Understanding and controlling the evolution of reproductive behaviour during *ex situ* conservation

Human appropriation of land and resources is reducing the habitat available to non-human species. As a result, many species are now being conserved *ex situ*. In such cases, natural phenotypes and diversity must be maintained in captive populations to allow for potential rewilding in the future. Much attention has been paid to the conservation of genotypes and genetic diversity, but heritable behaviours can also evolve in captivity, and the conservation of behaviours has received relatively little attention.

Birdsong is one behaviour that can evolve in captivity. For example, the Bengalese finch is a domesticated variant of the white-rumped munia, and during domestication its song has become more complex than that of its wild ancestor. Because of its role in mate recognition, birdsong is of particular importance to conservation practitioners. If the songs of captive and wild populations diverge until the animals cannot recognise each other as mates, it may be impossible to supplement wild populations with releases from captivity. In addition, if songs diverge among captive populations, it may be difficult to maintain genetic diversity by transferring animals among *ex situ* conservation facilities.

The Java sparrow is a congener of the Bengalese finch and is a species of conservation concern. A formal *ex-situ* conservation programme for the species is being developed. Despite its close relationship to the Bengalese finch, nothing is known about how captivity affects the song of the Java sparrow. Thus, population managers do not know whether they should be concerned about song conservation in this species. Moreover, if song conservation is important, practitioners lack evidence-based tools for achieving it.

In this project, we aim to i) understand how and why Bengalese finch song has evolved in captivity, ii) assess whether Java sparrow song is also affected by captivity, and iii) evaluate strategies for maintaining wild-type birdsong in captive populations. The student will:

1. Use molecular approaches to reconstruct the population history of the Bengalese finch in captivity. This will help us to understand when and how Benaglese finch song diverged from that of its wild ancestor.

2. Assess whether song has diverged among Bengalese finch populations in North America, Europe, and Asia. This will help us to understand whether songs have evolved due to drift, or whether similar selective pressures drive song evolution in different captive populations.
3. Use mate choice trials to determine whether divergence among Bengalese finch populations, and between Bengalese finch and white-rumped munia populations, is sufficient to inhibit mating and influence gene flow.
4. Assess whether song has diverged among native, captive, and introduced populations of Java sparrows. If divergence has occurred, assess whether this is sufficient to inhibit gene flow between populations.
5. Design and assess husbandry practices to slow or reverse song divergence in captive populations of estrildid finches.

The student in this project will receive training in modern molecular genetic approaches for analysing population history (*e.g.*, whole mtDNA sequencing or haplotype sharing), statistical approaches for assessing similarity and divergence between birdsongs, mate choice trials and behavioural assays, and birdsong recording in the field and in the lab.

The project will be a CASE partnership with Chester Zoo. The supervisory team will include Tucker Gilman and Susanne Shutlz (University of Manchester), Leah Williams (Chester Zoo), and Jakob Bro-Jorgenson (University of Liverpool). For more information, email tucker.gilman@manchester.ac.uk. Apply at http://tinyurl.com/java-sparrow-phd by **18 January 2017**.