

Dr Alexandra M Tyers

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Research

Evolutionary biology. Speciation; adaptive radiation, sexual selection & sympatric-divergence. Convergent evolution & parallel speciation. Population & speciation genomics. Phenotypic plasticity. Behavioural ecology; individual variation & comparative behaviour.

Publications

- Tinghitella MH, Lackey AR, Martin M, Dijkstra P, Drury JP, Heathcote R, Keagy J, Scordato ESC & **Tyers AM**. In Press. The role of male competition in speciation: A review and research agenda. *Behavioral Ecology*.
- Verheyen E, (on behalf of the **Cichlid Science 2015 Meeting, and concerned scientists**). 2016. Oil extraction imperils Africa's Great Lakes. *Science*. 351: 561-562.
- Malinsky M, Challis R, **Tyers AM**, Schiffels S, Terai Y, Ngatunga BP, Miska E, Durbin R, Genner M & Turner GF. 2015. Genomic islands of speciation separate cichlid ecomorphs in an East African crater lake. *Science*. 350: 1493-1498.
- Tonkins B, **Tyers AM** & Cooke GM. 2015. Cuttlefish in captivity: an investigation in housing and husbandry for improving welfare. *Applied Animal Behaviour & Welfare Science*. 168: 77-83.
- Tyers AM**, Bavin D, Cooke GM, Griggs C & Turner GF. 2014. Peripheral isolate speciation of a Lake Malawi cichlid fish from shallow-muddy habitats. *Evolutionary Biology*. 41: 439-451.
- Tyers AM** & Turner GF. 2013. Signal and preference divergence among populations of the non-endemic basal Lake Malawi cichlid fish *Astatotilapia calliptera* (Perciformes: Cichlidae). *Biological Journal of the Linnean Society*. 110: 180-188.

In review / submitted / in preparation

- Tyers AM**, Cooke GM & Turner GF. In review. Rare morph Lake Malawi mbuna cichlids benefit from reduced aggression from con- and hetero-specifics. *Behavioural Ecology*.
- Shechonge A, Ngatunga B, Bradbeer S, Day J, Ford A, Kihedu J, Mzighani S, Smith A, Sweke E, Tamatamah R, **Tyers A**, Turner G & Genner M. Submitted. Widespread colonisation of Tanzanian catchments by introduced *Oreochromis* tilapia fishes: the legacy from decades of deliberate introduction. *Plos ONE*.
- Malinsky M, Svardal H, **Tyers AM**, Miska EA, Genner MJ, Turner GF & Durbin R. In prep. Whole genome sequences of Malawi cichlids reveal multiple radiations interconnected by gene flow. Available on *bioRxiv*: 143859
- Tyers AM**, Wilson I, Ngatunga BP, Genner MJ & Turner GF. In prep. Phenotypic differentiation, morphological plasticity and allopatric speciation in Tanzania crater lake cichlids (*Astatotilapia*). *Proceedings of the Royal Society of London B*.
- Tyers AM**, Wilson I & Turner GF. In Prep. Genome-wide analysis of the evolution of new species of cichlid fish.

Grants / funding

- Involvement in grant application preparation (BBSRC/NERC/Lererhulme etc)
- £16,000 NERC Biomolecular Analysis Facility grant (2017)
- Application for, and supervision of, paid FSBI Summer intern (2015)
- £1000 Santander travel grant for the transfer of skills between universities (2011)
- Bangor University 125th Anniversary PhD scholarship (2010)

Post-doctoral employment

Research Officer October 2014 – September 2017, Bangor University, Wales UK. (Funded by Leverhulme Trust). *Genome-wide analysis of the evolution of new species*: Through the use of whole genome re-sequencing & SNP genotyping, we are carrying out a “Genome Wide Association Study” (GWAS) to investigate the genomics of phenotypic divergence during the initial stages of sympatric adaptive radiation in crater lake cichlid fish. Duties include: Sample collection/selection, preparation, curation, phenotyping. Aquaria based (behaviour & breeding) experiments, stock control, field work. Coordination of sample use with colleagues at Bristol University (for dietary ecology, gene expression and epigenetics). Collaboration with bioinformatician for data analysis and visualisation of results.

Research Officer February – June 2014, Bangor University, Wales UK. (Funded by Bangor University). *Sympatric divergence and speciation in African crater lake cichlids*: Design, implementation and analysis of large scale mate choice experiments to assess female mate preferences in a sympatric population undergoing divergent ecological selection. Breeding for future research.

Other current research involvement

Behavioural ecology and phenotypic plasticity. Role of intra-population behavioural variation in promoting population divergence. Investigation of plasticity of morphological and behavioural traits using wild caught and lab bred fish. Behavioural plasticity across contexts in a predatory-prey species (cuttlefish).

Parallel speciation and divergence. Ecological, morphological and behavioural studies of multiple allopatric populations of crater-lake cichlids and nearby riverine populations. Investigation of other possible adaptive radiations with potential for development as parallel study systems for future comparative studies.

Lake Malawi project (in collaboration with Cambridge University & the WT Sanger Inst.). Genome sequencing the Lake Malawi cichlid adaptive radiation of 500-1000 species. Collection currently consists of *ca.* 1500 individuals from *ca.* 250 species, with 200 individuals sequenced and hundreds more selected for sequencing this year. Specimens housed in Cambridge University Zoological Museum where samples representing the diversity of forms are to be used for newly refurbished public displays.

Conferences / meetings

Invited contributor

Biodiversity, Species Identification, and Stocking of Tilapiine Cichlid Fishes workshop, Sokoine University of Agriculture, Morogoro, Tanzania, 2017. Talk: “*Cichlids without borders: the importance of Tanzania for understanding haplochromine diversity*”. Workshop: Sample preservation and morphological analysis

ButterFish meeting, Cambridge University, UK, 2016. Informal meeting for discussions among *Heliconius* butterfly and cichlid fish researchers studying the genomics of divergence and speciation.

International Society for Behavioural Ecology; Male Competition & Speciation satellite symposium, Exeter University, UK, 2016. Talk: “*Behaviour, competition & speciation (haplochromine cichlids)*”

Environment, Ecology & Evolution seminar series, University of Sheffield, UK, 2016. Talk: “*Divergence-with-gene-flow (in East African crater lake cichlids)*”

Conference attendance

Cichlid Science conference, Charles University Prague, Czech Republic, 2017. Talk: “*Genome wide analysis of the evolution of new species*”

Bangor Genomics Symposium, Bangor University, UK, 2017.

African Great Lakes Conference: Conservation & Development in a Changing Climate, Entebbe, Uganda, 2017. Poster: “*Genome-wide analysis of the evolution of new species of cichlid fishes*”

Fisheries Society of the British Isles; Fish, Genes & Genomes symposium, Bangor University, UK, 2016. Talk: “*Evolution of new species: A genome-wide analysis*”

Wales Ecology & Evolution Network meeting, Wales, UK, 2015. Talk: “*Divergence-with-gene-flow in African crater lake cichlids: Mate choice on a genotypic/phenotypic continuum*”

Cichlid Science conference, Karl-Franzens- Universität Graz, Austria, 2015. Talk: “*Divergence-with-gene-flow in African crater lake cichlids: Mate choice on a genotypic/phenotypic continuum*”

Cichlid Science conference, Bangor University, UK, 2013. Talk: “*Signal and preference vs ecological: divergence*”

and allopatric speciation of Lake Malawi cichlid fish"

Association for the Study of Animal Behaviour conference, Aberystwyth University, UK, 2012. Talk: "*Behaviour and speciation in Lake Malawi cichlid fish*"

Cichlid Science conference, KU Leuven, Belgium, 2012

Bangor University post-graduate conference, Bangor University, UK, 2011. Poster: "*Speciation in Lake Malawi cichlid fish: Allopatric divergence, reproductive isolation and hybridisation*"

Cichlid Science conference, Universität Basel, Switzerland, 2010. Poster: "*Female mate preference and speciation in Lake Malawi cichlids*"

Skills and experience

General

- Research project design & understanding of sampling numbers, strategy and optimal sequencing coverage for genomic projects
- Development, co-ordination and supervision of projects for sub-groups of students (behaviour/morphology/genetics)

Field work

- Organisation and planning of trips, including logistical requirements, research work/goals, and supervising work in remote aquatic environments
- Collection/shipping of live and preserved study organisms from African lakes/streams and local (UK) inshore marine environments
- Survey Manager for Operation Wallacea (inc. training in conflict/emergency/disaster scenarios)

Aquaria / animal husbandry

- Understanding of the legal requirements for keeping live animals for research under UK Home Office ASPA (1986) regulations
- Extensive experience of maintaining large numbers of aquatic organisms in isolated tanks and large multi-tank recirculating systems in a research environment, including freshwater fish (cichlids, guppies, danios, sticklebacks) and marine invertebrates (cephalopods, crabs)
- Breeding and stock control of study organisms for current research, future and external projects
- Experience with birds, mammals, other animals

Molecular

- DNA extraction, gel electrophoresis, PCR and multiplexing
- Microsatellite genotyping, mtDNA sequencing
- GLP and an appreciation of health and safety

Data analysis

- Statistical analysis of behavioural & morphological data (including GLMMs, R/SPSS)
- Geometric morphometrics (R/GeoMorph, TPS, MorphoJ,)
- Microsatellite allele sizing (Genemapper, Peakscanner)
- MtDNA phylogeography (Chromas, DAMBE, DnaSP, Arlequin, HapStar, PopArt)
- Comfortable working in UNIX environments, theoretical (& some practical) understanding of many aspects of analysis involving genome data

Dissemination of information

- Writing, preparation and presentation of manuscripts/reports and presentations
- Promotion of group research and activities through research talks and group Twitter accounts

Research expeditions

- Tanzania June-July 2017 (with colleagues & Operation Wallacea)
- Tanzania January 2017 (with colleagues & external collaborators)
- Tanzania April-May 2016 (with PI & external collaborator)
- Malawi Feb-March 2016 (with external collaborators)
- Tanzania-Malawi August 2015 (with undergraduates, postgraduates, PI, external collaborators)
- Tanzania April 2015 (with field assistant)
- Tanzania March 2015 (with PI)
- Malawi July 2010 (with undergraduates & supervisor)

Education

Academic

PhD. Evolutionary Biology, 2009 – 2013, Bangor University, Wales UK. “*Divergence and speciation of East African haplochromine cichlids*”. Supervised by Prof. George Turner & Dr Martin Taylor. (Funded by Bangor University 125 year anniversary scholarship).

MRes. Natural Sciences (Ecology), 2008 – 2009, Bangor University, Wales UK. “*Mate choice and speciation in cichlid fish*”. Supervised by Prof. George Turner.

BSc. (Hons) Behavioural Biology, 2003 – 2005; 2006 – 2007, University of Wales Aberystwyth, Wales UK. “*The effects of artificial night lighting on the foraging times of small diurnal passerines*”. Supervised by Dr Rupert Marshall.

Workshop attendance

Workshop on Population and Speciation Genomics (Evomics), Český Krumlov, 2016. *Theory*: Likelihood & Bayesian inference, natural selection & adaptation, population demography, genomics of organismal diversity, ancient genomics, evolutionary population genomics, indels & sweeps in whole-genome data, introgression, divergence and gene-flow between species. *Practical*: UNIX, VCFtools, Plink, R (for RAD data & exploring selective sweeps), adegenet, STRUCTURE/fineSTRUCTURE, PCA, genotype & SNP calling, ANGSD, ngsTools, models for introgression & admixture, BayeScan, BayeScEnv, Python, dadi, BEAST2, SweeD, SNAPP.

Advancing in statistical modelling using R (PR~Statistics), Loch Lomond, 2015: Model selection/simplification, mixed effects models, generalised linear models, non-linear models.

Introduction to R, Bangor University, 2014: R environment, graphics, data manipulation.

Qualifications & training

United Kingdom Home Office ASPA Modules

- 1,2,3 Fish (Society of Biology), 2010
- 1,2 Birds (Society of Biology), 2010

Languages

- French (GCSE) – expanded on to an intermediate conversational level
- Welsh (Wlpan awst) – intensive one year conversational course
- Swahili – basic communication

Other

- Full UK driving license
- PADI Advanced Open Water Diver
- Emergency First Response (Primary & Secondary Care) 2017
- Pool Rescue Qualification 2017

Teaching

Lectures

- Guest lecturer in evolution & genomics (Bangor University module BNS-2002)

Supervision

- Behaviour, morphology and genetics projects using fish for studies of evolutionary biology and behavioural ecology
 - Training students in good aquaria practises, molecular lab techniques and data analysis
 - Development of ideas for potential behavioural genetics and aquaria breeding experiments for current and potential PhD students
 - Supervision of undergraduate and master’s project students (in the region of 3-8 per year)

- Field work in Africa (Tanzania & Malawi) for observation and collection of study organisms from aquatic environments (secondary school, undergraduate & post-graduate students)
- FSBI summer intern (2015): Provision of aquaria based behaviour project, assistance with writing the application and final report (published in the FSBI Summer 2016 Newsletter: “Charlotte Blackburn, experiments using mirrors to reflect fish personalities”)

Other teaching experience

- Planning/running undergraduate tutorial sessions and study skills workshops for 2nd year students
- Demonstrating and teaching assistance for practical courses for all years of undergraduate students, in a very wide range of subjects, including supervision of students on local field trips
- Marking undergraduate assignments

Administration & professional activities

Research group/community activities

- Organisation of field work in Africa, for student and research trips
- Organisation of seminar series and journal clubs
- Co-organiser of an evolutionary biology conference (Cichlid Science 2013)
- Peer review: Current Zoology, BMC Evolutionary Biology, Scientific Reports, Ecology & Evolution, PLOS ONE, Hydrobiologia, Biological Journal of the Linnean Society
- Society membership: The Genetics Society

Public engagement

- Running workshops in molecular ecology for groups of secondary school girls (“Girls Science Workshops” at Bangor University 2014/15)
- Administrator for an annual science festival with the aim to engage the community with university research by organising events, activities and exhibitions for all ages (Bangor Science Festival 2014)

Referees

Current employer:

Prof. George Turner, Lloyd Roberts Professor of Zoology.
G24 Memorial Building, SBS, Bangor University, Deiniol Road, Bangor. Gwynedd. LL57 2UW. UK.
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Collaborators / other:

Dr. Martin Genner, Reader in Evolutionary Ecology. (Senior collaborator, cichlid projects).
Office D25, Lab A89, University of Bristol, Woodland Road, Bristol. BS8 1UG. UK.
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Dr. Katherine Jones, Lecturer in Animal Behaviour. (Senior collaborator, cuttlefish behaviour project).
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Dr. Rupert Marshall, Reader in Animal Behaviour. (Undergraduate supervisor).
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