

Amphibian Behaviour & Endocrinology Group

Department of Biological Sciences, University of Chester



NC3Rs funded project:

Refining the laboratory husbandry of the African clawed frog, *Xenopus laevis*. The aim was to develop a non-invasive corticosterone assay, combined with behavioural measures, to identify where and how to improve *Xenopus* welfare with underpinning science.

Team:

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National Centre
for the Replacement
Refinement & Reduction
of Animals in Research

July 2016 saw the end of a three year project examining welfare and how to measure this in amphibians. This was the first amphibian welfare project to be funded by a major UK funding body (Research Council). The funding, via competitive bids to the NC3Rs (National Centre for Refinement, Reduction and Replacement of animals in research), provided over £400k to Dr Lottie Hosie (PI) and Prof Tessa Smith (co-PI) to develop novel techniques to establish evidence for best practice in the husbandry of the frog laboratory model *Xenopus laevis*.

This species has been housed in laboratories for decades and hundreds of thousands are used worldwide to produce biological material for a whole host of work including medical genetics research. However, other laboratory vertebrates, such as mice and rats, have comprehensive guidelines about best possible care that maximises their welfare. This, importantly, is based on experimental evidence. Such guidelines do not exist for *Xenopus*, essentially because the tools for non-invasive assessment of welfare did not exist and so evidence for best practise was impossible. Combining Tessa's expertise in stress hormone measurement with Lottie's amphibian behaviour background has enabled us to address this gap.

With postdoc Dr Andrew Holmes and research technician Mr. Chris Emmans our work over the last three years has shown, for example, that amphibians are sensitive to stress during transport (as has been shown for mammals for decades) and simple husbandry measures like altering the background colour of the tanks can reduce frog stress. Enrichment, mandatory for lab mammals, but not amphibians, we found also reduces stress measures in

these frogs - cheap and easy provision of plastic tubing in their tanks makes for happier frogs!

A number of UG and PG students have helped with the work and completed their dissertations with the frogs and salamanders. This year sees further development of this work on *Xenopus* welfare via UG dissertations and a project on our new [MRes stream](#). The project is discussed in various (Biological Sciences) UG and PG modules and students on our Animal Behaviour and Animal Behaviour and Welfare UG degrees are keen to hear about this understudied taxonomic group.

This research has been very well received at a number of conferences and we were invited to present an overview at the recent Society of Experimental Biology meeting (June 2016). Our talk (delivered by Lottie Hosie) won the prize for best oral presentation and Andrew Holmes won a poster prize. Lottie and Tessa were also invited to present the work to a large audience at the major international *Xenopus* meeting in Crete. Researchers world-wide were very keen to hear about the work and it is considered to be a major contribution to welfare in this lab species. Some papers have been accepted for publication in international journals (see [press release](#)), with more to follow.

This work has led to valuable spin-off projects examining welfare of other amphibians in field and laboratory contexts. The technique has been applied by Chris our technician (whilst undertaking a PT MSc with us in Wildlife Conservation) to a critically endangered salamander (listed as one of the world top 10 endangered amphibian species) to improve husbandry for their captive breeding. His dissertation on this work was awarded a distinction and is being prepared for publication. We have also established collaboration with Scottish Natural Heritage to examine stress in Great Crested Newts undergoing conservation monitoring and shown for the first time that stress is measurable in European newt species in the field. This work has extended more locally to working with partners at North East Wales Wildlife on Great Crested Newt sites they manage. We are looking, with colleagues in our department, at how to model newt populations and predict change, with an overall aim of informing conservation strategies for this endangered species.

Publications:

Holmes AM, Emmans CJ, Jones N, Coleman R, Smith TE, Hosie CA (2016). Impact of tank background on the welfare of the African clawed frog, *Xenopus laevis* (Daudin). *Applied Animal Behaviour Science* [doi: http://dx.doi.org/10.1016/j.applanim.2016.09.005](http://dx.doi.org/10.1016/j.applanim.2016.09.005)