

Emily Burdfield-Steel

Address: Centre of Excellence in Biological Interactions, Department of Biological and Environmental Science, P.O. Box 35, 40014 University of Jyväskylä, Finland

Telephone: (+358) 040 805 4653 **Email:** Emily.r.burdfield-steel@jyu.fi

D.O.B.: 04 May 1988 **Nationality:** British

Full UK Driving License

Research Statement

I am interested in how intra- and inter-specific interactions shape evolutionary processes. My particular areas of investigation are the evolution of automimicry, and the causes and consequences of sexual interactions within and among species. Coming from a background of both genetics and behaviour, I take an integrative approach to the study of evolution.

Research Career

2014 – date **Postdoctoral Researcher, University of Jyväskylä**

Investigating intra-species variation in chemical defence in the wood tiger moth.

2010 - 2014 **PhD. School of Biology, University of St Andrews, U.K.**

“The causes and consequences of reproductive interference in five species of seed bug (Hemiptera: Lygaeidae).” PhD Supervisor Dr David Shuker. Funded by NERC

2009 - 2010 **MSc. Evolutionary Genetics and Genomics, University of Manchester, U.K**

Projects: “Population structure in Caribbean Spiny Lobster.” Project supervisor Dr Richard Preziosi. “Phylogeography suggests population structure of *Anopheles baimaii* mosquitoes within Myanmar.” Project supervisor Dr Cathy Walton. Funded by BBSRC.

2006 - 2009 **BSc (Hons.) Zoology, University of Manchester, U.K. First class.**

Honours research project: “Shapes of Spiders; identifying the presence of microhabitat adaptations in the spider family Salticidae (Jumping spiders)”. Dr Chris Klingenberg. Winner of an Outstanding Achievement Award upon graduation for gaining the highest mark in Zoology that year.

Publications

Burdfield-Steel, E.R., Auty, S. & Shuker, D.M. (2015) Do the benefits of polyandry scale with outbreeding? *Behavioral Ecology*, 10.1093/beheco/arv103.

Shuker, D.M., Currie, N., Hoole, T. & **Burdfield-Steel, E.R.** (2015) The extent and costs of reproductive interference among four species of true bug. *Population Ecology*.

Burdfield-Steel, E.R. & Shuker, D.M. (2014) Mate-guarding in a promiscuous insect: species discrimination influences reproductive interference in seed bugs. *Evolutionary Ecology*, 28:1031–1042.

Burdfield-Steel, E.R. & Shuker, D.M. (2014) The evolutionary ecology of the Lygaeidae. *Ecology & Evolution*, 4(11):2278-2301

Burdfield-Steel, E.R., Dougherty, L.R., Smith, L.A., Collins, L.A. and Shuker, D.M. (2013) Variation in social and sexual behaviour in four species of aposematic seed bugs (Hemiptera: Lygaeidae): The role of toxic and non-toxic food. *Behavioural Processes*, 99 (2013) 52– 6.

Dougherty, L.R., **Burdfield-Steel, E.R.** and David M. Shuker (2013) Sexual stereotypes: the case of sexual cannibalism. *Animal Behaviour*. 99: 52– 6.

Truelove, N.K., **Burdfield-Steel, E.R.**, Griffiths, S., Ley-Cooper, K., Preziosi, R., Butler IV, M.J., Behringer, D.C., Box, S. and Canty, S. (2012) Genetic Connectivity of Caribbean Spiny Lobster (*Panulirus argus*) in Belize. *Proceedings of the Gulf and Caribbean Fisheries Institute* 64 464-467.

Burdfield-Steel, E.R. & Shuker, D.M. (2011) Reproductive interference. *Current Biology*. 21: R450-451.

Research Experience

Postdoctoral Researcher, 2014- date (The University of Jyväskylä, Center of Excellence in Biological Interactions)

I am currently working in the group of Professor Johanna Mappes studying the chemical defences of the wood tiger moth. This species produces two distinct defensive fluids and my project aims to identify the active components of each, as well as their life history trade-offs. I am also investigating the prevalence of automimicry in different populations across the species range, and its consequences for predator learning. Thus my work is a combination of behavioural assays and chemical analysis done in collaboration with Professor Stefan Schulz at TU Braunschweig.

Doctoral Researcher, 2010 - 2014 (The University of St Andrews, School of Biology)

The aim of my project was to investigate the causes and consequences of reproductive interference in the Lygaeidae. Reproductive interference (or RI) occurs when individuals of one species engage in reproductive activities with individuals of another species, and these interactions reduce the fitness of one or both species. While the bulk of my research is formed by several behavioural experiments, both in the laboratory and the field, I have also used techniques such as mass spectrometry and computerised tomography to investigate various aspects of mate choice and genital morphology in the Lygaeidae. Finally, I have also written a major review of the evolutionary ecology of the Lygaeidae.

Masters student, 2009-2010 (University of Manchester, Faculty of Life Sciences)

As part of my studies I carried out two separate projects. The first was an investigation of the population structure of Spiny Lobsters off the coast of Belize using microsatellite analysis. My work included the collection of tissue samples from the field, DNA extraction, and the optimisation of microsatellite primers for multiplexing. My second project was an investigation of the phylogeography of mosquitoes in South East Asia. I extracted DNA from previously collected samples from three sites in Myanmar, sequenced three nuclear genes and aligned and analysed the resulting sequence data.

Honours project student, 2008-2009 (University of Manchester, Faculty of Life Sciences)

I worked with Dr Chris Klingenberg comparing variation in body shape in jumping spiders across microhabitats to look for evidence of microhabitat specialization in this morphologically diverse taxa. I used geometric morphometrics to analyse body shape in 29 species of Salticidae, assessing both phylogeny and ecology.

Teaching/Mentoring Experience

2014 - 2015 Co-supervisor of a Master's student

2013 - 2014 Assisted with the supervision of an honours student.

I assisted with the student's experimental design and was responsible for teaching and supervising their laboratory work. The student later received a Certificate of Commendation by the Zoological Society of London for his thesis.

2013 Demonstrator on undergraduate course "Biology 1"

I assisted students in learning and performing basic laboratory techniques including microscopy and transformation of *E. coli*.

2013 Lecturer for the Biology Sutton Trust Summer School

I wrote and presented a 45 minute lecture on Sexual Conflict and its impact on evolution to Year 12 pupils as part of an initiative to encourage students from non-privileged homes to apply to University.

2012 - 2013 Demonstrator on honours course "Advanced Topics in Ecology & Evolution"

I assisted in marking student led presentations and discussion on key topics in ecology and evolution.

2011 - 2012 Demonstrator on sub-honours Marine Ecology Field Course

My role was to assist students in carrying out ecological and biodiversity surveys at the sea shore. I also helped students with experimental design and statistical analysis as they carried out semi-independent projects.

2011 - 2013 Demonstrator on “Statistics for Biologists: Introduction to R” course

My role was to provide guidance to students on the appropriate statistical tests to use for certain data types and to help troubleshoot any issues students came across while using the R statistical software package.

2007 - 2008 Peer Assisted Study (PASS) leader

After undertaking training, I organised and ran workshops and revision sessions for first year undergraduates in the Life Sciences and acted as a go between for students and staff on issues such as lecture style and content.

Professional Development and Training

President (2012-2013) St Andrews Postgraduate Biology Network

Conference Organiser (2012 and 2013) School of Biology Postgraduate Conference

Attendee at Tutoring and Assessment Training Course (January 2011).

Postgraduate Health and Safety Committee Member (2010-2011) University of St Andrews, School of Biology

Postgraduate Student Representative (2009-2010) for MSc Evolutionary Genetics and Genomics course

Additional Relevant Skills

Field work: I have conducted fieldwork in several countries, including biodiversity surveys, and collection of DNA samples and live specimens. I have also carried out field experiments, such as measuring predation and assessing mating behaviour in wild insects.

Specialist Computer Software: R (statistics and graphics), SPSS, Clustal, BLAST, DNAsp, ImageJ and MorphoJ.

Insect culturing and observation: As well as the maintenance of insect cultures crucial to my PhD and Postdoctoral research, I have extensive experience from my work caring for the collection of the St Ivo Entomology and Natural History Society. I also assisted with the care of educational insect collections at the University of Manchester. During my time at St Andrews I was responsible for setting up a laboratory population of mantids (*Sphodromantis viridis*).

Outreach: As part of my work, both with the St Ivo Entomology and Natural History Society and the Manchester Museum, I have frequently taken part in live animal displays to school children and the public. I have presented at both school and larger events such as the Manchester Museum Bug Day and the Cambridge Natural History Society Conversazione. During my PhD I assisted with several public outreach events at the Bell Pettigrew Museum to mark the British Ecological Society's Centenary Festival of Ecology.

Communication: In addition to presenting at national and international conferences I regularly give presentations to my colleagues as part of our section's weekly “Darwin meetings”. During my PhD I presented in, and contributed to, departmental “lab chats” and student-run talks hosted by the Bio-Network. This has given me the experience of presenting my research to an audience with very different background knowledge from myself. My work has also been reported in Science Now (“Sexual Cannibalism Is a Case of ‘He Said, She Said’” 15 January 2013), The Guardian (“Unkindest

cut? Insect penis gets the chop in the name of science”) and BBC News (“St Andrews team find size affects sexual reproduction in seed bugs”).

Abstracts and Presentations

(2015) “Truth and lies: honest signaling and automimicry in an aposematic insect” Behavior 2015 (Oral presentation)

(2015) “Reproductive Interference and Sexual Selection” Behavior 2015 (Poster presentation and speed talk)

(2015) “Truth and lies: honest signaling and automimicry in an aposematic insect” Graduate Seminar on Insect Evolutionary Ecology (Oral presentation)

(2015) “Sex-biased dispersal in an aposematic moth” PopGroup48 (Poster presentation)

(2014) “Do the benefits of polyandry scale with inbreeding?” PopGroup47 (Poster presentation) Won the student poster prize.

(2013) “The scent of a bug – do CHCs play a role in seed bug mate discrimination?” Royal Entomological Society’s Annual National Science Meeting (Oral presentation) Won second place in the student talk competition.

(2013) “Why is there so little pre-copulatory choice in a promiscuous seed bug?” Congress of the European Society for Evolutionary Biology (Oral presentation)

(2013) “Why is there so little pre-copulatory choice in a promiscuous seed bug?” ASAB Easter Conference (Oral presentation)

(2013) “Why is there so little pre-copulatory choice in a promiscuous seed bug?” Scottish Conference on Animal Behaviour (Oral presentation)

(2012) “Mate, Eat or Avoid? – Investigating Reproductive Interference between seed bug species” Scottish Conference on Animal Behaviour (Poster presentation)

(2011) “Mistaken Identity – Investigating Reproductive Interference between seed bug species” ASAB Winter Meeting (Poster presentation)

References

Dr David M. Shuker

University of St. Andrews
Harold Mitchell Building
St Andrews
KY16 9TH UK

Email:

david.shuker@st-andrews.ac.uk

Tel: +44 1334 463376

Dr Michael Ritchie

University of St. Andrews
Harold Mitchell Building
St Andrews
KY16 9TH UK

Email:

mgr@st-andrews.ac.uk

Tel: +44 1334 463495

Dr Richard Preziosi

University of Manchester
Michael Smith Building
Oxford Road, Manchester
M13 9PT UK

Email:

Richard.Preziosi@manchester.ac.uk

Tel: 44 (0)161 275 5959