

Impacts of inbreeding on life-long drought resistance in a Kalahari bird: a genomic approach

Project ID: 3741

Supervisory team

Main supervisor: Prof Andrew Young (University of Exeter)

Second supervisor: Dr Xavier Harrison (University of Exeter)

Other supervisors: (University of Exeter), Dr David Horsell (Physics, University of Exeter) Dr Sean Rands (University of Bristol)

Collaborators: Dr Misha Vorobyev (University of Auckland, New Zealand) Prof Daniel Osorio (University of Sussex)

Host institution: University of Exeter

Project description: Negative effects of inbreeding on animal health and performance (inbreeding depression) are well documented in artificially selected livestock and natural animal populations. However, it is less clear to what extent inbreeding undermines resilience to the climatic stressors becoming increasingly frequent under anthropogenically induced global change. Research to date has focussed principally on the effects of inbreeding on thermal stress resistance, with much less attention paid to its effects on drought resistance. This project will therefore use



Effects of inbreeding on climatic stress resistance in a Kalahari bird

genomic approaches to investigate the direct and intergenerational effects of inbreeding on drought resistance over the life-course, in an arid-zone bird known to experience both inbreeding and drought: white-browed sparrow weavers in the Kalahari desert. The project will leverage complete life-history data and genetic material for ~800 individuals monitored through a range of climatic conditions over our 12 year field study. We will construct a whole genome assembly for the bird and pair this with genomic data for all monitored birds (both existing high coverage RAD-Seq data and newly generated SNP-chip data) to calculate genomic estimates of inbreeding (GEI; reflecting the extent and structure of genomic homozygosity). We will then use novel statistical methods from global change healthcare to investigate:- The effects of inbreeding (having higher GEI) on drought resistance, from development to senescence.- The intergenerational effects of inbreeding on drought resistance (i.e. effects of parental GEI on offspring drought resistance and of offspring GEI on parental drought resistance; as offspring help their parents in this cooperatively breeding bird).- Whether inbreeding effects localise to particular genomic regions.- Whether the social environment (the presence of 'helpers' in this cooperative bird) mitigates inbreeding effects. The project will be supervised by an interdisciplinary team with expertise spanning Evolutionary Ecology (Andy Young, Exeter Centre for Ecology & Conservation; CEC), Genomics and Inbreeding (Xav Harrison; CEC) and Climate and Statistical Modelling (Theo Economou & Oscar Rodriguez-De-Rivera-Ortega; Exeter Mathematics & Statistics). The doctoral candidate will join Young's research group at the globally renowned CEC in Cornwall and receive extensive training and hands-on experience with diverse quantitative methods, from bioinformatics for genome assembly and variant calling to the application of novel statistical models for assessing organismal resilience to climatic change. The project will advance our fundamental understanding of both the impacts

of inbreeding and the drivers of variation in organismal resilience under anthropogenically induced global change.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.