alison Beresford ORCID iD[3], John Mallord ORCID iD[1], Christopher Orsman[1], Carles Carboneras ORCID iD[1], Cyril Eraud ORCID iD[2], Juliet Vickery[1,4], Graeme Buchanan ORCID iD[3]

[1]RSPB, Sandy, United Kingdom. [2]Office Français de la Biodiversité, Villers en Bois, France. [3]RSPB, Edinburgh, United Kingdom. [4]BTO, Thetford, United Kingdom

Abstract

We studied the wintering habitat and ecology of the European Turtle-dove (*Streptopelia turtur*), a globally-threatened Afro-Palaearctic migrant, through a combination of tracking data, remotely-sensed environmental information and field observations. 48 tagged birds (39 PTT and 9 GPS) spent the winter months distributed across the floodplains of Senegal, Gambia, Mali and Mauritania between October, when their arrival coincides with the end of the rainy season, and April.

In conditions characterised by null rainfall and maximum temperatures above 40°C, the tracked birds were permanently associated to a combination of open forests and thorny bushes for roosting, proximity to water for drinking, and natural grasslands and croplands for foraging. The analysis of the birds' within-season movements suggested two different strategies; while some of the birds barely moved from the region where they settled upon arrival in autumn, others shifted their wintering ranges, possibly in search of suitable habitat in the drying landscape. Such complementarity may depend on the accessibility to temporary and permanent water sources. Thus, despite their apparently extensive wintering area, the reliance of turtle doves on well-wooded river basins with access to suitable foraging areas may limit their distribution to a smaller fraction of the total area. In the last decades, the flooded forests of *Acacia nilotica* along the Senegal River have suffered significant fragmentation and reduction, and some that in the 1960s held massive Turtle-dove roosts, no longer exist. In-situ conservation and management plans for these habitats should benefit regional biodiversity, migratory species and local communities.

Synopsis

.

Twitter handle

@susana_requena1

248

Avian malaria (and pox) in Berthelot's pipit; using divergent island populations to identify genes linked to pathogen infection

David Richardson ORCID iD[1], Eleanor Sheppard[2], Claudia Martin[2], laireC Armstrong[2], Catalina González-Quevedo[1,3], Juan Carlos Illera[4], Alexander Suh[2], Lewis Spurgin[2]

[1]UEA, NORWICH, United Kingdom. [2]UEA, Norwich, United Kingdom. [3]University of Antioquia, Medellín,, Colombia. [4]Oviedo University,, Oviedo, Spain

Abstract

Exploring host genetic variation in relation to pathogen infection within and across bird populations can provide important insights into mechanisms of host defence and adaptation. Here we use a landscape genomics approach in conjunction with genome-wide data to test for associations between avian malaria prevalence and host genetic variation across 13 populations of Berthelot's pipit Anthus berthelotii, a passerine endemic to the Macaronesian islands. We found considerable consistent spatial heterogeneity in malaria prevalence among populations in this species, which provided the power to resolve linked loci. The prevalence of malaria infection was also strongly correlated with pox (Avipoxvirus) prevalence. Multiple significant associations between malaria and multiple host loci were found after controlling for genome-wide divergence due to neutral population structure. These sites were located near to- or within genes linked to metabolism, stress response, cell death regulation, complement and the inflammatory response. Taken together, our findings identify diverse genes - not just limited to the immune system - that may be involved in host protection against malaria - and suggests that spatially variable pathogen pressure is an important evolutionary driver of genetic divergence among the Berthelot's pipit populations. Further, our data indicate that spatio-temporal variation in multiple different pathogens (e.g., malaria and pox in this case) may have to be studied together to develop a more holistic understanding of host pathogen-mediated evolution.

Synopsis

Divergent populations of an island endemic - Berthelot's pipit - aid in understanding resistance to malaria

Twitter handle

@DSRichardson68

251

Anticoagulant rodenticides: causes and consequences of secondary exposure of a predatory bird

Hannah Watson ORCID iD, Johan Nilsson ORCID iD

Lund University, Lund, Sweden

Abstract

Despite tightening regulation of highly toxic anticoagulant rodenticides (ARs), they continue to be widely used. Screening of dead animals confirms that contamination of non-target wildlife by ARs is widespread. However, the potential for sub-lethal effects of ARs remains a complete unknown. As natural habitats are lost, generalist mesopredators increasingly inhabit human-modified landscapes, where rodent populations flourish, making them vulnerable to poisoning from ARs. Studies to date suggest that owls are particularly vulnerable, with high exposure rates reported and a poorer ability to metabolise ARs, compared with other species. Using a free-living population of tawny owls *Strix aluco* distributed along an environmental gradient of human modification, we are investigating the causes and consequences of sub-lethal AR exposure. Combining techniques from behavioural ecology and animal physiology, we are using GPS tracking to identify foraging areas, nestbox cameras and nest contents to quantify diet composition, and coagulation analyses to determine AR exposure. As the proportion of artificial surfaces in the territory increases, owls increasingly forage in human-dominated land covers and rodents become more prominent in the diet, consistent with a higher risk of AR exposure. I will present data on habitat use, foraging behaviour and AR exposure to identify exposure risks associated with different environments and diets. Lastly, I will discuss knock-on effects on reproductive success.

Synopsis

Contamination of wildlife by anticoagulant rodenticides is widespread, but nothing is known of sub-lethal effects

Twitter handle

@hydrobates1

310

Using thermal imaging to assess stratification of the nocturnal migrant community and quantify taxonomic-specific collision risk with terrestrial windfarms

Devin de Zwaan ORCID iD[1,2], Hilary Mann[1], Phil Taylor[1]

[1]Acadia University, Wolfville, Canada. [2]Mount Allison University, Sackville, Canada

Abstract

Current monitoring tools for nocturnal migrants and collision risk with energy infrastructure such as windfarms are often prohibitively expensive, reducing their potential as scalable solutions for monitoring operations across large geographic regions. Tools such as marine or weather radar also tend to have high resolution for target location or altitude, but lower resolution for species identification, limiting our understanding of the diversity and structure of the nocturnal migrant community. Using commercially available thermal imaging cameras, we tested methodology aimed at identifying the altitude and identity of nocturnal migrant birds flying overhead in New Brunswick, Canada. We recorded videos from dusk to dawn using thermal imaging cameras oriented straight up, as well as multiple angles from the horizon to test observation angle effect. A ground-based, marine radar was also deployed to record target altitude. We extracted wing beat frequencies from the thermal camera using 'radR' software to estimate family or species, body size, and flight altitude. Cross-correlations with altitude data from the radar were used to ground-truth these estimates. We identified nocturnal migrants up to 2km above ground, depending on body size and atmospheric conditions. Since clean energy projects such as windfarms disrupt the aerosphere up to ~200m, this method offers a promising tool for monitoring windfarm collision risk, as well as assessing how family-specific risk varies throughout the night or season. We discuss the future prospects and challenges of this approach for broadscale monitoring programs.

Synopsis

Thermal imaging cameras can be used to monitor nocturnal migrant communities & evaluate family-specific conflict with windfarms

Twitter handle

@DevindeZwaan

312

High temperatures during early development impact adult cognitive performance and reproductive success in a wild bird population

Camilla Soravia ORCID iD[1], Benjamin Ashton ORCID iD[2,1,3], Alex Thornton ORCID iD[4], Amanda Bourne ORCID iD[5,3], Amanda Ridley ORCID iD[1,3]

[1]University of Western Australia, Perth, Australia. [2]Macquarie University, Sydney, Australia. [3]FitzPatrick Institute of African Ornithology, Cape Town, South Africa. [4]University of Exeter, Penryn, United Kingdom. [5]Australian Wildlife Conservancy, Perth, Australia

Abstract

Evidence of the impacts of global warming on the behaviour, phenology and demography of wild animal populations is accumulating. However, the effect of high temperatures on the cognitive development of wild animals remains largely unknown. This is an important knowledge gap because cognition underpins behavioural flexibility, and it can be directly linked to fitness. Here, we investigate whether the temperatures experienced during development predict adult learning performance and long-term reproductive success in wild Southern pied babblers (*Turdoides bicolor*). We found that individuals that experienced higher mean daily maximum temperature as nestlings had reduced associative learning performance as adults. Additionally, individuals that experienced more days above 35.5 °C (a threshold associated with changes in physiology and in foraging and provisioning behaviour in this species) during the developmental period between fledging and nutritional independence had lower foraging efficiency and reproductive success as adults. These findings indicate that naturally occurring high temperatures during development have long-term negative effects on cognition, behaviour and reproductive success in wild birds.

Synopsis

High temperatures during development are associated with reduced adult learning performance and reproductive success in wild birds

Twitter handle

@SoraviaCamilla

342

Oxidative state is associated with migration distance, but not flight-related parameters across European birds

Csongor Vágási[1], Orsolya Vincze[2], Janka Pénzes[1], Péter Pap[1]

[1]Babeș-Bolyai University, Cluj-Napoca, Romania. [2]MTA Centre for Ecological Research-DRI, Debrecen, Hungary

Abstract

Flight is an energetically challenging type of locomotion in vertebrates. Accordingly, flight is believed to have driven the evolution of several traits in volant animals. For instance, multiple avian peculiarities such as elevated body temperature and metabolic rate are attributed to flight ability. These latter adaptations may ultimately influence the oxidative physiological state. Yet, such consequences in oxidative physiology of flight and migration are less known. Most evidence so far comes from studies of birds sampled during flight experiments or at stopover sites along their migratory route. Here we explored whether migration distance, a proxy of the amount of flight over the annual cycle, and predictors of flight energetics are associated or not with oxidative state markers at the macro-evolutionary level. We measured four oxidative state parameters of 1530 individuals belonging to 113 European bird species during their breeding season and correlated these with proxies of flight, while controlling for allometry and phylogeny. We found that the oxidative damage to lipids and the level of uric acid increase with migration distance suggesting important oxidative costs associated with migratory flight. In contrast, traits describing flight type or investment into flight (flight style, wing loading, wing aspect ratio and pectoral-to-supracoracoid muscle ratio) were not associated with any measured oxidative state parameters. These findings indicate that migratory flights might have a macro-evolutionary effect on oxidative state and these physiological consequences of migratory flight are carried over to the breeding season. Interestingly, traits describing flight capacity or intensity do not coevolve with oxidative physiology.

Synopsis

Migratory birds pay a physiological cost for their long journey.

Twitter handle

@EvolEcolUBB

375

A major myna problem; invasive predator removal benefits female survival and population growth of a translocated island endemic

Thomas Brown ORCID iD[1], Max Hellicar[1], David Richardson ORCID iD[1,2]

[1]University of East Anglia, Norwich, United Kingdom. [2]Nature Seychelles, Victoria, Seychelles

Abstract

Invasive predators are a major driver of bird extinctions and continue to threaten native bird populations. Island eradications of (mostly mammalian) invasive predators have facilitated the (re)establishment of numerous island bird populations. Other invasive taxa, such as some predatory birds, could pose a more persistent threat than invasive mammals due to their ability to actively re-invade even remote and isolated islands. However, the impact of invasive predatory birds on endemic bird populations has been largely overlooked. We report on a novel sex-specific impact of an invasive nest-predator, the common myna (*Acridotheres tristis*), on a reintroduced population of Seychelles warblers (*Acrocephalus sechellensis*); translocated from Cousin to Denis Island in 2004. Regular post-translocation monitoring revealed that female mortality was 20% higher than males, leading to a 60 – 70% male-biased sex-ratio between 2005 – 2015. This was attributed to mynas inflicting severe injuries to incubating female warblers while attempting to prey upon eggs in their nests. These effects likely contributed to slower-than-expected population growth (relative to previous translocations of Seychelles warblers to other islands) over the same period. An eradication program beginning in 2011 removed all mynas from Denis by 2015. Subsequently, we observed a balancing of sex-specific mortality and the population sex-ratio of Seychelles warblers and, consequently, accelerated population growth. This study demonstrates the importance of assessing the threat posed by all invasive taxa (not just the usual suspects!) to island bird conservation. Furthermore, we show how extended monitoring is needed to identify problems, and develop solutions, post-translocation.

Synopsis

NA

Twitter handle

376

Do blackcaps self-medicate to reduce oxidative stress associated with flight effort and parasites?

Lucía Jiménez-Gallardo ORCID iD, Jimena López-Arrabé ORCID iD, Javier Pérez-Tris ORCID iD, Carolina Remacha Sebastian ORCID iD

Faculty of Biology, Complutense University of Madrid, Madrid, Spain

Abstract

Migrating birds suffer energetic and physiological challenges that should be compensated during stopovers. Also, they are common hosts of haemosporidian parasites that cause oxidative damage. Oxidative stress must be dealt with either activating their internal antioxidant defences or adjusting their antioxidant intake. We tested whether birds can adaptatively alter their food choice to cope with oxidative stress caused by blood parasites during migration.

During autumn migration, we mist-netted young male blackcaps (*Sylvia atricapilla*) stopping over in central Spain. We placed the birds in cages where they were offered two pieces of melon, one soaked in olive oil (fat-enriched) and another one in blueberry juice (antioxidant-enriched). We tested their infection status with PCR techniques. We measured pecking, pecking attempts and interest towards each food offer. We also measured physiological variables accounting for nutritional and oxidative status.

We discovered that antioxidant-rich food was preferred by birds infected with multiple parasite linages and by birds that have recently arrived in stopover. Infected birds had lower antioxidant capacity of plasma, and individuals that had more oxidative damage and less antioxidant defences preferred antioxidant-enriched food. Therefore, migrating blackcaps shift preference from antioxidant-rich to fat-rich food during stopovers. However, parasite infections elevate individuals' antioxidant needs, which may impair migration performance if the urge to find dietary antioxidants reduces fuelling rate.

Synopsis

How do blackcaps cope with oxidative stress during stopovers when they also face parasite infections? Diet could be the key.

Twitter handle

@LuciaJG95

384

Dynamic response of arthropods to rainfall extremes drives locally asynchronous nesting of tropical insectivores

Felicity L. Newell ORCID iD[1,2], Ian J. Ausprey ORCID iD[1,2], Scott K. Robinson[2]

[1]University of Bern, Bern, Switzerland. [2]University of Florida, Gainesville, USA

Abstract

Phenological shifts are a pervasive response to climate change but remain poorly understood in the hyperdiverse tropics. Here, we employ spatiotemporal variation in montane climate in the Andes of northern Peru as a natural experiment to examine how rainfall regulates avian reproductive phenology at low latitudes. Using five years of intensive field sampling, in situ rain gauges, and 50 years of regional rainfall, we developed a dynamic model to describe response of arthropods to rainfall extremes. Long-term phenological means from this model showed arthropod biomass shifted from dry-to-wet season maxima across a 1000–2500 mm rainfall gradient with transitional bimodality (e.g., weak post rainy season peaks followed by a second peak after the dry season). Lower 90-day rainfall leading up to the dry season reduced arthropod biomass during the dry season despite similar rainfall seasonality across the region. Dry season biomass explained reproductive timing of insectivores (48 species in 11 families) and omnivores (4 species in 1 family), which shifted breeding from the beginning of the dry season to the beginning of the wet season. For the first time, we document repeated 5-month phenological shifts for the same species at sites less than 100 km apart in response to a threshold in dry season resource availability. Rapid response of arthropods to wet and dry extremes combined with locally asynchronous nesting suggest that tropical insectivores may be especially sensitive to changing rainfall regimes.

Synopsis

Dynamic response of arthropods to rainfall extremes drives locally asynchronous nesting of tropical insectivores

Twitter handle

@FelicityNewell

425

Evolution of avian hormone regulatory systems

Carolina Frankl-Vilches[1], Manfred Gahr[2]

[1]Max Planck Institute for Biological Intelligence, Seewiesen, Germany. [2]Max Planck Institute for Biological Intelligence, Seewieseb, Germany

Abstract

Recent advances in chemistry and sequencing technologies have enabled the genomic and transcriptomic comparison of biological systems at a high-resolution-level. The gapless genome assemblies allow access to repeat-rich regions that were previously poorly assembled, hence improving the spatial assignation, order, distance, and orientation of genes and their regulatory elements. We identified the enrichment of Steroid Hormone DNA motifs in bird promoters that can lead to differences in seasonal behavior and brain sensitivity to hormones among two songbird species. Many species-specific promoters sensitive to androgens and estrogens were caused by mutations at the single nucleotide level or the appearance of an alternative promoter bearing the EREs and or AREs (estrogen- and androgen response elements, respectively). Moreover, in a later attempt to understand the impact of RNA structures on bird systematics, we produced an unbiased avian tree of life based on transcriptomes of 429 species. Surprisingly, when we analyzed the gene structures with highly consistent results, we could identify that the mRNAs' 3'UTRs (3' untranslated regions) were more robust than coding and introns regions classifying the bird families. Moreover, by analyzing the different RNA motifs that lead to the family level phylogeny, the frequency of Transcription factor binding elements (TFBEs) can distinguish avian orders and frameworks composed by the specific spatial distribution of TFBEs might identify a bird genus. Unknown, however, is whether this ensemble of TFBEs is involved in a specific biological process that results in a particular phenotype and the molecular function of the TFBEs on the 3'UTRs.

Synopsis

NA

437

Demographic and environmental drivers of long-term population dynamics of British breeding Pied flycatchers.

Malcolm Burgess[1], Rob Robinson[2], Chloé Nater[3,4]

[1]RSPB Centre for Conservation Science, Sandy, United Kingdom. [2]British Trust for Ornithology, Thetford, United Kingdom. [3]Norwegian Institute for Nature Research, Trondheim, Norway. [4]Centre for Biodiversity Dynamics, Norwegian University of Science and Technology, Trondheim, Norway

Abstract

The demographic processes driving population dynamics are difficult to determine and quantify, and studies that do so are usually limited to single breeding populations. For migratory species in particular, lack of knowledge on demographic mechanisms prevents pinpointing during which part of the annual cycle populations are impacted, which, in turn, compromises our understanding of mechanisms.

We aimed to identify demographic and environmental drivers of British breeding pied flycatcher Ficedula hypoleuca populations. We implemented an integrated analysis of mark-recapture and nest box survey using long-term (34-64 years) data from seven populations encompassing the British distribution, quantifying the contributions of different demographic drivers to population dynamics.

Despite substantial variation in both averages of and environmental impacts on key demographic parameters across breeding locations, population sizes covaried, suggesting that change was the result of large-scale drivers. Past changes in short-term population growth rates and long-term population trends were primarily attributed to variation in annual survival and dispersal dynamics, which largely act during migration and/or the nonbreeding season. Contributions of variation in local reproductive parameters were small in comparison, despite sensitivity to local temperature and rainfall within the breeding period. Higher rainfall had localised effects on nest success probability, and a negative effect on first year survival when rainfall experienced in the 7 days post-fledging was high.

Synopsis

Rainfall reduces nest success and post-fledging survival, but the rainfall contribution to long-term population dynamics is small.

438

Precipitation timing, elevation, and life history traits mediate relationships between precipitation and avian reproductive success: A global meta-analysis

Katy M. Silber, W. Alice Boyle

Kansas State University, Division of Biology, Manhattan, USA

Abstract

Mechanisms underlying animal responses to temperature are relatively well studied, but we know less about how and why precipitation affects animal populations. Responses to precipitation may be influenced by physiology, ecology, or behavior, resulting in a myriad of potential mechanisms that may operate at specific points or times throughout a species' distribution, annual cycle, or life cycle. We synthesized published literature in a formal meta-analysis, accounting for shared evolutionary history to (a) understand the nature of relationships between precipitation and avian reproductive success, globally, and (b) test alternative hypotheses regarding the causes of variation in those relationships based on species-specific attributes or habitat characteristics. Overall, precipitation timing, life history traits, and elevation mediated the nature and magnitude of responses to rainfall. Birds incurred more negative responses to direct precipitation, while lagged precipitation (i.e. precipitation before the start of the breeding season) was associated with more positive responses to precipitation. Species with altricial nestling development and those that live at higher elevations responded negatively to precipitation, likely due to thermogenic consequences of wet conditions. Positive responses to precipitation over longer time scales were unrelated to diet or predator abundance, suggesting vegetation likely mediates indirect responses to precipitation. This study elucidates why rain leads to divergent responses in species living in different regions and with different life histories and provides a framework for understanding environmental mechanisms underlying bird population change under current and future precipitation regimes.

Synopsis

NA

439

Variation in DNA methylation in avian nestlings is largely determined by genetic effects

Bernice Sepers[1], Rebecca S. Chen[2], Michelle Memelink[1], Koen J.F. Verhoeven[1], Kees van Oers[1]

[1]Netherlands Institute of Ecology, Wageningen, Netherlands. [2]University of Bielefeld, Bielefeld, Germany

Abstract

As environmental fluctuations are becoming more common, organisms need to rapidly adapt to anthropogenic, climatic, and ecological changes. One potential mechanism to shape phenotypic responses during development is through epigenetic modifications: DNA methylation in particular. Studies suggest that environmentally induced DNA methylation might allow for adaptive phenotypic plasticity that could last throughout an organism's lifetime. Despite a number of studies demonstrating environmentally induced DNA methylation changes, we know relatively little about what proportion of the epigenome is affected by environmental factors, rather than being a consequence of genetic variation. In the current study, we use a partial cross-foster design in a natural great tit (Parus major) population to disentangle common origin common rearing environment effects on DNA methylation. We found that variance in DNA methylation in 8,315 CpG sites was explained by a common origin and only in 101 by a common rearing environment. Subsequently, we found that 24% of the CpG sites were associated with a genetic polymorphism. Our results indicate that the scope for environmentally induced methylation marks independent of the genotype is limited in great tit nestlings, and that the majority of variation in DNA methylation early in life is determined by genetic factors instead. These findings suggest that there may be little opportunity for selection to act on variation in DNA methylation, and implies that most DNA methylation variation likely does not evolve independently of genomic changes.

Synopsis

NA