Landscape genomics of Bornean water buffalos

Supervisory team:
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Collaborators: Jon Corpe (West Country Water Buffalo Ltd.), Dr Sen KSS Nathan (Sabah Wildlife Department), Dagan James (Broughton Water Buffalo)

Host institution: Cardiff University

Project description:
Understanding the role of environmental adaptation is crucial to develop strategies to mitigate the effects of climate change. Identifying genomic regions involved in local environmental adaptation in species of agricultural interest is among the first steps towards generating a plan to conserve the adaptive potential in those species to guarantee the resilience of agricultural systems in the future. However, identifying those regions has only become possible in the last decades with the development of sophisticated genomic and statistical methods. This project will sample water buffalos in Sabah (Malaysian Borneo) and the UK, and genotype them with the Axiom™ 90K Genotyping Array. This genomic data will be used to characterise the domestication and demographic history of the water buffalo. Additionally, it will be correlated to environmental variables from the samples' collection sites to identify genetic markers involved in local adaptation to Sabah's contrasting environments using state of the art landscape genomic methods. For the UK, correlative analyses between the genetic markers and production traits of interest will be carried out to identify genes of agricultural relevance. The combined results of these efforts will contribute to the generation of recommendations to inform husbandry practices while providing a collection of markers to monitor environmental adaptation.

The PhD student will be based 75% at Cardiff University, spending 50% of the time at the main supervisor's lab that specializes in identifying signatures of selection using genomics in livestock, while 25% of the time will be spent in Sabah based at Cardiff University's Danau Girang Field Centre collecting buffalo samples in collaboration with the Sabah Wildlife Department (Collaborator). 20% of the time will be spent with the Bristol University's supervisor, a world leader in the development of statistical approaches to study demographic history using genetic data. 5% of the time will be spent with the UK collaborator learning about the water buffalo industry in the UK and contributing to knowledge dissemination in the industry.

The PhD student will be trained in sampling and bioinformatics for SNP chip analysis (e.g. data quality filtering, demographic analyses, and identifying signatures of selection). This experimental design will enable the PhD student to characterise the domestication process of the swamp water buffalo and identify markers associated to local adaptation and production traits, while controlling for confounding factors such as the demographic history (to be simulated with approximate Bayesian computation).

Informal enquiries are also encouraged. Please contact Dr. Pablo Orozco-terWengel at 'Orozco-terWengelPA@cardiff.ac.uk'.