



中国鸟类研究简讯

Newsletter of China Ornithological Society



中国动物学会鸟类学分会
China Ornithological Society



全国鸟类环志中心
National Bird Banding Center

雪鸮 (*Bubo scandiacus*)
摄影 贾云国



戴胜 (*Upupa epops*)
摄影 郭玉民



目 录

会议报道.....	1
研究动态.....	2
环志简报.....	17
消息通知.....	20
英文摘要.....	24

Contents

Notes of Meetings	1
Research Reports	2
Bird Banding Reports.....	17
Announcement.....	20
English Abstracts	24

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会议报道

鸟类学分会第八届理事会第三次会议纪要

2017 年 6 月 18 日,在东北林业大学野生动物资源学院 312 会议室召开了鸟类学分会第八届理事会第四次常务理事会议,鸟类学分会 19 名常务理事中,刘迺发先生因病住院、陈水华去美国开会未能出席本次会议,其他 17 名常务理事均参加了本次会议,黑龙江的理事田秀华、李枫以及 14 届鸟类学大会秘书长于晓平理事列席了本次会议,东北林业大学马建章院士、副校长周宏力出席了开幕式。会议由分会理事长丁平主持。

简短的开幕式后,张雁云秘书长汇报了过去一年学会的工作进展,于晓平理事、孙悦华副理事长分别介绍了第十四届鸟类学大会的组织筹备情况和学术报告报名情况,孙悦华和张正旺两位副理事长就中国鸟类基础研究奖、中国鸟类学术新人奖的申请情况作了说明。

丁平理事长主持学习了中国科协、中国动物学会关于学会分支机构换届管理文件,主持讨论酝酿产生了中国动物学会鸟类学分会第九届理事会的理事长、副理事长、秘书长等负责人、常务理事建议候选人名单推荐办法。

理事候选人名单,由全体现任理事推荐产生,理事推荐要考虑到学术声望、省级行政区、重点科研院校等,然后依据理事提名,于 2017 年 9 月 21 日在陕西师范大学召开全体理事大会,确定理事候选人正式名单。2017 年 9 月 23 日在陕西师范大学召开的会员代表大会、理事会,选举差生学会的负责人。

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树莺科鸟类 (Cettiidae) 鸣唱长度与频率的演化起源

已知鸟类鸣唱特征常与鸟喙大小、体型大小以及所在生境等形态学及生态学因素相关。本文研究了 30 种树莺科鸟类 (Cettiidae) 的鸣唱长度与鸣唱频率的演化。发现鸣唱频率与体型大小负相关, 而鸣唱长度则与繁殖纬度呈正相关。虽然迁徙距离与繁殖纬度呈正相关, 鸣唱长度与繁殖纬度的相关性仅存在于非迁徙物种部分中, 说明迁徙因素并非这种相关性的直接原因。通过分析性状演化历史, 我们发现体型与鸣唱频率的相关性起源于演化的较早阶段, 而繁殖纬度与鸣唱长度的相关性则出现较晚。推测雌性选择压力随纬度增加而增大, 导致了鸣唱长度与繁殖纬度间的相关性。

本工作已被 *Journal of Avian Biology* 接受发表: DOI: 10.1111/jav.01366。

(北京: 魏晨韬 刘佳禹 张雁云;
美国: Trevor D. Price; 瑞典: Per Alström)

基于鸣叫声音的大杜鹃雄鸟的个体识别

利用声音识别个体是非损伤、低干扰的动物调查方法。大杜鹃因其巢寄生的习性而得到关注, 但能否用声音来调查个体数量尚无研究。本研究基于判别分析和相关分析, 比较大杜鹃鸣声特征在个体内和个体间的差异性, 并尝试基于鸣声特征来评估个体数量。基于 13 只大杜鹃雄鸟鸣叫的录音, 每句鸣叫测量 15 个时间和频率的特征。其中的 12 个

鸣声特征在个体间的差异大于个体内的差异。利用这 12 个鸣声特征计算鸣叫句子间的相似性, 并通过设置阈值来辨别句子是否来自同一个体以及总的个体数量, 同时利用判别分析检验通过鸣声区分大杜鹃雄鸟个体的可行性。来自同一个体的句子之间的相似性显著高于来自不同个体的句子间的相似性。通过试错的方法设置阈值, 可以辨别句子是否来自同一个体, 并估算出总的个体数量。判别分析可以将 91.9% 的句子正确归类到发出该鸣声的个体。基于重复录音的 3 只个体的研究, 发现个体内鸣叫特征稳定性至少可以维持 5 天。因此, 在短期的调查中可以利用大杜鹃雄鸟鸣叫特征来评估个体数量。

本工作已经被 *Avian Research* 接收发表。

(北京: 李扬 夏灿伟 张雁云; 海南: 梁伟;
辽宁: 李东来; 英国: Huw Lloyd)

白头鹤东部迁徙路线研究

根据越冬地的不同, 白头鹤 (*Grus monacha*) 迁徙路线可分为两条, 一条是前往日本越冬的东部迁徙路线, 另一条是前往中国长江中下游越冬的西部迁徙路线。为了探明东部迁徙路线上的时空利用模式, 并确定重要保护区域, 本研究组使用湖南环球信士 HQBP3622 型设备, 开展了卫星跟踪研究。通过对 2014 年—2016 年跟踪的 4 只成年鹤和 5 只亚成体鹤获得的 11 万条数据进行分析, 结果显示: 成年鹤春季秋季迁徙 (往来于繁殖地与越冬地间) 时间分别为 44.25 d (SE = 4.01) 和 54.00 d (SE = 4.06); 亚成体鹤春季

秋季迁徙（往来于游荡地与越冬地间）时间分别为 12.67 d (SE = 4.37) 和 5.20 d (SE = 0.86)。成年鹤繁殖时间为 122.25 d (SE = 6.03)，亚成体鹤游荡时间为 196.80 d (SE = 17.85)。越冬期分别为 133.75 d (SE = 5.79) 和 149.80 d (SE = 0.52)。此外我们还确定了白头鹤的 3 个重要的迁徙停歇地：俄罗斯的穆拉维克公园，中国的松嫩平原和韩国的西海湾。白头鹤春迁 62.15% 的时间和秋迁 85.65% 的时间停留于这三个重要停歇地。分析栖息地利用类型发现，白头鹤在迁徙、游荡和越冬期间，通常停留在农田取食和休息，尤其是 3 个最重要的迁徙停歇地，农田为其主要利用的生境类型。非越冬期只有 5.82% 的栖息位点位于保护区内。

（北京：宓春荣 郭玉民；法国：Anders Pape Møller）

当种 - 时间 - 面积关系遇到岛屿生物地理学：亚热带陆桥岛屿中鸟类群落多样性的时空格局

种 - 时间关系 (species-time relationship, STR) 和种 - 面积关系 (species-area relationship, SAR) 是群落生态学中最稳固和普适的模式中的两种。有研究表明，存在着某种统一的种 - 时间 - 面积关系 (species-time-area relationship, STAR)，时间和空间因素对物种多样性的影响是非独立且可以相互比较的。然而，现有的 STAR 研究都基于相对匀质生境中的取样曲线 (sampling curves)。本研究的主要目的是在岛屿系统中检验 STAR 的普适性，并探索除面积之外的其他岛屿变量如何作用于物种丰富度及其在时间上的累积和周转率。

2007—2015 年，我们在浙江省千岛湖地区的 36 个岛屿上开展鸟类群落调查，使用繁殖季的鸟类群落数据建立了岛屿水平的岛屿种 - 时间 - 面积关系 (island STAR, ISTAR) 和样线水平的局域群落 - 时间 - 面积关系 (local community-time-area relationship,

LCTAR)。我们使用偏相关分析和多元回归分析检验了隔离度、边缘效应和生境丰富度对 STR 的斜率 (w) 的影响。ISTAR 和 LCTAR 的模型解释度分别达到了 88.8% 和 83.1%，且都具有显著的时空交互作用项。偏相关分析的结果表明，岛屿到大陆的距离、周长面积比和生境丰富度都与 w 显著相关；多元回归分析的结果表明，周长面积比是最重要的影响因子。

据此，我们得出以下结论：STAR 格局同样适用于岛屿系统，时间和空间相互依存地作用于物种丰富度；除面积之外，其他岛屿变量也会影响物种丰富度在时间尺度上的积累和周转率；千岛湖鸟类群落具有很高的时间周转率。总体而言，我们建议生态学家在研究物种丰富度格局时，应该同时考虑时间和空间因素，以及它们的交互作用。

相关研究详见 Song et al. (2017) *Journal of Biogeography* (under review)。

（浙江：宋琥 丁平）

野生雁类受困于长江湿地

对野生雁类的高科技追踪结果表明，不同于北美、欧洲及邻近的日本和韩国，中国的雁类不愿意从它们世代栖息的湿地迁移到农田中觅食。本研究通过在 5 个物种 67 只雁身上放置最新的高科技追踪设备，证实了这些鸟类仍忠于其世代相传的栖息地。它们日夜都待在长江泛洪平原的湿地中，那里是它们的越冬家园。研究人员在雁类的繁殖地（从俄罗斯北极地区到蒙古草原），和越冬地（长江流域）捕捉它们，为其安装新型轻质的颈环式追踪器。全球定位系统记录着每小时每一只雁在地球上的位置，并通过移动手机网络将信息传至北京中国科学院生态环境研究中心曹垒研究员的团队。将这些鸟类随时间变化的位置信息，和全国生态环境十年变化调查评估项目所提供的土地利用图（30 m ×

30 m) 叠加, 即显示出雁类所利用的土地利用类型是农田还是自然湿地。在中国数量大幅下降的3种雁(鸿雁、白额雁和小白额雁), 有98%的时间停留在湿地中。而种群数量相对稳定的雁(灰雁和豆雁), 约有18%的时间在湿地之外活动(通常是在农田中觅食)。以上结果可以解释同一物种在不同越冬地的种群趋势, 在日本和韩国越冬的雁类在农耕地中以稻谷等为食物, 其种群数量不断增长。而中国的越冬雁类受困于湿地中, 以有限的湿地资源为食物它们不在周围的农耕地觅食, 可能是因为农民在农田中放牧家鹅和家鸭导致留给野生雁群的食物极少, 以及离开湿地的雁类面临更高的非法捕杀风险。同时, 本项工作也可以解释曹垒研究团队前期的研究结果: 越冬雁类种群数量下降, 与长江集水区经济发展导致的湿地退化和丧失之间的关联。

(北京: 于辉 王鑫 曹垒 张路 贾强; 湖南: 徐正刚; 江西: 刘观华 胡斌华; 安徽: 徐文斌; 韩国: Hansoo Lee; 丹麦: Anthony D. Fox)

灰头鹁的巢特征和巢成功

一般认为鸟类的巢址特征会影响其巢日生存率。2013—2014年, 我们在甘肃省莲花山国家级自然保护区对农田生境内的灰头鹁巢进行监测, 并初步报道了该地区灰头鹁的繁殖生物学资料, 同时利用逻辑斯蒂暴露模型(logistic-exposure)和信息论方法分析了可能影响巢日生存率的因素。模型平均结果表明, 与经典的边缘效应预测相反, 越靠近生境边缘内部的巢日生存率越低; 巢下方的遮蔽度越高巢日生存率越高, 水平方向和上方的遮蔽度对巢日生存率没有影响。结果还表明, 区分不同方向上的遮蔽度对巢日生存率的影响可以帮助我们了解本地捕食者的探索能力。

(北京: 赵青山 孙悦华)

春季迁徙大滨鹁在黄海南部和北部的迁徙兴奋和停歇决定

很多候鸟在迁徙过程中要在多个迁徙停歇地休息或补充能量。大量研究表明, 鸟类停歇的决定与迁徙途中鸟类自身的状态(例如积累的能量状况)和时空特征(例如日期及地理位置)以及外在环境因素(如风、降水等天气状况)等有着密切关系。尽管在有关迁徙鸟类的停歇决定及其影响因素方面的研究已开展了大量工作, 但大部分研究对象局限于同一个迁徙停歇地的同种鸟类或不同种鸟类。因此, 开展同种鸟类在同一迁徙路线的不同迁徙停歇地的停歇决定及其影响因子研究, 对于深入认识鸟类的迁徙活动及其调控有着重要意义。

大滨鹁是亚太地区的迁徙鸟类。大滨鹁在黄海区域南部和北部的停歇习性为研究同一物种在同一迁徙路线上不同停歇地的迁徙冲动提供了可能。黄海区域南部的长江口是部分在澳大利亚越冬的大滨鹁在飞越太平洋之后到达亚洲大陆的第一处迁徙停歇地, 而黄海区域北部的鸭绿江口附近区域是大滨鹁在连续飞行4,000 km以上到达繁殖地之前最后一处主要迁徙停歇地。大滨鹁在黄海区域南部和北部的迁徙活动表现出不同特征: 南部区域是大滨鹁春季迁徙时的一处临时休息地, 大滨鹁在南部停留时间很短, 积累能量较少; 而北部区域是大滨鹁春季迁徙时的一处关键能量补给地, 大滨鹁在北部的停留时间很长, 积累能量较多, 离开鸭绿江口的时间集中于5月中下旬。因此, 与在黄海区域南部停歇的个体相比, 在北部停歇的个体可能面临着更为直接和严峻的迁徙压力, 如更长的飞行距离、更多的能量积累需求以及更严格的时间限制等。由此推测, 大滨鹁在两个地点在迁徙兴奋、定向行为等与迁徙活动相关的特征方面可能有不同的表现。

对春季迁徙期在黄海区域南部和北部停歇的大滨鹁开展的定向笼实验结果表明, 在

黄海区域南部, 大滨鹬在顺风条件下的迁徙兴奋程度更高, 这与野外观察中发现的鸕鹚类倾向于在顺风条件下出发、在逆风条件下停歇的结果一致, 说明在黄海区域南部, 鸕鹚类的迁徙可能主要受外部因素(如风况)影响。在黄海区域北部, 大滨鹬的迁徙兴奋程度随日期推移而增强, 体重及风况对迁徙兴奋没有正面影响; 同时, 数量调查和无线电追踪表明它们的迁徙出发日期集中于 5 月中下旬很短的时间窗内, 这说明在黄海区域北部其迁徙活动可能受到内在节律的强烈影响。大滨鹬在定向笼中表现出的方向倾向与迁徙方向不一致, 而是与地面风向相对, 这说明它们在定向笼中的定向行为可能只反映了迎风起飞的习性, 并不代表迁徙中的定向行为。大滨鹬的迁徙兴奋和定向行为不受能量积累状况的影响, 但其迁徙兴奋的影响因素在不同停歇地存在差异, 反映了在黄海区域南部和北部, 鸕鹚类的迁徙可能受到不同因素的调控。

(上海: 华宁 马志军)

鸭绿江口湿地食物下降及其对鸕鹚类数量的影响

黄渤海区域是东亚-澳大利西亚候鸟迁徙路线上的重要迁徙停歇地, 每年有 300 万只鸕鹚类迁徙途中在黄渤海区域休息或补充能量。滨海地区的滩涂湿地是鸕鹚类在迁徙期的主要栖息地, 大量研究表明, 滩涂湿地的快速丧失是导致东亚-澳大利西亚候鸟迁徙路线上鸕鹚类种群数量下降的主要原因。尽管高质量的迁徙停歇地对于支持高密度的鸕鹚类在短时间内补充充足的能量至关重要, 但很少有研究探讨迁徙停歇地的质量下降对迁徙鸕鹚类种群的影响。

鸭绿江口滨海湿地位于黄海北部, 每年承载已知最大数量的斑尾塍鹬(*Limosa lapponica*)和大滨鹬(*Calidris tenuirostris*)的迁

徙种群在此停歇。自 2011 年至 2016 年的春季, 我们调查了鸭绿江口滨海湿地北迁期滩涂大型底栖动物及斑尾塍鹬和大滨鹬两种主要鸕鹚类的数量。研究结果显示, 斑尾塍鹬和大滨鹬在鸭绿江口湿地的主要食物光滑河篮蛤的数量在调查期间下降 99%。光滑河篮蛤的下降可能是由于: 1) 附近港口的建设改变了滩涂的水文条件和基质组成, 2) 近年来滩涂附近大规模的海参养殖对滩涂造成污染, 以及 3) 光滑河篮蛤受到寄生虫感染等原因。然而, 除了斑尾塍鹬 *menzbieri* 亚种的高峰数量下降 91% 以外, 大滨鹬的日累积数量和斑尾塍鹬 *baueri* 亚种的高峰数量无显著的下降。虽然对大滨鹬迁徙期无线电追踪的结果表明, 迁徙日程较晚的大滨鹬在鸭绿江口湿地的食物资源下降后会转移到其他迁徙停歇地, 但鸭绿江口湿地在研究期间稳定的个体数量表明, 虽然鸭绿江的食物资源快速下降, 但鸭绿江之外的其他区域可能没有更好的可替代的迁徙停歇地。斑尾塍鹬 *menzbieri* 亚种在鸭绿江口湿地的快速下降表明迁徙停歇地的食物资源下降可能是造成整个迁徙路线上鸕鹚类种群数量下降的一个被忽视但非常重要的原因。本研究表明, 在鸕鹚类保护工作中, 维持高质量的栖息地和避免因滩涂围垦而导致的栖息地丧失同样重要。同时, 我们建议在鸭绿江口湿地应立即采取措施恢复迁徙鸕鹚类的食物资源。

(上海: 张守栋 马志军)

千岛湖鸟类群落的功能与谱系结构

本研究基于千岛湖长期的鸟类监测数据探讨了生境丧失和片断化过程对鸟类群落构建机制的影响, 并结合物种的功能性状和谱系信息尝试扩展了经典的岛屿生物地理学理论。在片断化的岛屿生境中, 群落构建主要有两种可能的形成机制: 由于小型和较远岛屿的生境比较单一, 通过环境过滤作用使具

有相似功能性状或较近亲缘关系的物种共存；由于小型岛屿的资源 and 空间相对有限，通过种间竞争作用使具有不同功能性状或较远亲缘关系的物种共存。本研究的结果表明，千岛湖鸟类群落的功能-谱系多样性 (functional-phylogenetic diversity) 随着岛屿面积的增加而增加，随着隔离度的增加而减小。岛屿上鸟类群落的构建过程是非随机的。总体上，鸟类群落结构无论在功能还是谱系水平都呈现聚集的格局，并且小型和较远岛屿上的鸟类群落更为聚集。因此，生境过滤是导致千岛湖鸟类群落聚集的主要机制。本研究证实了综合物种的功能和谱系信息更能反映鸟类对生境丧失和片断化的响应，并且在分析物种差异性的同时从群落结构的角度对经典的岛屿生物地理学理论进行了扩展。

相关研究详见 Si *et al.* (2017) *Journal of Animal Ecology* 86: 532–542.

(浙江：斯幸峰 丁平)

千岛湖片段化生境鸟类群落的空间分布和季节动态

尽管普遍认为群落组成会表现出季节差异，但是对群落季节性构建机制的研究还十分匮乏。本研究中我们基于千岛湖 5 年鸟类监测数据分析群落嵌套结构和 β 多样性及其空间周转和物种丰富度差异组分的分布格局，并结合随机化检验方法探讨夏季（繁殖期）留鸟，冬季（非繁殖期）留鸟和冬季候鸟群落构建机制的差异。我们预期繁殖期后，由于冬季留鸟和候鸟扩散能力增强并且生境专一性降低，其群落的 β 多样性、丰富度差异组分和群落嵌套程度会低于夏季留鸟。研究发现，这三种鸟类群落的空间分布各不相同。冬季候鸟的空间分布与岛屿生境的丰富度差异没有显著关系，其 β 多样性与随机化模型接近。夏季留鸟的空间分布与岛屿生境的丰富度差异显著相关，并表现出反嵌套

格局。与预期相反，冬季留鸟的 β 多样性及组分和群落嵌套程度高于夏季留鸟和冬季候鸟，并与岛屿面积差有显著的相关性。该结果表明因面积大小而导致的选择性灭绝过程是决定千岛湖冬季留鸟空间分布格局的主要驱动机制，这极有可能与冬季食物匮乏有关。不同的是，夏季留鸟受与栖息地生境相关的生态位差异的影响更大。而冬季候鸟的分布更加随机。本文不仅提供了研究不同季节群落群落组成和构建机制的方法，并揭示不同季节鸟类群落生物学特征以及对生境变化的反应的差异共同决定了群落的分布格局。

该研究详见 Chen *et al.* (2017) *Journal of Biogeography* under review.

(浙江：陈传武 丁平)

中国鸟类的灭绝危险和易灭绝特征

中国是世界上鸟类多样性最丰富的国家之一。根据 2015 年环境保护部和中国科学院发布的《中国生物多样性红色名录》评估报告，在中国现有的 1,372 种鸟类中，列为极危、濒危和易危等级的受威胁鸟类有 146 种，区域灭绝的 3 种。但是，迄今为止，有关中国鸟类的灭绝模式和受威胁过程，还从未有过相关研究。而这种研究对于中国鸟类多样性的保护至关重要。为此，本论文首次系统地研究了中国鸟类的灭绝模式和受威胁过程。我们分析和探讨了以下 4 个科学问题：（1）受威胁物种在各个科中的分布是否是随机的？（2）如果不是，哪些科含有比随机分布更多的受威胁物种？（3）哪些物种特征与灭绝危险有关？（4）物种特征之间的作用方式是累加的 (additive) 还是协同作用的 (synergistic)？研究发现受威胁物种在各个科中的分布不是随机的。犀鸟科 (Bucerotidae)、鹤科 (Gruidae)、八色鸫科 (Pittidae)、雉科 (Phasianidae) 和鹰科 (Accipitridae) 含有比随机分布更多的受威胁物种。通过查阅文献获得了 11 个与灭绝

相关的物种特征: 身体大小、窝卵数、营养级、扩散能力、生境专属性、地理分布范围、巢址、巢的类型、集群状态、迁徙状态和捕猎敏感度 (hunting vulnerability)。在控制系统发育的影响后, 发现身体大小和捕猎敏感度的协同作用是预测中国鸟类灭绝危险的最佳模型。本研究表明, 为了有效保护中国鸟类, 我们应优先保护那些含有比随机分布更多的受威胁物种的科以及那些体型大和捕猎敏感度高的物种。

相关研究详见 Wang *et al.* (2017) *Ecography*, DOI: 10.1111/ecog.03158.

(浙江: 王彦平 斯幸峰 陈传武 曾嶂 赵郁豪 吴奕如 丁平; 英国: Peter M. Bennett)

结合物种多样性和谱系多样性评估中国自然保护区的保护成效

建立保护区网络是最行之有效的保护生物多样性的办法。通常对保护区的效力进行评价时, 能否覆盖物种多样性热点是十分重要、甚至是唯一的指标。然而, 对物种的过分重视可能使人们忽略那些在谱系和功能上具有独特性和重要性的区域, 使生态系统的进化潜力和生态功能得不到有效保护。

广东省生物资源应用研究所鸟类生态与进化研究中心权擎博士、邹发生研究员等科研人员用 2,279 种陆生脊椎动物 (两栖纲、爬行纲、鸟纲和哺乳纲) 的分布范围和系统发育关系研究了中国保护区网络 (国家级和省级保护区) 在 4 个物种多样性指数和 5 个谱系多样性指数的差异和空缺。结果表明, 利用不同的指数衡量生物多样性时, 12.1%~43.8% 的多样性指数高的区域被保护区覆盖; 中国陆生脊椎动物的物种丰富度和各个谱系多样性指数均有较高的相关性, 但在校正物种丰富度的影响后, 谱系多样性的格局与物种丰富度格局出现偏离。这说明, 能够覆盖物种丰富度热点的保护区网络也能

够较好地覆盖谱系多样性热点, 但不能覆盖部分谱系独特或多样性受到威胁的区域。例如, 中国东部尽管不是鸟类最丰富的群落, 但这一区域鸟类的谱系多样性受威胁的程度更高。中国的保护区网络已经覆盖了很多的热点地区, 但仍有进一步增加面积、优化布局的需要。

文章以 “Effectiveness of protected areas for vertebrates based on taxonomic and phylogenetic diversity” 为题在线发表在 *Conservation Biology* 上 (DOI: 10.1111/cobi.12986)。

该研究得到了国家自然科学基金 (31672265, 31501851)、广东省科学院科研平台环境与能力建设项目 (RYCG12-14, GDHS15SGFX07060) 等基金的资助。

(广东: 权擎 邹发生)

两种长尾山雀的种间基因流和基因组分化

近缘种之间基因组异质性的分化是一种普遍存在的现象, 一些高度分化的基因组区域 (分化岛, genomic differentiation islands) 随机的散落在未分化的基因组背景当中。早先的理论认为, 这些分化岛包含有生殖隔离的基因, 从而能够抵抗基因流, 进而导致这种异质性的分化格局。近期研究表明, 作用于低重组区的连锁选择也会导致该基因组区域的高度分化。本研究采用 RAD-seq 的数据调查了这两个近缘物种黑眉长尾山雀 (*Aegithalos bonvaloti*) 和银脸长尾山雀 (*Aegithalos fuliginosus*) 之间的基因流和基因组分化的模式。结果表明, 这两个物种在接触区存在显著的基因流。同时对基因组分化岛的分析表明, 整体上这些分化岛并没有显示出能够抵抗基因流的证据。另外我们的结果还表明, 两个物种异域种群之间的基因组的分化可能是由于连锁选择导致的, 但是连锁选择并不能解释伴随基因流的接触区的种群之间基因

组的分化。

(北京: 张德志 宋刚 高斌 程亚林 屈延华
邵施苗 吴永杰 Per Alström 雷富民; 江苏: 伍
少远)

鸟类是研究 2 型糖尿病的重要动物模型

在哺乳动物中, 慢性血糖升高 (高血糖) 和胰岛素含量减少最终会导致机体出现 2 型糖尿病症状 (T2DM)。鸟类比哺乳动物具有显著的高血糖特征 (体重相当时, 鸟类通常是哺乳动物的 1.5~2 倍), 而鸟类却能很好地调控血糖水平, 并无任何 T2DM 症状。一些研究发现鸟类飞行时能迅速增强脂肪酸转运和利用能力, 这种能量底物的利用方式是 T2DM 患者的典型症状, 即当葡萄糖充足时, 机体无法利用葡萄糖而依赖于脂类氧化。据我们所知, 目前鸟类糖脂代谢的具体调控机制还不清楚, 但是, 鸟类这种超强的糖脂代谢调控能力对揭示人类 T2DM 的发病机制及相应的治疗方案具有重要参考价值。

本文发表在 *Austin Endocrinology and Diabetes Case Reports* (2017; 2(1): 1007.)。

(河北: 李东明)

繁殖期树麻雀雄鸟在急性应激状态下血浆皮质酮、皮质酮结合蛋白和睾酮的动态关系

鸟类血浆中的皮质酮 (CORT)、睾酮 (T) 和皮质酮结合蛋白 (CBG) 参与调节繁殖和自身生存之间的“权衡”。急性应激状态下, 绝大多数鸟类的血浆内 CORT 水平均可显著升高, 而睾酮水平降低或维持稳定。鉴于鸟类中 CORT 和 T 竞争与 CBG 结合, 它们三者间在应激状态下的相互作用关系及潜在机制值得关注。本研究以树麻雀 (*Passer montanus*) 雄鸟为对象, 研究在筑巢期、产

卵期、育雏期其血浆 CORT、T、CBG 结合力、游离和结合 CORT、游离和结合 T 水平在急性应激过程中的动态变化特征。研究发现本底和应激水平 CORT 并不随特定繁殖阶段而变化, CORT 总量和与 CBG 结合的 CORT 水平却因刺激而增加, 但游离 CORT 水平不变; 本底水平的 T 总量、游离 T 和结合 T 仅在筑巢期最高、且应激状态下显著降低。在应激状态下, CORT 和 T 并无显著相关性。因此, 在急性应激状态下鸟类的 CBG 起重要的缓冲作用 (应激状态下, CBG 仍具很多可与 CORT 和 T 结合的位点), 这一特征有助于它们在繁殖期增加适合度。

本文发表在 *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology* (2017, 205: 41-47.)

(河北: 李亚青 孙砚峰 李末 吴跃峰 李东明; 美国: Jesse S. Krause)

树麻雀雄鸟的身体状况和免疫能力的关系受生活史影响

在野生动物中, 一些证据表明先天免疫能力和获得性免疫能力在不同生活史阶段的差异很大, 且与自身能量需求和外界食物资源可用性密切相关。然而, 动物如何协调身体状况与免疫能力、先天免疫与获得性免疫能力之间的关系, 以提高越冬期 (非繁殖期) 的生存率和增加繁殖期成功率? 本研究检测了越冬期和繁殖期树麻雀 (*Passer montanus*) 雄鸟的身体状况指标 (校正体重 [SCM] 和红细胞比容 [Hct]), 先天免疫能力指标 (血浆总补体活性 [CH50]) 和获得性免疫能力指标 (血浆免疫球蛋白 A [IgA]), 以及嗜异性 / 淋巴细胞比值 (H/L)。结果表明: 越冬期树麻雀的 IgA 水平显著高于繁殖期; 两个身体状况指标在越冬期和繁殖期均与血浆 CH50 活性呈显著负相关, 且在越冬期还与 IgA 水平呈显著正相关 (在繁殖期与 IgA 水平无关);

在越冬期和繁殖期 CH50 活性和 IgA 水平均无显著相关性。这些结果表明, 树麻雀雄鸟的身体状况与免疫能力之间的关系与生活史阶段有关, 且先天免疫能力和获得性免疫能力无关。本研究认为在非繁殖期鸟类的身体状况(SCM 和 Hct)可较好地预测其免疫能力, 这有助于进一步认识鸟类免疫能力的个体差异及潜在原因, 从而揭示野生动物先天免疫能力和获得性免疫能力之间的关系。

(河北: 赵宇亮 李末 孙砚峰 吴跃峰 李东明)

研究生论文选登

水鸟对渤海湾北部盐池的利用研究

随着天然滨海湿地正以惊人的速度消失, 东亚-澳大利西亚迁徙路线上多种水鸟的数量急剧下降。作为天然湿地被改造后出现的生境类型, 人工湿地为部分水鸟的生存和繁衍提供了替代性的栖息地。准确地评估人工生境在缓解天然湿地快速消失后对水鸟多样性维持所发挥的作用, 是本条迁徙路线保护工作的一项重要内容。海岸盐池是滨海地区常见的一种人工湿地类型, 在世界范围内被认为是一种能够支持大量水鸟的功能性湿地。位于渤海湾北部的南堡盐池区(总面积 290 km²)是世界上最大的盐池区之一, 有关该盐池在水鸟多样性维持方面的作用尚缺乏专项研究。为此, 我们于 2013—2016 年对该盐池区及其毗邻的天然潮间带滩涂的水鸟开展了系统的野外调查, 分析和评估了该湿地对于东亚-澳大利西亚迁徙路线水鸟生存和繁衍的生态功能和潜在价值, 并对未来该湿地的保护和管理提出了建议。本论文的主要结果如下:

1. 调查期间在南堡盐池区共记录到水鸟 89 种, 占我国水鸟物种总数的 31.37%, 其中 27 种水鸟的种群数量超过其在东亚-澳大利西亚迁徙路线总种群数量的 1%, 优势物种和

常见物种包括弯嘴滨鹬(*Calidris ferruginea*) (最大数量占该迁徙路线种群数量的 69%)、红腹滨鹬(*Calidris canutus*) (占 40%)、黑翅长脚鹬(*Himantopus himantopus*) (占 61%)、反嘴鹬(*Recurvirostra avosetta*) (占 57%)、鹤鹬(*Tringa erythropus*) (占 54%)、黑尾塍鹬(*Limosa limosa*) (占 11%) 和遗鸥(*Larus relictus*) (占 43%) 等。在该盐池区中, 包括取食和休息的个体在内, 高潮阶段春季和秋季记录到的最大水鸟数量分别是 96,000 只和 93,500 只; 而相应地低潮阶段在滩涂上记录到的最大水鸟数量分别为 73,000 只和 20,000 只。在春季北迁时期, 该地区利用滩涂的水鸟的平均数量较利用盐池的多; 而秋季南迁期间则刚好相反, 盐池中的鸟类数量相对更多。冬季该地区利用盐池的鸟类非常少, 但有数千只个体在滩涂上取食。从湿地功能上看, 不论是高潮还是低潮阶段, 春季水鸟在内陆盐池区(中心位置距潮间带距离约 8.7 km)主要是取食, 在海边盐池区(两处中心位置距潮间带距离分别约为 1.0 km 和 2.8 km)主要是休息。从各种水鸟对盐池的利用程度看, 黑尾塍鹬、反嘴鹬、泽鹬(*Tringa stagnatilis*) 和黑翅长脚鹬等水鸟几乎只利用盐池, 而红腹滨鹬、大滨鹬(*Calidris tenuirostris*)、斑尾塍鹬(*Limosa lapponica*)、白腰杓鹬(*Numenius arquata*)、遗鸥和灰斑鸻(*Pluvialis squatarola*) 等更偏好滩涂湿地。鉴于南堡盐池区以及毗邻的潮间带滩涂是东亚-澳大利西亚迁徙水鸟的关键中停地, 该地区正面临着巨大的开发压力, 因此尽早建立涵盖滩涂和盐池的自然保护区是加强该湿地及其水鸟保护的一条最有效途径。

2. 作为水鸟的重要栖息地, 南堡盐池区的底栖动物丰富, 主要以卤虫(*Artemia* spp.)、摇蚊幼虫(摇蚊科)以及盐水蝇的幼虫、蛹(水蝇科)构成。经鉴定, 水蝇科和摇蚊科的主要物种分别为盐生摇蚊(*Chironomus salinarius*) 和蓝额水蝇(*Ephydra glauca*)。在我们采集的所有样品中, 卤虫、摇蚊幼虫

以及盐水蝇的幼虫、蛹和成体所占的数量比例分别为29%、27%、17%、26%和0.3%。无灰干重(Ash Free Dry Weight, AFDW)生物量的比例(不包括其他稀少的底栖动物)分别为8.4%、8.3%、16.0%、66.0%和0.7%。底栖动物分布不均匀,密度在各盐池间差异悬殊。卤虫、摇蚊幼虫以及盐水蝇的幼虫、蛹和成体的平均密度分别为 700 ± 208 、 619 ± 194 、 445 ± 140 、 852 ± 289 和 7 ± 3 个/ m^2 (means \pm SE),相应的平均生物量为 0.110 ± 0.037 、 0.095 ± 0.032 、 0.240 ± 0.004 、 1.098 ± 0.374 、 0.009 ± 0.004 g AFDW/ m^2 。底栖动物中盐水蝇蛹的生物量最大。盐池周边的盐水蝇成体密度和生物量分别为 $11,890 \pm 3,963$ 个/ m^2 和 15.219 ± 5.073 g AFDW/ m^2 。广义线性混合模型分析表明,在春季,随着季节的推进,底栖动物的密度逐渐上升,而水深、盐度、水质情况以及位置对底栖动物的分布与密度存在重要影响。研究发现,南堡盐池区高密度的底栖动物为东亚-澳大利西亚迁徙路线上的候鸟提供了充足的食物资源。

3. 使用广义线性混合模型分析表明,3个类别的水鸟(小型鸻鹬类,非小型鸻鹬类及非鸻鹬类水鸟)对南堡盐池区的取食受水深、盐度、水质、人为干扰、天敌及日期等多方面因素的影响。盐度、水质、人为干扰和天敌对水鸟取食数量的影响在3个类别间是类似的,而水深和日期的影响则因类别而异。3类水鸟的取食数量都随着盐度的上升而减少,但模型中盐度只显著影响了非鸻鹬类水鸟的取食数量。在无废水的盐池中取食数量均显著大于有废水的盐池。天敌和人为干扰的存在会减少水鸟的取食数量,但均没有达到显著的影响。非小型鸻鹬类取食数量随水深的增加而减少;小型鸻鹬类和非鸻鹬类水鸟的取食数量则随水深增加而呈二次效应,但小型鸻鹬类的二次效应不显著。鸻鹬类最适宜的取食水深为0~10 cm,非鸻鹬类水鸟的最适宜取食水深为30~40 cm。日期对小型鸻鹬类有显著的二次效应,对非小型鸻鹬类

的二次效应不显著。随着迁徙季节推进非小型鸻鹬类取食数量持续减少,小型鸻鹬类和非鸻鹬类水鸟都在迁徙季节的中期取食数量最多。未发现其他显著影响水鸟取食的因素。除了2014年的小型和非小型鸻鹬类,2016的小型鸻鹬类,三类水鸟研究期间在各盐池间的数量都存在显著差异。

4. 在本研究区,泽鹬、反嘴鹬、黑翅长脚鹬主要利用盐池生境,黑腹滨鹬(*Calidris alpina*)、弯嘴滨鹬、红颈滨鹬(*Calidris ruficollis*)、环颈鸻(*Charadrius alexandrinus*)、尖尾滨鹬(*Calidris acuminata*)则综合利用滩涂和盐池生境,翻石鹬(*Arenaria interpres*)、翘嘴鹬(*Xenus cinereus*)则基本只利用滩涂生境。采用视频记录手段(或者直接观察取食行为)为主,查看部分死亡个体的胃容物分析为辅的研究方法,对南堡湿地的鸻鹬类食性进行了研究,并对泽鹬和黑尾塍鹬的取食成功速率进行了分析,对取食效率进行估算。结果发现:鸻鹬类在南堡湿地的食性组成多样化,包括贝类、螺类、甲壳类、双翅目、鞘翅目和蛛形目等;鸻鹬类的食性组成与其对滩涂和盐池生境的利用模式较吻合,来自盐池的主要食物为卤虫、盐水蝇幼虫、蛹和成体以及摇蚊幼虫等,不同鸟类的食性存在差异;泽鹬和黑尾塍鹬的取食成功速率分别为 $0.259 \pm 0.009/\text{s}$ ($n = 211$)和 $0.223 \pm 0.015/\text{s}$ ($n = 96$) (means \pm SE);泽鹬和黑尾塍鹬在盐池中的取食效率(单位时间无灰干重摄入)分别为 0.167 ± 0.011 mg AFDW/s和 0.172 ± 0.005 mg AFDW/s。对比每日摄入能量与每日能量需求(daily energy requirement, DER),我们推测泽鹬需在夜间取食,黑尾塍鹬应另有其他更高取食效率的取食地。主要在盐池中取食的鸻鹬类水鸟相对的肌胃干重和相对盐腺干重都要小于滩涂上以贝类或螺类为食的物种,而两种生境混合利用的水鸟相对的肌胃干重和相对盐腺干重的大小则介于上述两者之间。

5. 反嘴鹬是在南堡盐池区取食和繁殖的

一种常见候鸟。2015—2016 年我们对其繁殖表现进行了为期两年的调查与监测。结果发现,两年之中其巢表观存活率分别为 52.7% 和 47.9%,每日存活率分别为 0.984 和 0.970,以孵化期 24 天的平均存活率分别为 67.4% 和 48.2%。南堡盐池区反嘴鹬的巢存活率与世界其他地区同类的巢存活率相当,较高的存活率得益于该地区盐池较低的人为干扰。造成繁殖失败的主要原因是弃巢,而捕食者的影响因素相对较低。MARK 模型分析显示,巢存活率与卵数、巢区位置、巢距地面高度、巢龄、繁殖时间、温度和降雨等因素相关,各因素对存活率的影响在两年的两个研究地有所不同。此研究表明,在人为干扰较低的情况下,盐场可以成为反嘴鹬的一个理想繁殖地。

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白眉姬鹀配偶选择与繁殖适合度研究

配偶选择是影响动物繁殖适合度的决定性因素,对个体繁殖适合度的影响体现在直接受益和间接受益两方面。婚外交配现象在社会单配制鸟类中较为普遍,因雌性在配偶选择过程中常受繁殖期短和雌性间的竞争等影响,导致所选择的社会配偶不理想,婚外配因此被认为是弥补最初配偶选择的一种行为现象。虽然目前对鸟类婚外配的发生模式和获益进行了大量研究,但仍存在诸多争议。

2011 年—2013 年的 4 月—7 月,作者以白眉姬鹀为研究对象,在吉林省左家自然保护区利用人工巢箱招引 64 巢白眉姬鹀,采集了样地内所有繁殖巢 128 只成鸟的血液样品、形态测量数据、繁殖参数和 325 只雏鸟的血液样品等,并收集了繁殖巢密度等生态因子数据。室内采用多态性较高的 10 对 SSR 分子标记和 MHC II 族外显子 2 基因,对白眉姬鹀双亲的杂合度、基因相似度、遗传距离

等进行了实验分析,对婚外父权进行了鉴定,探讨了白眉姬鹀配偶选择和婚外配偶选择模式和配偶选择对子代繁殖适合度的影响。

白眉姬鹀社会配偶选择研究发现:社会配偶间的 MHC 基因相似性显著低于随机配对的配偶间的 MHC 基因相似性;雌性倾向于选择带有与本身 MHC 等位基因多样性居中的雄性作为配偶,因此与中间数量等位基因假说相符。

白眉姬鹀婚外配偶选择模式研究发现:白眉姬鹀种群婚外配比例较高;雌性倾向于选择微卫星位点杂合度较高且与自身 MHC 相似性较低的雄性作为婚外配偶;雌性与社会配偶间的 MHC 基因多样性交互作用影响婚外配的发生;雄性体长与微卫星杂合度显著相关,雄性的尾长与 MHC 基因杂合度相关联。研究结果说明雌性可能根据雄性的身体特征评估其遗传质量;基于微卫星位点的婚外配偶选择分析支持优质基因假说,但不排除基因兼容性假说;基于 MHC 位点的分析结果符合中间数量等位基因假说。

生态因子对婚外配影响分析结果表明:繁殖密度和繁殖同步性以及二者之间的交互作用对婚外配的发生无显著影响。与大多数研究结果不同,本论文发现白眉姬鹀不选择最近雄性邻居作为婚外配偶,婚外配偶的体长和微卫星杂合度明显高于社会配偶,说明选择高质量的雄性作为婚外配偶可能是白眉姬鹀不选择最近邻居的主要原因。另外,白眉姬鹀是否根据自身质量选择最近邻居以避免父权丧失有待于通过实验予以验证。

对白眉姬鹀子代适合度分析发现:白眉姬鹀婚外子代基因杂合度明显较婚内子代高,该结果与间接获益假说相符。种群子代性比显著偏雌,但婚外子代与婚内子代性比无显著差异。

(东北师范大学:鄂明菊;导师:王海涛)

三种雀形目鸟类报警信息传递研究

动物间的信息交流对维持社群关系、个体生存和繁殖至关重要。揭示动物信息的传递机制与起源进化,一直是动物通讯研究领域里的核心问题。鸣声是鸟类主要的通讯方式,当其遇到危险时除表现应激行为外通常伴随着报警声。然而,鸟类报警声究竟传递了哪些信息,这些信息是如何被传递等问题仍然不甚清楚。本文以 3 种雀形目鸟类为研究对象,初步探讨了捕食和巢寄生背景下报警声所传递的信息及传递机制。

本研究采用野外标本摆放、报警声录制及分析、声音回放及行为观察等方法,通过室内实验数据比较与分析,得出以下的主要研究结果:

将家燕(*Hirundo rustica*)对寄生者大杜鹃(*Cuculus canorus*)与捕食者雀鹰(*Accipiter nisus*)发出的报警声回放给同域繁殖和异域繁殖的家燕,结果发现:家燕回应同种对雀鹰发出的报警声时,行为应答强度显著高于回应同种对大杜鹃发出的报警声时的行为应答强度。研究结果表明家燕能够区分大杜鹃和雀鹰,其报警声可以传递不同信息给同种个体,且不同繁殖区域的同种个体可互享报警信息。

对大山雀(*Parus major*)面对雀鹰与大杜鹃时的行为反应及报警声的分析发现:大山雀面对两者时虽回应行为未表现出显著差异,但发出的报警声明显不同,其面对雀鹰比面对大杜鹃时发出了更多的 D 型音素和更少的 I 型音素。报警声回放实验发现:大山雀回应同种对雀鹰发出的报警声时,行为应答强度显著高于回应同种对大杜鹃发出的报警声时的行为应答强度。研究结果表明,大山雀可以区分雀鹰与大杜鹃,其可能通过调整报警语句音素组合类型和音素个数/句传递相关的报警信息。

将大山雀对大杜鹃发出的 C-D (含两种短语)报警语句及剪辑合成 C 和 D 两种报警

语句回放给雄性大山雀,结果发现:C 和 C-D 报警语句可引起雄性大山雀明显的扫视行为,回放 D 报警语句则并未引起雄鸟特殊的行为应答。研究结果表明,C 短语与 D 短语在传递信息时可能起不同的功能作用,C 短语可能起到提示威胁者在周围的作用,而 D 短语的功能作用尚待进一步研究。

将大山雀对巢捕食者花鼠(*Tamias sibiricus*)、雀鹰、大杜鹃、山斑鸠(*Streptopelia orientalis*)发出的报警声回放给巢内正在孵化的大山雀雌鸟,结果发现:雌鸟回应同种对花鼠发出的报警声时,可引起观望洞口甚至飞离巢的行为,其行为应答强度显著高于听到其他三种报警声时的回应强度。研究结果表明,大山雀雌鸟可根据报警声判断巢外情况进而采取不同的行为对策。

将绿背山雀(*Parus monticolus*)面对大杜鹃(大体型)和翠金鹃(*Chrysococcyx maculatus*,小体型)发出的报警声回放给巢内正在孵化的绿背山雀雌鸟,发现雌鸟在听到翠金鹃与大杜鹃报警声时行为应答相似,均表现出观望巢外或飞离巢的行为。研究结果表明,绿背山雀对寄生者发出的报警声可能未传递有关体型大小的信息。

本文证明雀形目鸟类报警声具有报警信息传递的功能。三种雀形目鸟类在面对不同压力类型的入侵者时,其行为上虽未表现出差异,但其报警声均传递了入侵者的相关信息给同种信息接收者。报警语句中的声学特征,如音素组合类型、音素个数/句及鸣叫速率等可能在报警信息传递过程中起到作用。当种内信息接收者接收到信息时,可对接收到的信息进行权衡,进而采取相应的行为应答。

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大山雀一次繁殖孵化期双亲投入研究

繁殖投入是鸟类关键的生活史特征,直

接影响到鸟类的繁殖成功率。孵化期是鸟类繁殖周期中的重要环节之一,双亲需在抚育亲代和自我生存之间进行权衡选择,但目前对孵化期雌雄双亲投入研究较少。作者于2015—2016年的3—7月,选择吉林省左家自然保护区为研究区域,通过悬挂人工巢箱招引大山雀,对其一次繁殖孵化期双亲投入进行了研究。采用半日录像记录雌鸟的坐巢率、雄鸟的递食次数,通过巢入侵者模拟实验检测雌鸟的巢防御强度,通过报警声回放实验检测雄鸟的巢防御强度,探讨分析了首枚卵产期、窝卵数、成鸟的身体质量及环境温度等内在和外在因素对大山雀孵化期双亲投入的影响。

研究发现:大山雀雌鸟的坐巢率与窝卵数、首枚卵产期、孵化天数呈显著正相关,即窝卵数越大,产卵越晚,孵化天数越多,雌鸟的坐巢率越高;而与环境温度呈负相关,即环境温度越低,雌鸟的坐巢率越高。雄鸟的递食次数与窝卵数呈正相关,即窝卵数越大,雄鸟递食次数越多;而与环境温度呈负相关,即环境温度越低,雄鸟递食次数越多。雄鸟的防御强度与其自身的身体质量呈正相关,即身体质量越高,防御强度越高。雌鸟的防御强度与窝卵数呈正相关,即窝卵数越大,防御强度越高。大山雀的孵化成功率与窝卵数呈正相关,即窝卵数越大,孵化成功率越高。研究结果表明:大山雀可根据窝卵数、首枚卵产期、自身身体质量、环境温度等调整孵化期繁殖投入。

(东北师范大学:吕伟伟;导师:王海涛)

雌性大山雀婚外配偶选择的影响因素

单配制鸟类中,雌性与社会配偶之外的雄性个体发生交配的行为被称为婚外交配,所产生的子代被称为婚外子代。单配制因此被区分为社会单配制与遗传单配制。婚外配的发生及影响因素近些年成为鸟类行为生态

学研究的热点问题之一,研究者对鸟类婚外交配发生机制开展了大量研究,但对于婚外交配发生的影响因素尚无定论,即使对于同一物种的研究结果也不一致。大山雀是一种社会单配制的小型次级洞巢鸟,研究已证实其存在婚外交配现象。2014—2016年,作者在吉林省左家自然保护区,利用人工巢箱招引大山雀,对其婚外交配行为进行了研究,目的是确定目标种群的婚外交配发生比例,探讨分析婚外交配发生的影响因素及婚外交配的形态和行为特征。

本研究共成功捕捉到73巢一次繁殖大山雀的双亲,并采集了成鸟及雏鸟血液,测量了成鸟身体条件;录制了49巢一次繁殖雄性的领域鸣唱。采用微卫星分子标记对大山雀进行父权鉴定,利用Cervus3.0软件、COANCESTRY软件以及SPSS21.0软件对分子实验结果、形态数据及声音数据进行分析。研究发现:35.61% (26/73)大山雀一次繁殖巢存在婚外父权,婚外子代占全部子代的9.28% (77/829),存在婚外子代的巢中28% (77/275)的雏鸟为婚外配子代。有婚外子代和无婚外子代巢的雄性形态特征、鸣唱特征均无显著差异,说明雌性可能不依据雄性形态特征及鸣唱选择婚外配偶。发生婚外交配和未发生婚外交配巢雄性的基因杂合度无显著差异 ($Z = -1.493$, $p = 0.135$),但发生婚外交配雌性的社会配偶的基因杂合度显著低于其婚外交配的基因杂合度 ($Z = -2.425$, $p = 0.021$)。同一巢内的婚内子代与婚外子代的基因杂合度无显著差异 ($Z = -1.323$, $p = 0.186$)。雌性选择的婚外交配的基因杂合度并不高于种群随机雄性的基因杂合度 ($W = -1.0309$, $p = 0.3091$),表明雄性基因杂合度并不是促使雌性发生婚外交配的主要动力,虽雌性偏爱比其社会配偶杂合度高的雄性作为婚外交配,但婚外交配未能增加其子代杂合度。发生婚外交配巢的雌雄配偶间的基因相似度显著高于未发生巢雌雄配偶间基因相似度 ($t = -2.237$, $p = 0.028$),且雌性与社会配偶的基因相似度显

著高于其与婚外配偶的基因相似度 ($t = 4.430$, $p < 0.001$), 说明社会配偶间基因相似度可能是雌性发生婚外配的主要影响因素, 雌性偏爱选择与自身基因相似度低的雄性作为婚外配偶。

(东北师范大学: 魏玉圣; 导师: 王海涛)

白眉姬鹀雄性婚外配获益与代价

在社会单配制鸟类中, 婚外配现象普遍存在, 超过 70% 的雀形目鸟类存在婚外交配的行为, 严格的遗传一夫一妻制不足 25%。前期研究发现, 左家地区白眉姬鹀 (*Ficedula zanthopygia*) 婚外配发生比例较高, 作者于 2015 年和 2016 年的 3—7 月, 利用人工巢箱招引白眉姬鹀, 对产卵期白眉姬鹀进行配偶监护的半日观察, 孵化期进行标本实验, 育雏期录像记录亲鸟递食次数, 探究白眉姬鹀在婚外配中获益与代价。

研究期间共发现白眉姬鹀 48 巢, 其中 25 巢存在婚外父权; 雏鸟共 245 只, 婚外子代 65 只; 婚外配发生比例约为 52.1%。

研究发现: 发生婚外配行为的雄性可获得的遗传子代总数多于未发生婚外配行为的雄性。雄性对于雌性的监护强度与婚外父权之间无显著相关, 雄性身体大小综合值与其对配偶的监护强度呈正相关。对于亲鸟防御实验的探究结果显示: 雄性防御强度与雌性防御强度之间无显著性差异; 雄性的防御强度与婚外父权之间无显著相关; 雄性的防御强度与其在其他巢中的婚外子代数之间无显著相关; 雄性的防御强度与窝卵数无显著相关。对于育雏期亲鸟的递食行为分析结果显示: 雌性平均递食率多于雄性平均递食率, 雌雄平均递食率之间存在显著差异; 雄性的递食百分比和在巢时长百分比与婚外子代数无显著相关; 存在婚外父权和不存在婚外父权巢中, 雌雄鸟的递食率无差异。雄鸟的递食率与其身体大小综合值间呈显著正相关。

以上研究结果显示: 雄性可能通过婚外交配获得更多的遗传子代, 增加繁殖适合度; 雄性并未通过配偶监护有效的防止父权的丧失。存在婚外配和不存在婚外配巢中, 雄性防御强度和递食投入无显著差异。

(东北师范大学: 于洋洋; 导师: 王海涛)

白眉姬鹀身体特征和鸣唱特征对婚外配偶选择的影响

婚外配现象在社会单配制鸟类中十分普遍, 前期研究发现在单配制的雀形目鸟类中, 约有 86% 的鸟种中存在婚外配行为。在发生婚外配的鸟类中, 雄性特征起到的重要作用已被证实。作者于 2015—2016 两年间在吉林省左家自然保护区内, 研究影响白眉姬鹀婚外配偶选择的因素。从雄性的身体特征以及领域鸣唱特征两个方面进行分析。两年共监测白眉姬鹀 48 巢, 成鸟 96 只, 雏鸟 245 只。在白眉姬鹀繁殖期内, 对 41 只雄性个体的领域鸣唱录音, 声音分析采用 Avisoft-SASLab Pro 5.2 声音分析软件根据选取的微卫星标记位点以及 Cervus 3.0 软件进行父权鉴定, 利用 SPSS 19.0 以及 R 软件分析结果。本文研究显示两年内监测的 48 巢中, 25 巢存在婚外子代, 婚外配巢比例为 52.08% (其中 2015 年婚外配巢比例为 59.26%; 2016 年婚外配巢比例为 42.86%), 婚外子代比例为 26.53%。其中 32 只婚外子代确定父权。婚外配发生比例及数量在年际之间不存在显著差异。

研究发现有婚外配行为的雌性其社会配偶与婚外配偶在身体特征 (跗跖长、翅长、尾长、体长、体重) 上无显著差异; 本研究中选取的 7 个雄性领域鸣唱特征 (鸣唱速率、鸣唱多功能性、句子中音素个数, 句子平均时长、句子最高频、句子最低频、主频) 中, 社会配偶和婚外配偶在句子最高频上存在显著差异 ($Z = -0.278$, $p = 0.029$), 句子最高频 ($\chi^2 = 6.300$, $p = 0.017$) 和句子主频 ($\chi^2 = 9.932$,

$p = 0.003$) 对白眉姬鹀婚外父权的分配有显著影响。此外, 本研究还发现白眉姬鹀的领域鸣唱特征不能代表个体的身体条件。

(东北师范大学: 张思宇; 导师: 王海涛)

松嫩平原五种鹤迁徙期停歇栖息分布研究

对于每年都进行长距离迁徙的鹤类来说, 松嫩平原是其迁徙途中的重要停歇地, 是鹤类迁徙途中的食物补给地与能量加油站。松嫩平原分布有丹顶鹤、白枕鹤、白头鹤、灰鹤与白鹤五种鹤类, 探讨松嫩平原迁徙期五种鹤类的迁徙分布规律, 能够对五种物种的种间关系及停歇地选择有更深层次地认知, 为维护鹤类生态安全提出行之有效的保护建议。本文以鹤类为主要研究对象, 2014—2016年春季的3—5月、秋季的8—11月, 在松嫩平原的扎龙、乌裕尔河、哈拉海湿地、向海、莫莫格及图牧吉六个保护区对五种鹤类的春迁期及秋迁期进行了连续地追踪调查。初步分析的结果如下。

1. 五种鹤春迁期迁徙时长依次为: 白头鹤 > 灰鹤 > 白鹤 > 丹顶鹤 > 白枕鹤; 秋迁期迁徙时长依次为: 白头鹤 > 灰鹤 > 白鹤 > 丹顶鹤 > 白枕鹤。春迁期五种鹤类种群数量排序为: 灰鹤 > 白鹤 > 白头鹤 > 丹顶鹤 > 白枕鹤; 秋迁期种群数量排序为: 白头鹤 > 灰鹤 > 白鹤 > 白枕鹤 > 丹顶鹤。

2. 丹顶鹤春迁期迁徙时长 32.5 ± 3.5 d, 春迁期集群多以三四个家族群的方式活动, 影响丹顶鹤春迁期停歇地选择的因素主要为气候要素、干扰要素、农田距离及水要素; 丹顶鹤春迁期松嫩平原停歇地的空间分布型为聚集分布, 多在扎龙、乌裕尔河保护区停歇。秋迁期迁徙时长 47.5 ± 0.5 d, 多以单独家族群的方式活动, 影响丹顶鹤秋迁期停歇地选择的因素主要为干扰要素、气候要素、农田距离及水要素; 秋迁期停歇地空间分布型为随

机分布。

3. 白枕鹤春迁期迁徙时长 31 ± 1 d; 影响白枕鹤春迁期停歇地选择的因素主要为食物与水要素、干扰要素及农田距离; 春迁期停歇地空间分布型为聚集分布。白枕鹤秋迁期迁徙时长 42 d, 多以 10 只左右的家族群方式活动。

4. 灰鹤春迁期迁徙时长 57.5 ± 1.5 d, 种群多以 220 只的集群规模活动, 4 月中旬达迁徙高峰; 影响灰鹤春迁期停歇地选择的因素主要为水要素与农田距离、隐蔽要素及气候要素; 春迁期停歇地空间分布型为聚集分布, 集中在各保护区的核心区内。秋迁期迁徙时长 58.5 ± 2.5 d, 秋迁期集群规模多在 100 只, 10 月下旬出现迁徙高峰; 影响灰鹤秋迁期停歇地选择的因素主要为隐蔽要素与水要素、气候要素及干扰; 秋迁期停歇地空间分布型为随机分布。

5. 白头鹤每年春季 3 月下旬迁飞至松嫩平原, 停留时间持续 59.5 ± 0.5 d, 多以 50 只种群规模进行活动, 每年四月中旬达迁徙高峰; 影响白头鹤春迁期停歇地选择的因素主要为食物要素、干扰要素及水要素; 春迁期停歇地呈现稍显聚集的空间分布型, 但随机因素发挥着重要作用。秋迁期 9 月下旬迁来, 种群规模多集 150 只活动, 停留时间持续 59.5 ± 2.5 d, 10 月中上旬达迁徙高峰; 影响白头鹤秋迁期停歇地选择的因素主要为干扰要素、食物要素、水要素与风速; 秋迁期停歇地空间分布型为随机分布。

6. 白鹤春迁期时长 55.5 ± 0.5 d, 影响白鹤春迁期停歇地选择的因素主要为气候要素、植被要素、水与干扰要素; 春迁期适宜其停歇的地点多集中在莫莫格鹅头泡、图牧吉三道泡、向海, 呈现明显的空间聚集趋势。秋迁期时长 57.5 ± 0.5 d, 影响白鹤秋迁期停歇地选择的因素主要为食物要素、气候要素与干扰要素; 秋迁期停歇地空间分布型为随机分布。

基于研究结果, 提出了在松嫩平原鹤类

迁徙期的主要保护管理措施包括对各保护区提出以下建议:1、建立生态补水长效机制。2、加强人为活动干扰监测力度,限制区内人为活动。3、对重要迁徙停歇点可采取人工投放

食物。4、强化核心区的资源保护。5、建议构建鹤类局部保护网络。

(东北林业大学:陶蕊 吴庆明 李全亮 黄
华智 高忠斯 王子健 邹红菲)



2016 年我国鸟类环志概况

2016 年全国有 48 个单位开展了鸟类环志工作,共环志鸟类 431 种约 10 万只,其中环志陆地鸟类的环志站有 29 个,共环志 298 种 8.6 万只。雀形目鸟类环志数量最多,共 239 种 8.5 万只,鸛形目 18 种 3,541 只,猛禽 34 种 800 只,鸽形目 52 种 4,635 只,鹃形目 11 种 394 只,雁形目 23 种 1,247 只,鹤形目 18 种 278 只,鷺形目 12 种 373 只,佛法僧目 3 种 181 只,分别占环志总数的 87.77%、3.67%、0.83%、4.81%、0.41%、1.29%、0.29%、0.39%、0.19%。

环志数量居前 10 位的种类均为雀形目鸟类,主要有灰头鹀 (*Emberiza spodocephala*)、白腰朱顶雀 (*Carduelis flammea*)、红胁蓝尾鸲 (*Tarsiger cyanurus*)、燕雀 (*Fringilla montifringilla*)、田鹀 (*Emberiza rustica*)、黄喉鹀 (*E. elegans*)、黄眉柳莺 (*Phylloscopus inornatus*)、小鹀 (*Emberiza pusilla*)、长尾雀 (*Uragus sibiricus*) 和棕眉山岩鹀 (*Prunella montanella*)。

2016 年全国开展彩色标记的单位有 23 个,彩色标记鸟类 107 种 5,067 只。主要种类有雀形目鸟类 42 种 941 只、鸽鹑类 42 种 3,870 只、雁鸭类 13 种 186 只、鸛形目 5 种 50 只、鹤形目 4 种 11 只、鷺形目 1 种 9 只。

(北京:陈丽霞 陆军)

黑龙江新青鸟类环志站 2016 年环志简讯

黑龙江新青鸟类环志站 2016 年全年共环志 8 目 28 科 88 种 25,183 只鸟,历时 141 天,其中:重捕 1,067 只,归家 24 只。自 2007 年开展环志工作以来,新青鸟类环志站已环志 14 目 41 科 189 种 376,778 只。

今年环志的鸟类还是以雀形目最多,共环志 18 科 69 种,占环志总量的 99.3%,非雀形目环志了 7 目 10 科 19 种 157 只,占 0.7%;在雀形目中环志数量最多的为鹀科 11 种 9333 只,占环志总量的 39% (其中灰头鹀 (*Emberiza spodocephala*) 3,940 只、田鹀 (*E. rustica*) 3774 只);其次是雀科 11 种 9,253 只,占环志总量的 38.5% (燕雀 (*Fringilla montifringilla*) 3,704 只、朱顶雀 (*Carduelis flammea*) 2,023 只、北朱雀 (*Carpodacus roseus*) 1,398 只);莺科 11 种 1,378 只,占环志总量的 5%;鹡科 10 种 494 只,占环志总量的 2%;山雀科 5 种 1,522 只,占环志总量的 6.3%;鹛科 3 种 234 只,占环志总量的 0.97%;鹧科 4 种 182 只,占环志总量的 0.75%;伯劳科 2 种 85 只,占环志总量的 0.35%。

根据 10 年间的环志数据分析,朱顶雀的数量变化最大,2007 年—2010 年、2013 年、2014 年环志的数量都在 5,000~10,000 只以上,而今年环志数量是继 2011 年、2012 年、2015 年后最少的一年,其原因可能是今年的降雪比往年晚,朱顶雀在森林里食物充足、觅食范围小,或其他原因,还需要进一步调查和探讨。

(黑龙江:侯林祥 李红伟)

河南董寨国家级自然保护区环志站 2017 年春夏季鸟类环志简讯

2017 年 5 月 10 日至 26 日, 河南董寨国家级自然保护区环志站组织环志员在凉亭和花门楼环志网络点开展春夏季鸟类环志工作。历时 14 天共环志鸟类 313 只, 隶属于 6 目 21 科 42 种。其中新捕 6 目 21 科 42 种计 291 只; 重捕 3 目 8 科 9 种计 22 只。

另外捕获金眶鸻和褐胸鹑各 1 只, 据文献显示系在董寨首次发现, 为董寨鸟类新记录。另外成功重捕发冠卷尾 1 只, 环号为 F09-6003, 于 2014 年 5 月在该点第一次环志。

(河南: 溪波 杜志勇 张俊峰)

黑龙江青峰鸟类保护环志站 2017 年春季环志工作简讯

黑龙江兴隆林业局青峰鸟类保护环志站 2017 年春季环志工作在 3 月 1 日开始, 于 5 月 31 日结束。共计环志鸟类 6 目 20 科 61 种 6, 324 只, 其中重捕 9 种 46 只, 新捕种类为雀形目攀雀科攀雀 1 只。

今年春季途经青峰迁徙的候鸟数量, 雀形目为最多, 共环志了 14 科 52 种 6,259 只, 占总环志量的 99.0%, 非雀形目环志了 5 目 6 科 9 种 65 只, 占总环志量的 1.0%; 鹀科环志数量最大, 环志了 9 种 2,121 只, 占总环志量的 33.5%; 其次是鸫科, 环志 11 种 1,579 只, 占总环志量的 25.0%; 雀科环志 5 种 737 只, 占总环志量的 11.7%; 莺科环志 7 种 651 只, 占总环志量的 10.3%; 岩鹀科环志 1 种 261 只, 占总环志量的 4.1%; 伯劳科环志 2 种 220 只, 占总环志量的 3.5%; 鹡鸰科环志 4 种 112 只, 占总环志量的 1.8%; 鹌鹑科 3 种 28 只, 占总环志量的 0.4% 等。

今年春季的环志种类数量和去年春季相比, 种类比去年多 3 种, 数量略少了一些, 在同等人数和下网数量相同的情况下, 分析

其原因, 最主要的是气候、温度的变化所至, 另外还可能有其他的原因, 有待于我们进一步的探索。

(黑龙江: 阳艳岚)

2017 年颐和园普通雨燕的定位器又回收 17 例

中国观鸟会按照北京鸟类环志站的工作要求, 于 2017 年 5 月 20 日在北京颐和园八方亭开展了普通雨燕的环志与回收工作。观鸟会此项工作已持续 10 年, 佩戴与回收定位器的工作已持续 4 年。

此次雨燕定位器回收与环志活动由赵欣如负责, 于方、彭澎、梁烜、付建平、侯笑如、吴岚等环志技术骨干人员为主体, 组织环志志愿者有序开展布网、捕捉与回收、记录、环志与放飞。

为提高环志工作的效率, 5 月 20 日凌晨 2:30 先头人员到达现场, 天亮之前 (3:25) 布好全部网具。2:45 第一只雨燕已入网, 7:10 全部放飞, 7:10 过后结束活动。

捕获普通雨燕 (*Apus apus pekinensis*) 165 只, 其中 96 只为往年环志的回收个体, 环志回收率 58.18%。在 96 只往年环志回收个体中, 回收佩戴定位器雨燕 17 例, 采集了更多雨燕年飞行活动的大量数据 (数据在整理与分析中)。在 96 只往年被环志, 今年回收的个体中, 第一次回收个体为 82 只, 第二次回收个体为 13 只, 第三次回收个体为 1 只; 另有 69 只雨燕为今年新上环的个体。环志成功率为 100%, 165 只雨燕全部成功放飞, 死亡率为 0%。

环志工作得到了颐和园管理处的大力支持。许多游人关注该活动并关心普通雨燕的生活习性、生态与分布等, 志愿者尽力现场给予解答。

参加此次活动的环志志愿者 30 余人。比利鸟环志专家 Lyndon Kearsley 和英国观

鸟爱好者 Terry Townshend 参与了当日的雨燕环志与回收定位器工作。

(北京：赵欣如 刘 明)

本季节共环志鸟类 34 种，486 只次。分属于 5 目 17 科。

(北京：赵欣如 刘 明)

北京翠湖湿地 2017 年春季鸟类环志圆满结束

2017 年，结合北京候鸟迁徙的特点，翠湖湿地春季鸟类环志安排在 4 月 22 日至 5 月 7 日进行。期间赶上多天连续的大风（瞬时风力超过 9 级）及干旱缺雨的季节，组织方克服多种困难，完成了春季的环志计划。近年来，翠湖环志站已成为合作开展鸟类环志工作的平台。本次环志着力开展以下 4 方面工作：

1. 由北京市野生动物救护中心领导的北京鸟类环志站牵头，开展北京地区环志站点及社会志愿者的环志培训，聘请全国环志中心刘冬平、陈丽霞，北京师范大学赵欣如，资深环志志愿者于方为参训者授课并在环志现场开展示范与强化训练；

2. 继续探索翠湖湿地公园与中国观鸟会（民间 NGO 组织）的紧密有效合作机制，70 余人次的环志志愿者等作为主力参加了每日的环志；

3. 结合气候的大风与干旱及湖水枯竭等实际情况，调整布网策略，利用“荒岛行动”，有效提高了网捕成功率。

4. 改进环志数据采集的有效性，增加环志过程的科技含量。

翠湖湿地公园对环志的工作条件和志愿者的餐食提供了热诚的服务。

江西遂川鸟类环志站 2016 年秋季环志简讯

江西遂川鸟类环志站位于我国三大候鸟迁徙通道之一的中亚迁徙路线上，是候鸟迁徙路上的关键停歇地。我站 2016 年秋季环志工作从 9 月 1 日开始，于 10 月 31 日结束，历时 61 天，共环志鸟类 13 目 28 科 83 种 1942 只，新增环志 6 种分别为丽星鸚鵡 (*Spelaeornis formosus*) 1 只、白尾蓝地鸫 (*Cinclidium leucurum*) 1 只、栗背短脚鸫 (*Hemixos castanonotus*) 3 只、小白腰雨燕 (*Apus nipalensis*) 1 只、日本松雀鹰 (*Accipiter gularis*) 1 只、棕腹杜鹃 (*Cuculus fugax*) 1 只。

我站环志的鸟类主要以池鹭、夜鹭、黄苇鸂鶒、牛背鹭等鸬形目的鹭科鸟类为主，占所环鸟类的 79.35%，其中池鹭为优势鸟种，占所环鸟类的 53.96%。

自 2002 年不间断开展环志工作以来，截止 2016 年 10 月江西遂川鸟类环志站共环志鸟类 13 目 47 科 200 种 30,197 只。

近年所环志的鸟类数量基本稳定在 1,500 至 2,000 只左右，今年比去年所环志的数量略有上升，原因可能是有的物种数量在增加，也有捕鸟方面的偶然因素，也有可能与我们环志期间台风的到来有关，这些都有待我们进一步研究。

(江西：朱高栋 廖许清)

消息通知



李佩珣教授逝世

2017 年 8 月 13 日 16 时 20 分，哈尔滨师范大学生命科学与技术学院退休教授、我国著名鹤类专家、野生动物生态保护领域知名学者李佩珣先生因突发脑溢血，经多方抢救无效，不幸逝世，享年 84 岁。

李佩珣先生于 1933 年 2 月 9 日出生于广东潮安，小学和初中就读于北京育英小学、育英中学，1951 年汕头聿怀中学高中毕业，1956 年东北师范大学生物系本科毕业，同年考取前苏联著名动物生态学家库加金先生在东北师大指导的动物生态学研究生班，1958 年毕业被分配到上海师范大学工作，1960 年调入哈尔滨师范大学生物系工作，直至 1998 年退休。

李先生在哈师大生物系历任讲师、副教授、教授，1985 年担任动物学硕士研究生导师（动物学科带头人），兼任黑龙江省动物学会常务理事，东北野生动物保护联合会顾问，中国鹤类联合保护委员会专家组成员，林业部《野生动物》杂志常务编委。

李佩珣先生长期以来从事脊椎动物分类学、鸟类学和动物生态学的教研工作，在国内外发表大量论文和专著，取得了很多重要的科研成果。李先生学术功底扎实，治学严谨，为哈师大动物学学科的建立和发展，做出了卓越的贡献，为国家培养了大批的专业人才。李先生的与世长辞，使我们失去了一位敬爱的师长、一位德高望重的老专家。愿李先生的在天之灵安息。

李佩珣先生千古！

（黑龙江：于丽杰 刘晓龙）

我国境内首次野外拍到灰腹角雉活体照片

2017 年 2 月 22 日，“自然影像中国·美丽生态德宏”项目组在中科院动物研究所召开专家鉴定会，对近期在云南德宏州拍摄到的疑似灰腹角雉影像进行鉴定。专家组主席为世界雉类协会理事长郑光美院士，成员包括北京师范大学张正旺教授、中科院动物所孙悦华研究员、北京林业大学王楠副教授等。专家组听取了“自然影像中国”考察人员发现灰腹角雉过程的汇报，并查看了野外拍摄的影像资料。经质询和讨论，给出了三点鉴定意见：一、本次考察发现的雉类确证为灰腹角雉，所拍摄照片为灰腹角雉的成年雄鸟。二、灰腹角雉是国家一级重点保护鸟类，本次拍摄的照片是我国境内首次在自然生境中拍摄到野生灰腹角雉的图片。同域还拍摄到红腹角雉，两种角雉在同一地区分布，具有重要的科学研究价值。三、本次考察的区域具有灰腹角雉栖息的典型生境，为灰腹角雉的重要分布区，而且其他动植物珍稀濒危物种也很丰富，属于生物多样性的热点地区，具有重要的保护价值。与会专家建议，应进一步加强德宏州及其周边地区灰腹角雉的栖息地保护及科学考察、生态学研究等工作。

（北京：张正旺）

我国新增 17 处国家级自然保护区

2017 年 7 月 4 日，国务院办公厅下发了“关于公布黑龙江盘中等 17 处新建国家级自

然保护区名单的通知”(国办发〔2017〕64号),我国新增了17个国家级自然保护区。截止到2017年7月底,我国的国家级自然保护区总数已经达到445处。新增国家级保护区名单如下:

黑龙江省

盘中国家级自然保护区

平顶山国家级自然保护区

乌马河紫貂国家级自然保护区

岭峰国家级自然保护区

黑瞎子岛国家级自然保护区

七星砬子东北虎国家级自然保护区

浙江省

安吉小鲵国家级自然保护区

江西省

南风面国家级自然保护区

湖北省

长阳崩尖子国家级自然保护区

大老岭国家级自然保护区

五道峡国家级自然保护区

四川省

白河国家级自然保护区

西藏自治区

玛旁雍错湿地国家级自然保护区

陕西省

摩天岭国家级自然保护区

甘肃省

多儿国家级自然保护区

新疆维吾尔自治区

阿勒泰科克苏湿地国家级自然保护区

温泉新疆北鲵国家级自然保护区

(北京:张正旺)

《中国鸟类图志》(上、下)出版

由段文科和张正旺主编的《中国鸟类图志》(上、下)已经于2017年3月在中国林业出版社出版。全书分上、下两卷,上卷为

非雀形目,下卷为雀形目。本套书以郑光美院士的鸟类学分类系统为基准,参考了国内外鸟类分类学研究的最新进展,共收录中国鸟类1,409种和603亚种,收录了800多位鸟类摄影者的精彩照片,是迄今为止涵盖国内鸟种最全面的鸟类图书。书中对每种鸟类的科学名称、分类地位、形态特征、地理分布、种群和资源状况等进行了科学的描述,以大量珍贵野外生态照片直观展示鸟类不同的形态(含雌、雄,成、幼,冬、夏等)。并且在全国鸟类普查的基础上,参考国内外最新的鸟类分布资料,针对每种鸟类的地理分布进行精准的绘制,使用不同的颜色标注不同类型的鸟类(留鸟、旅鸟,冬候鸟、夏候鸟)的活动和分布状况。本书用真实的图片和分布现状图,区别于过去的手绘标本图或合成图片类的图书,弥补了相关图书物种不全和内容年久未修订的缺憾。本书的出版,可满足所有鸟类爱好者、观赏者的兴趣,对我国鸟类科学研究及野生动物保护也将起到促进作用。

(北京:段文科)

Avian Research 影响因子有较大幅度提升

2017年6月,汤森路透集团于发布了2016年度的的期刊引证报告。由中国动物学会鸟类学分会和北京林业大学共同主办的鸟类学期刊 *Avian Research* 获得了该刊第二个影响因子(0.853),在鸟类学领域里排名第14位。与去年相比, *Avian Research* 的影响因子数值和排名均有较大幅度的提升。

希望广大学者继续支持 *Avian Research*, 积极贡献优秀的稿件,共同努力,使期刊保持良好的发展势头。

(*Avian Research*编辑部:程朋军)

2016 年鸟类学 SCI 收录刊物影响因子

Rank	Journal Title	Total Cites	Impact Factor
1	Condor	4,864	2.654
2	Ibis	4,466	2.279
3	Journal of Avian Biology	3,010	2.228
4	Auk	6,078	2.096
5	Journal of Field Ornithology	1,374	1.500
6	Journal of Ornithology	2,567	1.468
7	Ardea	1,114	1.395
8	Ornis Fennica	507	1.238
9	Bird Conservation International	807	1.088
10	Avian Conservation and Ecology	228	1.086
11	Emu	1,078	0.989
12	Bird Study	1,571	0.925
13	Acta Ornithologica	502	0.896
14	Avian Research	31	0.853
15	Ostrich	490	0.833
16	Avian Biology Research	290	0.828
17	Ardeola	433	0.807
18	Journal of Raptor Research	802	0.745
19	Waterbirds	1,107	0.678
20	Wilson Journal of Ornithology	759	0.647
21	Ornithological Science	165	0.500
22	Revista Brasileira de Ornitologia	236	0.414
23	Ornitologia Neotropical	457	0.241
24	Forktail	82	0.064

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第 13 届全国鸟类学研究生“翠鸟论坛” 报名通知

各位老师、同学：

第十三届“翠鸟论坛”将于 2017 年 9 月 20 日—21 日在陕西省西安市举办。本次会议由中国动物学会鸟类学分会主办，陕西师范大学承办。

1、论坛内容：

本次论坛包括专家报告、学生报告、研究方法讲座和墙报展示等内容。学生报告的报告人和主持人均为在读研究生。墙报展示环节中，展示者要在自己的墙报前做 3 分钟口头介绍。

最后由各参会单位投票选出金翠鸟奖、

银翠鸟奖、优秀报告奖和优秀墙报奖。

本次论坛不收注册费，往返旅费及研究生的住宿费用自理。

2、报名要求：

报名者必须为在读研究生，每位导师参加论坛的研究生不超过 4 人，总名额限于 80 人。

报名以提交的报名回执内容为准（电子版和含导师签字的扫描版），请将报名回执文件以“单位+姓名”命名，发给林玉英（linyuying@mail.bnu.edu.cn）。论坛将根据提交的摘要遴选 20-25 名同学做口头报告，未入选口头报告的同学可提交墙报申请。已提交全国鸟类学术研讨会的摘要也可提交至翠鸟论坛。

报名截止日期：7 月 25 日。

联系人：

报名表经审核后，7 月 31 日公布参会名单和口头报告入选名单。

林玉英 linyuying@mail.bnu.edu.cn

董 路 donglu@bnu.edu.cn

3、组委会及联系人

(中国动物学会鸟类学分会)

组委会：

张雁云 屈延华 董路 刘阳 林玉英

十三届翠鸟论坛回执

姓 名		性 别		民 族	
<input type="checkbox"/> 硕士研究生	<input type="checkbox"/> 博士研究生		导师姓名		
单 位			专业方向		
手 机			Email		
报告题目					
摘要（不超过 300 字）					
<div>导师意见：</div> <div style="text-align: right;"> 签名： 日期： </div>					

封面照片 红腹锦鸡 (*Chrysolophus pictus*) 由丁洪安 2011 年 4 月 11 日摄于陕西洋县。

English Abstract



Notes of Meetings

Summary of the third meeting of the Eighth Committee of the China Ornithological Society of the China Zoological Society

Research Reports

The evolutionary origin of variation in song length and frequency in the avian family Cettiidae

Aspects of bird songs have been shown to correlate with morphological and ecological features, including beak and body size, and habitat. We studied evolution of song length and song frequency of 30 species belonging to the Cettiidae. Frequency was negatively correlated with body size, and song length increased with latitude. Although migration distance correlated with latitude, the association of song length with latitude was only present within the non-migratory species, implying the association was not a consequence of migration. We found the association of body size and song frequency arose earlier evolutionally than the latitude-song length association in the group. We suggest that latitudinal correlates of song length may reflect increased importance of sexual selection by female choice. This work has been accepted for publication by *Journal of Avian Biology*, DOI: 10.1111/jav.01366

(Chentao Wei, Jiayu Liu and Yanyun Zhang, Beijing; Trevor D. Price, USA; Per Alström, Sweden)

Identification of vocal individuality in male cuckoos using different analytical techniques

Individuality in vocalizations may provide an effective tool for surveying populations of common cuckoo *Cuculus canorus* but data on which technique to use to identify individuality remain few. We compared the within and between individual variation in cuckoo calls using two different analytical methods, and discuss the feasibility of using call individuality to count male cuckoos within a population.

We recorded vocalization from 13 males, and measured 15 spectro-temporal variables for each call. The majority of these call variables ($n=12$) had greater variation between individuals than within individual. We calculated the similarity (Pearson's R) for each paired calls to find a threshold that could distinguish calls emitted from the same or different males, and then counted the number of males based on this distinction. We then used the more widely accepted technique of Discriminant Function Analysis (DFA) to identify individual male cuckoos, and compared the correct rate of classifying individuals between the two analytical methods.

Similarity of paired calls from the same male was significantly higher than that from different males. Under a relatively broad threshold interval, we achieved a high ($>90\%$) correct rate to distinguish calls and an accurate estimate of male numbers. Based on banded males ($n=3$), we found the similarity of paired calls from different days was lower when compare from paired calls from the same day, but this change did not obscure individual identification, as similarity values of paired calls from different days was still larger than the threshold used to distinguish calls from the same or different males. DFA also yielded a high (91.9%) rate of correct classification of individuals.

Conclusions: Our study suggests that identifying individual vocalizations can form the basis of an appropriate survey method for counting male cuckoos within a population, provided the performance of different analytical techniques are compared. This work has been published by *Avian Research*.

(Yang Li, Canwei Xia, Donglai Li and Yanyun Zhang, Beijing; Huw Lloyd, UK)

Hooded Crane (*Grus monacha*) on the eastern migration route

To investigate the spatio-temporal migration patterns of Hooded Cranes (*Grus monacha*) in the eastern migration route and to identify the sites that are important for conservation, four adult and five juvenile Hooded Cranes, wintered in Izumi, were fitted with satellite transmitters (GPS-GSM system) in northeastern China and southern Russia and followed during 2014-2016. Adults spent 44.25 d (SE = 4.01) and 54.00 d (SE = 4.06) for spring and autumn migration, respectively, while juveniles only spent 12.67 d (SE = 4.37) and 5.20 d (SE = 0.86), respectively. The breeding season of adults was 122.25 d (SE = 6.03), while juveniles spent 196.80 d (SE = 17.85) outside the migration seasons. The duration of wintering by these two groups was 133.75 d (SE = 5.79) and 149.80 d (SE = 0.52), respectively. We found three important stopover sites: the region around Muraviovka Park, Songnen Plain and the West Bay of South Korea, where cranes spent most of their migration time (62.15% and 85.65% during spring and autumn, respectively). During migration, nomadism and winter, Hooded Cranes usually stayed in cropland for resting and feeding. The adults bred in needle leaved (coniferous) forests. Only 5.82% of all inhabit sites (sites where there was no movement) were in protected areas outside the winter period. The three most important

stopover sites were mainly covered with crops.

(Chunrong Mi and Yumin Guo, Beijing; Anders Pape Møller, France)

When the species-time-area relationship meets island biogeography: Diversity patterns of avian communities over time and space in a subtropical archipelago

The species-area relationship (SAR) and the species-time relationship (STR) are of vital importance in community ecology. Previous studies suggest that a unified, general species-time-area relationship (STAR) may hold, with comparable but non-independent scaling of richness across space and time. Most studies to date have considered relatively homogeneous habitats, with sampling curves for SARs and STRs. We tested the generality of the STAR in an island system and assessed which factors, other than area, influence species richness, species accumulation, and turnover through time. We surveyed bird communities on 36 islands using line transects, and calculated annual species richness of breeding birds from 2007 to 2015, in Thousand Island Lake, China. We built island STAR models at both island (island STAR; ISTAR) and transect levels (local community-time-area relationship; LCTAR). We employed partial correlations and multiple regressions to examine the potential influence of island attributes other than area (i.e., isolation, edge effect and habitat richness) on slopes of STRs. The ISTAR and LCTAR models explained 88.8% and 83.1% of the total variance, respectively, and both models have a significant negative space-time interaction. Richness scales comparably in both space and time, for both whole-island and transect-level analyses. The partial correlation analysis showed that distance to mainland, perimeter-to-area ratio and habitat richness are significantly correlated with the time scalar (w). Multiple regression models identify perimeter-to-area ratio as being particularly influential. The STAR pattern indeed generalised to an island system, indicating an interdependency of time and space in determining species richness. Islands have many attributes other than area that influence patterns of species accumulation and turnover through time. There is an intriguingly high degree of temporal turnover in these bird communities. Overall, we recommend ecologists should consider the role of both space and time, along with their interdependency, when characterising patterns in species richness. Details of our research can be found in Song *et al.* (2017) *Journal of Biogeography* (under review).

(Xiao Song, Ping Ding, Zhejiang)

Are declining populations of wild geese in China 'prisoners' of their natural habitats?

While wild goose populations wintering in North America and Europe are mostly flourishing by exploiting farmland, those in China (which seem confined to natural wetlands) are generally declining. Telemetry devices were attached to 67 wintering wild geese of five different species

at three important wetlands in the Yangtze River Floodplain (YRF), China to determine habitat use. Fifty individuals of three declining species were almost entirely diurnally confined to natural wetlands; 17 individuals from two species showed stable trends and used wetlands 83% and 90% of the time, respectively, otherwise resorting to farmland. These results confirmed earlier studies linking declines among Chinese wintering geese to natural habitat loss and degradation affecting food supply. These results also contribute to explaining the poor conservation status of Chinese wintering geese compared to the same and other goose species wintering in adjacent Korea and Japan, western Europe and North America, which feed almost entirely on agricultural land, releasing them from winter population limitation.

(Hui Yu, Xin Wang, Lei Cao, Lu Zhang and Qiang Jia, Beijing; Zhenggang Xu, Hunan; Guanhua Liu and Wenbin Xu, Jiangxi; Binhua Hu, Anhui; Hansoo Lee, Korea; Anthony D. Fox, Denmark)

Nest-site characteristics and nesting success of the Chestnut Thrush

Nest-site characteristics may affect the daily survival rate of avian nests. We monitored the nests of Chestnut Thrush *Turdus rubrocanus* breeding in an agricultural landscape near the Lianhuashan Natural Reserve (central China) during the breeding seasons of 2013 and 2014. We described the Chestnut Thrush's breeding ecology and used logistic-exposure methods and an information theoretic approach to assess the factors influencing daily survival rates of nests. Results from model averaging indicated that daily survival rates of nests consistently decreased from habitat edge to interior, contradicting the classic edge effect hypothesis describing predation of avian nests. Concealment of nests from below was positively correlated with nest daily survival rates, whereas concealment from the side and from above were not. These results suggest that determining the various effects of vertical and/or horizontal concealment on nest survival rates may help us assess the variation in the ability of local predators to detect nests.

(Qingshan Zhao and Yuehua Sun, Beijing)

Migratory restlessness and departure orientation of great knots (*Calidris tenuirostris*) in the south compared to the north Yellow Sea in spring

The tendency of birds to proceed with migration is associated with both endogenous and exogenous factors. According to their migratory situation and to the characteristics of stopover sites, birds might exhibit migratory tendency differently among sites. Although migratory tendency of migrating birds has been well studied in many species, the investigation of the same species in different migratory situation and at different stopover sites is still limited. We predicted that birds at different stopover sites could differ in migratory disposition, including expression of migratory restlessness and responses to environmental cues.

We compared migration tendency and orientation of great knots *Calidris tenuirostris* at two stopover sites, Chongming Dongtan in the south Yellow Sea, which is a temporary rest site, and Yalujiang Estuary Wetland in the north Yellow Sea, which is a critical refuelling site, during northward migration. Modified Emlen funnels, with thermal paper inside to record scratches of the birds, were used to detect activity (intensity and direction) of birds. Environmental conditions, including wind direction and speed, cloud cover, tide condition, times of the day (before and after sunset) were recorded during experiments. Generalized linear models were used to detect the effects of endogenous and exogenous factors on the migratory tendency of the birds. Results indicated that in the south Yellow Sea, the migratory activity intensity of great knots was positively related to wind assistance. In the north Yellow Sea, where birds exhibited higher intensity of activity than in the south, the activity intensity increased and the tendency to initiate migration became stronger as the season advanced. The great knots exhibited wind-related orientation behaviour in the funnels at both sites. The results suggest that the intensity of migratory tendency differed between the two sites. Departure decisions of great knots appeared to be affected mainly by external factors at the temporary rest site in the south Yellow Sea but possibly by endogenous factors at the final pre-breeding refuelling site in the north Yellow Sea.

(Ning Hua and Zhijun Ma, Shanghai)

Persistent use of a staging site in the Yellow Sea by shorebirds despite severe declines in food resources implies a lack of alternative habitats

Many shorebird populations are in decline along the East Asian-Australasian Flyway and the rapid loss of coastal wetlands in the Yellow Sea, which provide critical stopover sites during migration, is believed to be the cause of the alarming trends. The Yalu Jiang coastal wetland, a protected area in the north Yellow Sea, supports the largest known migrating population of Bar-tailed Godwits *Limosa lapponica* and Great Knots *Calidris tenuirostris*. Nevertheless, our monitoring of the macrobenthos food for these shorebirds, from 2011 to 2016, exhibited declines of over 99% in individual densities of the bivalve *Potamocorbula laevis*, the major food here for both Bar-tailed Godwits and Great Knots. The loss of the bivalve might be caused by: (1) change of hydrological condition and sediment composition due to nearby port construction, (2) run-off of agrochemicals from the extensive shoreline sea cucumber farms, and/or (3) parasitic infection. Surprisingly, the numbers of birds using the Yalu Jiang coastal wetland remained stable, except for the subspecies of Bar-tailed Godwit *L. l. menzbieri*, which exhibited a 91% decline in peak numbers during the study periods. The lack of an overall decline in the number of bird days in Great Knots and the peak number in *Limosa lapponica baueri*, in the light of the reported dramatic decreases in their annual survivals, implies a lack of alternative habitats. The rapid decline of *L. l. menzbieri* highlights that food decline at staging sites could be an overlooked but important factor causing population decline of shorebirds along the Flyway. Maintaining the quality of staging sites is as important in shorebird conservation as is the preventing more staging sites to disappear

from land claim. Meanwhile, our study call for immediate action to restore the food base for these beleaguered migrant shorebirds at Yalu Jiang coastal wetland.

(Shoudong Zhang and Zhijun Ma, Shanghai)

Functional and phylogenetic structure of bird communities at the Thousand Island Lake, China

Biodiversity change in anthropogenically transformed habitats is often nonrandom, yet the nature and importance of the different mechanisms shaping community structure are unclear. We extended the classic Theory of Island Biogeography (TIB) to account for nonrandom processes by incorporating species traits and phylogenetic relationships based on a study of faunal relaxation following habitat loss and fragmentation. Two possible mechanisms can create nonrandom community patterns on fragment islands. First, small and isolated islands might consist of similar or closely related species because they are environmentally homogeneous or choose for certain shared traits, such as dispersal ability. Alternatively, communities on small islands might contain more dissimilar or distantly related species than on large islands because limited space and resource availability result in greater competitive exclusion among species with high niche overlap. We surveyed breeding birdson 36 islands and two mainland sites annually from 2010 to 2014 in the Thousand Island Lake region, China. We assessed community structure of breeding birds on these subtropical land-bridge islands by integrating species' trait and evolutionary distances. We additionally analysed habitat heterogeneity and variance in size ratios to distinguish biotic and abiotic processes of community assembly. Results showed that functional-phylogenetic diversity increased with island area, and decreased with island isolation. Bird communities on the mainland were more diverse and generally less clustered than island bird communities and not different from randomly assembled communities. Bird communities on islands tended to be functionally similar and phylogenetically clustered, especially on small and isolated islands. The nonrandom decline in species diversity and change in bird community structure with island area and isolation, along with the relatively homogeneous habitats on small islands, support the environmental filtering hypothesis. Our study demonstrates the importance of integrating multiple forms of diversity for understanding the effects of habitat loss and fragmentation, and further reveals that TIB could be extended to community measures by moving beyond assumptions of species equivalency in colonisation rates and extinction susceptibilities. Details of our research can be found in Si *et al.* (2017) *Journal of Animal Ecology* 86: 532–542.

(Xingfeng Si and Ping Ding, Zhejiang)

Do seasonal species assemblages differ in their biogeography? Evidence from the spatial structure of bird communities at the Thousand Island Lake, China

While it is recognized that many ecosystems may show considerable seasonal variability in abiotic and biotic conditions, the seasonal variation in community assembly is poorly known. We investigated the seasonal changes in the spatial structure of diversity patterns in bird communities on land-bridge islands through partitioning beta diversity into richness and turnover components and community nestedness metrics. We predicted that total beta diversity, the richness component of beta diversity, and community nestedness would be lower for bird assemblages in winter than in summer, and lowest of all for winter visitors. These predictions were derived from published ideas about (i) winter resource scarcity, broad movement and habitat choice of winter birds, (ii) expectations of weak habitat associations of migrant species, and (iii) the high habitat specificity of breeding birds. In our study, bird species were sampled using line transects on 36 islands during five breeding and winter seasons (2009–2014) in the Thousand Island Lake, China. Birds were grouped into assemblages of winter residents, winter visitors and summer residents. Associations between beta diversity partitioning, island area, isolation and habitat richness were tested using partial Mantel correlations. We complemented these tests with measures of nestedness and null model approaches. Overall, we found substantial differences in the biogeography of winter vs. summer residents, and seasonal visitor (migratory) vs. resident bird assemblages. As predicted, winter visitors showed little association with habitat richness, and beta diversity was rarely different from null communities. Summer residents had the highest correlations of beta diversity components with habitat richness, but showed the lowest level of total beta diversity, a low richness component and were anti-nested (less nested than random). Contrary to expectation, beta diversity, nestedness and difference of beta diversity or its components from null models were higher for winter residents than either summer resident or winter visitor assemblages. This matches our expectations derived from bird biology and population ecology. Summer residents highlighted the role of habitat-related niche differences, whereas winter residents showed area-related selective extinction. By contrast winter visitors appeared to be more randomly distributed. Our study provides a valuable approach to study the seasonal variation in species composition and assembly, and further reveals that seasonal differences in birds' biology and their response to environment changes determine their community assembly patterns. Details of our research can be found in Chen *et al.* (2017) *Journal of Biogeography* under review.

(Chuanwu Chen and Ping Ding, Zhejiang)

Ecological correlates of extinction risk in Chinese birds

China is one of the countries with the richest bird biodiversity in the world. Among the 1372 Chinese birds, 146 species are considered threatened and three species are regionally extinct

according to the officially released China Biodiversity Red List in 2015. We conducted the first extensive analysis to systematically investigate the patterns and processes of extinction and threat in Chinese birds. We addressed the following four questions. First, is extinction risk randomly distributed among avian families in Chinese birds? Second, which families contain more threatened species than would be expected by chance? Third, which species traits are important in determining the extinction risk in Chinese birds using a multivariate phylogenetic comparative approach? Finally, is the form of the relationship between traits additive or nonadditive (synergistic)? We found that the extinction risk of Chinese birds was not randomly distributed among taxonomic families. The families that contained more threatened species than expected were the hornbills, cranes, pittas, pheasants and hawks and eagles. We obtained eleven species traits that are commonly hypothesized to influence extinction risk from the literature: body size, clutch size, trophic level, mobility, habitat specificity, geographical range size, nest type, nest site, flocking tendency, migrant status and hunting vulnerability. After phylogenetic correction, model selection based on Akaike's information criterion identified the synergistic interaction between body size and hunting vulnerability as the single best correlate of extinction risk in Chinese birds. Our results suggest that, to be effective, priority management efforts should be given both to certain extinction-prone families, particularly the hornbills, pelicans, cranes, pittas, pheasants and hawks and eagles, and to bird species with large body size and high hunting vulnerability. For more details, please refer to Wang et al. (2017) *Ecography*, DOI: 10.1111/ecog.03158.

(Yanping Wang, Xingfeng Si, Chuanwu Chen, Di Zeng, Yuhao Zhao, Yiru Wu and Ping Ding, Zhejiang; Peter M. Bennett, UK)

Effectiveness of protected areas for vertebrates based on taxonomic and phylogenetic diversity

Establishing protected areas is the primary goal and tool for preventing irreversible biodiversity loss. However, the effectiveness of protected areas that target specific species has been questioned for some time, because targeting key species for conservation may impair the integral regional pool of species diversity and phylogenetic and functional diversity are seldom considered. We first assessed the efficacy of protected areas in China for the conservation of phylogenetic diversity using the ranges and phylogenies of 2279 terrestrial vertebrates. We found a strong positive correlation between phylogenetic and taxonomic diversity, and only 12.1%–43.8% of the priority areas are currently covered by protected areas. However, the patterns and coverage of phylogenetic diversity were affected when weighted by species richness. These results indicate that overall in China, protected areas targeting high species richness protected total phylogenetic diversity well, but failed to do so in some regions with more unique and/or threatened communities. For instance, the coastal areas of Eastern China where there are severely threatened avian communities were less protected. Our results suggest that the distributions of the currently protected areas still have room for improvement although most of the areas protect

both taxonomic and phylogenetic diversity.

(Qing Quang and Fasheng Zou, Guangdong)

Genomic differentiation and patterns of gene flow between two long-tailed tit species (*Aegithalos*)

Patterns of heterogeneous genomic differentiation have been well documented between closely related species, with some highly differentiated genomic regions (“genomic differentiation islands”) spread throughout the genome. Differential levels of gene flow are proposed to account for this pattern, as genomic differentiation islands are suggested to be resistant to gene flow. Recent studies have also suggested that genomic differentiation islands could be explained by linked selection acting on genomic regions with low recombination rates. We investigated genomic differentiation and gene flow patterns for autosomes using RAD-seq data between two closely related species of long-tailed tits (*Aegithalos bonvaloti* and *A. fuliginosus*) in both allopatric and contact zone populations. The results confirm recent or ongoing gene flow between these two species. However, there was little evidence that the genomic regions that were found to be highly differentiated between the contact zone populations were resistant to gene flow, suggesting that differential levels of gene flow was not the cause of the heterogeneous genomic differentiation. Linked selection may be the cause of genomic differentiation islands between the allopatric populations with no or very limited gene flow, but this could not account for the heterogeneous genomic differentiation between the contact zone populations, which show evidence of recent or ongoing gene flow.

(Dezhi Zhang, Gang Song, Bin Gao, Yalin Cheng, Yanhua Qu, Shimiao Shao, Yongjie Wu, Per Alström and Fumin Lei, Beijing; Shaoyuan Wu, Jiangsu)

Birds as pathology-free models of Type II Diabetes

In mammals, chronically elevated concentrations of blood glucose (chronic hyperglycemia) and decreased insulin levels can ultimately lead to Type 2 Diabetes Mellitus (T2DM) and its associated complications. In contrast, birds have significantly higher blood glucose concentrations than mammals of similar body mass (1.5~2 times) and yet are able to resist the regulation of glucose by insulin without any adverse effects. Most avian species for which the relevant data are available appear to possess specialized mechanisms to enhance fatty acid transport and oxidation during flight. These are similar to the way energy is utilized by diabetic humans who are unable to efficiently increase glucose utilization and consequently rely more on fatty acid oxidation when carbohydrates are plentiful. To the best of our knowledge, the underlying mechanism regulating glucose and lipid hemostasis in birds has yet to be clarified. Several aspects of glucose regulation in birds are, however, worth highlighting, and may contribute to better understanding the

pathogenesis and treatment of T2DM, and its associated complications, in humans. This study has been published in *Austin Endocrinology and Diabetes Case Reports* (2017; 2(1): 1007.)

(Dongming Li, Hebei)

Dynamic interactions between corticosterone, corticosteroid binding globulin and testosterone in response to capture stress in male breeding Eurasian tree sparrows

In birds, corticosterone (CORT), testosterone (T), and corticosteroid binding globulin (CBG) are involved in modulating the trade-off between reproduction and survival. In response to acute stress, increased total plasma CORT is a ubiquitous phenomenon while T levels can decrease, or remain unchanged. Since CORT and T bind competitively with CBG in birds, the underlying regulatory mechanisms and consequences of their dynamic interactions remain largely unknown. Here, we studied the dynamic changes of total CORT, T, and CBG, and estimated free and bound CORT and T in response to capture stress in male Eurasian tree sparrows (*Passer montanus*) across the nest building, egg-laying, and nestling stages. We predicted that free, bound and total hormone concentrations would increase for CORT and decrease for T in response to acute stress, and the relative magnitude of these changes would vary with life history stage. We found that baseline and stressed-induced CORT values did not vary across breeding sub-stages. However, total and bound CORT increased with stress while free remained unchanged. Baseline levels of total, free and bound T were highest during the nest building and it was the only stage in which all measures of T were affected by stress. Regardless of breeding stage or restraint stress, we did not detect a significant correlation between CORT and T. CBG was found to be mostly unoccupied by steroid hormones under stress and stress-free conditions and this likely provided an adequate buffer for changes in free levels of CORT and T during unpredictable environmental perturbations. This study has been published in *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology* (2017, 205: 41-47.)

(Yaqing Li, Yanfeng Sun, Mo Li, Xuelu Liu, Weiwei Zhu, Yao Yao, Yuefeng Wu and Dongming Li, Hebei ; Jesse S. Krause, USA)

Life-history dependent relationships between body condition and immunity, between immunity indices in male Eurasian tree sparrows

In free-living animals, recent evidence indicates that innate, and acquired, immunity varies with annual variation in the demand for, and availability of, food resources. However, little is known about how animals adjust the relationships between immunity and body condition, and between innate and acquired immunity to optimize survival over winter and reproductive success during the breeding stage. Here, we measured indices of body condition (size-corrected mass [SCM], and

hematocrit [Hct]), constitutive innate immunity (plasma total complement hemolysis activity [CH50]) and acquired immunity (plasma immunoglobulin A [IgA]), plus heterophil/lymphocyte (H/L) ratios, in male Eurasian tree sparrows (*Passer montanus*) during the wintering and the breeding stages. We found that birds during the wintering stage had higher IgA levels than those from the breeding stage. Two indices of body condition were both negatively correlated with plasma CH50 activities, and positively with IgA levels in wintering birds, but this was not the case in the breeding birds. However, there was no correlation between CH50 activities and IgA levels in both stages. These results suggest that the relationships between body condition and immunity can vary across life-history stage, and there are no correlations between innate and acquired immunity independent of life-history stage, in male Eurasian tree sparrows. Therefore, body condition indices predict immunological state, especially during the non-breeding stage, which can be useful indicators of individual immunocompetences for understanding the variations in innate and acquired immunity in free-living animals. This study has been published in *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology* (2017, 210: 7-13.)

(Yuliang Zhao, Mo Li, Yanfeng Sun, Yuefeng Wu and Dongming Li, Hebei)

Ph.D Thesis

Studies of the waterbirds used salt pans in north of Bohai Bay

The natural coastal wetlands of East Asian-Australasian Flyway (EAAF) are disappearing at alarming rates, leading to rapid declines of many populations of waterbirds in this most species-rich flyway in the world. Converted from natural wetlands, artificial wetlands provide alternatively habitat for the surviving and breeding of many waterbirds species. Identification and assessment of possible alternative habitats that may buffer the loss of natural wetlands and support the waterbirds diversity should be one of priority objects in this flyway. Coastal salt pans are functional wetlands that support large numbers of waterbirds worldwide. Nanpu Salt pans on the northern Bohai Bay in China, is one of the largest (290 km²) salt pan complexes in the world, but it is still unclear about its value for maintaining waterbirds diversity. In this thesis, we documented the value of Nanpu Salt pans for supporting waterbirds in the East Asian-Australasian Flyway. The research was carried out from 2013 to 2016, focused waterbird both in the salt pans and on the adjacent natural intertidal mudflats (57 km²). We analyzed and evaluated the ecological function and potential value of the Nanpu Salt pans for the survival and reproduction of waterbirds in the East Asian-Australasian Flyway, and provided suggestions about wetland protection and management in the future. The main results of the research are as follows:

1. During research period, total 89 waterbird species were recorded, 27 had maximum numbers exceeded the 1% threshold value of known flyway populations. These include a large numbers of Curlew Sandpiper *Calidris ferruginea* (69% of the EAAF population), Red Knot *Calidris canutus*

(40%), Black-winged Stilt *Himantopus himantopus* (61%), Pied Avocet *Recurvirostra avosetta* (57%), Spotted Redshank *Tringa erythropus* (54%), Black-tailed Godwit *Limosa limosa* (11%), and Relict Gull *Larus relictus* (43%). The maximum numbers of waterbirds in spring and autumn in Nanpu Saltpans were 96,000 and 93,500, respectively. These peak numbers included both foraging and resting birds. While the peak numbers on the adjacent mudflats at low tide reached to 73,000 and 20,000 waterbirds in spring and autumn, respectively, and almost all of them were foraging birds. In winter, few birds fed in saltpans, but several thousand fed on mudflats. Waterbirds used inland ponds (8.7 km from center to the intertidal area) mainly for feeding both during low tide and high tide, and used the nearshore ponds (two sites, 1.0 km and 2.8 km from center to the intertidal area respectively) mainly for high tide roosting. Some species such as Black-tailed Godwits, Pied Avocets, Marsh Sandpipers *Tringa stagnatilis* and Black-winged Stilts occurred mainly in saltpans; other species preferred mudflats, such as Red Knots, Great Knots *Calidris tenuirostris*, Bar-tailed Godwits *Limosa lapponica*, Eurasian Curlews *Numenius arquata*, Relict Gulls, and Grey Plovers *Pluvialis squatarola*. The Nanpu Saltpan complex with the adjacent intertidal mudflats is a key staging area for waterbirds in the East Asian-Australasian Flyway and this area is facing enormous development pressures, so establish a nature reserve as soon as possible is the most effective way to strengthen the protection of the wetlands and waterbirds.

2. As an important habitat for waterbirds, the benthic fauna of Nanpu Saltpans is rich, mainly composed of brine shrimp (*Artemia* spp.), larvae of chironomid (Chironomidae), larvae and pupa of brine fly (Ephydriidae). *Chironomus salinarius* and *Ephydra glauca* were the most important species of the brine fly and the chironomid respectively. In all of the samples we collected, the number of brine shrimp, larvae of chironomid, larvae, pupa and adult of brine fly accounted for 29%, 27%, 17%, 26% and 0.3%, respectively. The proportion of biomass (ash free dry weight, AFDW) of these benthic fauna (excluding other rare benthic animals) were 8.4%, 8.3%, 16%, 66% and 0.7%, respectively. There were great differences of the benthic fauna density among ponds. The mean density of brine shrimp, chironomid larvae, brine fly larvae, pupa and adult were 700 ± 208 , 619 ± 194 , 445 ± 140 , 852 ± 289 , and 7 ± 3 /m² (means \pm SE), respectively, and the corresponding biomass were 0.110 ± 0.037 , 0.095 ± 0.032 , 0.240 ± 0.004 , 1.098 ± 0.374 , and 0.009 ± 0.004 g AFDW /m², respectively. The biomass of the brine fly pupa was the largest in benthic fauna. The density and biomass of brine fly adult on the ground surrounding saltpans were 11890 ± 3963 /m² and 15.219 ± 5.073 g AFDW /m², respectively. The generalized linear mixed models (GLMM) showed, in the spring, as the times goes on, the density of benthic gradually increased, and the water depth, salinity, sampling location and water quality strongly affected the distribution and density of benthic fauna. This study found that high density of benthic fauna in Nanpu Saltpans can provide ample food for migratory waterbirds in East Asian-Australasian Flyway.

3. Using the generalized linear mixed models (GLMM) showed that three groups of waterbirds (small size shorebirds, non-small size shorebirds, and non-shorebirds waterbirds) used Nanpu

Saltpans for feeding were affected by many factors such as water depth, salinity, water quality, human disturbance, predators and date. The effects of salinity, water quality, human disturbance and predators on the number of waterbirds feeding in saltpans are similar among three groups, while the effects of water depth and date varied among groups. The number of three groups of waterbirds feeding in saltpans decreased with the increase of salinity, but only the non-shorebirds were significantly affected by salinity in the models. The number of three groups of feeding waterbirds were significant greater in ponds without pollution than those polluted. The presence of predators and human disturbance would reduce the feeding number of waterbirds, but no significant effect were found for the three groups of birds. The number of feeding non-small size shorebirds decreased as the water depth increased; while the number of feeding small-size shorebirds and waterbirds of non-shorebirds changed quadratically as water depth increased, however, the quadratic relationship was not significant for small-size shorebirds. The optimum feeding depth were 0-10 cm and 30-40 cm for shorebirds and non-shorebirds waterbirds, respectively. The quadratic effect of the date on the small size shorebirds was significant, but not on the non-small size shorebirds. In spring, as the time goes on, the number of feeding non-small size shorebirds decreased; while the number of feeding small size shorebirds and non-shorebirds were the highest in the middle of spring migration season. No other factors were found significantly affected the number of waterbirds feeding. The number of three groups of waterbirds feeding were all significantly different among ponds, except the small size and non-small size shorebirds in 2014, and small size shorebirds in 2016.

4. In Nanpu wetlands, Marsh Sandpiper, Pied Avocet, Black-winged Stilt mainly used saltpans; Dunlin *Calidris alpina*, Curlew Sandpiper, Red-necked Stint *Calidris ruficollis*, Kentish Plover *Charadrius alexandrinus* and Sharp-tailed Sandpiper *Calidris acuminata* used both saltpans and intertidal mudflats; Ruddy Turnstone *Arenaria interpres* and Terek Sandpiper *Xenus cinereus* mainly used mudflats. By analysis of video records of shorebirds feeding (or directly observer feeding behaviors) and supplemented by checking gizzard contents of some dead individuals, we studied diet of the shorebirds in Nanpu wetlands, and analyzed feeding rate and intake rate of Marsh Sandpiper and Black-tailed Godwit in saltpans. We found that the diet of shorebirds in Nanpu wetlands were diverse, including bivalve, gastropod, Diptera, Coleoptera, Araneae *et al.* The diet of different species of shorebirds were matched with their habitat use pattern between saltpans and mudflats in study area. Diet from saltpans were mainly brine shrimp, chironomid larvae, brine fly larvae, pupa and adult, and they were different among shorebird species. The feeding rates of Marsh Sandpiper and Black-tailed Godwit were $0.259 \pm 0.009/s$ ($n = 211$) and $0.223 \pm 0.015/s$ ($n = 96$) (means \pm SE), respectively. The intake rate of Marsh Sandpiper and Black-tailed Godwit were 0.167 ± 0.011 mg AFDW /s and 0.172 ± 0.005 mg AFDW /s, respectively. Compared daily energy intake with daily energy requirement (DER), we predicted Marsh Sandpiper needed feed at night, and Black-tailed Godwit had other higher intake rate feeding sites. The relative dry weight of gizzard and salt gland, both lighter in the species used saltpan than those species used intertidal mudflats and those species used mix habitats.

5. Pied Avocet is a common migratory species feeding and breeding in Nanpu Saltpans. We monitored the nests of avocet in 2015 and 2016. The apparent nest survival rates were 52.7% and 47.9% respectively in the two years. The daily nest survival rates (DSR) were 0.984 and 0.97, respectively. The average nest survival rate (calculated from DSR with 24 incubation days) were 67.4% and 48.2% respectively. This nest survival rates in Nanpu Saltpans were comparable to other sites around the world, and the high survival rates were due to low human disturbance in saltpans. The main reasons of nest failure were nest abandoned, and the effect of predators were limited. Programme MARK models showed that the survival rates of nest were related with the number of eggs, nest site, nest height to ground, nest age, breeding date, temperature, and precipitation. The effects of most factors on survival rates were different between two years. This study showed that in the case of low human disturbance, the saltpans can be an ideal breeding ground for the Pied Avocet.

(Weipan Lei, Beijing Normal Universit; Supervisors: Zhengwang Zhang, Jose A. Masero, Theunis Piersma)

Study on mate choice and reproductive fitness in the Yellow-rumped Flycatcher (*Ficedula zanthopygia*)

Mate choice is an important evolutionary process influencing a vast array of traits and ecological processes, which contains both direct and indirect benefits. Extra-pair paternity is widespread among avian species, which is considered to be a means by which females can modify their initial mate choice. The underlying causes of these extrapair matings are not well understood despite being a source of much recent study and debate.

The yellow-rumped flycatcher (*Ficedula zanthopygia*), a sexually dimorphic songbird exhibiting social monogamy with a considerable level of EPP was used as model species. Present study was conducted during breeding seasons from (April-July) 2011 to 2013 at Zuoja Nature Reserve. We aimed to test the effect of mate choice and extra-pair mate choice on fitness in yellow-rumped flycatcher. We collected blood samples and morphological measurements of 64 pairs of parents and 325 offsprings. In present study we aimed at unveiling the mechanisms of mate choice at 10 pairs of neutral markers (microsatellites) and MHC genes (adaptive genetic markers) to analyse the microsatellite marker heterozygosity. We checked relatedness between the pairs, and compared MHC marker diversity, similarity and amino acid distance between the pairs.

The study of the mate choice found that the MHC similarity between the social pairs are lower than random pairs. Females tend to choose optimum number of MHC alleles males, which support optimum hypothesis.

The study of the extra-pair mate choice found that female yellow-rumped flycatchers were

more likely to choose larger and relatively highly heterozygous and less MHC similarity males than their social mates as extra-pair mates. Similarly genetic similarity of pairs that produced mixed-paternity offspring did not differ from the similarity of pairs producing only within-pair offsprings. Further there was no effect of the interaction between male and female MHC allelic diversity on the occurrence of extra-pair paternity (EPP). These findings support the good genes hypothesis but do not exclude the compatibility hypothesis. Present study of MHC loci support for his optimal outbreeding hypothesis.

For the effect of ecological factors on EPP, we found that breeding density, breeding synchrony and their interaction did not affect the occurrence of extra-pair paternity in this species. Our results showed that most males were cuckolded by distant males rather than nearest neighbors. In addition, the cuckolders were significant more heterozygous and larger than males they cuckolded. However, no differences were detected between males being cuckolded and their nearest neighbors. These findings indicated that male yellow-rumped flycatchers could prevent from being cuckolded by their nearest neighbours by reducing social mate's willingness via quality-dependent nearest neighbour selection. Quality-dependent nearest neighbour selection might be a cryptic male paternity assurance strategy but still it needs further investigation.

The results of analysis on offspring fitness showed that that extra-pair offspring were more heterozygous than their half-siblings, which consist with 'indirect benefit hypothesis'. Our survey revealed that the sexual strain showed female-biased sex ratios but no evidence for a male-bias in EPO sex ratios. However, females may manipulate the sex ratio of their offspring according to their own condition.

(Mingju E, Northeast Normal Universit; Supervisors: Haitao Wang)

Study of alarm information transfer in three species of Passerine birds

Information communication among animals is very important for maintaining community relationship, individual survivorship and reproduction. Revealing the mechanism and evolution of information transfer of animal signals is a foundation question in animal communication. For birds, bird vocalization is the major means of communication, and they usually produce alarm calls in addition to showing behavioral responses when in danger. However, knowledge of what information contained in the alarm calls, and how the information transmitted are largely unknown. In this study, I focused on three Passeriformes species in conditions of predation and brood parasitism pressure, investigated the information of alarm calls, as well as their transfer mechanism.

This study adopt the methods of posing specimens, alarm calls recording and sonograms analysis, playing alarm calls back and behaviors observation. After the analyses of experimental data, we

obtained the major results and conclusions as follows:

I played back the recordings from barn swallows (*Hirundo rustica*) in response to a parasitic common cuckoo (*Cuculus canorus*) dummy (barn cuckoo alarm calls) and a predator Eurasian sparrowhawk (*Cuculus canorus*) dummy (barn hawk alarm calls) to sympatric and non-sympatric conspecifics. In playback experiments, swallow barns performed stronger responded behaviors to barn sparrowhawk alarm calls than to barn common cuckoo alarm calls. The results suggested that swallow barns could distinguish between common cuckoo and sparrowhawk, and their alarm calls could transmit different information to individuals of conspecifics. Conspecifics individuals among different breeding regions could share alarm information of alarm calls.

By posing specimens, I observed the response behaviors and recorded the alarm calls of great tits (*Parus major*) to a sparrowhawk and a common cuckoo. There was no significant difference in behavioral response among great tits when exposed to the dummy of cuckoo and sparrowhawk. But, they differed significantly in alarm calls. Great tits produced more notes per call contained increasing D-type and decreasing I-type notes when responding to sparrowhawk than to cuckoo. I then played back the recordings from great tits in response to the cuckoo (tit cuckoo alarm calls) and sparrowhawk (tit hawk alarm calls) to conspecifics. In playback experiments, we found that great tits responded more strongly to tit hawk alarm calls than to tit cuckoo alarm calls. This results suggested that great tits may be able to distinguish between common cuckoo and sparrowhawk, and they perhaps convey information in alarm calls by adjusting the number and combinations of notes of a single call type.

I divided alarm calls (C-D) of great tits which produced in response to common cuckoo into C and D phrases, then copied these two phrases to construct C and D calls separately. Original calls (C-D), C calls and D calls were played back to male great tits to observe their response behaviors. In playback experiments, male great tits performed scanning behaviour to C and C-D alarm calls, while, they did not perform any special response behavior to D calls. The present study suggested that C and D phrases perhaps have different functions. C phrases perhaps have the function to transmit information about dangers existing around, but, we are not sure the function of D phrases which needs further investigation.

I played back the recordings from great tits in response to chipmunk (*Tamias sibiricus*, nest predator), sparrowhawk, common cuckoo and dove (*Streptopelia orientalis*) to incubating great tit females. In playback experiments, great tit females performed the behaviours of looking out at the hole of nests or leaving nest to tit chipmunk alarm calls, which responded stronger than to other three alarm stimuli. The results suggested that incubating females could assess the outside conditions and adopt a response behaviors relying on alarm calls.

I played back alarm calls from green-backed tits (*Parus monticolus*) in response to common

cuckoo (lager size, tit com-cuckoo alarm calls hereafter) and Asian emerald cuckoo (*Chrysococcyx maculatus*, small size, eme-cuckoo alarm calls hereafter) to the incubating green-backed tit females. In playback experiments, females responded similar to tit com-cuckoo or tit eme-cuckoo alarm calls, such as looking out at the hole of nests or leaving nest. The results suggested that alarm calls of green-backed tits perhaps do not contain the information about sizes of brood parasites.

This study showed that Passeriformes birds' alarm calls have the function to transmit alarm informations. Although three Passeriformes species behaved similarly to different categories of intruders, their alarm calls could transmit relative information about intruders to conspecifics. Sound characteristics, such as note combination types, note number of a call and call rates, might play a role in the process of information transmission. Conspecifics receivers could make a trade-off and adopt appropriate response behaviors after receive informations.

(Jiangping Yu, Northeast Normal Universit; Supervisors: Haitao Wang)

Parental investment during the incubation period of first brood in the Great Tit (*Parus major*)

Reproductive investment is a key life-history trait of birds, which directly affects the reproductive success of birds. The incubation period is one of the important processes in avian breeding cycle, parents need to make a trade-off between parental care and self-existence. However, few studies researched on parental investment during incubation period. From March to July of 2015 and 2016, I researched parental investment of incubation period of first brood in the Great Tit (*Parus major*) which bred in artificial nest-boxes at Zuoja Nature Reserve of Jilin Province. A half-day video was used to record female nest attentiveness and rates of females fed by males. Nest intruder experiments were simulated by using fingers to test the female defence intensity. Alarm calls playback experiments were used to test the defence intensity of males. Simultaneously, we investigated the effects of intrinsic factor and external factor on parental investment during incubation period, such as laying date, clutch size, body condition of parents, ambient temperature.

Results showed that female nest attentiveness was positively related to clutch size, incubation days, laying date: increased with the larger clutch size, later laying date and more incubation days. While, the female nest attentiveness was negatively related to ambient temperature: increased with lower temperatures. Male incubation feeding was positively related to clutch size: increased with the larger clutch size. Male incubation feeding was negatively associated with ambient temperature: increased with lower temperatures. Male nest defence intensity was positively related to male body condition: increased with the better male body condition. Female nest defence intensity was positively related to clutch size: increased with larger clutch size. Hatching

success was positively related to clutch size: increased with the larger clutch size.

Results of this study indicated that Great Tit could regulate their reproductive investments of incubation period according to clutch size, laying date, body condition and ambient temperature.

(Weiwei Lu, Northeast Normal University; Supervisors: Haitao Wang)

The influence factors of extra-pair mate choice in female Great tit (*Parus major*)

In monogamous birds, female copulate with the male outside of social spouse is called extra-pair copulations, the offspring called extra-pair offspring. Monogamy is divided into social monogamy and genetic monogamy. The occurrence of extra-pair copulations and the influence have become the focus researches in the behavioral ecology of avian species. The researchers carried out a large number of studies on the mechanism of the occurrence and distribution of birds, but there is no conclusive evidence about the influence factors of extra-pair. Great tits (*Parus major*) are social monogamous, secondary cavity-nesting birds. It has been proved that there is extra-pair phenomenon in great tits. The author conducted a study on the extra-pair copulations behavior in the Great tits inside artificial nest box during March to July in 2014 to 2016 at Zuo Jia Natural Reserve Jilin province. The purpose of this study was to determine the proportion of extra-pair in the target population, to explore and analyze the influencing factors of extra-pair and the morphological and behavioral characteristics of extra-pair partner.

During the study period, we caught 73 pairs of great tits during their first brood, collected total parent-offspring blood samples and measured morphological characteristics, and recorded 49 males' territorial song. We identify extra-pair paternity by microsatellite marker methods, and the result of molecular experiment was analyzed through Cervus3.0 software, COANCESTRY software and SPSS 21.0 software. The results showed that: there are 35.61% (26/73) nest have EPO. There are 9.28% (77/829) offspring is EPO. In the nest with EPO, There are 28% (77/275) chicks were EPO. There were no significant differences between EPO and non-EPO male morphological features, singing characteristics, suggesting that females did not select males according to morphological characteristics outside marriage. There were no significant differences on genetic heterozygosity between the males had and did not have the EPY in nest ($Z = -1.493, p = 0.135$). The genetic heterozygosity of the social males cuckolded was significantly lower than that of the extra-pair males ($Z = -2.425, p = 0.021$), there were no significant differences on genetic heterozygosity between the EPY and WPY ($Z = -1.323, p = 0.186$). In choosing extra-pair males, females did not choose high genetic heterozygosity males in the population ($W = -1.0309, p = 0.3091$). The results indicate that male genes heterozygosity was not the main motivation for female occur extra-pair copulations; female preferred extra-pair males with higher genetic heterozygosity than their social males, but that did not increase their offspring heterozygosity. Pairwise relatedness of the males having EPY in nest was significantly higher than that of the males did not have EPY in nest

($t=2.237$, $p=2.237$). The pairwise relatedness between social males are significantly higher than extra-pair males ($t=4.430$, $p<0.001$). The results indicate that the pairwise relatedness of society pairs are the influence factors for extramarital pairing. The female preferred the lower pairwise relatedness than herself as the partner extramarital pair.

(Yusheng Wei, Northeast Normal University; Supervisors: Haitao Wang)

Benefit and cost for extra-pair copulations in male Yellow-rumped Flycatcher (*Ficedula zanthopygia*)

Extra-Pair Copulation (EPC) is widespread among avian species, and more than 70% of the Passeriformes birds have extra-pair mating behavior, and strict genetic monogamy is less than 25%. In the early study, it was found that the proportion of the extra-pair about Yellow-rumped Flycatcher (*Ficedula zanthopygia*) was higher in the Zuo jia Nature Reserve. We carried out a reach during breeding seasons from (April-July) 2015 and 2016 years. The study include 3 parts: a half-day observation of mate guarding during the egg laying period; the incubation period was used to carry out the parent birds defence experiment; provisioning rate of parent during the breeding period. In present study we aimed to test, relatedness between benefit and cost of male yellow-rumped flycatcher in extra-pair.

During the study period, a total of 48 nests were found, 25 of which were extra-pair nests, and of all 245 nestings, there are 65 extra-pair offsprings, EPC occurrence rate is 52.1%.

We found the total number of genetic offsprings of male cuckolders were significant more than males they cuckolded. There was no significant correlations between mate guarding intensity and proportion of extra-pair paternity, and we found positive correlation between the indicator of male composite body size and the guarding intensity of male guarding mate. Our parent birds nest defence experiments showed: defence intensity did no differ between male and female; we found no correlation between male defence intensity and proportion of extra-pair paternity; we found no correlation between male defence intensity and their extra-pair offsprings in other nests; there was no significant correlation between male defence intensity and clutch size. The provisioning experiments of parent birds showed: female shared more than male for provision; there was no significant correlation between proportion of male provision in the nest and proportion of extra-pair paternity. Male and female provisioning rate did not differ between exist extra-pair paternity and no extra-pair paternity. We found there existed significant positive correlation between male provisioning rates and male composite body size indicator.

The results suggest that the male may get more offsprings through extra-pair copulation, increase the breeding fitness; male do not pass mate guard against the effective prevention of the loss paternity, in the presence of extra-pair paternity with absence extra-pair paternity, there was no

significant difference in male defensive intensity and provisioning rates.

(Yangyang Yu, Northeast Normal University; Supervisors: Haitao Wang)

Effects of body characteristics and song characteristics on extra-pair mate choice in the Yellow-rumped Flycatcher (*Ficedula zanthopygia*)

Extra-pair mating has been observed in many socially monogamous species in birds. About 86% of Passerine birds have extra-pair mating. Male traits have intensified over the last two decades and there are now many species of birds for which male traits associated with extra-pair mating success have been identified. We examined the factors which influenced extra-pair mating in the Yellow-rumped Flycatcher (*Ficedula zanthopygia*). The research was carried in late-March to mid-July 2015-2016 in Zuoji nature reserve Jilin Province. We caught 48 pairs of Yellow-rumped Flycatcher and 245 nestings, we recorded 41 males' territorial song. We used Avisoft-SASLab Pro Software to analyze these songs and used microsatellite markers and Cervus3.0 software to identify the paternities. Our study showed that the extra-pair young (EPY) were distributed across 25 of a total 48 broods (52.08% in the pooled data; 59.26% in 2015; 42.86% in 2016). About 26.53% chicks were sired by the males outside the social pair bond. The genetic father could be determined for 32 of the extra-pair chicks. The extra-pair young frequency did not differ markedly between the two years.

We found there were no significant differences between extra pair and cuckolded males in the measured male traits (tarsi, wing length, tail length, body length, weight). Extra pair males had significantly higher song maximum frequency than the social males they cuckolded ($Z = -0.278$, $p = 0.029$) among the seven song characteristics we selected. In addition, we also found that the territorial song characteristics cannot represent body condition (wing length/weight) in the Yellow-rumped Flycatcher.

(Siyu Zhang, Northeast Normal University; Supervisors: Haitao Wang)

Bird Banding Reports

Bird Banding and Recovery of China in 2016

In China, a total about 100,000 birds of 431 species were banded at 48 stations in 2016. There were 86,000 land-birds belonging to 298 species from 29 stations. Passeriformes account for the largest proportion: 85,000 birds of 239 species. Other major groups that were banded included 3,541 birds of 18 stork species, 800 birds of 34 raptor species, 4,635 birds of 52 shorebird species, 1,247 birds of 23 duck and geese species, 278 birds of 18 cranes and coots, and 373 birds of 12 woodpeckers.

The top ten banded species were Black-faced Bunting(*Emberiza spodocephala*), Common Redpoll (*Carduelis flammea*), Red-flanked Bush Robin (*Tarsiger cyanurus*), Brambling (*Fringilla montifringilla*), Rustic Bunting (*Emberiza rustica*), Yellow-throated Bunting (*Emberiza elegans*), Yellow-browed Warbler (*Phylloscopus inornatus*), Little Bunting (*E. pusilla*), Long-tailed Rosefinch (*Uragus sibiricus*) and Siberian Accentor (*Prunella montanella*)。

There were 5067 birds of 107 species color marked at 23 bird banding stations, of which 941 songbirds of 42 species, 3870 shorebirds of 42 species, 186 ducks and geese of 13 species, 50 herons and storks of 5 species, and 11 cranes of 4 species..

(Lixia Chen and Jun Lu, Beijing)

Bird Banding of 2016 in Xinqing, Heilongjiang

The bird-banding of Xinqing Bird Banding Station, Heilongjiang was lasted for 141 days. A total of 25,183 individuals, 88 species, 28 families and 8 orders were banded. Furthermore, 1067 birds were recaptured and 24 birds returned to their birth places. Since the start of bird-banding in 2007, the Xinqing Bird Banding Station had banded 376,778 individuals, 189 species, 41 families, 14 orders in this area.

The dominant banded species of this year are Passeriformes, including Black-faced Bunting (*Emberiza spodocephala*), and Rustic Bunting (*Emberiza rustica*).

This number of common redpolls banded was smaller than before, which may be related with the weather conditions. The cold air arrived later than usual years, resulting the delay of migration. When the number of common redpolls peaked, our banding operation had already completed. The time may be also affected by the local weather at Xinqing Banding Station, but this conclusion still requires further investigation and discussion.

(Linxiang Hou and Hongwei Li, Heilongjiang)

Bird Banding at Dongzai National Nature Reserve, Henan

Bird banding work was conducted in Dongzai National Nature Reserve from May 10 to 26, 2017, lasted 14 days. A total of 313 birds belonged to 6 orders, 21 families, and 42 species were banded. Among the banding birds, a total of 22 birds of 3 orders, 8 families, 9 species were recaptured. We also recorded Hair-crested Drongo (*Dicrurus hottentottus*) recaptures. Golden-spectacled Warbler (*Seicercus burkii*) and Brown-breasted Flycatcher (*Muscicapa muttui*) are the new records of the Dongzai National Nature Reserve.

(Bo Xi, Zhiyong Du and Junfeng Zhang, Henan)

Bird Banding at Qingfeng Bird Banding Station, Heilongjiang during spring 2017

Bird banding was conducted in Qingfeng bird banding station in spring from 1 March to 31 May. A total of 6324 birds of 61 species, 20 families, 6 orders were banded and 46 birds of 9 species were come back home, 23 birds of 6 species were recapture. Chinese Penduline Tit (*Remiz consobrinus*) is the new record.

Of the birds banded, Passeriformes were the most common, 6259 birds of 52 species were banded, accounted for 99% total captures. There were 65 birds of 9 species, 6 families, 5 orders of the non-Passeriformes banded, accounted for 1.0% of total banded. Of Passeriformes, Emberizidae was the most, followed by Turdidae, Fringillidae, Sylviidae, Prunellidae, Laniidae, Muscicapidae, Motacillidae.

The total of the birds banded is the lowest this year compare to former years. The reasons of the decline could be due to the climatic change and change of the banding staff. We will explore other reasons.

(Yanlan Yang, Heilongjiang)

17 swift locators recovered in 2017 at Summer Palace of Beijing

China Bird Watch carried out the Beijing Swift (Swift) banding and locator recovery activities at Octagon Pavilion at Beijing Summer Palace on May 20, 2017. Bird Watch China has been carrying out this work for 10 years, wearing and recovering locators for four years.

Xinru ZHAO was in charge of these swift locator recovery and banding activities, assisted by Fang YU, Peng PENG, XuanLIANG, Jianping FU, Xiaoru HOU and Lan WU as banding technical staff with the volunteers to help with netting, capturing and recovering, recording, banding and releasing.

For increasing the efficiency, the team arrived at the site at 2:30 am and all nets were set before dawn (3:25 am). At 2:45 am, the first swift was captured. By 7:10 all works were completed.

A total of 165 swifts (*Apus apus pekinensis*) were captured. Of which 96 were recaptures of from last year, 58.18% recapture rate. We recovered 17 locators. Among 96 previously banded swifts, 82 were first time recaptures, 13 were recaptured twice, and 1 was recaptured for the third year. The other 69 swifts were first time banded this year, no mortality occurred.

With the strong support by Summer Palace Management Office, many visitors were interested in our research activities and the ecology and distribution of the swifts.

There were more than 20 volunteers participated the work. Bird banding expert Lyndon Kearsley from Belgian and birdwatcher Terry Townshend from England participated the work.

(Xinru Zhao and Ming Liu, Beijing)

Bird Banding at Cuihu National Urban Wetland Park

We conducted bird banding at Cuihu National Urban Wetland Park from April 22 to May 7, 2017. This banding work was focused on the following four areas:

1. Led by the Beijing Bird Banding Station and with the supervision of Beijing Wildlife Rescue & Rehabilitation Center, we carried out a bird banding training for the technicians and community volunteers of the banding stations from Beijing. We invited Dongping LIU and Lixia CHEN from China National Birds Banding Center, Xinru ZHAO from Beijing Normal University, and Fang YU to provide lectures, demonstration and on-site training.
2. Continued to explore close and effective collaboration with the Chinese Bird Watch Association, a NGO. More than 70 banding volunteers participated the daily banding activities.
3. In response to the strong wind and drought weather, lake dry-out conditions, we adjusted the net locations, and effectively improved the success rate of captures.
4. Improved the effectiveness of banding data collection, we increased science and technology components during the banding process.

We had a total of 486 captures, which belonged to 34 species of 17 families of 5 orders.

(Xinru Zhao and Ming Liu, Beijing)

2016-Autumn Bird Banding at Suichuan Bird Banding Station of Jiangxi Province

Along the central Asia's migration pathway, one of the three major migration pathways of China, Suichuan Bird Banding Station (E113°59'4.28", N26°13'24.59") at Jiangxi Province is a key migratory stopover site. The 2016-autumn banding was from September 1st to October 31st, lasted for 61 days. A total of 1942 birds of 13 orders, 28 families, 83 species were encountered, of which the 6 new species for the site: one *Spelaornis formosus*, one *Cinclidium leucurum*, three *Apus nipalensis*, one *Accipiter gularis* and one *Cuculus fugax*.

The main banded birds of our station were Aedeidae, in order Ciconiiformes, e.g., Chinese Pond Heron, Black-crowned Night Heron, Chinese Little Bittern, Cattle Egret. They accounted for 79.35% of all captures, Chinese Pond Heron was the most abundant species accounted for 53.96% of total captures.

The annual banding work at the site since 2002 has accumulated 30197 banded birds, belonging to 13 orders, 47 families, 200 species.

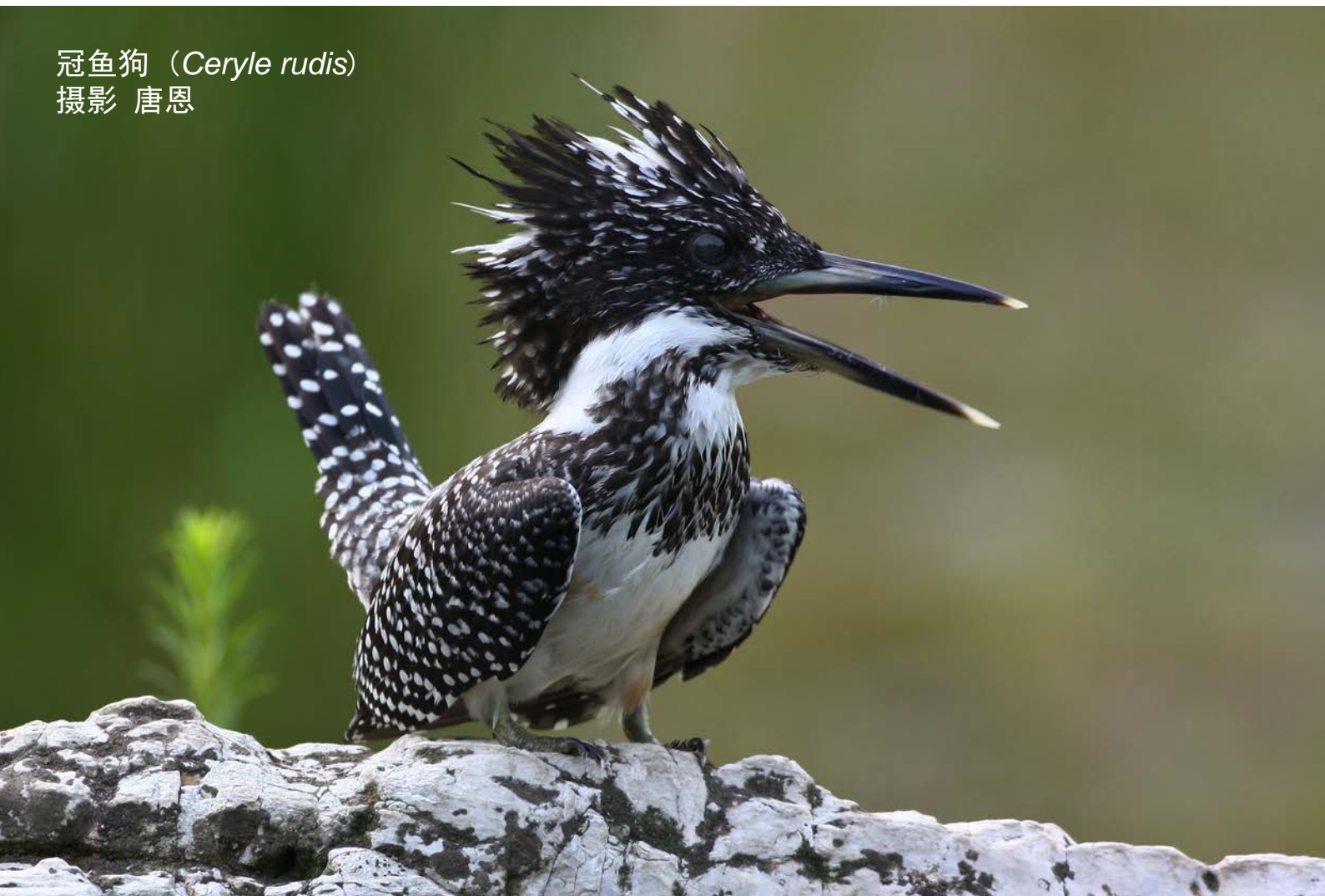
In recent years, the number of birds banded has been stable with a total between 1500 and 2000 annually. Comparatively speaking, the number of this year was slightly increased compared to last year, which could be due the increase of bird species encountered, accidental arrivals of some birds, and weather related factors such as typhoon, which requires further investigations.

(Gaodong Zhu and Xuqing Liao, Jiangxi)

中华攀雀 (*Remiz consobrinus*)
摄影 仇基建



冠鱼狗 (*Ceryle rudis*)
摄影 唐恩



栗斑腹鹀 (*Emberiza jankowskii*)

摄影 姚恒彪

