Assessing how ecology influences evolutionary transitions to complex societies in African cichlids

Supervisors: Susanne Shultz (UoM) and John Fitzpatrick (UoM)
Contact: susanne.shultz@manchester.ac.uk

COLLABORATION PARTNERS: Sigal Balshine (McMaster University) and Zambian Department of Fisheries (Mpulungu, Zambia)

Introduction: Animal behaviour does not evolve in a vacuum. Rather, ecological factors play an important role in shaping the evolution of animal behaviour by establishing the context under which individuals and species interact. For example, complex social interactions are unlikely to evolve in species where ecological pressures promote a solitary existence. Simillarly, when food resources are abundant there is little to be gained by coordinated foraging efforts (e.g., hunting in packs) among individuals. Yet despite the intimate link between species ecology and behaviour we still know surprisingly little about how differences in species ecologies directly infleunce the evolution of animal behaviours. In particular, the importance of ecological factors in promoting the evolution of complex animal societies, including in highly specialized cooperatively breeding species, remains an open question. This project will address this question by using recently developed phylogenetic techniques to examine how ecological forces shape social interactions, populations structure, parental investment patterns and mating behaviours in African cichlids.

Project Summary: The cichlids of the African Rift Lakes are one of the best extant examples of explosive adaptive radiation. The oldest of these lakes, Lake Tanganyika, is home to over 200 species of cichlids. Tanganyikan cichlids vary widely in their habitat use, diet, mating systems and parental care strategies, making them an ideal model system for understanding how ecological factors influence the evolution of animal behaviours. The aim of this multidisciplinary project is to identify how ecological forces, including microhabitat use, diet and predation risk, influence cichlid social, mating and genetic population structure. To do this, the student will perform field work in Lake Tanganyika, in central Africa, where they will collect data on feeding ecology, habitat availability, genetic mating system, and social structure for Tanganyikan cichlids. Tissue samples collected in the field will be process in the state-of-the-art molecular facilities at the University of Manchester

A male *Ophthalmotilapia ventralis* displaying his yellow egg dummies on elongated pectoral fins in Lake Tanganyika.

to evaluate how mating systems impact on effective population size, paternity allocation within broods, spatial patterns of relatedness, and dispersal. The student will then use recently developed phylogenetic models to assess evolutionary links between species ecology and social and mating structure. By sampling a diverse range of closely related species, this project will provide the first comprehensive assessment of how social and reproductive structuring are impact on paternity allocation, reproductive skew, effective population size and within population genetic structuring. Understanding the links between ecology, behaviour genetic structuring can also provide insight into population vulnerability to demographic crashes.

The project is highly multi-disciplinary, bringing together the fields of animal behaviour, evolutionary genetics, phylogenetics and ecology. The student will emerge with a suite of cross-disciplinary techniques directly relevant to concepts in evolutionary biology, genetics and animal behavoiur. During this project, the student will be trained in cutting-edge next generation molecular techniques in the Faculty of Life Sciences state-of-the-art Genomics Facility. The student will also gain extensive field experience in remote locations, as data collection will take place in central Africa. The project would suit students with a background or interest in evolutionary biology, phylogenetics and sexual selection.

References

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