

ANDREW JAMES HELMSTETTER

Date of Birth: 03/03/1989

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Objectives

I wish to pursue a career in academic research in the field of evolutionary biology, specifically using phylogenetic, population genetic and genomic approaches to understand the origins of plant diversity and improve conservation of rare and endangered plant species.

Education & Academic Qualifications

2011-2015 Doctor of Philosophy, Department of Life Sciences, Silwood Park, Imperial College London, UK

Title: The evolution of diversity and life history traits in annual killifish (*Austrolebias*) and other Cyprinodontiformes

Supervisors: Prof. Vincent Savolainen, Dr. Tom Van Dooren, Prof. Armand Leroi

2007-2011 Masters of Biological Sciences - Upper Second-Class Honours, Department of Animal & Plant Sciences, University of Sheffield, UK

2000-2007 King Edward VI Grammar School, Chelmsford, Essex, UK

Employment

Oct 2023-present Paternity leave

2020-2023 Postdoctoral researcher at the CESAB (Centre for the Synthesis and Analysis of Biodiversity) Montpellier, part of the FRB (Foundation for Research on Biodiversity). Project 'DiveRS' - from reproductive strategies to species diversity: how evolution of breeding systems and associated traits shapes plant species diversity.

Synthesised and analysed data from >150 studies on trait-dependent diversification in angiosperms. Collated a >300 species dataset of >20 reproductive and vegetative traits and characterised trait spaces to identify major axes of variation in flowering plant reproductive strategies.

After **7 month break Aug 2022 – Feb 2023**, we acquired additional funding for the project 'IndicatoRS' to use multidimensional trait space approaches from 'DiveRS' to develop indicators of ecosystem health based on reproductive traits using data from French floral surveys.

2018-2020 Postdoctoral researcher at L'Institut de recherche pour le développement (IRD) Montpellier, UMR DIADE.

Comparative phylogeography and evolutionary dynamics of central African rain forest trees. Analysed genomic data for >700 specimens. Generated date phylogenies, reconstructed demographic histories, performed population genetic analyses and conducted environmental niche modelling.

Generated a genus-level phylogenetic tree for Annonaceae and new phylogenetic hypothesis of the genus *Raphia* (Arecaceae) using sequence capture approaches and including herbarium specimens.

2016-2018 Postdoctoral researcher at Royal Botanic Gardens, Kew.

(Project 1) Estimating extinction risk using genomic data in Madagascan plants. Performed ddRADseq on samples from 10 Madagascan plant species, conducted bioinformatic analyses including demographic reconstruction.

(Project 2) Development of Primary Genomic Resources for Securing Sustainable Hazelnut Production in Turkey. Performed fieldwork in UK and Turkey to collect *Corylus avellana* specimens. Conducted ddRADseq on >200 samples to identify varieties, reconstruction relationships and characterise signals of domestication. Used existing data to reconstruct the phylogeny of *Corylus*.

2015-2016 Research Intern at Royal Botanic Gardens, Kew (Non-salaried).

Parallel adaptation to heavy metal pollution in *Silene uniflora*. DNA extraction, ddRADseq library preparation for <500 specimens, sequencing on Illumina MiSeq, bioinformatic analyses.

2011 Laboratory Support Worker for the University of Sheffield Dyslexia and Disabilities Support Service.

Assisted students with learning difficulties in their lab work and course work.

Grants, Awards & Memberships

2022 Participant in funded (€50,000) SYNERGY project 'IndicatoRS' from the call FRB-MTE-OFB 2022 'Impacts sur la biodiversité terrestre dans l'anthropocène' led by J. Kafer (LBBE, Lyon) & S. Glemin (ECOBIO, Rennes).

2020 Participant in funded grant (€8,100) on the evolutionary development of annual fishes (EvoDevoKillies; CLIMAT AmSud 2020) led by wT. Van Dooren (IEES, Paris)

2014 Awarded Best Presentation Prize at the 16th Young Systematists' Forum at the Natural History Museum, London

2011 NERC-funded PhD Studentship 3.5 years

2010 Research bursary of £1,330 by the Sheffield Undergraduate Research Education scheme. Designed and carried out a project entitled "*Sexual Conflict and Immunity*." Supervisor - Prof. Michael T. Siva-Jothy.

2010 Research bursary in order to conduct fieldwork on *Chorthippus parallelus*. Supervisor - Prof. Roger Butlin.

Member Society for the Study of Evolution

Reviews editor *Frontiers in Plant Science: Plant Systematics and Evolution*

Reviewer PNAS, *Molecular Ecology*, *New Phytologist*, *Annals of Botany*, *Evolution*, *BMC Evolutionary Biology*, Peer community in *Evolutionary Biology*, *Plant Systematics and Evolution*, *Frontiers in Plant Science*, *Forests*, *Bot. J. Linn. Soc.*

Presentations

- 2022** *Understanding the origins of angiosperm diversity at different scales*. Departmental Seminar, NHM Oslo, Norway
- 2021** *What can genomic data tell us about the recent evolutionary history of tropical palms (and other species)?* Journée des palmiers, IRD, Montpellier
- 2021** *A phylogenomic analysis of Magnoliidae using Angiosperm-353*. Genomics for Australian Plants Phylogenomics Symposium
- 2021** *The state of state-dependent speciation and extinction models : patterns in angiosperm macroevolution*. Virtual Evolution.
- 2021** *The evolutionary history of tropical rainforests*. Departmental Seminar, iDiv, Germany
- 2021** *Evolutionary responses of central African rain forest plants to past climate change*. Departmental Seminar, Université libre de Bruxelles
- 2019** *Dating the dynamics of central African rain forests*. Departmental Seminar, Florida Institute of Technology.
- 2019** *Dating the dynamics of central African rain forests*. 23rd Evolutionary Biology Meeting, Marseilles.
- 2019** *Evolutionary dynamics of central African rain forest palms*. European Network of Palm Scientists, Paris.
- 2018** *Comparative phylogeography and evolutionary dynamics of central African rain forest trees*. *Evolution*, Montpellier.
- 2017** *Development of Primary Genomic Resources for Securing Sustainable Hazelnut Production in Turkey*. New Phytologist Next Generation Scientists (Poster)
- 2017** *Development of Primary Genomic Resources for Securing Sustainable Hazelnut Production in Turkey*. Plant Health: Challenges and Solutions, Antalya, Turkey.
- 2016** *Investigating the Role of Human Colonisation on Population Decline in Madagascar's Highland Flora*. UK Plant Evolution, Cambridge. (Poster)
- 2015** *Co-occurrence, growth and morphology in Austrolebias - There's always a bigger fish*. Departmental Seminar, Université Pierre et Marie Curie, Paris
- 2014** *Reproductive Strategy Evolution Stimulates Diversification in an Order of Fish*, 16th Young Systematists Forum, Natural History Museum, London. *** **Won best conference presentation prize**
- 2013** *Phylogeography and morphology of the South American Annual Killifish Genus, Austrolebias*. Congress of the European Society of Evolutionary Biology, Lisbon.

Teaching & Supervision

- 2020-2021** Mentored PhD student M. Kpatenon on phylogenomic and population genetic analyses in *Borassus* (Arecaceae).
- 2019-2020** Mentored PhD student S. Escobar on inter and intraspecific phylogenomics in *Phytelephea* (Arecaceae).
- 2019-2021** Mentored PhD student L. Dagallier on phylogenetic reconstruction of *Monodorea* (Annonaceae).
- 2020** Mentored Masters student B. Brée on phylogenetic and diversification analyses in Annonaceae.
- 2019** Mentored Masters student A. Aublin on phylogenetic and diversification analyses in Annonaceae.
- 2019** Designed and ran a workshop on phylogenomic reconstruction on HPC with students and staff at IRD, Montpellier.
- 2017** Designed and ran a workshop on analysing RADseq data using STACKS with students and staff at Sabanci Uni., Turkey
- 2017-2018** Mentored PhD student R. Schley on ddRADseq population genetic analyses in *Brownea* (Fabaceae).
- 2017** Mentored Masters student K. Kereselidze on species delimitation in *Corylus*.
- 2011-2015** Teaching assistant at Imperial College London on undergraduate and Masters courses.
- Topics included: statistics in R, molecular ecology, phylogenetic inference, genome assembly, linkage mapping, gene expression, animal dissection, cycle sequencing and paper discussions.

Outreach

- 2023** Co-organised a local school visit to CESAB with activities such as plant identification, model CBD, expedition planning.
- 2021** [Interview](#) by IRD le Mag 'Changements climatiques : à chaque espèce végétale, sa réponse' (in French).
- 2019** Assisted in the organisation of the CESAB inauguration conference
- 2016-2017** Kew Science Festival. Species identification, DNA extraction and real-time DNA sequencing.
- 2014-2015** 'Bugs Day' Science Festival. DNA extractions with general public at Imperial College London, Silwood Park.
- 2011** Published an account of a collection expedition to Uruguay in the journal of the British Killifish Association, *Killi-news*.
- 2011** Invited to write an article for the Society of Biology on adaptive radiations in cichlids, featured on their website.

Courses & Workshops

- 2019** Advanced computer cluster use, IRD, Montpellier
2018 Phylsynth meeting <https://phylsynth.github.io/>
2018 Phylogenomics Software Symposium. University of Montpellier.
2017 Plant Health: Challenges and Solutions Antalya, Turkey.
2012 RAD-seq methodologies for ecological and evolutionary studies. Lund, Sweden.
2012 Generalised Linear Modelling. Silwood Park, Imperial College London.
2011-2014 Imperial College London Postgraduate Training including review writing, academic writing, time management.

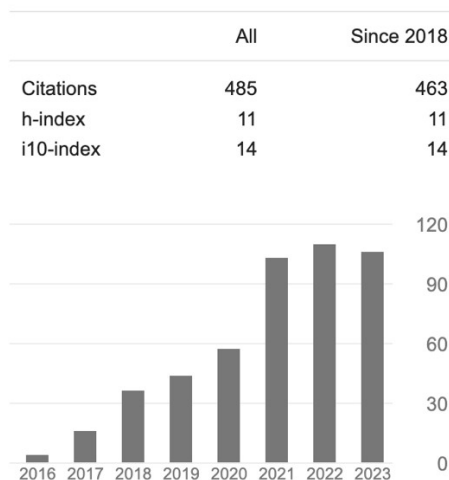
Personal Interests and Qualifications

- Languages:** English (native), French (fluent; niveau C1).
2016-2018 Member of Kew Gardens Choir
2011-2014 Member of Silwood Park Choir
2009-2011 Secretary and Member of the Sheffield University Shodokan Aikido Sports Club
2008-2011 Member of the Sheffield University Singers Society
 Sporting interests include Golf, Squash and Fishing. Qualified PADI Open Water Scuba Diver.
 Experience playing the Banjo, Trumpet, Piano, Oboe, Side Drum, Guitar and voice, including small local venues.

Research output

ORCID iD: <https://orcid.org/0000-0003-3761-4981>

Google scholar: <https://scholar.google.com/citations?user=Ye-lhkIAAAAJ&hl=en>



Citation summary taken from Google Scholar on 24/11/2023

Software

- 2021** papieRmache: An R package for chewing up papers, spitting out the information you don't want, keeping the information you do. A meta-analysis and synthesis aid that provides a convenient interface and output format.
<https://github.com/ajhelmstetter/papieRmache>

Selected Publications

- Helmstetter, A. J., Zenil-Ferguson, R., Sauquet, H., Otto, S. P., Mendez, M., Vallejo-Marin, M., ... & Käfer, J. (2023).** Trait-dependent diversification in angiosperms: patterns, models and data. *Ecology Letters*, 26(4), 640-657.
<https://doi.org/10.1111/ele.14170>

Role: Designed study, led an international team of researchers, collected data, analysed data, wrote paper.

Scope: We synthesised over 150 studies on trait-dependent diversification in angiosperms to determine the major traits affecting their diversification, and how our use of macroevolutionary models can bias results.

Impact: Our study is first empirical synthesis of SSE model results in angiosperms and a summary of our latest knowledge in the field. It provides guidelines on how to conduct future studies that will set a standard for the field.

Helmstetter, A. J., Glemin, S., Käfer, J., Zenil-Ferguson, R., Sauquet, H., de Boer, H., ... & Condamine, F. L. (2022). Pulled diversification rates, lineages-through-time plots, and modern macroevolutionary modeling. *Systematic Biology*, 71(3), 758-773. <https://doi.org/10.1093/sysbio/syab083>

Role: Proposed opinion piece, led an international team of researchers, analysed data, wrote paper.

Scope: A comment on Louca & Pennell, 2020, *Nature*, which aimed to educate non-experts on the results of the high-profile study, while putting it into wider context. We demonstrated what unidentifiability issues mean practically for users of modern macroevolutionary models.

Impact: The paper created dialogue in the research community, provided an accessible way to keep up with a major advancement in the field and addressed major challenges faced in macroevolutionary biology going forward.

Helmstetter, A.J., Cable, S., Rakotonasolo, F., Rabarijaona, R., Rakotoarinivo, M., Eiserhardt, W.L., Baker, W.J. and Papadopulos, A.S. (2021). The demographic history of Madagascan micro-endemics: have rare species always been rare?. *Proceedings of the Royal Society B*, 288(1959), p.20210957. <https://doi.org/10.1098/rspb.2021.0957>

Role: Co-designed study, performed laboratory work, analysed data and wrote paper.

Scope: We applied cutting-edge high-throughput sequencing and population genetic methods to reveal historical demographic decline in the rare endemic flora of Madagascar. These results show that it is possible to predict extinction risk from demographic patterns inferred from genomic data and that destructive human influence likely caused species decline.

Impact: We demonstrated that extinction risk in many groups may be underestimated by current methods. Our approach will be easily transferable to other taxa and could be useful as an additional source of information for conservation assessments.

Helmstetter, A. J., Béthune, K., Kamdem, N. G., Sonké, B., & Couvreur, T. L. (2020). Individualistic evolutionary responses of Central African rain forest plants to Pleistocene climatic fluctuations. *Proceedings of the National Academy of Sciences of the United States of America*, 117(51), pp.32509-32518. <https://doi.org/10.1073/pnas.2001018117>

Role: Co-designed study, collected samples, analysed data, wrote paper.

Scope: We generated an unparalleled genomic dataset to estimate the evolutionary dynamics of a range of co-distributed rainforest plant species. We reveal variable, asynchronous and individualistic evolutionary responses to climate change driven by different environmental factors and life-history traits.

Impact: Our results challenge the long-standing view that past climate change led to similar rain forest dynamics in central Africa. Our study has important implications for the conservation of tropical rain forest biodiversity in general as it indicates more focus should be placed on species unique characteristics.

Helmstetter, A. J., Oztolan-Erol, N., Lucas, S., & Buggs, R. (2020). Genetic diversity and domestication of hazelnut (*Corylus avellana*) in Turkey. *Plants, People, Planet*, 2(4), 326-339 <https://doi.org/10.1002/ppp3.10078>

Role: Co-designed study, collected samples, performed lab work, analysed data, wrote paper.

Scope: We used genomic data to reveal previously undocumented patterns of genetic diversity, levels of crop-wild gene flow and the nature of domestication in *Corylus avellana*.

Impact: Our study was the first to generate genomic resources for hazelnut in Turkey, the world's primary producer of this tree nut crop. We provide valuable information for future breeding efforts in this vulnerable crop by proposing previously unknown relationships among cultivars based on genomic data.

Couvreur, T. L. P.*, **Helmstetter, A. J.***, Koenen, E., Bethune, K., Brandao, R., Little, S., Sauquet, H., & Erkens, R. (2019). Phylogenomics of the major tropical plant family Annonaceae using targeted enrichment of nuclear genes. *Frontiers in plant science*, 9, 1941. <https://doi.org/10.3389/fpls.2018.01941> * **joint first author**

Role: Developed analysis pipeline, analysed data, wrote paper.

Scope: We developed a bait kit that sequences hundreds of nuclear loci for the plant family Annonaceae. We propose an updated phylogenetic hypothesis for the family, the first based on genomic data.

Impact: One of the first large-scale sequence capture studies in plants, we provided genomic resources that can be used by Annonaceae researchers worldwide. Our study acts as a reference for the most up-to-date relationships in the family.

Helmstetter, A. J., Papadopulos, A., Igea, J., Van Dooren, T., Leroi, A., & Savolainen, V. (2016). Viviparity stimulates diversification in an order of fish. *Nature communications*, 7, 11271. <https://doi.org/10.1038/ncomms11271>

Role: Designed study, collected data, analysed data, wrote paper.

Scope: We generated a new phylogenetic tree for the order Cyprinodontiformes and use this to demonstrate that though viviparity and annualism both evolved multiple times, only viviparity was linked to increased diversification in these fishes.

Impact: Our study acted as a key reference for relationships within Cyprinodontiformes. Our study was one of the first to use recently developed macroevolutionary approaches to concretely link a trait that arose multiple times to diversification.

Referees

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