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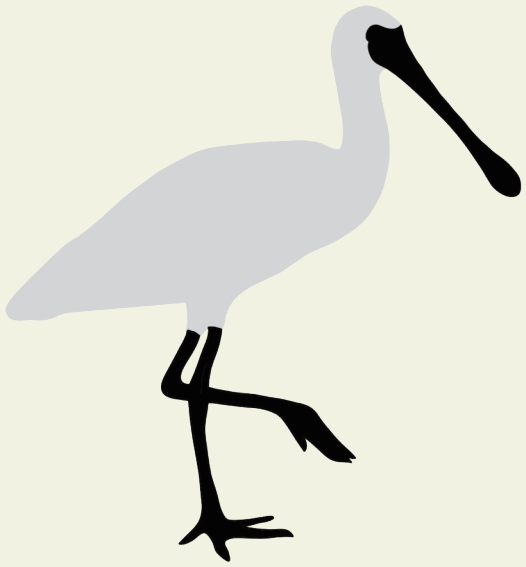
ASIAN ORNITHOLOGICAL CONFERENCE

PROGRAM 1ST ABSTRACT



ASIAN BIRDS SHARE ONE BLUE SKY

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Catalogue

I. Plenary Talk

1. Birds adaptation to the Third Pole Environment

Fumin Lei[1,2*]
1 Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing, 100101, China
2 University of Chinese Academy of Sciences, Beijing, 100049, China
* Correspondence: leifm@ioz.ac.cn

The Third Pole Enrvironment (TPE) is referred regions including Qinghai-Tibet Plateau (QTP) and surrounding mountains. The TPE is characterized by hypothermia, hypoxia and strong UV, etc. It has long been questioned why birds can fly and live under extreme environments in such a high altitude. This report briefily reviews our recent research proceding on birds in response to TPE.

Genomic studies of high elevation species, e.g. ground tit, uncovered a number of positive selection genes and / or fast evolved genes linked to energy metabolism, body size, DNA repair, etc. in association with hypoxia adaptation to extreme environmental conditions.

Transcriptomic analysis revealed gene sequence changes and expression shifts in some high-altitude tit species. For three high elevation tit species, most adaptive convergence in Hb gene function attributed to different amino acid substitutions in different species. The three descendant species of snowfinches on the QTP show that they not only inherited the ancestral traits, but also evolved divergently from the initial adaptation in their common ancestor reflecting an evolutionary process with an initial adaptation in the common ancestor followed by an adaptive diversification of the descendants. However, for recently colonized QTP tree sparrow, multiple genes were associated with phenotypic variations in the muscle (e.g. cardiac capillary number and myocyte area) of highland population, showing that polygenic adaptation appeared to drive rapid phenotypic evolution.

In summary, from genotype to phenotype, from ground tit-tits group to snow finches-tree sparrow group, we found both genomic and phenomic based adaptations to high elevational environments. More traits comparison from multiple species and populations in a larger area will harvest unpredictable and significant discoveries, which needs the world wide, in particular an Asian Ornithological Cooperation.

Keywords: adaptation, birds, genomics, Hengduan mountains, high elevation, Qinghai-Tibet Plateau, transcriptomics

Fumin Lei
Professor of Ornithology,
Key Laboratory of Zoological Systematics and Evolution,
Institute of Zoology, Chinese Academy of Sciences

Dr. Fumin Lei is a Research Professor from the Institute of Zoology (IOZ), Chinese Academy of Sciences (CAS), China. Dr. Lei received his PhD in ornithology at IOZ, CAS, in 1994. His research interests include taxonomy, biodiversity and distribution, molecular phylogeny and evolution, phylogeography, adaptive evolution by comparative genomics, and molecular epidemiology of wildlife diseases (e.g., avian influenza). He has published over 275 research papers or monographs in Science, Nature Communications, PNAS, MBE, Global Ecology and Biogeography, and Molecular Ecology. Dr. Lei is the Editor for Asia, Journal of Ornithology, and Associate Editor of Avian Research, Zoological Systematics, Journal of Biogeography, and Current Zoology. He is also the Vice-President of the International Ornithologists' Union (IOU), and President of the China Ornithological Society.

2. Avian Diversification and Conservation in Southeast Asia in the Era of NGS

Frank E. Rheindt

National University of Singapore, 14 Science Drive 4, Building S3 Level 4, Republic of Singapore; dbsrfe@nus.edu.sg

Southeast Asia is one of the most fascinating natural laboratories on Earth. It has brought forth a dazzling array of birds and continues to produce new discoveries at a high rate. This presentation will explore the major differentiation mechanisms that have given birth to Southeast Asia's mind-boggling avian diversity, and examine how the process of genetic introgression in particular has been of specific interest when studying speciation and differentiation in the region.

At the same time, biological diversity is under assault, perhaps nowhere as intensively as in Southeast Asia. I will showcase attempts to harness the power of population genomics to inform decisions regarding the conservation of a number of terminally endangered bird species in the region, with varying outcomes including examples of wonderful success as well as dismal failure.

Finally, I will share recent results illustrating that the era of bird species discovery is still not over in the region, which has continued to produce exciting finds in the last 10 years.

Keywords: avian diversity, speciation mechanisms, genetic introgression, conservation genomics, species discovery

Frank E. Rheindt
Associate Professor and Dean's Chair
Department of Biological Sciences, National University of Singapore

Frank E. Rheindt is an Associate Professor and Dean's Chair in the Department of Biological Sciences at the National University of Singapore. The broad purpose of his research is to understand the evolution of avian biodiversity and determine how this knowledge can contribute to conservation solutions in the face of a looming biodiversity crisis. Rheindt's lab combines field and lab work with computational analysis to study such phenomena as genetic introgression and complex evolutionary radiation. He also investigates phylogenetic relationships and population genetics among avian species in the Wallacean Region of the Indonesian archipelago, a region that is geographically important for its contribution to our understanding of biodiversity.

3. The superfamily Sylvioidea – a tree full of surprises

Per Alström

Department of Ecology and Genetics, Evolutionary Biology Centre, Uppsala University
Norbyvägen 18 DSE-752 36 Uppsala, Sweden

The Sylvioidea has been studied by molecular markers for the past three decades, and we have graually come to understand the circumscription of this group and the relationships among as well as within the different subclades, which are now treated as 30 different families. In this talk I present overall relationships among the families and give examples from some of them to highlight how the traditional morphology-based classifications were often strongly misled by cases of convergent as well as divergent morphological evolution. I also give a few examples of how taxnomic studies integrating molecular markers, morphology, vocalisations and other traits have led to the recognition of a larger number of species.

Per Alström
Professor of Ornithology
Department of Ecology and Genetics, Animal Ecology, Uppsala University

Per Alström is a Professor working at the Department of Ecology and Genetics at Uppsala University, Sweden. His research concerns taxonomy, systematics and evolution of birds, especially Asian passerines. He has been involved in comprehensive phylogenetic studies of multiple avian families as well as higher-level taxonomic groups, which have revealed previously unexpected relationships and complex evolutionary patterns. He uses an integrative taxonomic approach, involving analyses of e.g. morphology, vocalisations, behaviour, DNA, ecology and geographical distributions, to study the taxonomy of birds, which has resulted in a significant increase in the number of recognised species. He has also been involved in descriptions of 7 species and 3 subspecies new to science. His research subject also includes speciation, evolution of different geographical avifaunas, evolution of vocalisations of some passerine groups, evolution of UV vision in shorebirds and passerines, and biogeography of several groups of birds. He has travelled widely, especially in Asia, where he has spent altogether several years in the field since 1982. He has published a large number of scientific and popular science papers as well as two books and several book chapters. He also serves as Deputy Editor-In-Chief of Avian Research, Associate Editor of Birds of the World (hosted by Cornell Lab of Ornithology), chairman of the Swedish Systematics Association, Advisor to the IOC World Bird List, and member of the recently founded International Ornithologists' Union Working Group on Avian Checklists.

4. The PhyloG2P approach to bird biology and evolution

Scott V. Edwards

Comparative genome sequencing has allowed researchers to use phylogenies to map genotype to phenotype. Here I present three examples using such approaches, which we term PhyloG2P. First I present recent work by former postdoc Maude Baldwin showing convergence in sweet taste perception between hummingbirds and oscine passerine birds. Next we use convergent evolution to link genotype to phenotype in paleognathous birds, which include the flying tinamous of the New World and the flightless ratites (emu, ostrich, kiwi, etc), which are thought to have lost flight multiple times convergently. By examining evolutionary rates using a novel hierarchical Bayesian model, we identified a suite of conserved noncoding elements undergoing relaxation or acceleration in specific ratite lineages or convergently in multiple ratite lineages, suggesting a number of developmental and skeletal pathways undergoing evolutionary change in flightless birds. ATAC-seq and enhancer screens confirm that acceleration of these elements is associated with changes in the ability to drive gene expression in the developing forelimb. Lastly, I report identification of a color gene associated with color in an Andean tanager with a ‘leapfrog’ distribution, in which the central population differs in plumage from northern and southern populations. Together our results show that natural experiments and convergent evolution point to a strong role for non-coding regulatory evolution in the evolution of novel phenotypes in birds.

Scott V. Edwards
Professor of Organismic and Evolutionary Biology,
Curator of Ornithology in the Museum of Comparative Zoology，
Harvard University

Scott V. Edwards is Alexander Agassiz Professor of Zoology and Curator of Ornithology in the Museum of Comparative Zoology at Harvard University. His research focuses on diverse aspects of the biology of birds and related species, including evolutionary history and biogeography, disease ecology, population genetics, and comparative genomics. Dr. Edwards has helped develop novel methods for estimating phylogenetic trees (evolutionary diagrams) from multilocus DNA sequence data. His recent work uses comparative genomics in diverse contexts to study macroevolutionary patterns in birds, including the origin of feathers and the evolution of flightlessness.

From 2013 to 2015, Dr. Edwards served as Division Director of the Division of Biological Infrastructure at the U.S. National Science Foundation, overseeing funding programs focused on undergraduate research, postdoctoral fellowships, natural history collections and field stations, and cyber- and other infrastructure for all areas of biology. He served as President of the Society for the Study of Evolution, the Society of Systematic Biologists, and the American Genetic Association. He has served on the National Geographic's Committee for Research and Exploration, the Senior Advisory Boards of the NSF-funded U.S. National Evolutionary Synthesis Center (NESCent) and the National Institute for Mathematical and Biological Synthesis (NIMBioS), and on the Advisory Boards of the National Museum of Natural History at the Smithsonian and the Cornell Lab of Ornithology. He is a member of the American Academy of Arts and Sciences (2009), a Fellow of the American Association of the Advancement of Science (2009), and a member the National Academy of Sciences (2015).

5. Nutrients in marine environments leech from farmland affecting bottom-up and top-down cascades

Anders Pape Møller

Ecologie Systématique Evolution, Université Paris-Sud, CNRS, AgroParisTech, Université Paris-Saclay, F-91405 Orsay Cedex, France

Environmental change has during recent decades affected the relative frequency of bottom-up and top-down regulation of natural populations in marine environments. We collected long-term population data on common eiders *Somateria mollissima* and white-tailed sea eagles *Haliaeetus albicilla*, predators (mainly Arctic foxes *Alopex lagopus*) and lemmings *Lemmus sibiricus* and *Dicrostonyx torquatus*. In winter, long-tailed ducks *Clangula hyemalis* and common eiders rely on blue mussels *Mytilus edulis* for their diet. Farmland suffers from excessive leaching of nitrogen and phosphorus resulting in surplus phyto- and zoo-plankton, causing population growth in blue mussels with consequences for consumption of fish, cormorants *Phalacrocorax carbo* and other predators of fish including seals *Phoca vitulina*. Nitrogen and phosphorus have affected levels of phyto- and zoo-plankton with positive effects for benthos such as blue mussels, crustaceans and fish. Here we use statistical analyses of long-term time series to predict the outcome for population trends of population size. Leaching of nutrients increased populations of zoo-plankton with consequences for piscivores. These findings affect conservation and population growth.

Anders P. Møller
Professor at Université Paris-Sud

Prof. Anders P. Møller received his PhD in 1986 from University of Aarhus, Denmark. He served in multiple academic institutions such as Assistant prof. Univ. Uppsala, Sweden 1986, Assoc. prof. Univ. Uppsala, Sweden 1988, Senior scientist Univ. College London, UK 1991, Prof. Univ. Copenhagen, Denmark 1996, Prof. Univ Aarhus, Denmark 1994, Research director CNRS, France 1996 to present, Senior scientist, CAS, Oslo, Norway 2009. His Current research program covers climate change and its ecological and evolutionary consequences, behavioral adaptation, and urbanization and adaptation to human proximity. He has supervised 21 postdocs, 20 PhD students, 17 Masters students and 6 honors students. He has also taught 48 courses in 9 countries. His scientific publication includes 7 books, 4 edited books, 69 chapters in books, about 1000 papers in international journals, received in total 68,165 citations on Google Scholar. He is the editor of 16 journals, and the Corresponding fellow AOU 1993, Member of Ecology Institute, Germany 1995, dr. h. c. Univ. Jyväskylä, Finland May 21st 2009, dr. h. c. International University Menéndez Pelayo, Santander, Spain August 1st 2018.

6. The world of gentes in a brood parasitic cuckoo

Jin-Won Lee

Korea Institute of Ornithology & Department of Biology, Kyung Hee University, Seoul, Republic of Korea

The brood parasitic common cuckoo is composed of multiple groups of individuals that exploit the same host species, which is called host-specific races or gentes (gens in singular). Each cuckoo gens famously has a specific egg morph that mimic the color and pattern of their specialized host's egg, and female-specific gentes theory has been proposed to explain the maintenance of egg polymorphism among gentes. Due to extreme diversity of host's biology and environments in which they live, however, adaptation to a specific host species may need to occur not only in egg mimicry, but also in other life history traits, such as morphology, foraging, vocalization, mating and social structures, and migration. Furthermore, some recent works propose that male cuckoos may also have host specificity and thus could be divided into gentes as females. These may complicate the cause and effect of the presence of gentes in the common cuckoo. In this talk, I will present some recent works on the gentes of common cuckoos. Specifically, I will compare some life history traits and other features between cuckoo gentes in South Korea, including egg morph, body size, vocalization, genetic structure, dispersal and migration. These results may lead us to assume that each gens may be more isolated ecologically and genetically than ever thought. I will also introduce our ongoing works to reveal the nationwide distribution of cuckoo gentes across Korea, and finally suggest some future directions to resolve the evolutionary enigma in the world of gentes in avian brood parasites.

Keywords: avian brood parasites, common cuckoo, gentes, egg morph, life history traits

Jin-Won Lee
Professor, Department of Biology & Korea Institute of Ornithology

Prof. Lee received his PhD in Zoology from University of Sheffield. After he continued research work as a Post-doctoral Research Assistantin University of Sheffield, UK & Macquarie University, Australia, Post-doctoral Research Fellow in Seoul National University, and Senior Researcher, Korea Institute of Ornithology, Kyung Hee University. His research interests are sociality and behavioral ecology, and focuses on avian brood parasites with several cuckoos species as research models. Up to now he have published more than 40 peer-reveiwed research papers in scientific journal such as Behav Ecol, Front Ecol Evol, Ibis ect.

7. How to introduce birds to their original distributions from community view - idea, techniques and cases

Huijian Hu

Institute of Zoology, Guangdong Academy of Sciences

Containing biodiversity recession is the main aim in Kunming COP15. It is the most difficult task to contain wildlife diversity recession. Usually, we will take actions to protect and conserve endangered species, and improve their habitats. The practices showed that these actions might not be enough. Because of so many lost species, strong barries and serious fragmentation of habitats, most of spoiled region could not restore by itself. More, bio-community is a self-orgnazation so that we need to help them recovery their capacity to restore naturally by itself. Here, we introduce how to restore bird diversity, especially introduce lost species to their original distribution in China with the way of community. The idea, vital applications, techonogical routine, techniques and cases which to introduce species and experiement will be presented. The practices showed that we can restore the bird diversity quicklier than it is losting. We wish more actions can be carried to contain the recession of biodiversity in the scale of world and local regions.

Huijian Hu
Professor, Institute of Zoology, Guangdong Academy of Sciences

Prof.Hu Huijian has been engaged in the scientific expedition of wildlife in large scale, researches on species assemblage, AI recognition of terrestrial vertebrate, and techniques of wildlife restoration since 1997. He innovately promoted the idea and plan to restore the wildlife in the cites and urban area, and established the demonstration station for wildlife restoration in Guangzhou, China, in 2009. He owns more than 60 patents on AI and wildlife restoration and won more than 17 scientific and technological awards.

II. Evolution and Biogeography

1. Seasonal variation in community composition and distributional ranges of birds along a subtropical elevation gradient in China

Dan Liang[1,2,3*], Xinyuan Pan[1], Xu Luo[2], Cheng Wenda[4], Yanyan Zhao[1],Yiming Hu[5], Scott K. Robinson[6], Yang Liu[1]

1. State Key Laboratory of Biocontrol, School of Life Sciences & School of Ecology, Sun Yat-sen University, Guangzhou, Guangdong 510275, China

2. Faculty of Biodiversity and Conservation, Southwest Forestry University, Kunming 650224, China

3. Princeton School of Public and International Affairs, Princeton University, New Jersey 08544, USA

4. Division for Ecology & Biodiversity, School of Biological Sciences, The University of Hong Kong, Pokfulam, Hong Kong SAR, China

5. School of Environmental Science and Engineering, Southern University of Science and Technology, Shenzhen 518055, China

6. Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA

* Correspondence: Dan Liang: dliang@princeton.edu

Seasonal variation in community composition and species distributional ranges along elevational gradients remain poorly known but are essential to inform conservation. In this study, we aim to understand how species richness, community composition, and elevational ranges of montane birds change between the breeding and the non-breeding season. We compared bird species richness and community composition in nine 300-m elevational bands in the breeding (April - May) and non-breeding (December - January) seasons at Gaoligong Mountains in SW China. We also calculated seasonal elevational shifts of 97 species with sufficient data recorded in both seasons and assessed how species' traits influenced these shifts. Species richness declined in high and low elevations between the breeding and non-breeding season. The temporal beta diversity shift from the breeding to the non-breeding season was mainly caused by species losses rather than species gains in high- and low- elevation communities. Communities in middle elevations showed a contrasting pattern, with seasonal composition change resulting mainly from species gains. We also found that species' seasonal distribution shifts were mainly associated with breeding elevation and diet. Notably, high- and middle-elevation breeders and insectivores significantly shifted their elevational ranges

downslope in the non-breeding season. In addition, species that participate in mixed-species flocks and that rely on forests also showed significant downslope shifts in the non-breeding season. These results show complex patterns of the interconnectedness of bird communities along the elevational gradient. Keeping forests at middle elevations intact appears especially important as they are used in winter by species that breed at both high and middle elevations. Furthermore, our results suggested conservation actions maintaining connectedness in low and middle elevations are urgently needed to conserve regional biodiversity and highlight the importance of seasonality in montane ecosystem research.

Keywords: community composition, functional traits, montane birds, range shift, seasonal variation, temporal beta diversity

2. Ectoparasite load is unrelated to the reproductive success of Barn Swallow (*Hirundo rustica*) populations in North-eastern China

Yu Liu, Zhuoya Zhou, Li Tian, De Chen, Donglai Li, Yong Wang, Zhengwang Zhang*
Beijing Normal University, Beijing, 100875 Liaoning University, Shenyang, 110036 Alabama A&M University, Normal, AL, USA, 35762
* Corresponding author: zzw@bnu.edu.cn

The Hamilton-Zuk hypothesis suggests that sexually selected traits mediate the coevolution between hosts and parasites; thus, the female choice of male sexual ornaments is a sustainable process. In this research, we tested the Hamilton-Zuk hypothesis in the Barn Swallow (*Hirundo rustica*) - haematophagous mite (*Dermanyssus hirundinis*) system. Over 60% of broods were parasitized by D. *hirundinis* in a Barn Swallow population in north-eastern China, while only 5.0% of adult swallows were parasitized by haemosporidian parasites. We examined whether ectoparasites affected the reproductive success of hosts considering the sexually selected traits of males and whether the body condition of offspring was affected by the mite load or adult traits (breeding pairs: N = 59; broods: N = 94). Contrary to our predictions, males with more extravagant sexual ornaments had heavier brood mite loads and bred earlier than males with less extravagant traits, and the brood mite load did not affect the brood size. Nestlings from later nests or within larger broods had lower body masses, while their body masses were not associated with the brood mite loads. We conducted experimental ectoparasite manipulations in 78 Barn Swallow nests and found that experimental (artificially parasitized) nests were more frequently parasitized by D. hirundinis than negative control nests. Similar to our correlational research results, the body mass of nestlings was significantly correlated with breeding time other than the mite load in the manipulation experiment. Besides, the hemoglobin concentration of nestlings was significantly correlated with both breeding time and the mite load. We concluded that ectoparasitic mites are not a strong selective factor for breeding success, and the impact of ectoparasites on the development of nestlings was restricted to hemoglobin concentration other than body mass in the Barn Swallow population considered in this study.

Keywords: Asia, *Dermanyssus hirundinis*, Hamilton-Zuk hypothesis, *Hirundo rustica*, mite load, reproductive success, sexual selection

3. Evolution of social organization: phylogenetic analyses of ecology and sexual selection in weavers

Zitan Song [1,2,6], András Liker[3], Yang Liu[1,2*] and Tamás Székely[1,2,4,5]
1 State Key Laboratory of Biocontrol, School of Life Sciences/School of Ecology, Sun Yat-sen University, Guangzhou, Guangdong 510275, China
2 Milner Center for Evolution, Department of Biology and Biochemistry, University of Bath, Bath BA1 7AY, UK
3 MTA-PE Evolutionary Ecology Research Group, University of Pannonia, H-8201 Veszprém, Pf. 158, Hungary
4 Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing 100875, China
5 Department of Evolutionary Zoology and Human Biology, University of Debrecen, H-4032 Debrecen, Hungary
6 Department for the Ecology of Animal Societies, Max Planck Institute of Animal Behavior, Konstanz, Bücklestraβe 5, D-78467, Germany

Crook published a landmark study on the social organization of weavers (or weaverbirds, family Ploceidae) that contributed to the emergence of sociobiology, behavioral ecology, and phylogenetic comparative methods. By comparing ecology, spatial distribution, and mating systems, Crook suggested that the spatial distribution of food resources and breeding habitats influence weaver aggregation, both during the breeding season (colonial vs solitary breeding) and non-breeding season (flocking vs solitary foraging), and the spatial distributions in turn impact mating systems and sexual selection. Although Crook's study stimulated much follow-up research, his conclusions have not been scrutinized using phylogenetically controlled analyses. We revisited Crook's hypotheses using modern phylogenetic comparative methods and an extended dataset of 107 weaver species. We showed that both diet and habitat type are associated with spatial distribution and the latter predicts mating system, consistently with Crook's propositions. The best supported phylogenetic path model (PPA) also supported Crook's arguments, and in addition the PPA uncovered a direct relationship between non-breeding distribution and mating system. Taken together, our phylogenetically corrected analyses confirm Crook's conjectures in the roles of ecology in social organizations of weavers, although our finding also uncover new associations not envisaged by Crook, which suggest the non-breeding distributions are associated with mating system.

Keywords: sexual selection, social behavior, pair-bonding, parental care, coloniality, sexual size dimorphism

4. Mitochondrial genetic diversity of a captive population of Great Hornbill (*Buceros bicornis*) in Thailand

Pimpisa Jansamut1*, Budi Trifan[1], Manakorn Sukmak[2], Worawidh Wajjwalku[2], Vijak Chimchome[3], Chainarong Punchong[4], Worata Klinsawat[1], George A. Gale[1]

1 Conservation Ecology Program, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand

2 Faculty of VeterinaryMedicine, Kasetsart University, Kamphaeng Sean Campus, Nakhon Pathom, Thailand

3 Department of Forest Biology, Kasetsart University, Thailand

4 Khao Kheow Open Zoo, Bangpra, Sriracha, Chonburi, Thailand

* Corresponding author: pimpisa.jan@mail.kmutt.ac.th

Maintaining genetic diversity is a significant problem in conservation biology, especially in the management of captive threatened species. In this study, we demonstrate the population genetic and demographic structure of the Great Hornbill (*Buceros bicornis*) in a captive population from five zoos in Thailand based on partial mitochondrial genes. The concatenated mitochondrial ND2 and COI genes from 97 sampled individuals using 3,082 base pair nucleotide sequences revealed 19 variable sites. 21 haplotypes were discovered based on these variable locations with one shared haplotype among the zoos. The results demonstrate a high level of diversity (H=0.772, = 0.000582, n=97) in these hornbills in all 5 zoo groups which implied a success of the captive breeding program. Our findings suggests that there is sufficient genetic diversity in this sample to form a founder population for re-introduction.

Keywords: Captive population, COI, Great Hornbill, mitochondrial DNA, ND2

5. Migration loss and potential “ghost introgression” in a song bird species

Dezhi Zhang[1†], Huishang She[1,2†], Frank E. Rheindt[3], Lei Wu[1,2], Kai Zhang[1,2], Yalin Cheng[1], Gang Song[1], Chenxi Jia[1], Yanhua Qu[1], Urban Olsson[4,5], Per Alström[1,6] and Fumin Lei[1,2,7*]

1 Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, 100101 Beijing, China

2 College of Life Sciences, University of Chinese Academy of Sciences, 100049 Beijing, China.

3 Department of Biological Sciences, National University of Singapore, Singapore 117543 Republic of Singapore

4 Department of Biology and Environmental Science, University of Gothenburg, Box 463, SE-405 30 Gothenburg, Sweden

5 Gothenburg Global Biodiversity Centre, Box 461, SE-405 30 Gothenburg, Sweden

6 Animal Ecology, Department of Ecology and Genetics, Evolutionary Biology Centre, Uppsala University, Norbyvägen 18 D, SE-752 36 Uppsala, Sweden

7 Center for Excellence in Animal Evolution and Genetics, Chinese Academy of Sciences, 650223 Kunming, China

*To whom correspondence may be addressed. Email: leifm@ioz.ac.cn

†These authors contributed equally.

Loss of migratory behavior in birds is likely a polygenic process, as avian migration is governed by multiple correlated components with a variable genetic basis. The genetic underpinnings of avian migration loss and the interactions between the migratory and the derived resident populations are rarely investigated. Using one annotated near-chromosomal level de novo genome assembly, 50 re-sequenced genomes, and dozens of morphometric and bioacoustic data, we investigate the polygenic basis of migration loss and the complex population interactions involving the migratory and derived resident populations of an Asian songbird species, Emberiza elegans (*Aves: Emberizidae*). We first demonstrated that the southern resident population originated from the northern migratory population through migration loss. Using differentiation and selection scans, we identified 5 possible candidate genes associated with brain and nervous system development, circadian rhythm as well as hormone secretion and transportation which might be responsible for migration loss. These genes are slightly upstream or downstream from the actual genomic peaks of differentiation between migratory and non-migratory populations, indicating that non-coding elements may play an important regulatory role in the loss of migratory behavior in E. elegans. Using population structure, linkage disequilibrium and demographic inference analyses, we reveal that a hybrid lineage which is geographically adjacent to

the southern resident population was possibly derived from ghost introgression between two extinct lineages, highlighting the necessity to incorporate extinct populations in population structure and phylogenetic analyses of living taxa.

Keywords: Migration loss, ghost introgression, extinction, Emberiza

6. Coping with extremes: Physiological adaptations to hypobaric- hypoxia across the altitudinal gradients

Ghulam Nabi, Lingling Guo, Danning Xing, Yanfeng Sun, Qian Zhang, Mo Li, Kaiyue Hu, Yuefeng Wu, Dongming Li
Key Laboratory of Animal Physiology, Biochemistry and Molecular Biology of Hebei Province, College of Life Sciences, Hebei Normal University, Shijiazhuang, 050010, China
E-mail: lidongming@hebtu.edu.cn

Avian fauna across the altitudinal gradients has developed a suite of strategies, though little is understood for optimizing fitness under the environmental hypobaric hypoxia. To uncover the coping strategies and underlying mechanisms of physiological adjustments across the altitudinal gradients, we studied hemtaology, biochemistry, blood gases, and molecular biology in the muscles and liver of Eurasian tree sparrows (*Passer montanus*) across three altitudinal gradients: high-altitude (Jiangxigou, 3,230m, n=15), medium-altitude (Zhangbei,1400m, n=12), and low-altitude (Shijiazhuang, 80m, n=14). Our results showed that sparrows at high- and medium-altitude had significantly higher levels of Haemoglobin, Haematocrit, and Red Blood Cells, but a lower Mean Corpuscular Volume, and P50 relative to the low-altitude population. Sparrows at high-altitude had a significantly lower PCO2 but a higher pH value, Na+ and Cl- relative to the medium- and low-altitude population. The Hypoxia-inducible factor-1alpha (HIF-1α) protein expression varied significantly with elevation and tissue and with the interaction of elevation and tissue. In the liver, high- and medium-altitude sparrows had significantly lower HIF-1α protein expression than low-altitude sparrows, and medium-altitude sparrows had significantly lower expression relative to high-altitude ones. In the muscle, although there were no significant differences between the high- and low-altitude sparrows and between high- and medium sparrows, medium-altitude sparrows exhibiting significantly lower HIF-1α protein than those of low-altitude ones. In low- and medium-altitude sparrows, there were no significant differences in HIF-1α protein expression between liver and muscle. However, high-altitude sparrows had significantly higher HIF-1α protein expression in the muscle than in the liver. The Cytoglobin (Cygb) protein expression did not vary with elevation and tissue, but there was a significant interaction between elevation and tissue. Similarly, the muscle HIF-2α and Myoglobin protein expression did not vary with altitudinal gradient. In summary, our results indicate that some physiological parameters reach their limit somewhere at the medium-altitude beyond which other tissue-specific pathways are activated to cope with the escalating hypoxia and conserve energy for survival.

Keywords: Hypoxia, Hypobaria, High-altitude, Physiological adaptation, birds

7. Genetic studies of cranes in the Asian part of Russia

Elena Mudrik[1*], Elena Ilyashenko[2], Kirill Postelnykh[3], Tatiana Kashentseva[3], Oleg Goroshko[4, 5], Nadezhda Kuznetsova[6], Aleksandra Nechaeva[1], Sergei Smirenski[7], Sergei Surmach[8], Dmitry Politov[1]

1 Vavilov Institute of General Genetics Russian Academy of Sciences, Moscow, Russia

2 A. N. Severtsov Institute of Ecology and Evolution Russian Academy of Sciences, Moscow, Russia

3 Oka Crane Breeding Center, Oka State Nature Biosphere Reserve, Brykin Bor, Russia

4 Institute of Nature Resources, Ecology and Cryology Russian Academy of Science, Chita, Russia

5 Daursky State Nature Biosphere Reserve, Nizhny Tsasuchey, Russia

6 Reintroduction Station of Rear Birds, Khingansky State Nature Reserve, Arkhara, Russia

7 Muraviovka Park for Sustainable Land Use, Muraviovka, Russia

8 Federal Scientific Center of Biodiversity of the East Asia Terrestrial Biota, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia

* Corresponding author: mudrik@vigg.ru

Seven out of 15 species of cranes inhabit Russia, and breeding ranges of all of them are partly or entirely located in the Asian part of the country. This communication is aimed to present population genetic studies of all these species by nuclear and mitochondrial DNA markers. Due to rarity of some crane species and poor availability of biological material from the wild, studies of such species are carried out on samples from captive birds; otherwise we used specimens from native populations. Brief summary of our results obtained on seven crane species of Russia are as follows.

Demoiselle Crane (*Anthropoides virgo*). We have collected the most representative material from native populations of this species. We did not reveal strong genetic differences between European and Asian Demoiselle Cranes by both nuclear and mitochondrial DNA, however, we showed that birds in the European part of the range are more differentiated than in the Asian part (Mudrik et al., 2018; 2021). This may be caused by the lower intensity of gene flow between breeding groups in the European part of the range, where birds use two wintering sites in Africa, in contrast to the Asian Demoiselle Cranes which share wintering sites in a common area in India (Mudrik et al., 2021).

Eurasian Crane (*Grus grus*). Previously, we showed a high level of genetic variability of this species throughout its entire breeding range in Russia and the absence of genetic differentiation by nuclear microsatellite loci between the western (*G. g. grus*) and eastern (*G. g. lilfordi*) subspecies (Mudrik et al., 2015). We continue this study with the

use of different molecular genetic markers.

White-naped Crane *(Antigone vipio*). This species is distributed only in Asia. It is represented by western and eastern populations which located not as far apart as populations of the wide-spread Eurasian and Demoiselle Cranes. Differentiation between White-naped Cranes in Transbaikalia and the Far East of Russia is even less pronounced than that of the species mentioned above. Shallow genetic differentiation in White-naped Crane may reflect incomplete isolation of its populations (Mudrik et al., 2019).

Siberian Crane (*Leucogeranus leucogeranus*). Our study of the Siberian Crane is focused on the aspects of captive breeding and reintroduction of this species into the wild taking into account its nearly extinct western population. Thus, we carry on genetic passportization of individuals, sex identification, establishment of genetic relatedness, paternity analysis in chicks obtained under multiple artificial insemination of dams, estimation of the species gene pool in captivity (Mudrik et al., 2013; 2014; 2015; 2016).

Red-crowned (*Grus japonensis*) and Sandhill (*Antigone canadensis*) Cranes. Population genetic studies of these species were conducted quite detailed in Japan and North America, respectively. We mainly solve applied questions of sex determination and individual identification of these birds both living in the wild and held in breeding centers of Russia. Hooded Crane (*Grus monacha*). Study of this species is at the stage of collecting biological material in nature.

Keywords: cranes, genetic diversity, genetic differentiation, population, molecular markers

8. Kerala Bird Atlas 2015-2020: Aspects and Outcomes

Ashish Jha

Kerala Agricultural University

The Kerala Bird Atlas (KBA) is a state-wide citizen-science project aimed at assessing the distribution of avian species across the state. Over 400 volunteers systematically surveyed the entire Kerala for two seasons, dry (mid-Jan. to mid-Mar.) and wet (mid-July to mid-Sep.) during 2015-2020. Four 15-minute checklists were made per sub-cell per season and every bird species seen or heard during the sampling session was noted. With 0.3 million records of 382 species from over 25000 checklists, KBA is Asia's largest bird atlas in terms of geographical extent, sampling effort and species coverage. This data was utilized to derive season-wise distribution maps of the species. Species count, richness and evenness were higher in northern and central Kerala than southern Kerala, despite sampling effort being consistent across all regions (except Idukki and Pathanamthitta districts). Most of the endemic species and SoIB concern category species were distributed in the Western Ghats. The threatened species were not restricted to the Western Ghats and were also distributed across the western regions of the state. Among the winter migrants analyzed, 95% showed higher abundance during the dry season (Jan.–Mar.) than in the wet season. Among resident species, 52% showed no change in abundances, 35% showed higher abundance in the dry season, and 12% showed higher abundance in the wet season. The KBA dataset is an important tool for the study of macroecology, climate change and species-habitat associations.

9. New Information on the Distribution of Turkestan White Stork (*Ciconia Ciconia Asiatica*) in Fergana Region

Shakhzod Dekhkonov[1], Javlon Yorkulov[1]

1 Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan, Tashkent

The given materials are about the turkestan white stork (*Ciconia ciconia asiatica*), a rare bird species included in the Red Book of the Republic of Uzbekistan and its distribution and number of white storks in the Fergana region. In our observations, in the area of Pungon village, 4 (2 nesting water towers, 2 in concrete electric pylon) white stork N40º43’34,2” E70º49’11,3” were found. One nest of the white stork was spotted 126 meters from the area, and another nest 200 meters west was seen in a concrete electric pylon. After that, a number of nests of the white stork N40º43’18.1” E70º50’17.1” were seen from the entrance post to the territory of Fergana region. The next destination was Yazyavon district. Here again a colony of white storks consisting of more than a thousand individuals was found. According to employees of the Fergana Hunting and Fisheries Society, the number of birds observed in the region from September to mid-May each year ranges from 1,500 to 2,000. After the fish are collected in the ponds, they gather in the area to feed on the small fish left in the ponds. In the territory of Chagali village of Dangara district, 13 white stork nests were registered, of which 3 nests were located in 1 concrete electric pylon. 1 nest was built in the water tower. We headed to the white stork colony in the “Hob Buva” cemetery in Dangara district. The area is the largest number of white storks in the region. The area of the cemetery is 43 hectares (N40º44'02.9" E70º58'25.5”). All the nests were located in the Turongil (*Populus diversifolia*) tree, In April 2020, a strong wind blew, breaking the branches of the turangil and causing the collapse of several nests. At the entrance to the Fergana city were noted 2 white storks N40º25'09.5" E71º25'39.2". 1 white stork's Nest seen at N40º32'06.1" E71º25'39.2" which it was located on the water tower. Another pair of storks was seen in the nest 200 meters east of another nest of concrete electric pylon. There is one stork nest in 40º17'52.9"N 71º29'55.3"E village of Khankizi. In the area (N40º34’35.1” E71º20’15.1”) of Buvayda district, 2 white stork nests were found on a concrete electric pylon, 450 meters north, another white stork nest was found in concrete electric pylon. Four white stork nests were observed on the islands in the Syrdarya river, one km north from N40º38’24.3” E70º40’44.0”. In the territory of Furkat district (N40º33'07,9” E70º46'55,3”) one white stork nest, 2 nests in Oltintepa

village, in Beshoga village (N40º32'23,7" E70º42'56,1") 1 nest was found. Along the way, it was noted that another a nest was located at N40º32'24.2" E70º42'46.8", and another one nest was located N40º32'24.5" E70º42'44.3" on a concrete electric pylon. At N40º20'09,0" E71º23'03,4" in Altyarik district, one white stork nest was seen on a concrete electric pylon and another nest was seen on concrete electric pylon 100 meters east. One nest was recorded in N40º30'17.4" E71º25'18.0".

Sources the information about the white stork is specific to the Fergana valley, but the research and results in the Fergana region are insufficient. As a result of our observations, it can be seen that the habitat of the white stork in the Fergana valley, especially in the Fergana region has increased 3,6 times compared with the literatures. In particular, in the 2019 issue of the Red Book of the Republic of Uzbekistan, 745 pairs nested in Uzbekistan until 2005, of which 452 pairs were in the Fergana valley. In 2015, 70 pairs of 721 nests in the country were located in the Fergana valley. During our observations, we recorded 244 white stork nests in different biotopes of Fergana region.

10. Comparative genomics and transcriptomics reveal insights into high-elevation adaptations of the snowfinch ancestor

Yan Hao[1], Yalin Cheng[1], Chenxi Jia[1], Gang Song[1], Yanhua Qu[1], and Fumin Lei[1,2,3*]

1 Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China

2 College of Life Science, University of Chinese Academy of Sciences, Beijing 100049, China

3 Center for Excellence in Animal Evolution and Genetics, Chinese Academy of Sciences, Kunming 650223, China

* Corresponding author:leifm@ioz.ac.cn or quyh@ioz.ac.cn.

Species generally evolve similar adaptive traits to cope with environmental stresses under common phylogenetic background. However, the evolutionary mechanisms of initial adaption and how the ancestor influences the descendant species are largely unknown. Here we integrate comparative genomics and transcriptomics to investigate adaptive evolution in the ancestral lineage of 3 high-altitude passerine birds (Snowfinch, Passeridae) endemic to the Qinghai-Tibet Plateau, where high-altitude adaptations may have initially occurred. Our whole genome-wide screening identifies numerous accelerated coding and noncoding regions of the ancestor overrepresented in functions associated with metabolism and development, especially neural development. Consistently, by evolutionary rate estimations for protein-coding genes, we also reveal that the ancestral branch and even 3 descendants exhibit significantly higher evolutionary rates in developmental and metabolic processes compared with closely related birds, which is not the case at the genome-wide level. Using multiple-tissue gene expression analyses, we demonstrate a conserved tissue-specific expression pattern for all genes and significantly identical gene expression shifts in snowfinches. In particular, we find the largest number of differentially expressed genes in brain tissue. Accelerated evolution in non-coding regions may regulate gene expression changes to adapt to high-altitude areas. Our study provides new evidence for why high-altitude species evolve larger body sizes and increased metabolic rates than their low-altitude relatives to respond to selective pressure from high-altitude environments.

Keywords: adaptive evolution, high altitude, gene expression, development, metabolism

11. Modern aspects of the legal regulation for the protection of rare bird species living in transboundary areas between China and Kazakhstan

Viktoriya Ilina
Institute of Zoology Republic of Kazakhstan, 93 al-Farabi Str., Almaty, 050060, Republic of Kazakhstan
Institute of Zoology CAS, 1 Beichen West Road, Chaoyang District, Beijing 100101, People's Republic of China
* Corresponding author: ilina@kazmab.kz

The article analyzes the environmental legislation of the Republic of Kazakhstan and the People's Republic of China and the experience of international environmental legislation from the perspective of conservation of biological diversity. The legal aspects of maintaining and improving the Red Books of the Republic of Kazakhstan and the People's Republic of China are outlined.

The relevance of studying aspects of the conservation of rare bird species is beyond doubt and is the focus of scientific interests of many scientists and environmental organizations around the world. Birds tend to migrate and for this reason it is necessary to pay attention to the development of common concepts and approaches in countries where the migration routes of rare bird species are located. This topic is very extensive and it was decided to explore only the most general aspects of the conservation of rare bird species in the transboundary territories between Kazakhstan and China.

One of the main problems is the lack of uniformity in the list of birds listed in the Red Book. Therefore, some bird species that have a special protection status in Kazakhstan may be in danger during migration to the territory of other countries. This problem can be solved by the joint efforts of scientists and lawyers from different countries, who will apply an integrated approach, and create a system of practical actions for the conservation of rare bird species.

Similar initiatives have already been successfully applied, but it is necessary to deepen this work through the creation of regional groups and the development of mechanisms for the implementation of international strategies and recommendations of international recommendations at the level of the national law system.

Keywords: birds, legal regulation, protection of rare bird species, transboundary areas, international cooperation, international organizations, China, Kazakhstan.

III. Conservation

1. Implementation of the Oriental stork (*Ciconia boyciana*) Conservation Strategy in Russia

Yury Darman[1*], Vladimir Andronov[2], Anna Serdyuk[1]

1 Amur Branch of WWF Russia, Verkhneportovya street 18A, Vladivostok, 690007, Russia

2 FGBU Zapovednoe Priamurye, Serysheva Street 60, Khabarovsk, 680038 Russia

* Corresponding author: ydarman@wwf.ru

The Oriental stork (*Ciconia boyciana*) is an endangered species included in the Red List of the Russia, China, IUCN (En), CITES Appendix I. As the final link of the food chain, the Oriental stork is an indicator of the well-being of the Amur freshwater ecosystems. Most of the Oriental Stork population breeds in the Amur River basin: 75% in the Russian Far East and 15% in North-East China. In 2000, the Strategy for Oriental Stork Conservation in Russia was developed by initiative of WWF and IUCN. By that time, the decreasing Oriental stork population in Russia was about 382-426 breeding pairs. To implement this Strategy, the Amur Coalition was created under the umbrella of WWF Amur Ecoregional Program. The Conservation Strategy included 9 blocks. Most important were creation of protected areas' network, the improvement of nesting conditions and securing safety of electric poles. Of course, protection from hunting, poisoning and overfishing were underway by law enforcement structures. Ecological education helped to change behavior of people and gained support from local villagers. And all actions were based on research and regular monitoring at 6 model sites. During 20 years, the protected areas network for the stork habitat was doubled, forming up to 17.4 thousand square kilometers of wetlands and supporting 280-355 nests of Oriental stork (45% of all breeding pairs). Most important are zapovednicks – strictly protected state nature reserve under the management by federal Government (IUCN category 1). But they cover only 3,697 sq. km with 75-86 breeding pairs of Oriental stork (10% of population in Russia), including Khingansky, Khankaisky and Bolonsky nature reserves. Much larger is the system of provincial wildlife refuges but level of their protection is not sufficient. Thousands of locals took part in the "Nest Keepers" program. They helped to construct 47 nesting platforms and fixed 20 baskets on the trees improving nesting conditions. Each September, volunteers made fire-fighting treatment around nesting trees and tripods. So, they were saving in October fire season and next

April-May fire season as well. In recent years, nesting trees have also been protected from bears, which have begun to destroy stork nests. All this has led to an increase in the successful breeding of birds.

In the last decade, more and more Oriental storks have started using power line poles for nesting – almost 20% of nests are now registered on it. All this leads to short circuits of power lines, power outages and the death of birds. Therefore, WWF entered into an agreement with the Federal electric grid company, which installed 4,300 special repellent devices to prevent birds from landing on poles in dangerous places. And more than 1,000 special platforms have been set up for nesting in places that are safe for wires and storks.

Success of the Conservation Strategy implementation was proved by the full-scale census conducted in 2018-2019. The Oriental stork population in Russia had increased by 90% compared to the year 1999 up to 718–815 breeding pairs with total number not less than 4,500 birds.

Keywords: Oriental stork, Amur River Basin, Russian Far East

2. Conservation of the Oriental Stork living close to human habitation - To reduce accidents caused by human activities

Mina Izaki[1,2*], Rei Matsumoto[3], Tomohiro Deguchi[1,3]

1 Graduate school of Regional Resource Management, University of Hyogo, 128 Shounji, Toyooka, Hyogo, Japan

2 Local Government of Toyooka City, 2-4 Chuocho Toyooka, Hyogo, Japan

3 Hyogo Park of the Oriental White Stork, 128 Shounji, Toyooka, Hyogo, Japan

* Corresponding author: naoiza0609@gmail.com

In 1963 storks' captive breeding project started in Japan as the population of the Oriental Stork *Ciconia boyciana* declined. Nevertheless, they became extinct in 1971. Several conservation efforts have been conducted through the "industry-government-academia" collaboration. Overcoming various issues, Hyogo Park of the Oriental Stork initiated to reintroduce the storks by releasing them into the wild in 2005. As a result, the population is increasing every year, and the total number of birds exceeded 250 in July 2021 in Japan. More than 15 years have passed since the storks were initially released into the wild, and one of the most important problems is the accident caused by human activities. Storks living closely to human habitation injured or died due to traffic accidents, wire collisions and electrocutions, and net entanglements which are basically set up to protect rice paddies from deer and boars. These three causes make approximately 40% of all accidents of reintroduced birds. We challenge to deal with these problems and reduce them to a minimum. First, we focused on breeding pairs. The protection of breeding pairs is quite important because it contributes to the population increase. Previous studies in Japan have shown that each breeding pairs have each exclusive territory and live close to their nest throughout the year. In other words, it is useful to set the appropriate protection area for them. Therefore, we conducted a study for 20 months (from 2017 to 2020) to clarify the territory area and home range of one breeding pair. We analyzed these areas by kernel density estimation for each sex, and determined the most plausible range of each territory by recording locations where aggressive interactions occurred with other storks. Our results indicated that 40% of the kernel density in the overlap area (65.82 hectares) between pair members was determined as the territory of the study pair within their home range. The pair's home range sizes changed synchronously from the non-breeding period during 2017–2018 to

the nest-building and copulation period in 2019, preceding egg-laying. Differences in changes between the male and female home range sizes were found during the incubation period and the early chick-rearing stage in 2019; the male stayed within the territory whereas the female frequently occurred outside the territory. These results suggest that necessary conservation and management areas differ for male and female among the breeding Oriental Storks. On the basis of this detailed research, it is necessary to practice stork conservation in human habitation. Because the establishment of protected areas affects the property and livelihood of the people living there, the boundaries of protected areas should be determined severely. This is a significant perspective in the coexistence of storks and local residents. In this presentation, we will explain some cases of stork conservation activities carried out with local residents and the local government on the stork breeding sites.

Keywords: *Ciconia boyciana*, territory, home range, sexual difference, human habitation

3. Trade-offs between economic development and biodiversity conservation on a tropical island

Emilio Pagani-Núñez[1], Yang Xu[2], Mingxiao Yan[1], Jiekun He[3], Zifei Jiang[1], Haisheng Jiang[3]

1 Department of Health and Environmental Sciences, Xi'an Jiaotong-Liverpool University, Suzhou, China

2 Environmental Horticulture Research Institute of Guangdong Academy of Agricultural Sciences, Guangzhou, China

3 Spatial Ecology Lab, School of Life Sciences, South China Normal University, Guangzhou, China

Resolving trade-offs between economic development and biodiversity conservation needs is one of the defining issues of our time. This is crucial in currently developing countries and in particularly sensitive systems harboring especially high biodiversity such as tropical islands. Yet, such a task can be challenging as human activities may have complex effects on biodiversity. Here we assessed the effects of intense economic development on different components of biodiversity using Hainan Island (S China) as model. This highly biodiverse tropical island has experienced intense economic development, and extensive forest to agriculture conversion and urbanization, across the last decades. We characterized three main habitat clusters, quantified land use, local climate and socioeconomic changes, and estimated avian biodiversity responses between 1998 and 2013. We recorded ongoing taxonomic biotic homogenization at the regional scale, and communities becoming overall phylogenetically clustered and functionally overdispersed. Biodiversity's priority effects were pervasive, with less diverse communities showing positive and more diverse communities showing negative biodiversity changes. Finally, at the local scale, different socioeconomic (landscape urbanization, light pollution at night and economic growth) and environmental factors (changes in habitat productivity and changes in precipitation and temperature) showed complex and divergent effects across habitat clusters and biodiversity components. These effects were only partially ameliorated within a newly established Ecological Function Conservation Area in the mountainous central part of the island. Still, while detrimental local-scale effects of human activities showed inconsistent patterns among biodiversity dimensions, improved conservation policies did not fully prevent ubiquitous regional scale biodiversity changes. Thus, our results depict complex effects of economic development at different spatial scales. Profound ecosystem damage as a consequence of economic development was partially averted, probably due to enhanced biodiversity conservation policies and law enforcement, yet at the cost of broad-scale biotic homogenization and localized biodiversity loss.

4. Impact of agricultural netting on open-country bird populations in the Central Plains of Thailand

Rongrong Angkaew[1*], George A. Gale[1]

1 Conservation Ecology Program, School of bioresources and technology, King Mongkut's University of Technology Thonburi, Thailand

* Corresponding author: rongrong.ang@mail.kmutt.co.th, rongrong.ang@gmail.com

Nets are used across a wide variety of agricultural landscapes to control perceived avian pests, but netting impacts remain mostly unquantified, particularly in rice fields. Here we examined the scale of agricultural netting impacts on bird populations in the central plains of Thailand, a region dominated by rice fields with aquaculture ponds often interspersed. Net-types, number of individual birds and species caught were recorded using 1,312 road-survey transects (2-km length × 0.4-km width). We also interviewed 104 local farmers. We found 1,881 nets on 196 of the survey transects (including nets comprised of only horizontal parallel cords). The highest net counts were from aquaculture ponds (n=1,735) followed by rice fields (n=128) and other habitats (i.e., cropland, human settlement areas, reedbeds; n=18) respectively. The number of observed nets was significantly different from expected based on landuse area proportions, with the number set in aquaculture ponds ~13 times higher than expected. Vertical nets were the most commonly observed net type overall (n=1,299). 735 individual birds of at least 45 species were caught in the nets, including the globally near-threatened Asian golden weaver (*Ploceus hypoxanthus*; n=46 individuals). This weaver was also considered a significant pest by farmers. Among aquaculture ponds, the number of birds caught in vertical nets was significantly higher relative to those caught in the cord nets. Within the vertical nets, the number of entangled birds in rice fields was significantly higher than those in aquaculture ponds. Species in paddy fields, like weavers, were probably more likely to travel in larger flocks increasing the risk that multiple individuals were caught simultaneously. From interviews, 55% thought nets ineffective and only 6% thought they are very effective, particularly the cord nets, which they estimated saved >50% of their product. We suggest that these nettings haphazardly trap a wide range of species with roughly 20% of individuals caught in paddy fields and 95% at aquaculture ponds being non-target bycatch. Furthermore, although not observed in nets during our study, at least 15 other species of global concern, including highly localized populations of globally critically endangered Yellow-breasted bunting (*Emberiza aureola*), are likely at risk. Raising awareness of

agricultural netting impacts on birds as well as the problem of easy availability of nets is vital for reducing this threat. However, netting appears to be fairly localized suggesting that targeted outreach to farmers in selected regions may also help reduce this problem. Further studies should investigate the efficacy of less deleterious, but low-cost deterrents practical for farmers. We also urge researchers to examine the impacts of similar netting practices in other agriculture types such as orchards, as well as in other rice-growing countries.

Keywords: nets, agricultural landscapes, agricultural management, pest control

5. Nest surveys and conservation of the Eastern Sarus Crane *Antigone antigone sharpii* in the Ayeyarwady Delta, Myanmar

Thet Zaw Naing

Wildlife Conservation Society – Myanmar Program No.100, Yadanar Myaing Street, Yadanar Myaing Housing, Yangon, Myanmar

*Corresponding author: thetzawnaing@gmail.com

Until recently, the status and breeding biology of the Eastern Sarus Crane *Antigone antigone sharpii* in Myanmar was poorly known. The objective of our survey was to determine the current breeding status of ESC in the Ayeyarwady Delta, to inform conservation management of the species. Between 2016 and 2018, ESC nests were surveyed in the Ayeyarwady Delta. A total of 356 nests were found (33 breeding pairs in 2016, 138 pairs in 2017, and 185 pairs in 2018 respectively). Most nests were in rice paddies (79.5%) and grassland (20.5%). Most nests had a clutch size of two eggs (99.4%). The incubation period was 29-32 days. Hatching success was high, with 98% of eggs at 90.7% of nests. This is the first detailed study on the breeding of the ESC in Myanmar, and possibly even regionally. The key threats to the survival of the ESC in our study area are habitat loss and degradation due to conversion of land for aquaculture. Our results indicate that the Ayeyarwady Delta is of high national and global significance for the conservation of the ESC.

Keywords: Eastern Sarus Crane, A*ntigone antigone sharpie*, crane nest survey, breeding, Ayeyarwady Delta

6. Endemicity and land-use type influence the abundance range-size relationship of birds in Sri Lanka

Rachakonda Sreekar[1], Salindra Dayananda[2,3], Uromi Goodale[2], Sarath Kotagama[3], Eben Goodale[2]

1 Centre for Nature-based Climate Solutions, Department of Biological Sciences, National University of Singapore, Singapore, Singapore

2 Guangxi Key Laboratory of Forest Ecology and Conservation, College of Forestry, Guangxi University, Nanning, China

3 Field Ornithology Group of Sri Lanka, Department of Zoology, University of Colombo, Colombo, Sri Lanka

*Corresponding author: rachakonda.sreekar@outlook.com

The abundance range-size relationship (ARR) has been reported to be negative on tropical islands, perhaps allowing endemic species in such environments to remain extant. But there is a need to understand how endemism and land-use interact to shape ARR. Using 41 highly replicated transects along the full elevational gradient of Sri Lanka, we determined: i) the direction of ARR, ii) if endemism affects ARR, and iii) if land-use (protected rainforest, reserve buffer, and intensive agriculture) changes ARR differently for endemics and non-endemics. We found a positive relationship between species abundances and elevational range size. This positive ARR was maintained among endemic and non-endemic species, across land-use types, and at local and regional scales. Endemics shifted the ARR upwards, which indicates that at any given range size, endemics have higher abundances than non-endemics. Changing natural rainforests to intensive agriculture shifted the endemic ARR downwards, and the non-endemic ARR upwards. This suggests that naturally abundant endemics have been replaced by non-endemics in agricultural habitats. Nine (29%) endemics had both below average abundance and elevational range size. Sri Lanka Whistling Thrush (*Myophonus blighi*), Red-faced Malkoha (*Phaenicophaeus pyrrhocephalus*), Sri Lanka Thrush (*Zoothera imbricata*) and White-faced Starling (*Sturnornis albofrontus*) were the four most vulnerable species to global extinction risk. We demonstrate that ARR is influenced by the interaction between endemism and land-use. Examining shifts in ARR is not only important to understand community dynamics but can also act as a tool to inform managers about species that require monitoring programs.

Keywords: Abundance–range size relationship, agriculture, extinction risk, island endemics, land-use

7. Effects of anthropogenic landscapes on population maintenance of waterbirds

Xiaodan Wang[1], Xinhai Li[2], Xiaotong Ren[1,3], Micha V. Jackson[3,4], Richard A. Fuller[3], David S. Melville[5], Tatsuya Amano[3], Zhijun Ma[1*]

1 Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, National Observations and Research Station for Wetland Ecosystems of the Yangtze Estuary, Institute of Eco-Chongming, School of Life Sciences, Fudan University, Shanghai, 200433, China

2 Institute of Zoology, Chinese Academy of Sciences, Beijing, 100101, China

3 School of Biological Sciences, University of Queensland, St Lucia, Queensland, Australia.

4 Current address: School of Biological Sciences, University of Adelaide, Adelaide, Australia.

5 Global Flyway Network, 1261 Dovedale Road, RD 2 Wakefield, Nelson 7096, New Zealand.

Backgrounds: Habitat loss caused by human activities is the dominant threat to global biodiversity. Anthropogenic impacts have reduced natural areas but increased the area of anthropogenic landscapes. There is debate about whether anthropogenic landscapes (e.g., farmlands, orchards, and fish ponds) provide alternatives to natural habitat and under what circumstances. We considered whether anthropogenic landscapes can mitigate population declines for waterbirds.

Methods: We collected data on population trends and biological traits of 1203 populations of 579 species across the planet. Using Bayesian generalized linear mixed models, we tested whether the ability of a species to use an anthropogenic landscape can predict population trends of waterbird globally and of species of conservation concern.

Results: Anthropogenic landscapes benefited population maintenance of common but not less-common species. Conversely, the use of anthropogenic landscapes was associated with population declines for threatened species.

Conclusion: Our findings delineate some limitations to the ability of anthropogenic landscapes to mitigate population declines, suggesting that the maintenance of global waterbird populations depends on protecting remaining natural areas and improving the habitat quality in anthropogenic landscapes.

Keywords: Conservation, habitat management, natural habitat, wetlands, population trends, threatened species, waterbirds.

8. Conservation of Critically Endangered Migratory Bird Using Surrogate Species Model

Ferry Hasudungan[1*], Dewi M. Prawiradilaga[2,3], Mohammad Irham[2], Donald E. Lyons[4], Simba Chan[5], Yat-tung Yu[6], Fransisca N. Tirtaningtyas[3,7], Ryan Avriandy[7], La Eddy [8], Ayu Diyah Setiyani[9]

1 Burung Indonesia, Jl. Dadali No.32, RT.04/RW.05, Tanah Sareal, Kec. Tanah Sereal, Bogor, West Java

2 Museum Zoologicum Bogoriense, RCB-Lembaga Ilmu Pengetahuan Indonesia (LIPI), Jl. Raya Jakarta-Bogor No.Km.46, Cibinong, Bogor, West Java, Indonesia

3 Indonesian Bird banding Banding Scheme (IBBS), Jl. Raya Jakarta-Bogor No.Km.46, Cibinong, Bogor, West Java, Indonesia

4 Conservation Science of Audubon's Seabird Institute, 225 Varick St, New York

5 Wild Bird Society of Japan, Japan

6 Hong Kong Bird Watching Society, Hong Kong

7 Fauna & Flora International's Indonesia Programme, Jakarta, Indonesia

8 Pattimura University, Ambon, Indonesia

9 Nature Conservation Agency of Maluku (BKSDA Maluku), Maluku, Indonesia

* Corresponding author: h.ferry@burung.org

The data and information derived from migrant-habitat, spatial and temporal aspects such as timing and flight trajectory, are essential for conservation strategies of migratory bird and management plans, especially for critically endangered migratory birds. While it is often difficult to obtain data from critically endangered species directly, the study on a surrogate species could be used as a proxy to infer the information. To promote the conservation of critically endangered Chinese Crested Terns (*Thalasseus bernsteini*), we studied a surrogate tern species, Greater Crested Terns (*T. bergii*), in one known wintering area. We targeted individuals residing in the Maluku region of eastern Indonesia during the boreal winter. We outline a practical framework for studying migrant birds during their presence in stopover sites, movement areas, and flight corridors to draw more robust inferences about the behavior, ecology, and conservation of migratory birds. T. bergii were captured and fitted with metal and engraved plastic colour rings and 5g satellite telemetry tags from 2018-2020. The results showed that birds using nine stopover sites in Queensland, Maluku, Banda Sea, and Palau; 28 of core areas movement; and eight seas for their flight corridors. The locations used by Greater Crested Tern can be developed into information for studying the distribution path of the Chinese Crested Tern. Meanwhile, two stopover areas in Indonesia have been declared as protected areas. In the future, we propose to visit and

survey tracking locations to identify other important sites for seabirds, including wintering areas of Chinese Crested Terns.

Keywords: Great-crested tern, Chinese-crested tern, Maluku, satellite tracki

9. Arriving and breeding status of the Chinese crested tern in South Korea

Yunkyoung Lee[1*], Jihyun Kang[1], Duri Noh[1], Hyun-Gi Cha[1]

1 National Institute of Ecology, 1210 Gumgang-ro, Seocheon, Chungcheongnam-do, ROK

* Corresponding author: redstart76@gmail.com

The Chinese Crested Tern was first discovered in April 2016 in Chilsan-do, a significant breeding ground of the Black-tailed Gull (*Larus crassirostris*) in South Korea. To reveal Chinese Crested Terns' arrival pattern and breeding status for 5 years (2016-2020), we collected still images and 24-hour video data using unmanned-sensor cameras (from 2016) and CCTV cameras (from 2018). The number of individuals gradually increased to 5 in 2016, 6 in 2017, 7 respectively in 2018 and 2019, and 8 in 2020. They arrived at the breeding site in pairs (sometimes alone) asynchronously, and the first individuals were identified on March 29, 2018, March 30, 2019, and March 21, 2020. The Chinese Crested Tern only stayed on the island at night until before laying eggs. The first eggs were recorded on April 18 in 2018 and 2019, and on April 19, 2020. One pair (2019-2020) or two pairs (2016-2018) attempted breeding. We identified a total of 11 nests, including the replacement for 5 years, of which chicks were successfully fledged from 4 nests. The others (7 nests) failed in the incubation period (n=6) and in the early stage of chick-rearing period (n=1). The results of the image data analysis showed that the cause of the breeding failure was the immaturity of the breeding individual (almost not building its nests and often exposing eggs during incubation), and attacking by Black-tailed Gull. After the failure, their egg was re-laid again in 10 to 12 days. Clutch size was one (n=11), and the incubation period was average 26.7 days (26 to 28 days, n=3). The chicks were able to fly with their parents in an average of 39.7 days (37 to 43 days, n=3) from hatching. These results provide fundamental data on the breeding of Chinese Crested Terns and are expected to be utilized in establishing strategies for conservation of species and habitat.

Keywords: Arrival, Breeding Ecology, Critically Endangered Species, Chinese Crested Tern, Black-tailed Gull

10. Status and distribution of Green Peafowl in northern stronghold of Thailand

Ghan Saridnirun, Niti Sukumal[1], Matthew J. Grainger[2], Tommaso Savini[1]

1 Conservation Ecology Program, King Mongkut's University of Technology Thonburi, 49 Soi Thian Thale 25, Bang Khun Thian Chai Thale Road, Bangkok 10150, Thailand

2 Norwegian Institute for Nature Research, Postbox 5685 Torgarden, 7485 Trondheim, Norway

The endangered Green Peafowl has declined across its historical range due to habitat loss and degradation following, primarily, agricultural expansion. In Thailand, two strongholds remain, in the west and the north. While the western stronghold has been continuously investigated and well protected, the status of the species in the north remains unknown. This stronghold is composed of four continuous protected areas surrounded by agricultural landscapes, where conflict with farmers has been reported and expected to intensify. In this work, we therefore investigate the species' status in the northern Thailand stronghold, we define species' habitat use within and outside protected areas, and we highlight recommendations for the species' long-term conservation. Using Distance sampling over 54 transects, 2 km long, located in the forest interior, edge and in agriculture landscape, we estimated density for the whole stronghold of 15.82 calling males/km2, ranging from 13.55 to 19.89 calling males/ km2 in the four protected areas. General linear models showed that the species distribution was positively affected by dry dipterocarp forest and negatively affected by human settlements. The model also predicted higher species density within the protected forest than agricultural landscapes outside. Peafowl primarily used dry dipterocarp (15.76 calling males/km2) and mixed deciduous forest (19.84 calling males/ km2). They were also found in natural and mixed teak forest (12.68 and 9.93 calling males/km2 respectively). The species was also abundant (14.28 calling males/km2) in the agricultural landscape within 1 km from the protected areas' edges. While micro-habitat analysis showed higher bird detection in the area with high ground cover and fire evidence it also showed low detection where humans, cattle and domestic dogs are present. Our results highlight the important of large and continuous forest patches in the stronghold sustaining long-term species existence. We are also providing long-term conservation management by supporting agro-ecotourism through the species distribution in the agricultural landscapes. Effective conservation requires cooperation with local communities, with conservation programs dedicated to managing and mitigating human-wildlife conflict.

11. Evaluation of management methods for post-release dispersal in reintroduction: which combination of management methods contribute to dispersal after release?

Rina Kuwabara[1*], Yoshito Ohsako[1,2], Tomohiro Deguchi[1,2]

1 University of Hyogo, 128, Shounji, Tyooka, Hyogo Pref.668-0814, Japan

2 Hyogo Park of the Oriental White Stork, 128, Shounji, Tyooka, Hyogo Pref.668-0814, Japan

* Corresponding author: 0713.rina.1010@gmail.com

Number of reintroductions which aim to return species to parts of their historical ranges and re-establish an extirpated population has rapidly increased since the 1990s, however the success rate is generally low. Many attempts have encountered difficulty in the long-distance dispersal of the released animals. Long-distance dispersal is caused by post-release stress, lack of conspecific in the release site, natal habitat preference induction（NHPI）, and habitat exploration. Release technique (hard or soft release) and age selection (juvenile or adult) are considered as methods for mitigating the dispersion of released individuals. The effectiveness of management for regulating four above factors depends on the combination of release technique and age, and may vary over time. In Japan, juvenile and adult oriental white storks have been reintroduced using soft and hard release. We predicted that post-release dispersal in the 1st year increased in the following order of soft release juvenile (SJ) and soft release adult (SA), hard release adult (HA), hard release juvenile (HJ) and the difference between HA and HJ may disappear in the 2nd year dispersal. We verified these predictions using the released birds with GPS transmitters. We estimated 25% kernel home range as the core area in released birds from release day to 1st and 2nd year using locational data of GPS transmitters. Dispersal distance was defined as the straight-line distance from the release site to the center of gravity of the kernel. The distance was compared among SJ (n=7), SA (n=4), HJ (n=3), and HA (n=4). The dispersal distances were divided into three criterions; less than several km, several kmseveral hundred km, and more than several hundred km. The overall results were in 37% and 46% agreement only with the predictions in 1st and 2nd year dispersal, respectively. About post-release stress and lack of conspecific, the prediction that release of adults mitigates dispersal was generally correct. Soft release was expected to be effective for mitigating dispersal but the effectiveness varied greatly among juveniles. About NHPI, soft release of juveniles was expected to be the most effective for mitigating dispersal but the effectiveness was

likely to be small. About exploration, the prediction that release of adults mitigates dispersal was generally correct. In conclusion, the effectiveness of soft release for mitigating dispersal was out of expectation. Dispersal distance varied greatly among juveniles but was relatively small in adults. A hard release is a very simple and cost-efficient method because of no acclimation period after transport to the release site. We recommend the hard release of adult for reintroduction in species with a high dispersal ability and late maturity such as the oriental white stork.

Keywords: Conservation, Reintroduction, Post-release dispersal, Release technique, *Ciconia boyciana*

12. Development and Assessment of Strategies to Protect Cranes and their Habitats in South Korea

Yong-Chang Jang[1*], Seung-Hwa Yoo[2], Ki-Sup Lee[3], Sun-Mi Hwang[4]

1 Kyung-Nam University, Chang-Won, Gyeongnam 51767, Korea

2 National Institute of Ecology, Seo-Cheon, Chungnam 33657, Korea

3 Waterbird Network Korea, Seoul 03147, Korea

4 Suncheon Municipal Government, Sun-Cheon, Jeonnam 58027, Korea

* Corresponding author: pdnote2@hanmail.net

Strategies to protect cranes and their habitats were assessed by 50 participants who attended a workshop held in Suncheon City, South Korea, 2019. They were a total of 15 strategies, including 5 for the central government, 5 for local governments, and 5 for non-governmental organizations (NGOs). The most effective strategy identified was increasing the number of crane habitat areas legally protected by local governments, and the most feasible strategy was monitoring of the crane population by NGOs. This study proposes an integrated set of policies for protecting cranes in Korea.

Keywords: Endangered Bird Species, Local Government, Conservation Policy, NGOs, Wetland

13. Assessing habitat suitability for recovery of the endangered Hume's pheasant (*Syrmaticus humiae*, Hume 1881) in Thailand

Jitmat Thintip[1,2], Sutee Duangjai[1], Kornsorn Srikulnath[2], Paanwaris Paansri[1], Aingorn Chaiyes[3], Prateep Duengkae[1,4*]

1 Special Research Unit for Wildlife Genomics (SRUWG), Department of Forest Biology, Faculty of Forestry, Kasetsart University, Bangkok 10900, Thailand email: *prateep.du@ku.ac.th

2 Laboratory of Animal Cytogenetics and Comparative Genomics (ACCG), Department of Genetics, Faculty of Science, Kasetsart University, 50 Ngamwongwan, Chatuchak, Bangkok 10900, Thailand

3 School of Agriculture and Cooperatives, Sukhothai Thammathirat Open University, Nonthaburi 11120, Thailand

4 Center of Advanced Studies in Tropical Natural Resources, Kasetsart University, Bangkok 10900, Thailand

* Corresponding author: prateep.du@ku.ac.th

Hume's pheasant (HP) is classified as globally near threatened by the International Union for Conservation of Nature (IUCN) and locally endangered species in Thailand. While, Thailand has only one successful breeding of HP at the Doi Tung Wildlife Breeding Center, there are approximately 150 individuals in captive that can be recovery program. However, there is a lack of data on the appropriate habitat assessment then aim of this study is assessing habitat suitability for reintroduction HP. This study used MaxEnt (maximum entropy model; resolution 1×1 km) with 622 occurrences and 23 environmental variables in Thailand. Modeling means temperature of coldest quarter and forest types were the key environment factor influencing the distribution of HP. Current habitat suitability results of the model show only 1,904 km2 (0.37%) but the other 476,116 km2 (92.79%) are unsuitability in Thailand. Based on habitat suitability area which in 1,564 km2 (82.14%) inside and 340 km2 (17.16%) outside of protected area in Thailand. Our results indicated that immediate practices for protection and conservation of suitability areas and field habitat surveys should be carried out for preparing HP recovery program in the future.

Keywords: Hume's pheasant, Habitat suitability, MaxEnt

14. Monitoring species diversity of birds in forest gaps and closed canopy habitats of the lower montane evergreen forest at Mae Sa-Kog Ma Biosphere Reserve, Northern Thailand

Yuwadee Ponpituk[1], Supalak Siri[1,2], Paanwaris Paansri[1], Mongkol Safoowong[3], Dokrak Marod[1,2], Prateep Duengkae[1,2*]

1 Department of Forest Biology, Faculty of Forestry, Kasetsart University, 10900, Bangkok, Thailand

2 Address Center of Advanced Studies in Tropical Natural Resources, Kasetsart University, Bangkok, 10900, Thailand

3 Address Department of National Park, Wildlife and Plant Conservation, Doi Chiang Dao Wildlife Research Station, Wildlife Research Division, Wildlife Conservation Bureau, Chiang Mai, Thailand

We studied bird species diversity in the understory of forest gaps and closed canopy habitat within a lower montane evergreen forest at the Mae Sa-Kog Ma Biosphere Reserve, Chiang Mai, Northern Thailand. Bird sampling was conducted using the mist-netting method in closed canopy and forest gap habitat. A total of 12 sites monthly were sampled from October 2014 through October 2019 (42,480 net-hours). We compiled 1,813 mist-net capture (83 species). Of these, 961 individual birds in 68 species were in the closed canopy with the dominant species; Hill Blue Flycatcher (*Cyornis banyumas*), Grey-cheeked Fulvetta (*Alcippe fratercula*), Grey-throated Babbler (*Stachyris nigriceps*), Puff-throated Bulbul (*Alophoixus pallidus*), Bianchi's Warbler (*Seicercus valentine*). Eight hundred fifty-two individuals in 64 species were caught in forest gaps Grey-cheeked Fulvetta (*Alcippe fratercula*), Hill Blue Flycatcher (*Cyornis banyumas*), Grey-throated Babbler (*Stachyris nigriceps*), Puff-throated Bulbul (*Alophoixus pallidus*) and Blyth's Leaf Warbler (*Phylloscopus reguloides*). Seventeen species were captured only in closed canopy habitat versus 15 at forest gaps, and 51 species occurred in both areas. The number of bird species in closed canopy habitats was higher than those in forest gap habitats. Forest gap habitats had higher capture rates for nectarivores, frugivores and insectivores. Closed canopy habitat had higher a value of species diversity (Shannon-Weiner Diversity Index H′ = 3.10, Simpson Diversity Index D = 0.92, Evenness J′ = 0.32 and Species richness r = 68) than at forest gap (H′ = 3.21, D = 0.92, J′ = 0.38, and r = 65). Our study highlights the occurrence of gap dynamics in the forest. Intermediate disturbance is required to maintain bird

biodiversity in the area. Therefore, we need to have a suitable habitat for these birds to shelter.

Keywords: understory birds, forest gaps, closed canopy, mist-net capture, lower montane evergreen

15. Bird diversity in urban farmlands in China: new opportunity for urban bird diversity conservation

Myung-Bok Lee*, Daojian Chen, and Fasheng Zou
Institute of Zoology, Guangdong Academy of Sciences, No.105 Xingang West Road, Guangzhou, 510260, China
Corresponding author: bok.ecology@outlook.com

Background: Urban expansion often accompanies a loss of natural habitats and arable lands but an increase in urban population. In China, cities are compact and highly populated; however, they have a unique feature that can be classified as urban agriculture: small-scale urban farming throughout a city. These vegetable-dominant small urban farmlands are partly supported by government to enhance food availability for city citizens. While they create open greenery cover, biodiversity in urban farmlands is rarely explored, especially in China and other Asian countries. Using hierarchical models, we examined how species richness and abundance of winter birds are associated with environmental characteristics within and surrounding urban farmlands in Guangzhou, the largest city of southern China.

Results: After accounting for heterogeneous detection among species (multi-species occupancy model), percent cover of open green vegetation at the local scale showed a consistently positive effect on species occupancy within a community: that is, species richness increased with percent cover of open green vegetation (grassy/herbaceous vegetation) within a farmland. At the landscape scale (a 500m circular area), vegetation features did not affect species richness and occupancy of most species. Of five species used for abundance analysis with N-mixture model, three species responded positively to the variable. Two species were more abundant at farmlands with higher crop diversity. Detection probability of two species was also affected by environmental noisy or temperature. Abundance of one species increased with percent cover of farmlands in the landscape.

Conclusions: These findings suggest that diversity and abundance of birds in urban farmlands are more influenced by local environmental features than matrix features. In particular, the strong positive effect of open green vegetation on species richness supports the importance of natural and semi-natural vegetation to birds in anthropogenic landscapes. The positive relationship between crop diversity and abundance of some species also indicates that urban farmlands cultivating diverse crops can benefit several bird species, which in turn may increase ecosystem service such as

pest control in these farmlands. Depending on how we manage urban farmlands, they can contribute to improve urban biodiversity while maintaining agricultural production for city citizens.

Keywords: abundance, farmland, hierarchical model, urban agriculture, scale, species richnes

16. Using Migration Monitoring Data to Assess Christmas Frigatebird's Population Status for Future Conservation in Jakarta Bay

Fransisca N Tirtaningtyas[1], Alexander Kurniawan Sariyanto Putera[2], Radhitiya Anjar Pramana Putra[1], Ani Mariani[1,3]

1 Burung Laut Indonesia, Jl. Sempu raya no 43, Depok, West Java, Indonesia

2 Graduate Program of Animal Biosciences, Department of Biology, IPB University, Bogor, Indonesia

3 Graduate of Biology Education Programme, Faculty of Mathematics and Sciences, Universitas Negeri Jakarta, Jakarta, Indonesia

* Corresponding author: fntirtaningtyas@gmail.com

Knowledge and information about the wintering area used by bird species from the same breeding site migrate to the same wintering site are essential to understand processes affecting populations of migrants throughout the annual cycle. Here, we study the population of critically endangered seabirds, Christmas Frigatebird (*Fregata andrewsi*) in Jakarta Bay, 400 km from the breeding area in Christmas Island, Australia. Nearly one per cent of the global population is foraging and roosting in this bay. We calculated the number of birds from 2011-2021. The results showed the population trends showed a decline. We found the main threat in birds such as anthropogenic activities, seabird bycatch, and entangled due to the fish hook. Community-wide programs about conservation in Christmas Frigatebird have been done, from education program for children to the workshop with the fishermen around Jakarta Bay. In the future, we still need collaborative conservation action to reduce the threats in Christmas Frigatebird during their wintering time.

Keywords: Christmas Frigatebird, Jakarta Bay, Population, Conservation

17. Hainan peacock-pheasant

John Corder, Geoffrey Davison.

Following the research by Chang et al, 2008) and Davison et al, (2012), the Bornean Peacock-pheasant (*Polyplectron schleiermacheri*) and the Malaysian Peacock-pheasant (*P. malacense*) were recognised as well-differentiated species. Further study of these two species in captivity in the UK has shown that display behaviour in captivity appears to replicate that of wild birds and numerous new behaviours are described, which show many differences as well as similarities between the two species. In addition, a number of new calls by Bornean Peacock-pheasants are demonstrated using video and sonograms. Both species present breeding challenges in captivity and perhaps these experiences may be of benefit for any future programme for the Hainan Peacock-pheasant (*P.katsumatae*).

IV. Ecology I

1. Egg burial protects eggs being hurled out the wind-swayed nest in Chinese penduline tits

Jia Zheng[1], Emiel Zuidema[1], Tamás Székely[3], Zhengwang Zhang[2], Jan Komdeur[1*]

1 Behavioral and Physiological Ecology, Groningen Institute for Evolutionary Life Sciences, University of Groningen, 9712 CP Groningen, The Netherlands

2 Ministry of Education Key Laboratory for Biodiversity Sciences and Ecological Engineering, College of Life Sciences, Beijing Normal University, No.19 Xinjiekouwai Street, Beijing 100875, China

3 Milner Centre for Evolution, Department of Biology and Biochemistry, University of Bath, Claverton Down, Bath BA2 7AY, UK

*Corronsponding author: j.komdeur@rug.nl

Background: Egg burial behavior, i.e. when breeders bury the eggs with a layer of nest material during the egg-laying stage, has been described in various egg-laying animals. Several functions of egg burial have been revealed in animals that exhibit different life histories and nest shapes. In a polygamous Eurasian penduline tits (*Remiz pendulinus*), sexual conflict over care was proposed to drive egg burial since females appear to hide the progress of her egg laying from males by covering the eggs so that the female can desert the clutch and leave parenting to the male. Here we investigate a con-generic species, the Chinese penduline tit (*R. consobrinus*), and test four hypothesised functions of egg-burying behavior using experimental manipulations.

Results: We found that egg burial is unlikely (1) to play a role in sexual conflict resolution, as both males and females freely enter the nest during egg-laying and both parents appear to bury eggs; (2) to prevent nest parasitism, as no egg rejection or clutch abandonment were observed by experimentally augmented clutches. (3) Our results are also not consistent with the temperature regulation hypothesis since unburied eggs and buried eggs had similar hatching success. (4) Our results are most consistent with the egg protection against wind hypothesis, since the burying layer efficiently prevented the eggs from being blown out of wind-swayed nests.

Conclusions: Our study reports a novel function of egg burial behaviour. We highlight that the same behaviour, i.e. nest burial, can serve different evolutionary functions between close-related species.

Keywords: egg burial, sexual conflict, brood parasitism, ecological factor, functions

2. Identification of breeding grounds and annual routines of the newly discovered *bohaii* subspecies of Black-tailed Godwits

Bing-Run Zhu[1,2,3], Mo A. Verhoeven[2], A.H. Jelle Loonstra[2], Lisa Sanchez-Aguilar[2], Chris J. Hassell[4], Katherine K-S. Leung[5], Weipan Lei[1], Zhengwang Zhang[1,*], Theunis Piersma[2,4,6,7]

1 Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing 100875, China

2 Conservation Ecology Group, Groningen Institute for Evolutionary Life Sciences, University of Groningen, PO Box 11103, 9700 CC, Groningen, The Netherlands

3 Hunan Global Messenger Technology Co., Ltd. Changsha, Hunan, 410205, China

4 Global Flyway Network, PO Box 3089, Broome, Western Australia 6725, Australia

5 Hong Kong Waterbirds Ringing Group, Mai Po Nature Reserve, Hong Kong

6 Department of Coastal Systems, NIOZ Royal Netherlands Institute for Sea Research, PO Box 59, 1790 AB Den Burg, Texel, The Netherlands

7 CEAAF Centre for East Asian-Australasian Flyway Studies, Beijing Forestry University, Qinghua East Road 35, Haidian District, Beijing 100083, China

*Corronsponding author: zzw@bnu.edu.cn

Background

The East Asian-Australasian Flyway (EAAF) is the most species-rich of nine global waterbird flyways and also has the most populations in decline. The annual cycles of most migratory waterbirds in the EAAF are poorly described, making it difficult to diagnose their population trends and to implement proper conservation measures. In the case of Black-tailed Godwit *Limosa limosa*, until recently only a single subspecies *L. l. melanuroides* was assumed to occur in the flyway. This long-standing belief was challenged by the discovery of a morphologically larger and genetically distinct population: *L. l. bohaii*.

Method

Based on satellite tracking of 21 individuals that were tagged in northern Bohai Bay, China, from 2016 to 2018, here we (1) describe the annual cycle of *bohaii*, (2) classfy the habitat type of this subspecies during their annual cycle, (3) test whether the timing of migration to and from the wintering grounds, Bohai Bay, and the breeding grounds, differed between males and females, (4) compared breeding distribution of godwits known to be *melanuroides* on the basis of our previous genetic study.

Results

All the birds had Thailand as their southernmost ‘winter’ destination. The spring

departure was in late March during northward migration, Bohai Bay was the first stopping site where they spent on average 39 days (± SD = 6 d), followed by Inner Mongolia and Jilin province (stopping for 8 d ± 1 d). The arrival of the breeding grounds in the Russian Far East was centred in late May. Two breeding sites were detected, with average locations 1100 km apart; the eastern site was beyond the known Asian breeding distribution of the Black-tailed Godwit. Southward migration started in late June, with the godwits tending to make longer stops at the same two main stopping sites used in the spring, i.e. Inner Mongolia and Jilin province (32 ± 5 d) and Bohai Bay (44 ± 8 d), with some individuals making a third stop in the middle-lower reaches of the Yangtze River in southern China (12 ± 4 d). By the end of September, most tracked individuals had arrived in Thailand, but some moved south to Thailand as late as early December.

Conclusions

Compared with the previously known subspecies, *bohaii* godwits have strikingly different schedules of migration and moult. We infer that during southward migration male bohaii godwits completed their primary moult before leaving Bohai Bay, whereas females-initiated moult there to finish on the wintering grounds. This study thus adding to the knowledge about intraspecific diversity of black-tailed godwits in the East Asian-Australian Flyway.

Keywords: *Limosa limosa*; *bohaii*; Bohai Bay; annual cycle; migration; timing; EAAF

3. Demographic composition, post-release and natal dispersal, and breeding success of the reintroduced Oriental White Stork, *Ciconia boyciana*

Tomohiro Deguchi[1,2*], Yoshito Ohsako[1,2], Shiro Sagawa[1,2], Yasuo Ezaki[2]

1 Graduate school of Regional Resource Management, University of Hyogo, 128 Shounji, Toyooka, Hyogo 668-0814, Japan

2 Hyogo Park of the Oriental White Stork, 128 Shounji, Toyooka, Hyogo 668-0814, Japan

*Corresponding author. E-mail: deguchi@rrm.u-hyogo.ac.jp

Species restoration through reintroduction and reinforcement is widely considered as an effective method for the conservation of threatened animals. Therefore, over the last half-century, these approaches have been increasingly implemented; however, many attempts have failed. Dispersal behaviour is one of the key factors determining reintroduction success. We reported the demographic composition and post-release and natal dispersal of a reintroduced Oriental Stork *Ciconia boyciana* population in Japan, and identified the determinants of breeding success in 2005–2019. We hypothesized that one of the key determinants of breeding success is the density-dependent effect through post-release and natal dispersal. The F1 generation occurrence corresponded to two, F2 to seven, F3 to 11, and F4 to 14 years after initial reintroduction. Wild-born birds accounted for 74% of the reintroduced population at F4 occurrence. Post-release dispersal distances were shorter than natal dispersal. Inter-nest distance was selected as the key factor determining breeding success. These results may have been due to feeding habitat restoration and conspecific interactions. In conclusion, steady recruitment to the next generation is thought to be due to a moderate natal dispersal and the subsequent low breeding density of wild-born birds.

Keywords: species restoration, reintroduction, Oriental Stork

4. No evidence of host-specific egg mimicry in Asian koels

Mominul Islam Nahid[1,2,3]

1 Jahangirnagar University, Savar, Dhaka, Bangladesh

2 Department of Biology, Norwegian University of Science and Technology (NTNU), Trondheim, Norway

3 Ministry of Education Key Laboratory for Ecology of Tropical Islands, College of Life Sciences, Hainan Normal University, Haikou 571158, China

Avian brood parasitism is costly for the host, in many cases leading to the evolution of defenses like discrimination of parasitic eggs. The parasite, in turn, may evolve mimetic eggs as a counter-adaptation to host egg rejection. Some generalist parasites have evolved host-specific races (gentes) that may mimic the eggs of their main hosts, while others have evolved 'jack-of-all-trades' egg phenotypes that mimic key features of the eggs of several different host species. The Asian koel (*Eudynamys scolopaceus*) is a widely distributed generalist brood parasite that exploits a wide range of host species. Based on human vision, previous studies have described Asian koel eggs as resembling those of its main host, the house crow (*Corvus splendens*). Using measurements of egg length and breadth, digital image analysis, reflectance spectrophotometry and avian visual modelling, we examined Asian koel egg variation and potential mimicry in egg size and shape, and eggshell pattern and color in three sympatrically occurring host species in Bangladesh: the common myna (*Acridotheres tristis*), house crow, and long-tailed shrike *(Lanius schach*). We found some differences among Asian koel eggs laid in different host nests: a) Asian koel eggs in long-tailed shrike nests were larger than those laid in common myna and house crow nests, and b) Asian koel eggs in house crow nests were less elongated than those in common myna nests. However, these changes in Asian koel egg volume and shape were in the opposite direction with respect to their corresponding host egg characteristics. Thus, our study found no evidence for Asian koel host-specific egg mimicry in three sympatrically occurring host species.

Keyword: Avian interspecific brood parasitism, host-specific egg mimicry, Asian koel, reflectance spectrophotometry, host egg characteristics

5. Body weight of understory birds in natural gaps of different sizes in a lower montane evergreen forest at Mae Sa-Kog Ma Biosphere Reserve, northern Thailand

Supalak Siri[1,2], Yuwadee Ponpituk[1], Mongkol Safoowong[3], Dokrak Marod[1,2], Prateep Duengkae[1,2*]

1 Department of Forest Biology, Faculty of Forestry, Kasetsart University, Bangkok 10900, Thailand

2 Center of Advanced Studies in Tropical Natural Resources, Kasetsart University, Bangkok 10900, Thailand

3 Department of National Park, Wildlife and Plant Conservation, Doi Chiang Dao Wildlife Research Station, Wildlife Research Division, Wildlife Conservation Bureau, Chiang Mai 50170, Thailand

* Corresponding author: prateep.du@ku.ac.th

Weights variation is importance in understanding the ecological responses of birds. Information on body weight has proven highly influential as a forest bird indicator, strongly connected to habitat and its relationship to environmental change. Thus, bird body weights can be used as indicators of the health of ecosystems. In nature, the tree canopy is changing continuously due to growth, death, and succession. The falling of a tree introduces heterogeneity into the microhabitat, which in turn powerfully influences ecological structure and function in forests. Forest gaps maintain diversity and promote alternative sites for utilization by understory birds in tropical forest. This study was concerned with the size of natural forest gaps in the lower montane evergreen at the Mae Sa-Kog Ma Biosphere Reserve, northern Thailand. We conducted a five-year study to examine the effects in natural gaps on different sizes of the body weight of understory birds. This study selected all the existing twelve mist net sites in the forest gaps (between 130-1,020 m2). The forest gaps which had been created by natural large single-tree falls, Diameter of Breast Height (DBH) between 43.2-124.2 cm. The large single-tree species that cause forest gap were Persea gamblei (DBH 43.2 cm), Markhamia stipulata (DBH 51 cm), Elaeocarpus floribundus (DBH 55.7 cm), Catanopsis acuminatissima (DBH 58.3-82.2 cm), and Choerospondias axillaris (DBH 124.2 cm). The field work was carried out from October 2014 through October 2019.

In total, 844 captured birds belonging to 60 species were captured over 25,620 trap hours (61 months). The body weight correlation of all the understory birds (weights 4.6-158.5 g) and the size of the forest gaps was a negligible negative correlation ($r=-0.05$, $p>0.05$). We considered four groups of birds, related to the most captured groups,

comprising of the Babbler, Bulbul, Flycatcher, and Spiderhunter. Negligible negative correlations were found for the Bulbul, Flycatcher, and Spiderhunter (r between -0.01 to -0.19) with no significant differences. A negligible positive correlation was found in Babbler (r between 0.01 to 0.19) with no significant differences. However, increasing the forest gap size in Mae Sa-Kog Ma Biosphere Reserve affected large-sized birds of the Flycatcher (Asian Paradise-Flycatcher and Rufous-bellied Niltava) and Spiderhunter groups (Streaked Spiderhunter and Little Spiderhunter) that avoid the large open gaps (>532 m2). Conversely, the large-sized birds of Bulbul (Puff-throated Bulbul) can adapt to living in diverse size gaps and large size gaps in the lower montane forest. In addition, this study confirmed that different size gaps can carry small-sized through large-sized birds in forest. Bird body weight changed during successive parallels with gap dynamics. Our result suggested that if we want to maintain diverse sizes of birds in the forest, then we must protect natural forest gaps, that is suitable forest gaps created by the falling of big tree.

Keywords: Body weight, forest gap, heterogeneity, tree falling, understory birds

6. Carrying Capacity Analysis of Wintering Hooded Crane (*Grus monacha*) at Shengjin Lake

Shanshan Xia[1,2], Wenjing Wan[1,2#], Lizhi Zhou[1,2*], Zhenhua Wei[1,2]

1 School of Resources and Environmental Engineering, Anhui University, Hefei 230601, China

2 Anhui Province Key Laboratory of Wetland Ecosystem Protection and Restoration, Anhui University, Hefei 230601, China

*Corresponding author: Lizhi Zhou (zhoulz@ahu.edu.cn)

Carrying capacity can reflect the quality characteristics of population habitat. Therefore, to a certain extent, the utilization status of degraded lakes wetlands by wintering waterbirds can be quantified by assessing the carrying capacity of waterbird populations in the area. We selected Hooded cranes (*Grus monacha*) wintering at Shengjin Lake, an internationally important wetland seriously degraded by human intrusion and disturbance, as the study population. Based on nutrient carrying capacity formula, considering hooded crane suitable habitat, habitat utilization rate and the proportion of its population in the same feeding group, overwintering days, daily field metabolic rate and other factors, we calculate the carrying capacity of hooded cranein three wintering period in different habitat types, and analyze the influential factors. The results showed that the suitable foraging habitat area and food density were different in different wintering stages, and the energy provided by the suitable foraging habitat and the carrying capacity of the population of hooded crane decreased with time. At Shengjin Lake the carrying capacity of hooded crane is 1195 individuals in the early winter period, 672 individuals in the middle winter period, 234 individuals in the late winter period. In different wintering periods, the foraging activities of hooded crane are affected by lake water levels, human disturbance and food resources to varying degrees. Therefore, hooded cranes frequently adjust their foraging behaviors to adapt to the degradation of wetlands and the reduction of suitable habitats to maintain a certain energy intake and maximize their energy income. In conclusion, degraded lake wetlands still play a positive role in protecting threatened waterfowl populations, and the implementation of species protection scheme should be accelerated.

Keywords: Carrying capacity, Hooded crane, Foraging activity, Wintering waterbird, Shengjin Lake

7. Exploring hawk mimicry of the four sympatric *Cuculus* species in South Korea

Jun-Seo Go, Jin-Won Lee*, Jeong-Chil Yoo

Department of Biology, Korea Institute of Ornithology, Kyung Hee University, Seoul, South Korea

*Corresponding author: jwlee99@khu.ac.kr

Visual similarity between *Cuculus* cuckoos and *Acciptier* hawks, such as yellow eyes and feet, and barred underparts have been recognized as coevolutionary traits obtained against host defense in *Cuculus* cuckoos through taking advantage of aggressive hawk mimicry. However, the variation of these traits within and among cuckoo species remains poorly understood because empirical studies quantifying these traits are limited in terms of the number of studies and the number of species concerned, and mostly depend on museum collections. In this study, we quantified and compared these traits as well as other new features (e.g., inner wing spot and underpart background color) in the four sympatric *Cuculus* cuckoos (*C. poliocephalus, C. micropterus, C. optatus, and C. canorus*) that were wild-captured in South Korea. We found that the yellow color of the eye ring and feet was fairly consistent across the four species. However, the iris color appeared to vary within a species (e.g., between sexes) and varied more substantially among species from nearly black in *C. micropterus* to bright yellow in *C. canorus.* In addition, there were significant differences among species with respect to the thickness of the underpart bars, from the thinnest in *C. canorus* to the thickest in *C. micropterus.* We also found that the underpart color (pure white versus yellowish brown) and the number of inner wing spots varied within and among species. These results indicate that although hawk-like traits are widely present in *Cuculus* cuckoos, detailed quantitative features of these traits vary across species. We discuss the potential reasons that generate such variations and suggest future directions to increase our understanding of visual signals in avian brood parasitism.

Keywords: brood parasitism, *Cuculus* cuckoos, hawk mimicry, morphology, reciprocal interactions.

8. Effects of Landscape Variation, Population Abundance, and Host Activity on the Rate of Asian Koel (*Eudynamys scolopacea*) Brood Parasitism of Long-tailed Shrike (*Lanius schach*)

Dayna Levine

Natural Resource Management, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, 126 Pracha Uthit Rd, Khwaeng Bang Mot, Khet Thung Khru, Krung Thep Maha Nakhon 10140, Thailand.

*Dayna Levine: dlevine1@skidmore.edu

Brood parasitism likely causes decline in many bird populations globally, however impacts have rarely been studied in Southeast Asia, a region where biodiversity is already under intense threat from multiple anthropogenic factors. This study is an ongoing investigation of the impact of Asian koel (*Eudynamys scolopaceus*) brood parasitism on Long-tailed shrike (*Lanius schach*) and potential factors influencing this parasitism. The Long-tailed shrike population, specifically the *longicaudatus* subspecies which is endemic to the central plains of Thailand, has been in apparent decline over the last thirty years. Previously described as extremely common in Thailand, they are currently listed as a nationally endangered subspecies. The cause of this decline remains unclear however, some potential stressors are urbanization, brood parasitism, predation, and potential deterioration in prey quality. This study was done through nest monitoring during one breeding season (March- August 2021) in Mueang district, Sukhothai in lower northern Thailand. Susceptibility to parasitism was determined by observing host activity during nest building and egg laying stages, as well as habitat differences between nest sites. Host foraging activity was also being studied to determine whether habitat differences and population decline is predicted by prey changes through urbanization and farming practices, brood parasitism effects on reproductive success, or a combination thereof. Preliminary results suggest that brood parasitism is a significant issue in this population, with 69% of nests with identifiable eggs (25 of 36) being parasitized. Of the 11 non-parasitized nests, only 4 were successful. Additionally, of the 12 nests that were parasitized and also successful in producing fledglings, only 2 successfully fledged shrikes as well as koels. In terms of prey availability, there seems to be a difference in prey size between park/garden habitats versus agriculture habitats. In agricultural habitats, the number of prey

consumed of varying prey size (0.0-0.5x, 0.5-1.0x, 1.0-1.5x, 1.5-2.0x, and >2.0x bill length) is relatively equal. In contrast, shrikes in park/garden habitats consume much smaller prey more often, with prey of 0.0-0.5x bill length making up more than 50% of food observed. The significance of this, especially in terms of reproductive success and shrike population abundance has yet to be determined, however, it does suggest potential differences in prey availability between major habitat types within this shrike population's remaining range. Although data analysis is still ongoing, this project shows the negative influence of Asian koel brood parasitism on Long-tailed shrike reproductive success. This reproductive stressor, especially when coupled with the variation in prey availability, could be the root cause of this population's drastic decline.

Keywords: Brood parasitism, Asian koel, Long-tailed shrike, Habitat variation, Thailand

9. Evaluation of a Robot Model in Playback Experiments

Miao Tian, Canwei Xia*

Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, No.19, Xinjiekouwai St, Haidian District, Beijing, 100875, P.R.China

* Corresponding author: xiacanwei@bnu.edu.cn

Playback experiments is a well-established method for birds research, especially in the study of territorial responses of songbirds. Birds obtain information from multimodal signals while only acoustic signal provided during the playback. Many efforts have been made to combine vision signal into playback experiments, e.g., static specimen, video, live birds. In this study, a robot model, mimicry of a territory intruder, was provided to Eurasian Nuthatch (*Sitta europaea*), and its effect on playback experiments was evaluated. The experiments were conducted in Baihuashan National Nature Reserve (39°83′N, 115°58′E), China. There were 45 individuals involved in the study during 2021 breeding season. These 45 individuals were randomly divided into three equal-sized groups, corresponding to the three experimental conditions: playback only; playback with a static model; playback with a dynamic model. There were 7 behavior variables observed during 3-min playback: minimum distance to the model/loudspeaker, number of individuals participation, latency to approach, latency to calling, number of flights, number of calls, time spent near the model/loudspeaker; and 5 behavior variables observed within 3 minutes after playback: minimum distance to the model/loudspeaker, number of individuals participation, number of flights, number of calls, time spent near the model/loudspeaker. Principal component analysis (PCA) was employed to compress the original variables and analysis of variance (ANOVA) was used to compare the intensity of responses among groups. Nuthatches generally showed high degree of response when their mate also took part in territory guard, and there was no significant influence of the model during the playback. Considering the dense habitat where nuthatches live, the robot model may insufficiently increase stimulation of sensory perception. We suggest the effect of vision signal during playback should be evaluated in more species, especially for the birds live in open area.

Keywords: playback, nuthatch, robotic model, simulated territorial intrusion, breeding season

10. Hotter summers and milder winters nearly double winter mortality over three decades in a wild songbird

Lei Lv[1,2*], Martijn van de Pol[3], Helen L. Osmond[2], Yang Liu[1*], Andrew Cockburn[2], Loeske E. B. Kruuk[2]

1 School of Ecology, Sun Yat-sen University, 510275, Guangzhou, China

2 Division of Ecology and Evolution, Research School of Biology, The Australian National University, ACT 2601, Canberra, Australia

3 Department of Animal Ecology, Netherlands Institute of Ecology (NIOO-KNAW), 6700 AB, Wageningen, The Netherlands

* Corresponding author. Email: lvlei1004@gmail.com & liuy353@mail.sysu.edu.cn

Despite widespread evidence of climate effects on life-history traits in wild animals, attributing demographic consequences to changes in specific climate variables has been more challenging. Here, we investigated climate effects on adult mortality in a year-round censussed passerine bird, the superb fairy-wren (*Malurus cyaneus*). Over a 27 year period, the population density declined by nearly half, and the annual adult mortality rate outside the breeding season nearly doubled, from 16% to 31%. Our analyses show that this 'non-breeding-season' mortality increased with both lower daily minimum and higher daily maximum temperatures in winter each year. It also increased with higher intensity of heatwaves in the previous summer. Fine-scale analyses showed that the mortality hazard rate in a given week increased with higher maximum temperatures in the week of two weeks prior, and with lower minimum temperatures in the current and previous weeks, indicating costs of large temperature changes (in particular, temperature drops) during winter. Path analysis showed that increases in winter maximum temperature and summer heatwaves across years contributed most to the increased mortality in the non-breeding season. Our study therefore reveals adverse and complex effects of warming temperatures on individual survival and hence on fitness, with the potential for drastic demographic consequences.

Keywords: climate change, winter mortality, *Malurus cyaneus*, demography, thermal physiology

11. Comparison of Escape Distances Between Juvenile and Adult Tree Sparrow in Beijing

Qianyi Zhang

Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing 100875, China

A common measure of anti-predator defense in birds under field conditions is the escape-related distances, the distances at which an individual takes actions (e.g., alert, flee) when approached by a potential predator (e.g. human). These distances represent a compromise between the predation risk of mortality due to predation and foraging opportunity. The difference of escape-related distances among groups is affected by the life expectancy: the group with relatively better survival prospect should take small risks (i.e., long escape-related distances) in order not to jeopardize their prospects of survival. In the middle to high latitudes, lots of juvenile birds died in their first winter due to the harsh climate and food shortages. So, survival rates and life expectancy are different among age groups. In addition, urban birds should have shorter escape-related distances in order to coexist with humans in the frequent disturbance habitats. Larger flocks have more eyes that should result in an earlier detection of approaching predators and, therefore, increasing escape-related distances. Field data on age-specific escape-related distances in Tree Sparrows Passer montanus (145 adults and 75 juveniles) were collected from Beijing in the 2018 summer. The analyses showed longer escape-related distances in adult than juvenile, and the adult, rather than juvenile, has higher probability to be the first individual to escape within the flock. The findings are consistent with the hypothesis that adults take smaller risks than juveniles. Independently, escape-related distances were significantly negatively related with the number of pedestrians, and positively correlated with flock size. Most previous studies emphasized the interspecific variation of escape-related distances, as the relationships between these distances and life-history traits, but our finding revealed that the escaped-related distances of different age groups could be substantial varied within the population.

Keywords: Bird, Age, Escape, Flight initiation distance

V. Ecology II

1. Interspecific information flow among birds, and the consequences for populations, communities, and ecosystems

Eben Goodale[1*]

1 College of Forestry, Guangxi University, 100 DaXue Rd., Building 10B, Office 109, Nanning, Guangxi 530004, China

* Correspondence: eben.goodale@outlook.com

Species diverse communities are known to be more productive, stable and resilient… but is there also a relationship between species diversity and information flow? Birds can acquire information from the presence, fitness, and communicative signals of heterospecifics. Species vary in the sensitivity, accuracy, transmissibility, abundance, and value of information they make available. Some species are particularly productive about information, and could be considered 'community informants'; for example, 'sentinel' species that make alarm calls in mixed-species flocks, or 'aggregation initiators', like seabirds or scavengers that circle above a resource discovery. High levels of species diversity are more likely to include such species. It is logical, but not yet fully tested, that multiple species increase the quantity or quality of information, because of differences between species, as well as a larger quantity of redundant information being more reliable. Two recent subjects of research have begun to explore these questions: birds solve novel feeder problems faster when in diverse groups, and vocal mimics that imitate more species are more effective in manipulating competitors and predators. Tests are needed to determine whether the number of information-producing species influences ecosystem-level processes such carcass discovery and consumption. An applied objective is to conserve species in part for their value as a source of information for other organisms, including humans.

Keywords: Avian community ecology, Communication, Ecosystem services, Information ecology, Species interactions

2. Local movement patterns of birds within a critical wintering ground of Central Asian Flyway: Mannar, Sri Lanka

Bharani Gayomini Panagoda[1,2], Taej Mundkur[3], S. Balachandran[4], Sarath Kotagama[1], Cao Lei[5], Sampath S. Seneviratne[1,2*]

1 Field Ornithology Group of Sri Lanka, Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka

2 Avian Evolution Node, Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka

3 Wetlands International, P.O. Box 471, 6700 AL Wageningen, The Netherlands

4 Bombay Natural History Society, Hornbill House, Shahid Bhagat Singh Rd, Lion Gate, Fort, Mumbai, Maharashtra 400001, India

5 State Key Laboratory of Urban and Regional Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China

* Corresponding author: sam@sci.cmb.ac.lk

Sri Lanka represents the southernmost destination of Central Asian Flyway (CAF) that spans across Eurasia. The Mannar Island of north-western Sri Lanka is considered an entry point of migrants to the country. It holds critical wintering grounds for migrants of CAF, especially the waterbirds. About 400,000 to one million waterbirds can be seen in Mannar annually. Mannar also offers breeding grounds for 08 species of seabirds, many of which are listed as critically endangered (CR) in the national redlist. Accordingly, the Mannar Island can be considered as a critical site in CAF.

Our research aims to understand the local movement patterns of birds & connectivity within Mannar & also its connectivity with the greater Palk Bay area & the rest of Sri Lanka.

Since 2018, we conducted quarterly bird banding sessions in the critical wetlands of Mannar as a part of the National Bird Ringing Program in Sri Lanka. In 2020, we initiated leg-flagging of shorebirds in Mannar, for the first time in Sri Lanka. The international flagging color code for Sri Lanka is two green flags that are attached to the right leg of the bird. A waterbird tracking program was also initiated in 2020 in Mannar, using GPS/GSM trackers. In addition to bird marking, we further conducted monthly & quarterly bird surveys in the banding sites.

So far, we have marked 480 individuals which belong to 75 species, out of which 48 individuals was either recaptured or resighted (Percentage of recovery – 10%). These subsequent recoveries have revealed site tenacity of 08 migrant species (06 shorebird

species & 02 passerine species). Under the migration tracking program, 21 individuals of 11 waterbird species were tagged. The tracking data which was collected from June 2020 to present, revealed the local movement patterns of birds within Mannar. Besides highlighting the connectivity of Mannar's wetlands, the tagged birds visited Iranativu Island (40 km from Mannar), wetlands in Chavakachcheri & Kytes of Jaffna peninsula (80 km) of northern Sri Lanka & Kalametiya Sanctuary (340 km) of southern Sri Lanka.

The wetlands of Mannar are becoming increasingly threatened as a result of both planned & unplanned development. Drastic destruction of habitats, encroachment & widespread disturbances can be seen in this critical site. Sri Lanka's largest wind power plant was also opened in Mannar in 2020, the effects of which on migratory birds are yet to be understood. The data generated from our marked birds would help to assess the true impact of the aforementioned threats & thereby to guide the policy makers & prioritize the much-needed conservation action to protect this critical site of CAF.

Keywords: Connectivity, wetlands, Mannar, Central Asian Flyway

3. Testing the Interspecific Function of Female Common Cuckoo "Bubbling" Call

Wang Yanyi, Xia Canwei*

Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing 100875, China

* Corresponding author: xiacanwei@bnu.edu.cn

The arms race between Common Cuckoo (*Cuculus canorous*) and its hosts is a classic example of coevolution. Recently, the “bubbling” call type of female Commom Cuckoo has also been considered as a parasitic strategy. Previous studies suggested that the “bubbling” calls are used for both interspecific and intraspecific functions during breeding season and have the effect in distracting host parental attention and reducing egg rejection rate. Why are the hosts fooled by this “bubbling” call? Two hypotheses were proposed. The first hypothesis emphasizes that the call variations reduce the opportunity the host species see through the trick. Field recordings from three areas were collected to test whether there are consistent differences among calls generated at different times. Multivariate analysis of variance (MANOVA) and discriminant function analysis (DFA) showed there were highly overlapped in the calls generated between different time periods. Oriental Great Reed Warblers (*Acrocephalus orientalis*), a host species, didn’t show different response towards the playback of female Common Cuckoos calls generated before noon or after noon. The second hypothesis states that the cost of anti-parasitic behavior may prevent the evolution of anti-parasitic strategies. Based on the bird count data, the playback of predator-like call is insufficient to suppress bird activities. None of hypotheses is supported by our field data. More studies should be conducted to increase the understanding about the coevolution between Common Cuckoo and its hosts in acoustic signals.

Keywords: Acoustic signals, Call variation, Common Cuckoo, Female vocalization, Playback

4. Novel Migration of Black Kite *Milvus migrans govinda* by Satellite Tracking

Chanatip Ummee[1], Sithichai Imchit[2], Prateep Duengkae[3], Chaiyan Kasorndorkbua[1*]

1 Laboratory of Raptor Research and Conservation Medicine, Faculty of Veterinary Medicine, Kasetsart University, Bangkok, Thailand

2 Pakpli Raptor Conservation Club

3 Department of Forest Biology, Faculty of Forestry, Kasetsart University, Thailand

* Corresponding author: chaiyan.k@ku.th

Black kite *Milvus migrans govinda* is currently classified as a sedentary species in Thailand. Its ecology and seasonal movement have never been studied in the country. Four Black kites, two each of juvenile and adult, were tracked with a GPS-GSM logger weighing 14 and 22 g (Druid Technology Co., LTD). Juvenile kites were tagged when they were nestling in nests, whereas the two adults were trapped using Do-Ghaza method. All tagged kites migrated from the breeding area, between September to May in central Thailand to spend monsoon months in India through Myanmar and Bangladesh. The kites show a distinct migratory pattern of east-west direction, as opposed to many North-South boreal raptorial species in the country. One juvenile, designated as R96 and tagged in April 2020 when it was a nestling, completed its loop migration between Thailand and India (black line), spent 328 days in the latter country, and then travelled back to Thailand at its natal site in April 2021 with a total distance of 16,920 km. In May 2021, R96 launched its westward journey again to NE India (red line). The other three kites, tagged between January to March 2021 showed the similar pattern of westward movement to India. Based on GPS fixes available, juvenile Black kites, hatched in Thailand, travelled longer a distance to India than adult kites (juvenile: 3,971±1,458 km; n = 3) vs adult: 2,877±349 km.; n = 2). Thus, the movement pattern of the 4 tagged kites suggest that Black kite subspecies govinda in Thailand is likely a breeding visitor, not a year round resident. This study provides first substantial evidence that Black kite subspecies govinda in Thailand is migratory. Fig. 1 Migration of Black kite *Milvus migrans govinda*: R96 (black line) 16 May 2020 – 10 Apr. 2021 = 16,920 km, (red line) 11 – 23 June 2021 = 2,565 km, R226 (yellow line) 15 May - 16 June 2021 = 3,123 km, R209 (blue line) 13 - 26 May 2021 = 2,630 km, R210 (green line) 27 Apr. - 2 June 2021 = 3,872 km.

Keywords: Black kite, *Milvus migrans govinda*, Loop migration, Satellite tracking

5.AFCoW: An Asian Flyways Collaborative for Waterbirds

John Y. Takekawa[1], Diann J. Prosser[2], Andrea Contina[3], Jeff Sullivan[2], and Xiangming Xiao[3]

1 Suisun Resource Conservation District, Suisun City, California, USA

2 U. S. Geological Survey, Laurel, Maryland, USA

3 University of Oklahoma, Norman, Oklahoma, USA

* Corresponding author: jtakekawa@suisunrcd.org

Movements of waterbird species that migrate along the Central and East Asian Australasian Flyways are some of the least studied in the world. These flyways also include two countries with the largest human populations, and rapid development and land use changes are greatly altering the habitats within the flyways. In addition, climate change effects are resulting in changing conditions affecting the wetlands that the waterbirds depend upon during their migrations. Here we introduce a new collaborative group, the Asian Flyways Collaborative for Waterbirds (AFCoW) to encourage and build research partnerships to improve knowledge and conservation of waterbirds in these flyways. Participation in the collaborative is voluntary, but we encourage members to consider sharing all types of waterbird data as well as collaborating on new analysis approaches. We encourage collaborations that use datasets including surveys, banding returns, satellite telemetry, and isotope analyses or combine them to provide insights within and among different waterbird groups. We have established an AFCoW informational website (www.afcow.org), a discussion listserve for members (afcow@simplelists.com), and a monthly webinar series beginning in October 2021. We welcome participation of the scientific and conservation community to help us to build a communication network to improve knowledge and conservation of waterbirds in the Asian Flyways.

Keywords: Waterbirds, Shorebirds, Ducks, Geese, Swans, Central Asia Flyway, East Asian Australasian Flyway, satellite telemetry

6. Immunometabolism: Under cold and low food availability, immunocompetence takes precedence over maintenance in the free-living bird, Eurasian tree sparrow, *Passer montanus*

Ibrahim M. Ahmad[1,2], Ghulam Nabi1, Yuliang Zhao[1], Lirong Zuo[1], Baohua Zhao[1], Chuan Jiang[1*], Dongming Li[1*]

1 Key Laboratory of Animal Physiology, Biochemistry and Molecular Biology of Hebei Province, College of Life Sciences, Hebei Normal University, Shijiazhuang, 050010, China

2 Department of Biological Sciences, Faculty of Science, Abubakar Tafawa Balewa University, Bauchi, Nigeria

Corresponding authors：chuanj@hebtu.edu.cn; lidongming@hebtu.edu.cn

Cold temperatures typically lower the immune responses of animals, challenging their fitness. To ameliorate this, food intake should be increased. However, cold seasons are also characterized by deficient food availability prompting a dicey trade-off between maintenance and immunity. How small, resident, and temperate birds modulate their physiology to overwinter and the corresponding molecular mechanisms are little understood. To unravel these phenomena, adult Eurasian tree sparrows (ETS; *Passer montanus*) were divided into three groups: CONTROL (sufficient food at 20 °C), COLD (sufficient food at 4 °C), and COLD+FR (food restriction at 4 °C) for 7 days. Their liver transcriptomics, liver metabolic enzymes, plasma metabolites, and immunological parameters were determined. Our results showed that the birds in COLD+FR group had lower red blood cells. The pectoralis AMPK levels remained unchanged in the COLD group but decreased in COLD+FR group. Regardless of food availability, low temperatures depreciated heterophil counts and increased liver CPT-I, HK, plasma LDH; but only did CH50 levels increased in COLD group. Conversely, liver PK and plasma TG increased in COLD group while decreased in COLD+FR group. Plasma ALT decreased in COLD group and further decreased in COLD+FR group. Both groups upregulated Glucose, VLDL and downregulated HDL and UA levels. Only COLD+FR treatment enhanced TC, FFA, monocyte counts, and H/L ratio. The KEGG pathway analysis revealed high enrichment of metabolic pathways in the COLD group, and together with the COLD+FR group, adaptive and immunological pathways. In conclusion, under cold with sufficient food, both innate and adaptive immune responses are retained aided by improved metabolism. However, under cold and energetic

challenges, metabolism (maintenance) is relegated in favor of innate, but not adaptive, immunocompetence. Eurasian tree sparrows may adapt to cold temperatures, but food shortage during winter may exacerbate immunocompromise.

Abbreviations: AMPK - AMP-activated protein kinase; CPT-I - Carnitine palmitoyltransferase I; HK – Hexokinase; PK – Pyruvate kinase; LDH – Lactose dehydrogenase; ALT – Alanine transaminase; VLDL – Very low density lipoproteins; HDL – High density lipoproteins; UA – Uric Acid; TG – Triglyceride; TC – Total Cholesterol; FFA – Free fatty acids; H/L ratio – Heterophil to lymphocytes ratio; CH50 - 50% of total haemolytic complement

Keywords： Cold stimulation, Food availability, Eurasian tree sparrow, Immunity, metabolism

7. The New Breeding Distribution of Jankowski's Bunting (*Emberiza Jankowskii*) Discovered in Mongolia

Amarkhuu Gungaa[1], Gankhuyag Purev-Ochir[1], Saraingerel Ichinkhorloo[2], Uchrakhzaya Tserenbat[1], Tsoggerel Baldandugar[1], Bulgan Odmaa[1]

1 Mongolian Bird Conservation Center, Ulaanbaatar, Mongolia

2 Saraana Conservation Fund, Ulaanbaatar, Mongolia

*Corresponding email: amarkhuu@mbcc.mn; gamarkhuu@gmail.com

The distribution of Jankowski's Bunting *Emberiza jankowskii* is restricted to China, Russia and North Korea, and it has been listed as 'Endangered' on the IUCN Red List of Threatened Species since 2010 due to its small distribution and rapid population decline (BirdLife International 2012). The population size of Jankowski's Bunting estimated between 9,800 and 12,500 individuals in China (Z.Han et al, 2017). The main threat to this species appears to be the conversion of its habitat into agricultural land, pasture and sometimes even forestry (BirdLife International 2016). The distribution range of Jankowski's Bunting has been substantially reduced from its historical breeding range and the current breeding distribution of Jankowski's Bunting is highly scattered and habitat isolation and fragmentation may drive population declines (Z.Han et al, 2017).

During the field survey of a feasibility study on World heritage nomination for Eastern Mongolian Steppes, a team of Mongolian Bird Conservation Center discovered two sites of a breeding colony of Jankowski's Bunting from southeastern Mongolia in 7 June 2020. The first site locates within the Vangiin Tsagaan Mountain in the Protected Area, where there is no human influence and no livestock grazing, and a second site found near West Matad Mountain where there both threats exist and no protection. Breeds in the slope with stipa grass and shrubs of the isolated steppe mountains that above sea level 800-1000m alt. The species believed to be vagrant in the country before. We believe that there can be more potential breeding mountains in the east, especially east of the SPA. More surveys needed to estimate the population distribution and determine the threats because there can be threats from livestock grazing in the areas where there is no protection.

8. Water level management plan based on the ecological demands of wintering waterbirds at Shengjin Lake

Yiqun Zhang[1,2], Lizhi Zhou[1,2,*], Lei Cheng[1,2], Yunwei Song[3], Xianglin Ji[1,2]

1 School of Resources and Environmental Engineering, Anhui University, Hefei 230601, China

2 Anhui Province Key Laboratory of Wetland Ecosystem Protection and Restoration, Anhui University, Hefei 230601, China

3 Management Bureau of Anhui Shengjin Lake National Nature Reserve, Chizhou 247230, China

*Corresponding author: Lizhi Zhou (zhoulz@ahu.edu.cn)

A reasonable hydrological regime is of great significance for ecosystem services and wildlife habitat management in river-connected lakes. Shengjin Lake is a Ramsar site with international importance for wintering migratory waterbirds. Since the Huangpen River sluice began operations, the lake's hydrological rhythm was changed. We investigated the effect of different hydrological conditions under water level control on the abundance of waterbird foraging guilds using habitat as an intermediary. First, linear models of 12 years dataset (2008–2019) based on waterbird surveys and satellite remote sensing images were constructed to analyse the relationship between habitat area and water level. Then, generalized linear mixed models were used to explore the effects of habitat area on abundance in different waterbird foraging guilds. Finally, the abundance of each type of waterbird guild was predicted at intervals of 0.10 m at the water level. Overall, 60% of the abundance of waterbird foraging guilds could be explained by water level with habitat as an intermediary, and this was affected by the rate of change of their preferred habitat area with water level increase. When the water level was less than 10.2 m, the meadow area was negatively correlated with the D80 water level (average water level of 71–80 days before waterbirds wintering), which was the main factor that affected tuber foragers and seed foragers/dabbling waterbirds. The abundance of food for these herbivorous waterbirds during the middle wintering was affected by the exposed tidal flat area in October, which provided suitable conditions for the secondary growth of grass. Starting from 10.20 m, waterbird abundance rapidly reduced with a sharply increasing water area, which was influenced by artificial sluice control and reduced rainfall. Therefore, management should be focused on appropriately lowering the water level in the early wintering period. Considering the suitable habitat area, hysteresis of meadow growth, and residential water demand, a water level control scheme was recommended to be 8.65–9.50 m in the early wintering

period, 8.11–8.80 m in the middle wintering period, and 8.09–9.40 m in the late wintering period. The results of this study will help to promote the reasonable water level control for the lakes as the wintering grounds of migratory waterbirds.

Keywords: Waterbird, Foraging guild, Wintering habitat, Water level control, Shengjin Lake

9. Abundance, Diversity and Daily Activity of Terrestrial Bird Species in a Limestone Habitat using Camera Trapping in Thailand

Pemika Kanka, Ronglarp Sukmasuang*
Department of Forest Biology, Faculty of Forestry, Kasetsart University, Bangkok, Thailand
Email: mronglarp@gmail.com

This study on the abundance, diversity and daily activity of terrestrial bird species was conducted in the limestone mountainous area of Central Thailand, located on the east of Dong Phaya Yen – Khao Yai forest complex. Camera traps were placed in both habitats disturbed by limestone mining and undisturbed habitat areas. From the study, a total of 23 species of birds from 14 families in 7 orders were recorded. From the wild birds recorded in this study, 22 species are listed in the least concern category and one, the rufous limestone-babbler is categorized as vulnerable. A total of 19 species of wild birds were found in the disturbed area and 11 species in the undisturbed area. It was also found that there was no difference in the overall abundance and diversity of bird species between disturbed and undisturbed areas, which is not in accordance with the hypothesis. The relative abundance of wild birds was found to differ significantly between areas. A high number was found in the areas with mining activities, although there was no difference in the diversity index of the two areas. It was found that when the combined data was analyzed, there was a significant difference in the daily activity of the wild birds in both areas.

The %RAI between the undisturbed and the disturbed area using the Mann-Whitney U test, it was found that there was a significant difference between the two areas (Z= -2.19692, P=0.0278). This means that wild birds species use the limestone areas even with mining activities, especially the ground foraging species. When considering the diversity of wild birds in the undisturbed habitat. The diversity index calculated with the Shannon-Weiner index was 1.2083, while the evenness of the species in the area following the species evenness index was 1.8851 and in the disturbed habitat the Shannon-Weiner index was 2.1412, the species evenness index was 1.8406. The key measure proposed is to preserve some natural habitats within the areas with mining activities, as wildlife remains in the area.

Keywords: karstic habitat, Species diversity, Relative abundance, active time, Camera trapping

VI. Roundtable

1. Changes in occurrence of breeding landbirds in South Korea over the past two decades

Hankyu Kim[1,2,*], Yongwon Mo[3], Changyong Choi[4], Brenda McComb[1,2], Matt Betts[1,2]

1* Department of Forest Ecosystems and Society, Oregon State University, Corvallis, Oregon, United States

2 Forest Biodiversity Research Network, Department of Forest Ecosystems and Society, Oregon State University, Corvallis, Oregon, United States

3 Department of Landscape Architecture, Yeungnam University, Gyeongsan, South Korea

4 Department of Agriculture, Forestry and Bioresources, College of Agriculture and Life Sciences, Seoul National University, Seoul, South Korea

* Corresponding Author's Current Contact and Affiliation: hankyu.kim@wisc.edu

In South Korea, land use and climate change have transformed habitat conditions for breeding birds in the past two decades. However, data and analysis on avian population trends and associated drivers are yet sparse in South Korea. Using historic and modern atlas data, we modeled changes in occupancy of 52 common breeding landbird species in South Korea between two periods (1997-2005 and 2013-2019). Thirty-eight percent (20/52) of the species showed evidence of declines, and seven of these were declining severely (46-95%). Meanwhile, ten species showed increase in occupancy between two periods. Occupancy of Black-capped Kingfisher (*Halcyon pileata*) population has dropped the most precipitously over the study period. Among declining species, long-distance migrants (9/20) and common species (14/20) showed more rapid declines than other groups. Declines of five species were associated with climate change, and two species appeared to be affected by the land-cover change. However, causes of change in occupancy of other species (46/52) remain cryptic. Based on our results, we suggest an immediate re-evaluation of species' conservation status and legal protection levels for at least seven severely declining species in South Korea and a dedicated survey design and analysis effort for the continued monitoring of landbird populations. In addition, because many species exhibiting declines migrate from beyond national boundaries, international collaborations are required to understand population trends and mechanisms across their annual cycle.

2. Decline of Eurasian Tree Sparrow in Hong Kong – a conservation insight from a Citizen Science programme

Chun-chiu Pang[1], Yat-tung Yu[1 *]

1 The Hong Kong Bird Watching Society, 7C, V Ga Building, 532 Castle Peak Road, Lai Chi Kok, Kowloon, Hong Kong

* Corresponding author: yyattung@hkbws.org.hk

Eurasian Tree Sparrow (*Passer montanus*) has a long history of living in close association with people, which demonstrates highly adaptive behaviour to inhabit in or near human settlements. In Hong Kong, despite that agriculture is no longer a major industry for more than half a century, Eurasian Tree Sparrow remains as the commonest species in the urban, built-up area within the territory. A citizen science monitoring programme was initiated since 2016 for censusing its population size across different urban habitats in Hong Kong. In this study, we analyzed data collected from 88 1-km transects, across six urban habitats from 2016 to 2021. A decline of 30.8% in sparrow population is detected since the first census. The decline is also apparent in all urban habitats. Sparrow decline had been reported in many European and Asian countries in recent decades although most studies are restricted to House Sparrow (*Passer domesticus*). Many possible reasons had been suggested to explain their decline, including intensification of agricultural practice, homogenized landscape design in built-up areas, inter-specific competition, and reduced availability of food and/or nesting spaces etc. However, it remains speculative for the case in Hong Kong due to the lack of relevant evidence.

Keywords: Eurasian Tree Sparrow, Citizen Science, Hong Kong, Population monitoring

3. Change detection of bird distributions in 20 years, from the Hong Kong Bird Atlases data

Hoi-ning Fong[1], Chun-chiu Pang[1], Yat-tung Yu[1 *]

1 The Hong Kong Bird Watching Society, 7C, V Ga Building, 532 Castle Peak Road, Lai Chi Kok, Kowloon, Hong Kong

* Corresponding author: yyattung@hkbws.org.hk

Bird Atlas is a grid-based sampling method to record occurrence and relative abundance of bird species, which is an important reference for wild bird distributions and conservation planning. Each Hong Kong Bird Atlas was conducted to collect bird data within five years, under the same set of predefined grids in Hong Kong 1980 Grid System. The atlas surveys were repeated in ten to twenty years' time to allow temporal comparisons. During the Hong Kong Breeding and Winter Bird Atlas surveys in 2016-2020, over 95% of the 1,583 1km2 sampling grids were covered by 120 citizen scientists. After consolidating the current results and results from Breeding Atlas in 1993-1996 and Winter Atlas in 2001-2005, we found that over 77% of the bird species with a shrunken distribution were bird species of open country areas. Among which, Oriental Magpie and Richard's Pipit showed a shrinkage of 60%, while Oriental Turtle Dove had an alarming shrinkage of 82%. These resident and migratory bird species favour in inhabiting open country areas, including farmland, lowland grassland, abandoned lands in countryside. Most open country habitat in Hong Kong is not designated as protected area as it is usually regarded as of low conservation value when compared with wetlands and woodlands, thus lacks adequate attention and protection. In addition, open country habitat often attracts destruction and development with its wide and flat geographical characteristics. These numbers unveiled that open country habitats were greatly damaged and shrunken in the past three decades and had become unfavourable for birds.

Keywords: bird atlas, distribution changes, citizen science, open country, Hong Kong

4. Research and conservation of raptors along East Asian Flyway: How collective efforts of citizen scientists can make a difference?

Chong Leong Puan[1,2*], Kim Chye Lim[3], Aun Tiah Lim[3], Swee Seng Khoo[3], Mark Ng[3]
1 Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
2 Institute of Tropical Forestry and Forest Products (INTROP), Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
3 Malaysian Nature Society, JKR 641, Jalan Kelantan, Bukit Persekutuan, 50480 Kuala Lumpur, Malaysia
*Corresponding author: chongleong@upm.edu.my

Various diurnal migratory raptor species make annual southbound and northbound movements along the East Asian Flyway over open habitats and across water. Depending on their magnitudes and migration routes, localised short-term and long-term efforts to record the numbers of these raptor species have been made, usually on a voluntary basis, by countries along the flyway especially at places where raptors aggregate daily in thousands during passage. These countries are members of the Asian Raptor Research and Conservation Network (ARRCN) which aims to strengthen collaboration among the countries to protect raptors through research, information sharing and capacity building. Over the past decade, increasing research through migration count and satellite tracking has helped with understanding of the migration behaviour and patterns of several raptor species. In Malaysia, two prominent count sites in Peninsular Malaysia, i.e. Tanjung Tuan and Taiping, involving spring and autumn migration counts, respectively, of three major raptor species, namely Oriental Honey-buzzard (*Pernis ptilorhynchus*), Black Baza (*Aviceda leuphotes*) and Chinese Sparrowhawk (*Accipiter soloensis*), have determined their passage dates and daily passage rates in relation to daily temperature and wind direction. In 2009 and 2010, during which nearly full-season migration counts were made, more than 50,000 raptors (of 11-13 species) were counted on average each year, although the proportions of species and their daily activity patterns captured were different between autumn and spring migration. In addition, attempts were also made to identify other count sites but their numbers were under-represented as compared to the two main count sites. Manpower and financial constraints are main challenges to sustain long-term monitoring, especially for full-season counts. Assessment of the imminent effects of anthropogenic activities, landscape change and climate change on these migratory raptors with respect to conditions and resources at overwintering and stopover sites, coupled with citizen science, as well as more effective collaboration among countries along the flyway are crucial for the protection of these raptors.

Keywords: Migration count, passage rate, Oriental Honey-buzzard, citizen science, overwintering site

5. Change detection of bird distributions in 20 years, from the Hong Kong Bird Atlases data

Hoi-ning Fong[1], Chun-chiu Pang[1], Yat-tung Yu[1*]

1 The Hong Kong Bird Watching Society, 7C, V Ga Building, 532 Castle Peak Road, Lai Chi Kok, Kowloon, Hong Kong

* Corresponding author: yyattung@hkbws.org.hk

Bird Atlas is a grid-based sampling method to record occurrence and relative abundance of bird species, which is an important reference for wild bird distributions and conservation planning. Each Hong Kong Bird Atlas was conducted to collect bird data within five years, under the same set of predefined grids in Hong Kong 1980 Grid System. The atlas surveys were repeated in ten to twenty years' time to allow temporal comparisons. During the Hong Kong Breeding and Winter Bird Atlas surveys in 2016-2020, over 95% of the 1,583 1km2 sampling grids were covered by 120 citizen scientists. After consolidating the current results and results from Breeding Atlas in 1993-1996 and Winter Atlas in 2001-2005, we found that over 77% of the bird species with a shrunken distribution were bird species of open country areas. Among which, Oriental Magpie and Richard's Pipit showed a shrinkage of 60%, while Oriental Turtle Dove had an alarming shrinkage of 82%. These resident and migratory bird species favour in inhabiting open country areas, including farmland, lowland grassland, abandoned lands in countryside. Most open country habitat in Hong Kong is not designated as protected area as it is usually regarded as of low conservation value when compared with wetlands and woodlands, thus lacks adequate attention and protection. In addition, open country habitat often attracts destruction and development with its wide and flat geographical characteristics. These numbers unveiled that open country habitats were greatly damaged and shrunken in the past three decades and had become unfavourable for birds.

Keywords: bird atlas, distribution changes, citizen science, open country, Hong Kong

6. Monitoring Sundaic-wintering East Asian migrant landbirds on Ko Man Nai (Man Nai Island), South-East Thailand

Philip D. Round[1*], Andrew J. Pierce[2], Kaset Sutasha[3], Suthep Jualaong[4]

1 Mahidol University, Faculty of Science, Department of Biology, Rama 6 Road, Bangkok 10400, Thailand (corresponding author)

2 King Mongkut's University of Technology, Conservation Ecology Program, Thonburi, Bangkok 10150, Thailand

3 Bird Conservation Society of Thailand, Nakornsawan Road, 77 Entrance, Wat Sommanat, Pom Prap Sattru Phai, Bangkok 10100, Thailand

4 Eastern Gulf Coast Marine Resources and Research Center, Department of Marine and Coastal Resources, Pak Nam Prasae, Klaeng, Rayong, 21170, Thailand.

Thailand's diverse ecosystems form key stopover and winter habitat for more than 200 migratory landbird species in Southeast Asia. In recent years, ground-based surveys and ringing work has revealed the importance of small islands in the Gulf of Thailand as stopover and refueling sites for migratory landbirds, the best-known being Ko Man Nai. During eight of the last 10 spring seasons (2012–2021), over 6,000 landbirds have been ringed on passage migration on Ko Man Nai, of which 81 species (>93% of individuals) were Sundaic-wintering migrants. The most numerous species ringed were Larvivora cyane (1,125), Ficedula zanthopygia (438), Dicrurus annectens (434), Turdus obscurus (382), Muscicapa dauurica (288) and Lanius tigrinus (277). Totals of annually recorded, globally Threatened/ Near threatened species were Pitta nympha (24), Terpsiphone atrocaudata (249) and Cyornis brunneatus (19). The longest unbroken period of coverage, 73 days in 2021, yielded a total of just 1333 migrant landbirds ringed, and was exceeded in 2016 in less than half that duration (1,379 birds in 35 days) with otherwise similar catching effort. Inclement weather may have played a part in the unexpectedly low 2021 total but marked disparities among individual species also suggests a likely trend of decline in some, caused by either habitat loss or other extrinsic factors. Ko Man Nai has important long-term potential as a migration monitoring station. Recommendations are made for future sustained monitoring coverage in collaboration with government agencies and the Thai BirdLife partner.

7. Contrasting migration strategies of landbird species from Sakhalin Island to Australasia: Pacific Swift vs Oriental Cuckoo

P. Ktitorov, O. Kulikova, V. Bulyuk, W. Heim, L. Gibson

Just three landbird species in the East Asian-Australasian Flyway regularly winter in Australia: Pacific Swift (*Apus pacificus*), White-throated Needletail (*Hirundapus caudacutus*) and Oriental Cuckoo (*Cucuclus optatus*). Using light-level geolocators, we tracked the almost 10,000 km long journey of three individual Pacific Swifts between Sakhalin Island (Russia) and Australia. Migrating individuals avoided prolonged sea crossings; both during the southward and northward migrations they performed detours, moving from Sakhalin to the nearest Asian continent, reaching northern Australia via Indochina and the Indonesian archipelago. Noteworthy, White-throated Needletails tracked from Hokkaido, Japan, showed very similar migration patterns. However, Oriental Cuckoos tagged by ICARUS transmitters showed totally different migratory behavior. Five individuals moved south from Sakhalin, crossed Hokkaido and performed prolonged stopovers in central Honshu (tree to four weeks). After that, three individuals went for a direct crossing of the Pacific Ocean. All three birds flew non-stop for 5 days and more than 4000 km. One individual was blown to the west by a typhoon, and landed at the Lan Island, near Taiwan. Another individual almost reached the wintering grounds, but landed in Helena Island, Palau. The third individual successfully reached Papua New Guinea. We are still receiving new positions. The migration of the Oriental Cuckoo is extreme and probably a unique example of direct ocean crossing by a landbird. Our results illustrate the risks for migrants using these strategies and might explain why even perfect flyers like swifts perform prolonged detours around the sea, avoiding direct non-stop flights.

8. International Action Plan for conservation of the Yellow-breasted Bunting *Emberiza aureola*

Simba Chan (Wild Bird Society of Japan, Japan Bird Research Association)
Evgeny Syroechkovskiy (Birds Russia)
Nyambayar Batbayar (Wildlife Science and Conservation Center of Mongolia)
Hayama Seiji (Wild Bird Society of Japan)
Vivian Wing-kan Fu (Hong Kong Bird Watching Society)
Yu Yat Tung (Hong Kong Bird Watching Society)
Johannes Kamp (University of Muenster)
Bou Vorsak (BirdLife International Cambodia Programme)
Thiri Da Wei Aung (Biodiversity and Nature Conservation Association, Myanmar)
Raju Kasambe (Bombay Natural History Society)

Yellow-breasted Bunting *Emberiza aureola* was regarded as one of the most abundant passerine species until the 1980s, when it started to decline drastically. The most likely cause of its decline is massive hunting. It is believed other species of migratory passerines in Asia are also suffering big decline and not universally noticed as not all countries in Asia have monitoring scheme of passerines. In November 2016, 56 researchers and conservationists held the first international workshop at Sun Yat-sen University, Guangzhou, China to discuss actions needed to be taken. Since 2016 several national workshops and meetings on Yellow-breasted Bunting were held in Russia, China, Japan, Myanmar, Cambodia and Thailand. Action recommended will be compiled into an international action plan to be published in 2022. Action proposed including genetic analysis of different populations, migration studies, survey for important sites, monitoring of populations and development of an international network of research and conservation. International cooperation field researches have been started in Russia, Mongolia, Hong Kong, Myanmar, Nepal, Japan and Germany since 2016. Actions proposed will also be beneficial to other declining bunting species such as Rustic Bunting *Emberiza rustica* and Chestnut Bunting *Emberiza rutila.*

9. The critically endangered Yellow-breasted Bunting in Myanmar

Thiri Dae We Aung

Biodiversity And Nature Conservation Association (BANCA), Myanmar

In Myanmar, Yellow-breasted Bunting, migratory land bird was common recorded in Indawgyi Lake and Tanai, northern part of Myanmar, Inle Lake and Kalaw, eastern part of Myanmar, Bagan in central Myanmar, Natmataung in western part of Myanmar and Tante, southern part of Myanmar in 2003- 2009. According to the recorded, the population ranges were decreasing on the individual of (343) in 2003 to (58) in 2009. Two more study sties, Pantanaw and Warkhema townships, Ayeyarwaddy Region is new recorded sites for the Yellow-breasted Bunting in 2017-2019 and still holding a good population in Myanmar. The habitat in Myanmar during wintering season is tall grasses near water. Due to the habitat loss in 2020-2021, Yellow-breasted Bunting was not recorded in Pantanaw township. In Myanmar, the population have declined due to by hunting with the traditionally trap for selling and consumption as food and releasing the trapping birds for traditional merit. The decline of this small migratory birds is obvious in Myanmar but there are no much data and not sure of the causes. Therefore, BANCA organized the National conservation meeting of Yellow-breasted Bunting, conservation awareness talks Yangon University and it was initiated to form University of Yangon Bird Watching Club in Myanmar to enhance collaboration and networking for monitoring and conservation among concerned stakeholders in Myanmar. Education awareness short talks, producing and distribution the materials of Information, Education and Communication (IEC) to students, villagers and the participants who were joining in awareness discussion. Concurrently, we are seeking way to improve the management of habitat in wintering season in Myanmar.

Keywords: Yellow-breasted Bunting; migratory land bird, tall grasses, University of Yangon Bird Watching Club, education awareness, management of habitat

10.Bird Monitoring Schemes in Japan

Mutsuyuki Ueta (Japan Bird Research Association)

Breeding Bird Atlas

The third survey of the Japan Breeding Bird Atlas program was conducted from 2016 to 2021. 2,344 sites across Japan were surveyed with the support of 2,090 survey participants. In addition, 242,871 questionnaires were received from all over Japan. As a result, 278 species with breeding records (or possible breeding records) in Japan, including past records, were mapped and compiled.

Based on the results of 1,947 comparable field survey sites, we summarized the results of the second (1990s) and the third (2010s) surveys in terms of changes in the number of recorded sites and the total abundance of individual birds. Many forest bird species including Grey Bunting increased, however, many open habitat bird species including Yellow-breasted Bunting decreased.

Phenology Watch

The monitoring of bird phenology in Japan started with the cooperation of citizens in 2005. Records of the arrival and first singing dates of summer visitors were collected over the Internet. The species were selected with the identification ease for beginners to in mind. We are planning to expand the area of this survey to Asia, and have started a trial in the spring of 2021. We would like to proceed to the main survey while considering the target species in the future, and would like those who are interested to participate.

11. Wintering Status of Critically Endangered Yellow-breasted Bunting in Nepal

Krishna Prasad Bhusal[1*], Mitra Pandey[1] and Simba Chan[2]

1 Bird Conservation Nepal, Lazimpat, Kathmandu, Nepal *

2 Japan Bird Research Association / Wild Bird Society of Japan, Japan

* Corresponding author: krishna.biologist@gmail.com

The Yellow-breasted Bunting *Emberiza aureola* is a passerine bird in the bunting family. One of the most abundant songbirds of the Eurasia's has declined by more than 90%. Within just 14 years, Yellow-breasted Bunting was re-classified from Least Concern to Critically Endangered, mainly due to habitat loss, use of agrochemicals and excessive trapping at its migration and wintering sites. Yellow-breasted Bunting is a passage migrant and winter visitor for Nepal. Although, this is critically endangered and a flagship species that represents some terrestrial migratory birds in Asia; not monitored properly before. We identified the six major wintering sites of Yellow-breasted Bunting in Nepal based on the previous record, birdwatchers experience and preliminary field visit. We monitored its wintering population in those sites from 2019 to 2021. During the study period we identified more than 15 locations of Yellow-breasted Bunting within these major six sites in Nepal. We counted them mainly in the roosting sites and found that n=535 in 2019, n=696 in 2020 and n=873 in 2021. The species winters in cultivated areas, rice fields and grasslands, preferring scrubby dry-water rice fields for foraging and reed beds for roosting in Nepal. The habitat loss and trapping are major threats on its wintering ground in Nepal. We conducted the community awareness and stakeholder interaction in and around those wintering sites. This preliminary monitoring result is very optimistic and demanding for the long-term monitoring and conservation campaign. Nepal and northern India should be the migration endpoint of the Yellow-breasted bunting that arrives all the way from China. Thus, it is seeking for the local to international collaboration to save from the brink of extinction.

Keywords: Conservation, migration, Nepal, trapping, wintering, yellow-breasted bunting

12. Breeding Status of Yellow Breasted Bunting in Sarobetsu, Hokkaido Japan

M. Hasebe （Sarobetsu Eco Network）

Yellow Breasted Bunting widespreadly bred in grassland of Hokkaido Japan until 1980s. However, its distribution gradually decreased in unknown factors since 1990s. In 2015 the confirmed breeding population remained only in Sarobetsu Wetland, northern Hokkaido. Only 14-31 breeding pairs left at intermediate moor of the wetland in 2017-2021. In Sarobetsu wetland, distribution of Yellow Breasted Bunting decreased in last 30 years and it is concerned that the domestic breeding population gets extinct in the near future.

13. Migration Dynamics of the Rustic Bunting Based on the Banding Monitoring in the Northeast China

Li Xianda[1,2,3], Sui Xin[4], Bo Petersson[5], Wu Wei[6], Dong Chuanlong[7], Xie Xichun[8], Wang Xiaoping[9], Zhang Hailong[10], Fu Yuxia[11], Tang jingwen[12], Zhangshouling[3], Gu yanchang[13], Hou Linxiang[14], Li Xiang[2], Guo Yumin[1]

1 School of Ecology and Nature Conservation, Beijing Forestry University，Beijing 100083

2 Heilongjiang Zhongyangzhan Black-Billed Capercaillie National Nature Reserve Administration，Nenjiang 161499

3 Heilongjiang Gaofeng Bird Ring Station，Nenjiang 161407

4 College of life sciences, Heilongjiang University,Haerbin 150080

5 Swedish Museum of natural history

6 Maoershan Bird Ring Station, Northeast Forestry University，Shangzhi 150600

7 Heilongjiang Qingfeng Bird Ring Station，Suihua 151801

8 Neimenggu Wuerqihan Bird Ring Station，Yakeshi 022159

9 Liaoning Laotieshan National Nature Reserve，Dalian 116000

10 Liaoning bird Research Center，Dalian 116013

11 Jilin Hunchun Bird Ring Station，Hunchun 133300

12 Jilin Bird Ring Station，Jilin 132000

13 Heilongjiang Dazhanhe Wetland National Nature Reserve,Wudalianchi 164133

14 Heilongjiang Xinqing Bird Ring Station，Yichun 153036

Populations of long-distance migratory passerines have been declining continuously, and such decline has been especially striking in Rustic Bunting *Emberiza rustica*. Through a long-term monitoring and migration dynamics analysis on Rustic Bunting, this study aims to provide scientific basis for more effective conservation actions. We collected and analyzed the data on Rustic Buntings between 2001 and 2018 from 10 banding stations in Northeast China. During the 18-year period, a total of 184 181 Rustic Buntings were banded, including 88 571 in spring and 95 610 in autumn. The annual banding number fluctuated greatly, and showed a rapid downward trend. The overwintering mortality rate of juvenile birds was 41.3% higher than that of the adults. The data on the 106 recovered Rustic Buntings indicated that under natural conditions, Rustic Buntings enjoy a life span of up to 11 years, and can travel as far as 300 kilometers a day. Northeast China is an important migration channel for Rustic Buntings, with a relatively stable migration route. It is where Rustic Buntings would fly through on their way to the south of Tianjin for overwintering after breeding in northern Sweden. The results showed that the Rustic Bunting population decreased

rapidly in recent years, as the banding number decreased by more than 95% compared with the peak year, which deserves our greater attention. Habitat fragmentation and illegal hunting are two major threats to Rustic Buntings. It is suggested that efforts should be made to strengthen habitat protection, keep long-term ringing monitoring, and explore migration patterns of Rustic Bunting, so as to facilitate its population recovery.

Keywords: Rustic Bunting, population, banding, monitoring, migration, recovery

14. Abstract of YBB in BPL, Cambodia

Ly Samphors

NatureLife Cambodia (samphors.ly@birdlifecambodia.org)

The Yellow-breasted Bunting *Emberiza aureola* is a globally threatened migratory passerine that winters widely across southern China, continental Southeast Asia west to north-eastern India. In Cambodia, YBB has been recorded with small and big flock of bird from December to April. Our study was counted the population of YBB in Boeung Preak Lapouv, Cambodia, a wetland located in the Lower Mekong floodplains in southeast Cambodia. We gathered at pre-determined roost sites and counted the birds as they returned to roost. The highest population recorded is 2,870 individuals in March 2021. This is show that Boeung Prek Lapouv is an important wintering site for YBB and probably a stop along the fly way of the bird during their migration. BPL could potentially hold the largest known congregations of the species in Cambodia, and possibly Indochina. Our study is baseline research of this species in BPL, the further research should be conducted the whole landscape of protected area.

VII. Poster

1. Examination of survey items and methods for regional comparison of Little Terns breeding in Asia.

Masaharu Hayakawa[1 2 *], Takashi Fuji[1 3], Satomi Mathunaga[1 3]

1 Little Tern Research Center, 3-54-5 Wada Suginami-ku Tokyo, Japan

2 Uekusa Gakuen University, 1639-3 Ogura-cho Wakaba-ku Chiba-shi Chiba, Japan

3 Japanese Society for Preservation of Birds, 3-54-5 Wada Suginami-ku Tokyo, Japan

*Corresponding author: m-hayakawa@uekusa.ac.jp

According to the IOC World Bird List (v. 11.2), little terns (*Sternula albifrons*) are classified into three subspecies, and one subspecies inhabiting the Pacific Ocean is "S. a. sinensis". The other hand, HBW and Bird Life International classifies groups that breed in eastern Australia into "S. a. pusilla" and groups that breed in countries near the equator into "S. a. placens". However, since the basis of classification is not clear, it is necessary to make a multifaceted comparison of genetic diversity, migration pathways, and morphological characteristics. This is considered to be an important point of view for clarifying the groups to be prioritized and protected.

However, from the viewpoint of preventing the spread of coronavirus infection and complying with the Nagoya Protocol, it is not possible to go to each country to investigate. Therefore, I would like to use a common format for comparing the results of surveys in each region. We are preparing to publish a protocol for elucidating the genetic information of the regulatory region of mitochondrial DNA.

We would like to share this and clarify the genetic composition of this species by comparing the haplotypes of little terns breeding on the East Asian-Australtic region flyways on the same basis. In addition, we would like to share information on morphological features and how to investigate migration using GPS and geolocators.

Keywords: little tern, population, genetic diversity, migration pathways, morphological characteristics

2. Birds and forest, and conservation status in 2021, on Amami-oshima, a south-western island in Japan

Ken Ishida (PhD)

Free Scientist, (University of Tokyo, former Prof.), Yokoze 6632-12, Saitama, 368-0072, Japan

Amami-oshima is the northern most island of "Nansei-shoto", South-eastern Islands" of Japan. As the geological history of this archipelago with acient connection to Eurasian Continent from the south, and it has long been isolated, we have many of endemic (mostly relic for birds) species here. I have been continuing my field work and conservation activities by myself and also with local citizen since 1988, and the forest environment was very much disturbed at that time, after an intensive forest development during a couple of decades for the local economy, increase of human population, and / or a little recognition on the significance of nature here by the local and Japanese societies. I roughly estimated only less than 5% of the natural forest was reserved then. An invasive Small Indian Mongoose, *Helpestes auropuctatus*, had been expanding its population during this period. The population size of Amami Thrush (*Zoothera major*) was especially small as an endemic bird, unique only on the single Amami-oshima Island, which we estimated not much more than a hundred singing individuals (maybe males), for example. All these problems have been gradually solved in 2000's fortunately. Most clear-cut forest area has regenerated in a warm and humid island environment, or mongoose eradication project by the Ministry of the Environment Japan has almost achieved now. Amami-gunto" national park was established by Japanese government in 2017 also on this island. Natural districts on four island of Nansei-shoto including Amami-oshima is added into UNESCO's World Natural Heritage in 2021. I shall introduce a part of endemic birds, such as Amami Thrush, population trend, biodiversity, and forest environment history since 20th centuries. I shall also mention several of environmental or conservation problems to be solved.

Keywords: Amami-oshima, endemic population, national park, world helitage, Garrulus lidthi

3. Mitochondrial DNA suggests phylogenetic relationships and evolutionary history of Korean bush warbler (*Horornis canturians borealis*) and Japanese bush warbler (*H. diphone cantans*)

Hyun-Ah Leep[1], Jong-Gil Park[2] , Dong-Ha Nam[3,4*]

1 Department of Biological Sciences and Biotechnology, Chonnam National University, Gwangju 61186, Korea

2 Visitor Interpretation Division, Korea National Park Service, Wonju, 26466

3 Department of Biological Sciences and Research Center of Ecomimetics, College of Natural Sciences, Chonnam National University, Gwangju 61186, Korea

4 AgriBio Institute of Climate Change Management, Chonnam National University, Gwangju 61186, Korea

* Corresponding author: dongha@jnu.ac.kr

Here, we report mtDNA Cytochrome b gene (1143bp) to suggest evidences of speciation between Korean bush warbler (*Horornis canturians borealis*) and Japanese bush warbler (*H. diphone cantans*). We obtained 42 Korean bush warblers and 26 Japanese bush warblers in Korea and compared to the sequences accessible in GenBank of Cettia taxa (unsettled taxonomy, currently listed as Horornis from the International Ornithological Congress). We calculated haplotype and nucleotide diversities to compare levels of genetic variation among localities from the two species. Although the Korean and Japanese bush warblers have been considered as a subspecies of Cettia diphone (borealis and cantans, respectively), it requires to estimate their taxonomic position based on morphological characteristics and phylogenetic relationships.

Keywords: Cettiidae, bush warbler, phylogenetic relationships, mitochondrial DNA, cytochrome b gene.

4. Molecular phylogenetic classification of the Morphologically Indistinguishable *Phylloscopus tenellipes* and *P. borealoides*.

Si-Yoon Jeong[1], Jong-Gil Park[4], Dong-Ha Nam[2,3*]

1 Department of Biological Sciences and Biotechnology, Chonnam National University, Gwangju 61186, Republic of Korea

2 Department of Biology, Chonnam National University, Gwangju 61186, Republic of Korea

3 Research Center of Ecomimetics, Chonnam National University, Gwangju 61186, Republic of Korea

4Visitor Service Division, Korea National Park Service, Wonju 26466, Republic of Korea

* Corresponding author: tldbs02@naver.com

The *Phylloscopus tenellipes* has been reported as a summer visitor and/or a passage migrant in Korea, while it is difficult to grasp the actual arrival status of *P. borealoides* due to their morphological similarity. This study was aimed at distinguishing these two species using molecular systematic approaches and identifying phylogenetic analysis using COX1 and ND2 in mtDNA, the two *Phylloscopus* species were classified into two prominent clades, showing that their genetic distances were 0.0391 in COX1 and 0.0238 in ND2. Arrival patterns after being identified from their molecular phylogenetics indicated that *P. tenellipes* arrived from mid-April to mid-September, but *P. tenellipes* from late April to mid-May in Heuksan Island. There results may provide basic data for the classification of the two morphologically distinguishable *Phylloscopus* species and the actual conditions of their arrival in Korea.

Keywords: *Phylloscopus tenellipes*, *Phylloscopus borealoides*, classification, mt DNA, COX1, ND2

5. Breeding Success of the Red-Crowned Crane (*Grus japonensis*) in the South Kurile Islands

Alexander Kisleiko[1,3], Eugeny Kozlovsky[1,3], Elena Linnik[1], Valentin Ilyashenko[2,3], Kunikazu Momose[4,5], Yulia Momose[4,5], Elena Ilyashenko[2,3,5]

1 State Nature Reserve of "Kurilsky", Yuzhno-Kurilsk, Kunashir, Sakhalin Region, Russia

2 Institute of Ecology and Evolution A.N. Severtsov Russian Academy of Sciences, 33, Leninsky Prospect, Moscow, 119072 Russia

3 Crane Working Group on Eurasia

4 Red-crowned Crane Conservancy, Kushiro, Hokkaido, Japan

5 International Red-crowned Crane Network

*Corresponding author: eilyashenko@savingcranes.org

With the increasing number of the island's sedentary population of the Red-crowned Crane in Hokkaido, there is also growth of its numbers in the South Kurile Islands (Chishima-retto). The number of pairs increased from 6–7 in the 1980s to 14–15 in 2019-2020. Breeding of four out of eight pairs on Kunashir Island has been known since the 1980s: three pairs breed regularly, and one pair has never been seen with chicks. Four new pairs occupied the territory three to five years ago, but no chicks have been recorded. In 2019 and 2020, one pair was sighted on Shikotan Island, one pair in Iturup Island, and one pair in Urup Island, but their breeding was not confirmed. On the Lesser Kuril Islands (Habomai-shoto), the regular breeding of three pairs was observed on Tanfiliev (Suisho-to), Yuri (Yuri-to) and Zeleny (Shibotsu-to). Successful breeding of one more pair on the Polonsky Island (Taraku-to) was first recorded in 2019.

Thanks to regular monitoring by the staff of the State Nature Reserve of "Kurilsky", as well as tagging of a female in 2017 with a satellite transmitter, the breeding success of three regularly nesting pairs on Kunashir Island from 2016 to 2020 was determined. For the pair with a tagged female, it is known that its clutch was destroyed during a storm in 2016. In 2018–2020 four chicks hatched (one each in 2018 and 2020 and two in 2019), but only one chick survived and was sighted with parents in winter 2018/2019 in Hokkaido. During this period, the second pair hatched one chick each in 2018 and 2020. They fledged and were observed with parents on Kunashir Island until late autumn. The third pair had five chicks (two in 2019, and one each in 2017, 2018 and 2020), of which three fledged and reliably survived until late autumn. In summary for Kunashir Island, three out of 7–8 pairs breed regularly, six out of 11 hatched chicks fledged from 2016 to 2020. It is difficult to determine the breeding success of Red-crowned Crane pairs on the Lesser Kuril Islands.

The main threats on Kunashir Island which affect Red-crowned Crane breeding success are the predation of foxes, White-tailed eagles, Black and Large-billed Crows, stray dogs as well disturbance by people. Occasionally, clutches and chicks of pairs, which breed in interfluves, can be destroyed during storms.

Keywords: Red-crowned Crane, South Kurile Islands, number, breeding success

6. Features of the Demoiselle Crane Migration in Asia

Elena Ilyashenko[1], Elena Mudrik[2], Oleg Goroshko[3,4], Andrei Gavrilov[5], Dmitry Politov[2], Kirill Postelnykh[6], Martin Wikelski[7], Cao Lei[8], Valentin Ilyashenko[1]

1 Severtsov's Institute of Ecology and Evolution Russian Academy of Science, Moscow 119072 Russia

2 Vavilov Institute of General Genetics Russian Academy of Science, Moscow 119091 Russia

3 Daursky State Nature Biosphere Reserve, Nizhny Tsasuchei, Trans-Baikal, 674495 Russia

4. Institute of Natural Resources, Ecology and Cryology SB RAS, Chita, Trans-Baikal Territory 672014 Russia

5 Institute of Zoology MSK, Almaty 050040, Kazakhstan

6 Oka State Nature Biosphere Reserve, Ryazan Region 391071 Russia

7 Max Plank Institute of Animal Behavior, Radolfzell 04103 Germany

8 Research Center for Eco-Environmental Sciences Chinese Academy of Sciences, University of Chinese Academy of Sciences, Beijing 38400 China

*Corresponding author: eilyashenko@savingcranes.org

Migration of 29 Demoiselle Cranes in Asia was tracked from 2017 to 2020 using GPS-GSM transmitters: 8 from Kazakhstan (7 from Eastern Kazakhstan and 1 from Tian-Shan Mountain) and 21 from Russia (6 from Trans-Ural, 2 from Altai, 3 from Khakasia, and 10 from Trans-Baikal). In the fall, cranes used the six main flyways to Northwest India coming there from the north, northeast and east. In the spring, they flew firstly with a narrow front until the western tip of the Tien Shan Mountains. According to estimations near 110,000–160,000 cross this part during spring migration. Then they flew out West Tian-Shan foothills in a fan north, northeast and east directions. Thus, Demoiselle cranes from the Asian part of the range, excluding Trans-Urals and probably North Kazakhstan, made a circular migration. Difference of their fall and spring flyway distance varied from 600 to 700 km for breeding groups from Altai and Eastern Kazakhstan, from 1300 to 1500 km – Khakasia and Tian Shan, and up to 2400 km – Trans-Baikal. Key staging areas and stopovers in spring and autumn in Mongolia include the Khovd River Basin and Khar-Us Lake and the Great Lake Hollow, in China – the Emel River Valley and Barkol Lake in Xinjiang, and in Xilin Gol and Khulun-Buir in Inner Mongolia.

Most cranes arrived in Northwest India firstly in Rajasthan and then moved to Gujarat, but some of them spent the whole winter in Rajasthan. Only once one individual spent a part of the winter in Karnataka.

The migration period consists of two stages – trophic, when cranes accumulate energy resources, and transit, when they make a long active flight without replenishing

energy reserves. Autumn migration takes place in a short time. With total migration route lengths from 2170 to 5600 km, the distance of the transit flights varied from 1900 to 4600 km, and their durations are from seven to 13 days. Obviously, this is the period that cranes is able to overcome without essential replenishment of energy costs, due to the resources accumulated before the start of the transit flight. The spring migration of adults is more extended with shorter daily flights and longer rest at transit stops, which is, probably, necessary to save energy resources before the breeding period. Some young cranes return to their places of birth with their parents in the spring, while others make a transit flight to the first places of long stopover located in the Tian Shan Foothills in Uzbekistan and Kazakhstan. Some of them spend the whole summer in these territories, while others gradually move to their places of birth, arriving 1–1.5 months later than adults do. Young birds from Trans-Baikal and, probably, from Altai and Khakasia make two transit flights with a long rest approximately in the middle of the flyway. Some young birds reached their birthplaces not every year for the period of three years before breeding start.

Keywords: Demoiselle Crane, migration, satellite tracking

7. Sparrows use a medicinal herb to defend against parasites and increase offspring condition

Canchao Yang[1], Ping Ye[1], Juan Huo[1], Anders P. Møller[2], Wei Liang[1], William E. Feeney[3,4,5]

1 Ministry of Education Key Laboratory for Ecology of Tropical Islands, College of Life Sciences, Hainan Normal University, Haikou 571158, China

2 Eologie Systématique Evolution, Université Paris-Sud, CNRS, AgroParisTech, Université Paris-Saclay, F-91405 Orsay Cedex, France

3 Environmental Futures Research Institute, Griffith University, Nathan, QLD 4111, Australia

4 Department of Behavioural Ecology and Evolutionary Genetics, Max Planck Institute for Ornithology, Seewiesen, Germany

5 Department of Zoology, University of Cambridge, Cambridge CB23EJ, UK

The incorporation of aromatic plants into nests by birds is suspected to constitute an example of preventative medicine use, whereby the phytochemical compounds within plants reduce infestation by parasites and increase offspring condition. In China, russet sparrows (*Passer cinnamomeus*) incorporate wormwood (*Artemisia verlotorum*) leaves into their nests around the same time that local people hang wormwood from their doors as a traditional custom during the Dragon Boat Festival. The belief that this behaviour confers protection against ill health is supported by the description of anti-parasite compounds in wormwood. It has been suggested that the incorporation of fresh wormwood leaves into nests may serve a similar function for sparrows. Here we show that sparrows choose nest location and resupply established nests with fresh wormwood leaves using olfactory cues, that nests containing wormwood leaves have lower ectoparasite loads, and that nests with more wormwood leaves produce heavier chicks. Our results indicate that sparrows use wormwood as a preventative medicine to control ectoparasites and improve the body mass of their offspring.

Keywords: *Artemisia verlotorum*, olfactory cues, parasites, *Passer cinnamomeus*

8. Nest site selection patterns, habitat characteristics, and spatio –temporal dynamics of the endangered Oriental Storks (*Ciconia boyciana*) in China

Lei Cheng [1, 2, 3], Lizhi Zhou [1, 2, 3*], Chao Yu [4], Zhenhua Wei [1, 2, 3], Chunhua Li [1, 2, 3]

1 School of Resources and Environmental Engineering, Anhui University, Hefei, 230601, P. R. China

2 Anhui Province Key Laboratory of Wetland Ecosystem Protection and Restoration (Anhui University), Hefei, 230601, P. R. China

3 Anhui Biodiversity Information Center, Anhui University, Hefei, 230601, P. R. China

4 College of Life and Environment Science, Huangshan University, Huangshan, 245021, P.R. China

*****Corresponding author: Lizhi Zhou (zhoulz@ahu.edu.cn)

Over the few past decades, many bird species have expanded their nesting habitats, owing to traditional nest habitat loss and degradation. By strengthening protections, the population of some species has been increased, and their nesting sites have been continuously expanded based on traditional breeding areas. Understanding how the nest site selection of individuals will be affected by habitat characteristics and how to adapt to environmental change are central for species recovery, habitat management decisions, and predicting, especially for endangered birds. In this study, we used geographic variables and multi-scale data with a field survey of nests occurrence to perform an analysis of the selection patterns of nest sites in different nesting areas, and then predict potential suitability nesting areas and the distribution ranges change process in the future of the breeding Oriental Storks (*Ciconia boyciana*). Our results indicated that the food resources of wetland and the intensity of human disturbance had the greatest impact on nest site and height selection of the breeding Oriental Storks, however, the microhabitat characteristics did not affect. Storks adopted flexible nesting strategies in response to the higher level of human associated disturbances in new areas, as it could ensure their survival safety and improved breeding success rate. Meanwhile, the nest height was also influenced by the height of the nest support structure, when the height of the nest support structure fails to counteract the human disturbance, storks will nesting in other areas. The Maxent model results showed that the breeding Oriental Storks prefer low altitude, near river, and flat regions as their nesting grounds. In addition to, temperature factors (solar radiation, monthly maximum temperature, isothermality), precipitation factors (seasonality and driest month), and wind speed and

were factors of lesser importance. Finally, the predictions showed that the Sanjiang Plain, western part of Northeast, Bohai Bay coast, and the middle-lower Yangtze River floodplain in China were suitable nesting areas for breeding storks. Meanwhile, even though we predicted that the overall nesting geographical range of the Oriental Storks will expand under all emission scenarios in the future, the gain rate of suitable habitat will still decline, and the loss rate increase as well. The suitable nesting habitat areas also show discrepant variation trends in different regionals, the loss rate of suitable areas in the South both decrease under two emission scenarios in the future, while the net gain suitable habitat areas were relatively stable and showed an increasing trend. According to our results, we suggest that actively identify the conservation gap area and control the loss rate of suitability habitat. Potentially suitable habitats should be considered and planned in the selection of protected areas. Furthermore, maintaining food resources at high densities by increasing the percentage of wetland area in nesting ground is a particularly key conservation strategy. Meanwhile, in potential nesting ground setting suitable height artificial nests can provide enough nesting resources for the breeding Oriental Storks. Finally, establishing soft barriers around the nest site is important management that can effectively ensure the success of reproduction.

Keywords: Nest site selection, Microhabitat, Habitat suitability, Breeding range expansion, Oriental Storks

9. Flexible Foraging Response of Wintering Hooded Cranes (*Grus monacha*) to Food Availability in the Lakes of the Yangtze River Floodplain, China

Zhenhua Wei[1], Meng Zheng[1,2], Lizhi Zhou[1*] and Wenbin Xu[3]

1 Anhui University, Hefei, China

2 The Forestry Department of Hunan Province, Changsha, China

3 Anhui Shengjin Lake National Nature Reserve, Dongzhi, China

*Corresponding author: zhoulz@ahu.edu.cn

Wetlands are disappearing or degrading at an unprecedented rate due to the increase in human encroachment and disturbance, eventually leading to habitat loss for waterbirds, which is the primary cause of the decline in the Hooded Crane (*Grus monacha*) population. The Hooded Cranes have to constantly adjust their foraging strategies to survive to cope with this situation. In order to study the response of cranes to food resources in mosaic habitat, we surveyed a total of 420 food quadrats and 736 behavioral samples from three habitats during three wintering periods in Shengjin Lake and Caizi Lake. We measured temporal and between-habitat differences in foraging time budget, foraging frequency, and foraging success rate. Akaike's information criterion was selected between the models of food abundance and availability. The results indicated that the wintering cranes spent the majority of their time (66.55%) foraging and shifted their foraging behaviors based upon food abundance and availability in different habitats. Our analyses also indicated that cranes were willing to forage more food with poor sediment penetrability in sub-optimal habitats. Foraging time budget was based on the food depth, and the foraging frequency and foraging success rate were based on food abundance. Cranes adopted flexible foraging strategies in response to the alternative food resources in mosaic wetland habitats, as it could mitigate the negative impacts of habitat loss and facilitate survival.

Keywords: *Grus monacha*, Foraging behavior, Foraging strategies, Food availability, Wintering ecology

10. Status and Distribution of Potential Suitable Habitats of Greater White-fronted Goose Population

Wu Entao [1, 2], Lei Jialin [1, 2], He Ke [1, 2], Jia Yifei [1, 2], Lei Guangchun [1, 2*]

1 School of Ecology and Nature Conservation, Beijing Forestry University, Beijing 100083, P.R.China

2 East Asia-Australia Migratory Bird Migration Research Center Beijing ,Beijing 100083,P.R.China

*Corresponding author: guangchun.lei@foxmail.com

Greater White-fronted Goose (*Anser albifrons*), which are abundant worldwide, have been listed as second-class protected animals in China, where their wintering populations have fallen sharply. Based on the Yangtze River Basin Conservation Network, this study integrates the 2015-2021 simultaneous survey data of waterbirds in the middle and lower reaches of the Yangtze River, january waterbird survey data from 12 provinces and 1 city in eastern China, and Citizen science data of Greater White-fronted Goose in China from 2015 to 2021.We have established a distribution model of the species of *Anser albifrons*, and predicted the potential suitable winter distribution area of the Greater White-fronted Goose through 71 items distribution information, Comprehensive species distribution model(SSDM) and GIS technology. There are 30,906 wintering species in eastern China, and the population size has shrunk by 77.98 percent. The wintering population of the white-forehead in eastern China is the largest in Jiangxi Province, at 27,401, followed by Anhui Province at 3,164. The AUC (area under the receiving operator curve) value of the potentially suitable habitat for the white-forehead winter population predicted by the comprehensive species distribution model is 0.967, indicating a high confidence of the prediction results. Greater White-fronted Goose are highly dependent on low-altitude wetland habitats, especially in hydrological fluctuation zones and areas of water fields.The habitat suitable for the winter population of white-forehead is mainly distributed in the middle and lower reaches of the Yangtze River, and the probability of the appearance of white-forehead in the lake areas of Shizhu Lake in Jiangsu Province, coastal areas in Jiangsu Province, Nanyu Lake in Anhui Province, Baima Lake, Lubo Lake, Looma Lake and Jinsha Lake in Jiangsu Province is also higher. This study is helpful to understand the mechanism and population status of winter habitat selection of threatened white-foreheads in China, and to provide scientific basis for species protection.

Keywords: *Anser albifrons*, suitable winter habitat, population estimation, species distribution model

11. Inter-specific Brood Parasitism Record in the Third Century

Zhang Yimei[1]

1 Beijing Normal University / Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing 100875, China

Interspecific brood parasitism is practiced by certain birds, in which eggs are laid in the nests of other host birds, causing them to be hatched and the young reared by the hosts, at the cost of the hosts' own fitness. Parasitic birds and their hosts provide the clearest examples of coevolution in ornithology. Common cuckoo, widely distributed in Eurasian continent, and its several hundred hosts are among the best studied of all brood parasite systems. Through consulting the Chinese ancient book materials, we found an interspecific brood parasitism record occurred in the Three Kingdom Period (220-280 A.D.). Based on the ecological habits and morphological characteristics described in the books, we confirmed this record is a brood parasitism on barn swallow by common cuckoo, which imply there is a long history of coevolution between these two species. This record is likely to be the first accurate record of brood parasitism by common cuckoos in China.

Keywords: brood parasitism, common cuckoo, barn swallow

12. Sexual dimorphism and sex-differential migration of Little Buntings (*Emberiza pusilla*) at an East Asian stopover site

Sook-Young Cho[1,2†], Hyun-Young Nam[1,3†], Se-Young Park[1,4], and Chang-Yong Choi[1,4*]

1 Bird Research Center, Korea National Park Research Institute, Jeonnam 58863, Republic of Korea

2 Honam National Institute of Biological Resources, Mokpo 58762, Republic of Korea

3 School of Biological Sciences, College of Natural Sciences, Seoul National University, Seoul 08826, Republic of Korea

4 Department of Agriculture, Forestry and Bioresources, College of Agriculture and Life Sciences, Seoul National University, Seoul 08826, Republic of Korea

* Correspondence: sub95@snu.ac.kr

† These authors contributed equally to this work.

Sex difference in morphology provides key information for understanding a species' morphological adaptation in relation to the evolution of sexual selection. In migratory birds, of which morphological traits have been adapted to the long distance travel, sexual dimorphism is known to reflect sex-differential migration phenology. We measured sexual size dimorphism and sexual dichromatism of the Little Bunting (*Emberiza pusilla*), and investigated their relationship to the spring arrival dates on a stopover site in Korea. Wing length was the most important predictor to identify the sex, and wings of males were longer than those of females. Males also had significantly stronger chestnut color than females in their head feathers but the color difference was prominent in the spring than in the fall. Seasonal difference in the degree of sexual dichromatism implies that chestnut plumage coloration can be used as a social or sexual signal of males in the breeding season. Arrival dates were correlated to both size and color, but unlike other bunting species previously studied in the same area, there was no clear sex-differential trend in the relationship between arrival dates and morphological characters. Contribution of size and color to the early arrival regardless of sex may indicate the preference for assortative mating or sex-differential migration strategies are not detected in the early stage of northward migration. Our findings on the sexual dimorphism of the Little Buntings, one of the longest migrants and the least dichromatic species among the *Emberiza* buntings, will be an important piece to reveal the evolution of sex-differential migration of the buntings in the East Asian flyway.

13. The past, present, and future of the Siberian grouse *Falcipennis falcipennis* under glacial oscillations and global warming

Wen-Dong Xie[1, 2], Kai Song[1*], Siegfried Klaus[3], Jon E. Swenson[4], Yue-Hua Sun[1 *]

1 Key Laboratory of Animal Ecology and Conservation Biology, Institute of Zoology, Chinese Academy of Sciences, Beijing, 100101, People's Republic of China

2 College of Life Science, Hebei University, Baoding, 071002, People's Republic of China

3 Lindenhöhe 5, D-07749 Jena, Germany

4 Faculty of Environmental Sciences and Natural Resource Management, Norwegian University of Life Sciences, PO Box 5003, NO-1432 Ås, Norway

* Corresponding author: Kai Song, Email: songkai2014@sina.com,

Yue-Hua Sun, Email: sunyh@ioz.ac.cn

Global climate change has a significant effect on species especially in subarctic areas, as they formed an equilibrium with the environment conditions that will be changed, causing the shifting of the species distribution. During the last three million years, the earth has experienced glacial oscillations, forcing species to survive in ice-free refugia during glacial periods and disperse deglacial. In this study, by assessing the potential distribution of Siberian grouse *Falcipennis falcipennis*, we modeled their pattern of range changes during glacial oscillations and the potential impact of present global warming using Global Circular Models and Representative Concentration Pathways.

We used 158 records of Siberian to generate a full climate model using 19 bioclimate variables in MaxEnt, and discard variables with correlation coefficient larger than 0.8 and relatively lower modeling contributions. With the rest of the variables, we created a normally uncorrelated simple climate model to predicate the possible distribution of Siberian grouse from ice age to present and to 2070. Then we added geographical data and the human interference index to construct a multiple factors full model to evaluate the important factors among multiple variables related to the distribution of Siberian grouse. The logistic output was classified in to different suitability zone for further analysis.

The total suitability zone ($P \geqslant 0.33$) of Siberian grouse is near 243,000 km2 and the Maximum Suitability Zone is 36,000 km2 confined to the Russian Far East. From current potential habitat modeling, we found that annual precipitation, annual mean temperature and the distance from lakes are the most explanatory variables for the distribution of Siberian grouse. The distribution center moved to the southeast during

the Last Glacial Maximum and spread back to the northwest after the ice melted and temperature rose.

The total area range of Siberian Grouse experienced a dramatic loss during Last Glacial Maximum. Global warming is presently forcing the Siberian grouse to migrate northward with a contraction of its range, indicating an urgent need to protect its habitat, considering little of its Maximum Sustainable Zone is protected although there are large reserves in that area.

Keywords: Climate change, *Falcipennis falcipennis*, ice age refugia, Last glacial maximum

14. Demographic history and divergence of sibling grouse species inferred from whole genome sequencing reveal past effects of climate change

Kai Song[1, 2*], Bin Gao[2], Peter Halvarsson[3], Yun Fang[2], Siegfried Klaus[4], Ying-Xin Jiang[2], Jon E. Swenson[5], Yue-Hua Sun[2*], Jacob Höglund[1*]

1 Animal Ecology, Department of Ecology and Genetics, Uppsala University, Norbyvägen 18D, 75236, Uppsala, Sweden.

2 Key Laboratory of Animal Ecology and Conservation Biology, Institute of Zoology, Chinese Academy of Sciences, 100101, Beijing, P.R. China

3 Unit of Parasitology, Department of Biomedicine and Veterinary Public Health, Swedish University of Agricultural Sciences, PO Box 7036, 75007, Uppsala, Sweden

4 Lindenhöhe 5, D-07749 Jena, Germany

5 Faculty of Environmental Sciences and Natural Resource Management, Norwegian University of Life Sciences, PO Box 5003, NO-1432 Ås, Norway

* Corresponding author

Email: songkai2014@sina.com

Background

The boreal forest is one of the largest biomes on earth, supporting thousands of species. The global climate fluctuations in the Quaternary, especially the ice ages, had a significant influence on the distribution of boreal forest, as well as the divergence and evolution of species inhabiting this biome. To understand the possible effects of on-going and future climate change it would be useful to reconstruct past population size changes and relate such to climatic events in the past. We sequenced the genomes of 32 individuals from two forest inhabiting bird species, Hazel Grouse (*Tetrastes bonasia*) and Chinese Grouse (*T. sewerzowi*) and three representatives of two outgroup species from Europe and China.

Results

We estimated the divergence time of Chinese Grouse and Hazel Grouse to 1.76 (0.46-3.37) MYA. The demographic history of different populations in these two sibling species was reconstructed, and showed that peaks and bottlenecks of effective population size occurred at different times for the two species. The northern Qilian population of Chinese Grouse became separated from the rest of the species residing in the south approximately 250.000 years ago and have since then showed consistently lower effective population size than the southern population. The Chinese Hazel Grouse population had a higher effective population size at the peak of the Last Glacial Period

(approx. 300.000 years ago) than the European population. Both species have decreased recently and now have low effective population sizes.

Conclusions

Combined with the uplift history and reconstructed climate change during the Quaternary, our results support that cold-adapted grouse species diverged in response to changes in the distribution of palaeo-boreal forest and the formation of the Loess Plateau. The combined effects of climate change and an increased human pressure impose major threats to the survival and conservation of both species.

Keywords: Boreal Forest, Demographic history, Genomics, Ice age, Climate change, Qinghai-Tibetan plateau

15. Satellite telemetry facilitate first breeding age and natal dispersal study in wild Oriental Storks population

Anton Sasin[1], Anna Serdyuk[2], Baoguang Zhu[3], Qingshan Zhao[4*], Lei Cao[4,5]

1 Amur Regional Public Ecological Organization "AmurSEU", 675000, Amur region, Blagoveschensk, Russia. E-mail: anton_160386@mail.ru

2 WWF-Russia, Amur branch, Vladivostok, 690003, Russia. E-mail: barma.au@gmail.com

3 Honghe National Nature Reserve, Jiansanjiang 156332, China. E-mail:zhubaog@163.com

4 State Key Laboratory of Urban and Regional Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China. E-mail:qszhao@rcees.ac.cn

5 University of Chinese Academy of Sciences, Beijing, 100049, China. E-mail: leicao@rcees.ac.cn

*Corresponding author: Qingshan Zhao qszhao@rcees.ac.cn

Studies show that both first breeding age and natal dispersal are all important life history traits, which influence bird population dynamics. Previously, information on age at first breeding has been collected from long term ringing of chicks as nestlings followed up by resightings of the same birds as adults at their own nest sites in subsequent years. While this approach combines the advantages of low cost of rings and large sample size, the disadvantages include its labour intensiveness and the reliance on individuals returning to the monitored parts of the natal area (because an unknown number of individuals may not return to the same study area to start breeding). Technological improvements now enable us to track individual birds in ways that have provided us with valuable insight into many aspects of avian biology. Here, using GPS/GSM telemetry devices, we reveal new information on the age of first breeding of Oriental Storks breeding in Southeast Siberia. This study was carried out in the middle Heilongjiang-Amur River Basin. Chicks captured before fledgling and attached with solar powered GPS-GSM backpack tracker. We inspected their traces to determine whether storks was building a nest, subsequently visiting these locations for verification of a nesting attempt. We individually marked and tracked 41 Oriental Storks in 2018 of which two showed distinct signs of nesting in May 2020. DNA sex identification showed that they are both male and field inspections confirmed that both of them successfully built nests. Of these, no egg was laid in the nest of the stork tagged with tracker 180467, but the pair including the male with tracker 180458 successfully incubated four eggs and fledging two chicks in August 2020. The natal dispersal distance of 180467 and 180458 were 388.91 km and 86.83 km, respectively. This is the

first solid evidence that male Oriental Storks can successfully reproduce at age two years in the wild population. Despite limited sample size, the use of new technology in this case was critical to our ability to confirm the early attempt at reproduction in these two individuals, which provides new insights into the population dynamics of this species.

Keywords: *Ciconia ciconia*, first breeding age, telemetry, natal dispersal

16. Integrating habitat suitability modelling and assessment of the conservation gaps of nature reserves for the threatened Reeves's Pheasant

Shan Tian[1], Shuai Lu[1], Junqin Hua[1], Jiang Chang[2], Jianqiang Li[1], Zhengwang Zhang[3], Yong Wang[4,5], Jiliang Xu[1*], Mingxiang Zhang[1]
1 School of Ecology and Nature Conservation, Beijing Forestry University, Beijing 100083, China
2 State Key Laboratory of Environmental Criteria and Risk Assessment, Chinese Research Academy of Environmental Sciences, Beijing 100012, China
3 Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing 100875, China
4 Department of Biological and Environmental Science, College of Agricultural, Life and Natural Sciences, Alabama A&M University, Normal, AL 35762, USA
5 College of International Education, Nanjing Forestry University, Nanjing 210037, China
* Author for correspondence; email: xujiliang@bjfu.edu.cn

As threats to biodiversity proliferate, establishment and expansion of protected areas have increasingly been advocated in recent decades. In establishing a network of protected areas, recurrent assessments of the biodiversity conservation actually afforded by these areas is required. Gap analysis has been useful to evaluate the sufficiency and performance of protected areas. We surveyed Reeves's Pheasant *Syrmaticus reevesii* populations in 2018–2019 across its distribution range in central China to quantify the distribution of habitat suitable for this species. Our goal was to ascertain the current distribution of Reeves's Pheasant and then identify the gaps in protecting Reeves's Pheasant of the existing national nature reserve (NNR) network to provide suggestions for improving the conservation of this important species. The existing NNR network encompassed only 17.0% of the habitat suitable for Reeves's Pheasant. Based on the current distributions of both suitable habitat and NNRs for Reeves's Pheasant, we suggest most currently unprotected areas comprised moderately suitable habitat for species and should be prioritized in the future. A multiple species approach using Reeves's Pheasant as a flagship species should be considered to understand the extent of mismatch between the distributions of protected areas and suitable habitat to improve the management effectiveness of NNRs. This case study provides an example of how the development of a conservation reserve network may be based on species distribution and habitat assessments and is useful to conservation efforts in other regions and for other species.

Keywords: Gap analysis, *Syrmaticus reevesii*, National nature reserves, Suitable habitat

17. Flock size do not influence escape decisions of urban lawn-foraging birds

Jin-Ming Zhao[1*], Xiang-Rong Song[1,2], Xiao-Yu Yang[1], Yue Xie[1], Xiao-Nong Yang[3]

1 School of Life Science, Huaibei Normal University, No. 100, Dongshan road, Huaibei 235000, People's republic of China

2 School of Resources and Environmental Engineering, Anhui University, No.111, Jiulong Road, Hefei 230601, People's Republic of China

3 Chengdu Bird Watching Society, No. 13, Yulinnan Road, Chengdu 610041, People's Republic of China

* Corresponding author: jinmingzhao@yahoo.com

Better predator avoidance is been considered as a main evolutionary force in shaping the behavior of aggregation, which is a ubiquitous phenomenon found in the whole animal kingdom. Many studies examined the behavioral differences of animals in different sized groups to infer the antipredator benefits of aggregations. An overlooked aspect is that whether individuals can make better escape decisions (have greater benefits) when joining larger groups. Although some researches examined the flight initiation distance (FID) of individuals in different animal groups, inconsistent results found in these studies still lack a convincible explanation. Moreover, escape decisions made by animals include not only when to flee away (as FID) but also a series of other behavioral decisions, such as distance fled (DF), flight direction (FD) and whether fleeing to a refuge. We studied a series of escape behaviors of eight urban lawn foraging bird species when approached by one, two or three persons representing low, intermediate or high predation risk levels. We found no overall effects of flock size on the birds' escape decisions, including FID, DF, FD and whether to flee to the nearest refuge, although there was some variation among species. Predation risk did not influence the escape decisions of birds either. Urban birds might retain a minimum antipredator effort to approaching human beings due to the frequent, benign disturbances of humans. We recommended researchers to consider the potentially different reactions of animals to human beings and to natural predators along a gradient of habituation in future studies.

Keywords: group living, antipredator behavior, urban birds, flock size, predation risk, habituation

18. A survey of sex ratios of raptors at a rescue center in China

Li-Xing Yang[1], Bing Zhou1, Xi Huang[1], Kai Gao[1], Ze-Ru Chen[1], Chang Dai[2], Shuai Zhang[2], Lei Zhou[2], Zhi-Sai Li[2], Yu-Gang Shang[2], Chao Xi[1], Wen-Hong Deng[1,2*]

1 Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing, China

2 Beijing Raptor Rescue Center, International Fund for Animal Welfare, Beijing, China

* Corresponding author e-mail: dengwh@bnu.edu.cn

The sex ratio is an important concept in estimating population demography, and such data could contribute to both theoretical research and conservation. Although numerous studies have analyzed the sex ratios of raptors in the wild, few studies have focused on the sex ratios of raptors in wildlife rehabilitation facilities. Here, we report the results of polymerase chain reaction (PCR)-based sex identification of raptors brought to the Beijing Raptor Rescue Center in 2018–2020. This rescue center is located in eastern China, on a major migratory route for raptors in East Asia. We identified the sex of 646 individuals (belonging to 29 species) using two sets of primers, and analyzed the sex ratios of five species with a sample size >30 individuals. Generally, the sex ratios differed among species: the sex ratio of Eurasian Kestrels (Falco tinnunculus) was skewed toward males (P = 0.006), while the sex ratio of Eurasian Sparrowhawks (Accipiter nisus) was skewed toward females (P = 0.024). The sex ratio of Long-eared Owls (Asio otus) tended to be female-biased (P = 0.058). There was no significant bias of sex ratio in Oriental Scops-Owls (Otus sunia) or Amur Falcons (Falco amurensis). We discussed several possible reasons that could drive the biased sex ratios of raptors brought into rehabilitation centers. We reported the sex ratios of raptors at a raptor rescue center, and our findings could be helpful for future studies on sex identification of raptors and conservation efforts.

Keywords: adult sex ratios; binomial test; captive; hatch-year sex ratios; molecular sexing; raptors; rehabilitation center.

19. Neglected parasite reservoirs in wetlands: Prevalence and diversity of avian haemosporidians in waterbird communities in Northeast China

Guocheng Yang[1], Haiyan He[1], Guogang Zhang[2], Wenyu Zhao[1], Jingying Zhou[3], Ying Qian[3], Xi Huang[1*], Lu Dong[1*]

1 MOE Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing, 100875, China

2 Key Laboratory of Forest Protection of National Forestry and Grassland Administration, National Bird Banding Center of China, Research Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry, Beijing, 100091, China

3 Tumuji National Nature Reserve of Inner Mongolia, Zhalaiteqi, Inner Mongolia Autonomous Region, 137600, China

The diversity of waterbirds is threatened, and haemosporidian parasite infection is considered one of the most important causative factors. However, to date, only a few studies focusing on specific parasite species have been carried out, which cannot reflect the general patterns at the community level. To test whether the reported haemosporidian diversity in waterbirds is underestimated, we estimated the prevalence and lineage diversity of avian haemosporidian parasites in 353 waterbirds from 26 species in the Tumuji National Nature Reserve, Northeast China, as well as the host-parasite associations. According to the molecular analysis of cytochrome b (cyt b) barcode sequences, 28.3% of the birds were infected by 49 distinct parasite lineages, including 11 Plasmodium, 12 *Haemoproteus*, and 26 *Leucocytozoon* lineages, of which 39 were novel. The highest prevalence was contributed by *Leucocytozoon* (13.31%), followed by Plasmodium (13.03%) and *Haemoproteus* (4.25%), which suggested that waterbirds were infected to a lesser extent by *Haemoproteus* than by the other two genera. Among the most sampled birds, species belonging to Anatidae appeared to be susceptible to *Leucocytozoon* but resistant to Plasmodium, while Rallidae presented the opposite pattern. On the phylogenetic tree, most of the *Leucocytozoon* lineages detected in Anatidae clustered together and formed two well-supported clades, while lineages restricted to Gruidae were distantly related to other parasites in all three genera. SW5 was the most abundant lineage and therefore might be a major threat to waterbirds; among the hosts, the common coot harboured the highest diversity of parasite lineages and thus could act as a reservoir for potential transmission. This is the first study of avian haemosporidian infections in a wild waterbird community in Asia. Our findings have doubled the number of lineages recorded in waterbirds, broadened our

understanding of host-parasite associations, and addressed the importance of studying haemosporidian infections in wild waterbird conservation.

Keywords： Haemosporidian parasites, Host specificity, Tumuji National Nature Reserve, Waterbirds, Wetland

20. Host personality predicts cuckoo egg rejection in Daurian redstarts *Phoenicurus auroreus*

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

1 Ministry of Education Key Laboratory for Biodiversity Sciences and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing, China

2 Department of Behavioural Ecology and Evolutionary Genetics, Max Planck Institute for Ornithology, Seewiesen, Germany

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

* Corresponding author: dengwh@bnu.edu.cn

In species that are subject to brood parasitism, individuals often vary in their responses to parasitic eggs, with some rejecting the eggs while others do not. Whilst some factors, such as host age (breeding experience), the degree of egg matching and the level of perceived risk of brood parasitism have been shown to influence host decisions, much of the variation remains unexplained. The host personality hypothesis suggests that personality traits of the host influence its response to parasitic eggs, but few studies have tested this. We investigated the relationship between two personality traits (exploration and neophobia) and a physiological trait (breathing rate) of the host, and egg-rejection behaviour in a population of Daurian redstarts *Phoenicurus auroreus* in northeast China. We first show that exploratory behaviour and the response to a novel object are repeatable for individual females and strongly covary, indicating distinct personality types. We then show that fast-exploring and less neophobic hosts were more likely to reject parasitic eggs than slow-exploring and more neophobic hosts. Variation in breathing rate – a measure of the stress-response – did not affect rejection behaviour. Our results demonstrate that host personality, along the bold-shy continuum, predicts the responses to parasitic eggs in Daurian redstarts, with bold hosts being more likely to reject parasitic eggs.

Keywords: personality, breathing rate, cuckoo parasitism, egg rejection, Daurian redstart

21. The value of coastal saltpans for migratory shorebirds: conservation insights from a stable isotope approach based on feeding guild and body size

Weipan Lei[1], Jose A. Masero[2], Caroline Dingle[3], Yang Liu[4], Ziwen Chai[1], Bingrun Zhu[1,5], Hebo Peng[5,6], Zhengwang Zhang[1], Theunis Piersma[5,6]

1 Key Laboratory for Biodiversity Science and Ecological Engineering, National Demonstration Center for Experimental Life Sciences & Biotechnology Education, College of Life Sciences, Beijing Normal University, Beijing, China

2 Ecology in the Anthropocene, Associated Unit CSIC-UEX, Zoology, Faculty of Sciences, University of Extremadura, Badajoz, Spain

3 Division of Ecology & Biodiversity, School of Biological Sciences, The University of Hong Kong, Hong Kong S.A.R., China

4 State Key Laboratory of Biocontrol, School of Ecology, School of Life Sciences, Sun Yat-sen University, Guangzhou, China

5 Conservation Ecology Group, Groningen Institute for Evolutionary Life Sciences (GELIFES), University of Groningen, Groningen, The Netherlands

6 Department of Coastal Systems, NIOZ Royal Netherlands Institute for Sea Research, Texel, The Netherlands

Email: jamasero@unex.es

Migratory shorebirds are among the most threatened groups of birds. They rely on natural intertidal habitats outside the breeding season, but, to some extent have adjusted to using man-made habitats. Here, we assessed the importance of coastal saltpans – a type of anthropogenic wetland – for feeding in migratory shorebirds during their northward migration along the East Asian-Australasian Flyway (EAAF). We combined low tide counts on intertidal flats and nearby saltpans at the Luannan coastal wetland complex (Bohai Bay, China) with Bayesian mixing model analyses (BMMs) based on stable isotopes to evaluate the relative importance of coastal saltpans versus natural intertidal habitats as foraging grounds for migrating species. We grouped shorebird species (n = 24) according to feeding guild and body size, and found that both predictors explained the broad-scale patterns of foraging use of saltpans by shorebirds at low tide. The guild of water-surface foraging species (e.g. stilts and avocets), independently of body size, mostly fed in saltpans, and the small-medium visual (e.g. plovers) and tactile-surface (e.g. sandpipers) foraging species consumed a significant portion of their diet in this habitat. In contrast, most large tactile-surface foraging species barely foraged in saltpans at low tide. BMMs showed that shorebirds had a greater reliance on saltpans than did traditional counts of foraging birds in each habitat at low tide. Saltpan food is

rich in essential fatty acids, so the contribution of saltpans to the diet of shorebirds should not be considered only in absolute values, but also in the quality of this contribution. Saltpans may therefore help conserve declining shorebirds if properly managed – for example by controlling water levels – to serve the specific feeding guilds that rely on them. While our focus is in the EAAF, the findings are relevant for other flyways and other non-tidal anthropogenic wetlands.

22. Occurrence and risks of PCDD/Fs and PCBs in three raptors from North China

Ya Zhang[1,2], Xiaobo Zheng[3], Pu Wang[4], Qinghua Zhang[5,6], Zhengwang Zhang[1]

1 Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, College of Life Sciences, Beijing Normal University, Beijing 100875, China

2 The High School Affiliated to Beijing Normal University, Beijing 100052, China

3 College of Resources and Environment, South China Agricultural University, Guangzhou 510642, China

4 Hubei Key Laboratory of Environmental and Health Effects of Persistent Toxic Substances, Institute of Environment and Health, Jianghan University, Wuhan 430056, China

5 State Key Laboratory of Environmental Chemistry and Ecotoxicology, Research Center for Eco, Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China

6 University of Chinese Academy of Sciences, Beijing 100049, China

Concentrations of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) and polychlorinated biphenyls (PCBs) were investigated in muscle samples from common kestrels (*Falco tinnunculus*), eagle owls (*Bubo bubo*), and little owls (*Athene noctua*) collected in Beijing, China. The concentrations of PCDD/Fs were in the ranges of 22.7–5280, 67.5–1610, and 68.4–3180 pg/g lipid weight (lw), while levels of dioxin-like PCBs ranged from 4.91 to 1560, 8.08–294, and 28.2–3540 ng/g lw, in common kestrel, eagle owl, and little owl, respectively. The main PCDD/Fs congener was 2,3,4,7,8-PeCDF, and CB-153 dominated the seven indicator PCBs. PCB levels have shown a decreasing trend in the last decade for the common kestrel, but not for little owl in Beijing, which exhibited higher levels of pollutants and toxic equivalency (TEQ) values than the other two species. Concentrations of PCDD/Fs, dioxin-like PCBs, and indicator PCBs differed between fledgling and adult raptors for certain species. Raptors in this study generally had a higher TEQ than the no-observed-effect level in the literature, indicating significant exposure risks to PCDD/Fs and dioxin-like PCBs in raptors, especially in adult little owls.

Keywords: PCDD/Fs, PCBs, Raptor, TEQ

23. Breeding Observation of Yellow-breasted Bunting *Emberiza aureola*

Pan Kaijun[1], Li Xianda[2,3], Li Xiuming[1], Qian Fawen[1*]

1 Research Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry, 1 Dongxiaofu, Haidian District, Beijing, China;

2 School of Ecology and Nature Conservation, Beijing Forestry University, 35 Qinghua East Road, Haidian District, Beijing, China;

3 Heilongjiang Central Station Black-Billed Capercaillie National Nature Reserve Administration, Nenjiang Heihe, Heilongjiang, China;

* Corresponding author: cranenw@caf.ac.cn

From May to August 2021, we investigated the breeding population by line transect and habitat vegetation by 1×1m2 quadrat of Yellow-breasted Bunting *Emberiza aureola* in Quanhe Provincial Wetland Park, Nenjiang, Heilongjiang Province. The results showed that the breeding habitat of the Yellow-breasted Bunting in the park is composed of shrub and grassy, dominant plant species are Salix spp., *Ulmus pumila*, etc., and primary herbs are *Artemisia carvifolia*, *Arthraxon hispidus*, *Vicia sepium, Kummerowia striata*, *Spiraea salicifolia*, *Equisetum arvense*, etc. Yellow-breasted Buntings arrived at the breeding sites and began to breed in late May. In June and July, males were often found singing and giving warning calls in top of trees, showing obvious territorial behavior. Females can be seen in early June and are difficult to find after mid-June. Males and females take turns to incubate their eggs and feed their juveniles together. Yellow-breasted Bunting mainly feeds its juveniles with insects during the breeding period. The following species can be seen in the territory of Yellow-breasted Bunting: Eurasian Skylark Alauda arvensis, Sand Martin *Riparia riparia*, Richard's Pipit *Anthus richardi*, Black-browed Reed Warbler *Acrocephalus bisteigiceps*, Oriental Reed Warbler *Acrocephalus orientalis*, Chinese Penduline-tit *Remiz consobrinus*, Black-faced Bunting *Emberiza spodocephala*, Pallas's Bunting *Emberiza pallasi*, etc. And we also found nature prey species are Amur Falcon *Falco amurensis*, Common Cuckoo *Cuculus canorus*, Brown Shrike *Lanius cristatus*, Eurasian Magpie Pica *pica*, etc., and mammals including Siberian Weasel Mustela *sibirica*, Red Fox Vulpes *vulpes*, etc. The breeding rate of Yellow-breasted Bunting is being threatened. Their breeding habitats are often flooded by river due to high temperature and heavy rainfall during the breeding season. Human activities such as land reclamation and dredging have further contributed to their habitat loss. To strengthen protection of Yellow-breasted Bunting, such as determining the bird's breeding range and

establishing protection areas, prohibiting local reclamation and dredging, conducting public education sessions to raise public awareness of protecting Yellow-breasted Bunting.

Keywords: Yellow-breasted Bunting, Quanhe Provincial Wetland Park, Breeding, Species protection

24. Mitogenome Phylogeny, Subspecies Divergence and Demographic History of the Great Tit (*Parus major*, Linnaeus, 1758) in Northeast of Iran

Faezeh Fatemizadeh[1], Gang Song[2], Fumin Lei[2]

1 Department of Environmental Science, Faculty of Natural Resources, University of Tehran, Karai, Iran

2 Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing, 100101, China

The Great Tit (*Parus major*) is a widely distributed highly polytypic species divided into four subspecies groups: major, bokharensis, cinereus, and minor. The species has been a model organism for population genomics studies for decades. Here, we use complete mtDNA genomes from 11 individuals to reconstruct the phylogeny and demographic dynamics of P. major with a focus on a population from northeast of Iran using coalescent-based Bayesian methods (Extended Bayesian skyline plots and Bayesian skygrid). Moreover, neighbor net and median joining algorithms were applied to reveal the mitogenomic population structure of P. major in northeast of Iran. P. m. intermedius has been known to occur in this part of Iran. Our BI-based tree detected three major clades corresponding to the three populations studied (NE Iran, Europe, East Asia). At the intraspecific level, the phylogenetic tree and the haplotype network revealed no diversification among individuals within the NE Iranian clade. Also, this clade was recovered as a sister clade to the European major clade; however, the East Asian population formed a strongly divergent clade. The demographic analyses of the NE Iranian clade found a rapid range expansion around ~100 thousand years ago during the Last Interglacial Maximum. Our study sheds light on the demographic history of P. m. intermedius in northeast of Iran and helps better understand P. major patterns of divergence and the effects of historical demographic changes on natural populations.

Keyword: Mitogenomics, *Parus major*, demographic history