

PhD studentship: Sheffield, United Kingdom

Conservation genomics of the Seychelles warbler

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This PhD project is part of the NERC funded Doctoral Training Partnership 'ACCE' (Adapting to the Challenges of a Changing Environment; <http://acce.group.shef.ac.uk/>). This is a partnership between the Universities of Sheffield, Liverpool, York and the Centre for Ecology and Hydrology.

In the 1960s, the Seychelles warbler was reduced to a single population of less than 30 birds on Cousin Island. The population later recovered ten-fold due to habitat restoration and has since increased through translocations to four other islands. The global population was however historically vastly larger and an intensive 20-year study of the life history of the entire Cousin population has recorded negative effects of inbreeding on fitness. As the bottleneck in this species was recent and the contemporary population size remains historically small, we hypothesize that genetic variation will continue to be eroded by inbreeding. This project will conduct one of the first conservation genomic analyses, assessing regions of the Seychelles warbler genome that contribute to inbreeding effects. It will model the population size required to maintain extant genomic diversity and so inform future management plans of this and other species of conservation concern. We are seeking a student passionate about conservation biology, cooperative breeding and genomics. They should have a keen interest in learning field and laboratory skills, including next generation sequencing techniques. They will be trained in population bioinformatics, statistics, conservation genetics, and evolutionary theory. Along with the standard application, applicants should submit a one page PhD proposal.

This study will assess directly how the genomics of individuals contributes to both the lifetime survival and reproductive components of individual fitness, and ultimately to the long-term persistence of the entire species. It will use large-scale representational sequencing analysis from across the genome, combined with a multi-generational family tree of more than 1500 individuals with detailed life-history and fitness data. The student will generate data in Liverpool and analyse the data in Sheffield. The student will quantify variation and identify the genomic regions that contribute to fitness, including inbreeding effects. The effective size of haplotypic variation at each of these regions will then be used to model and predict the population size required to maintain the extant genetic variation. The results will be used to define strategies for the most effective future management 'to maximize adaptive potential' of this (and

similar) populations. Our long-term data on population fluctuation (driven by El Niño events) will be included in an associated risk analysis.

Unravelling the genomics of inbreeding in natural populations that experience environmental variation, such as El Niño events, is an achievable but unresolved goal in evolutionary biology. With increasing environmental variability it is important to understand the extent to which populations can respond to this in the short and long term. The proposed study will provide novel insights into our understanding of how both the genome and the environment influence evolution and population persistence in natural systems.

The Seychelles warbler was critically endangered but four pioneering translocations have reduced the risk. Translocation is now an increasingly important conservation tool in a range of contexts. The results will contribute to the next IUCN assessment of whether the recovery programme is effective and complete, whether deliberate population exchanges are desirable, and influence the design of many other translocation programmes now in progress. No previous study in a natural population has dissected inbreeding effects at the genomic level. This will be one of the first conservation genetic studies to produce an explicit, evidence-based and implementable management plan to maintain evolutionary potential.

Funding notes: Fully funded for a minimum of 3.5 years, studentships cover: (i) a tax-free stipend at the standard Research Council rate (at least £13,863 per annum for 2015-2016), (ii) research costs, and (iii) tuition fees at the UK/EU rate.

Eligibility: Studentships are available to UK and EU students who meet the UK residency requirements. Students from EU countries who do not meet residency requirements may still be eligible for a fees-only award.

Selection process: Shortlisting will take place as soon as possible after the closing date and successful applicants will be notified promptly. Shortlisted applicants will be invited for an interview to take place at the University of Sheffield on w/c 9th February 2015.