

Thomas M. Houslay

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Education

Ph.D. Biology, 2010-2014.
'Causes of adaptive differences in age-dependent reproductive effort'
Awarded 2014.
University of Stirling.
Advisor: Dr Luc F. Bussière.

M.Sc. Bioinformatics, 2004.
Awarded with distinction.
University of Manchester.

B.Sc. (Hons) Computer Science, 2002.
Upper second class.
University of Lancaster.

Research profile

My research focus is – very broadly – the creation and maintenance of phenotypic variation. I am particularly interested in traits that vary within individuals, and in how different traits vary and covary at different levels (within and among individuals, as well as at the genetic level), and how such (co)variation affects the potential response to selection. I am also interested in how the social environment affects trait expression, and how interacting phenotypes may affect selection at different levels.

Employment history

Postdoctoral research associate, July 2018 – *present.*
Large Animal Research Group, Department of Zoology.
University of Cambridge.

My postdoctoral research focuses on individual development and social dynamics in cooperative mammals, working with Prof. Tim Clutton-Brock. I use long-term data collection and experimental manipulations to study the effects of variation in social conditions on age-related growth, reproduction, behaviour and endocrine traits in Damaraland mole-rats *Fukomys damarensis* and Kalahari meerkats *Suricata suricatta*. I am also using the long-term meerkat data and pedigree to assess the genetic and social contribution to variation in several cooperative behaviours, and multi-level selection in this group-living species.

Postdoctoral research associate / postdoctoral research fellow, May 2015 – June 2018.
Wilson Group, Centre for Ecology and Conservation.
University of Exeter.

My postdoctoral research with Prof. Alastair Wilson focused on the evolutionary genetics of the vertebrate stress response. I used the Trinidadian guppy, *Poecilia reticulata*, with studies of behaviour and stress-related hormones to determine phenotypic, among-individual and genetic trait (co)variances. I

was also involved in collaborative studies taking similar approaches with a variety of other fish and invertebrate species. This research was performed in collaboration with Dr. Ryan Earley (University of Alabama) and Dr. Andy Young (University of Exeter).

Statistics course instructor, Dec 2014 – December 2017.

'Advancing in R', various venues.

PR Statistics.

Alongside Dr. Luc Bussière, I taught a 5-day residential workshop on statistical analysis using R, aimed at ecologists and evolutionary biologists. The course bridges the gap between basic R coding and more advanced statistical modelling, providing an introduction to model selection and simplification, mixed effects models, generalised linear models, and nonlinear models. I wrote and delivered course material, and provided instruction and assistance to attendees.

Computational biologist, 2006–2010.

Advanced Science & Technology Laboratory.

AstraZeneca UK.

Research assistant, 2005–2006.

Bioinformatics Research Centre.

University of Glasgow.

Analyst programmer, 2004.

Bioinformatics Group.

Novartis CH.

Publications

Pre-prints (not yet peer reviewed):

Houslay, T. M., R. L. Earley, S. J. White, W. Lammers, A. J. Grimmer, L. M. Travers, E. L. Johnson, A. J. Young, A. J. Wilson. Genetic integration of the stress response. *BioRxiv* doi: 10.1101/770586

Prentice, P. M., C. Mnatzaganian, **T. M. Houslay**, A. Thornton, A. J. Wilson. Cognitive performance and stress responsiveness in the Trinidadian guppy - a multivariate approach. *BioRxiv* doi: 10.1101/2020.05.19.103689

Peer-reviewed publications in ecology & evolution:

2020

Houslay, T. M., P. Vullioud, M. Zottl, T. H. Clutton-Brock. Benefits of cooperation in captive Damaraland mole rats. *Behavioural Ecology* 31(3): 711-718.

Houslay, T. M.*, P. Kitchener*, N. J. Royle. (2020). Are older parents less flexible? Testing age-dependent plasticity in *Nicrophorus vespilloides* burying beetles. *Animal Behaviour* 162: 79-86. *Joint first author

Santori, C, L. F. Bussière, **T. M. Houslay**. (2020). Heightened perception of competition hastens courtship. *Behavioral Ecology* 31(1): 239-246.

Prentice, P. M., **T. M. Houslay**, J. G. A. Martin, A. J. Wilson. (2020). Genetic variance for 'predictability' in behavioural response to stress. *Journal of Evolutionary Biology* 33: 642-652.

McCain, S., S. Kopic, **T. M. Houslay**, A. J. Wilson, H. Lu, R. L. Earley. (2020). Choice consequences: Salinity preferences and hatchling survival in the mangrove rivulus fish (*Kryptolebias marmoratus*). *Journal of Experimental Biology* (in press).

2019

Houslay, T. M., R. L. Earley, A. J. Young, A. J. Wilson. (2019). Habituation and individual variation in the endocrine stress response in the Trinidadian guppy (*Poecilia reticulata*). *General and Comparative Endocrinology* 270: 112-122.

Lailvaux, S. P., A. Cespedes, **T. M. Houslay**. (2019). Conflict, compensation, and plasticity: sex-specific, individual-level trade-offs in green anole (*Anolis carolinensis*) performance. *Journal of Experimental Zoology Part A* 331: 280-289.

Dyble, M., **T. M. Houslay**, M. Manser, T. H. Clutton-Brock. (2019). Intergroup aggression in meerkats. *Proceedings of the Royal Society B: Biological Sciences* (Accepted)

White S. J., **T. M. Houslay**, A. J. Wilson. (2019). Evolutionary genetics of personality in the Trinidadian guppy II: Sexual dimorphism and genotype-by-sex interactions. *Heredity* 122: 15-28.

Styga J. M., **T. M. Houslay**, A. J. Wilson, R. L. Earley. (2019). Development of **G**: A test in an amphibious fish. *Heredity* 122: 696-708.

Duffield K. R., K. J. Hampton, **T. M. Houslay**, J. Hunt, B. M. Sadd, S. K. Sakaluk. (2019). Inbreeding alters context-dependent reproductive effort and immunity in male crickets. *Journal of Evolutionary Biology* 32: 731-741.

2018

Houslay, T. M., M. Vierbuchen, A. J. Grimmer, A. J. Young, A. J. Wilson. (2018). Testing the stability of behavioural coping style across stress contexts in the Trinidadian guppy. *Functional Ecology* 32(2): 424-438.

Maskrey D. M., A. J. Wilson, S. J. White, **T. M. Houslay**. (2018). Who dares doesn't always win: risk-averse rockpool prawns are better at controlling a limited resource. *Animal Behaviour* 140: 187-197.

Styga J. M., **T. M. Houslay**, A. J. Wilson, R. L. Earley. (2018). Ontogeny of the morphology-performance axis in an amphibious fish (*Kryptolebias marmoratus*). *Journal of Experimental Zoology Part A* 327: 620-634.

Duffield K. R., K. J. Hampton, **T. M. Houslay**, J. Hunt, J. Rapkin, S. K. Sakaluk, B. M. Sadd. (2018). Age-dependent variation in the terminal investment threshold in male crickets. *Evolution* 72(3): 578-589.

Longdon, B., ..., **T. M. Houslay**, ..., F. M. Jiggins. (2018). Parallel genetic changes in viruses adapting to closely related hosts following a host shift. *PLoS Pathogens* 14(4): e1006951.

2017

Houslay, T. M. & A. J. Wilson. (2017). Avoiding the misuse of BLUP in behavioural ecology. *Behavioral Ecology* 28(4):948-952.

Duarte, A., S. C. Cotter, O. de Gasperin, **T. M. Houslay**, G. Boncoraglio, M. Welch, R. M. Kilner. (2017). No evidence of a cleaning mutualism between burying beetles and their phoretic mites. *Scientific Reports* 7(1): 13838.

Jarrett, B. J. M., M. Schrader, D. Rebar, **T. M. Houslay**, R. M. Kilner. (2017). Cooperative interactions within the family enhance the capacity for evolutionary change in body size. *Nature Ecology & Evolution* 1: 0178.

Longdon, B., ..., **T. M. Houslay**, ..., F. M. Jiggins. (2017). Vertically transmitted rhabdoviruses are found across three insect families and have dynamic interactions with their hosts. *Proceedings of the Royal Society B* 284: 20162381.

Pre-2017

Houslay, T. M., K. F. Houslay, J. Rapkin, J. Hunt, L. F. Bussière. (2016). Mating opportunities and energetic constraints drive variation in age-dependent sexual signalling. *Functional Ecology* 31: 728-741.

Houslay, T. M., J. Hunt, M. C. Tinsley, L. F. Bussière. (2015). Sex differences in the effects of juvenile and adult diet on age-dependent reproductive effort. *Journal of Evolutionary Biology* 28: 1067-1079.

Houslay, T. M. & L. F. Bussière. (2012). Sexual Selection and Life History Allocation. *eLS 2012, John Wiley & Sons, Ltd: Chichester*.

Other peer-reviewed publications:

Isherwood, B. J., R. E. Walls, M. Roberts, **T. M. Houslay**, S. R. Brave, S. T. Barry, N. O. Carragher. (2013). High-content analysis to leverage a robust phenotypic profiling approach to vascular modulation. *Journal of Biomolecular Screening* 18(10), 1246-1259.

Caie, P. D., R. E. Walls, A. Ingleston-Orme, S. Daya, **T. M. Houslay**, R. Eagle, M. E. Roberts, N. O. Carragher. (2010). High-content phenotypic profiling of drug response signatures across distinct cancer cells. *Molecular Cancer Therapeutics* 9(6), 1913–1926.

Xu T. R., G. S. Baillie, N. Bhari, **T. M. Houslay**, A. M. Pitt, D. R. Adams, W. Kolch, M. D. Houslay, G. Milligan. (2008). Mutations of beta-arrestin 2 that limit self-association also interfere with interactions with the beta(2)-adrenoceptor and the ERK1/2 MAPKs: implications for beta(2)-adrenoceptor signalling via the ERK1/2 MAPKs. *Biochemical Journal* 413, 51–60.

Smith, K. J., G. S. Baillie, E. I. Hyde, X. Li, **T. M. Houslay**, A. McCahill, A. J. Dunlop, G. B. Bolger, E. Klussmann, D. R. Adams, M. D. Houslay. (2007). H-1 NMR structural and functional characterisation of a cAMP-specific phosphodiesterase-4D5 (PDE4D5) N-terminal region peptide that disrupts PDE4D5 interaction with the signalling scaffold proteins, arrestin and RACK1. *Cellular Signalling* 19(12), 2612–2624.

Baillie, G. S., D. R. Adams, N. Bhari, **T. M. Houslay**, S. Vadrevu, D. Meng, X. Li, A. Dunlop, G. Milligan, G. B. Bolger, E. Klussmann, M. D. Houslay. (2007). Mapping binding sites for the PDE4D5 cAMP-specific phosphodiesterase to the N- and C-domains of beta-arrestin using spot-immobilized peptide arrays. *Biochemical Journal* 404, 71–80.

Huston, E., I. Gall, **T. M. Houslay**, M. D. Houslay. (2006). Helix-1 of the cAMP-specific phosphodiesterase PDE4A1 regulates its phospholipase-D-dependent redistribution in response to release of Ca²⁺. *Journal of Cell Science* 119(18), 3799–3810.

Huston, E., **T. M. Houslay**, G. S. Baillie, M. D. Houslay. (2006). cAMP phosphodiesterase-4A1 (PDE4A1) has provided the paradigm for the intracellular targeting of phosphodiesterases, a process that underpins compartmentalized cAMP signalling. *Biochemical Society Transactions* 34, 504–509.

Wallace, D. A., L. A. Johnston, E. Huston, D. MacMaster, **T. M. Houslay**, Y. F. Cheung, L. Campbell, J. E. Millen, R. A. Smith, I. Gall, R. G. Knowles, M. Sullivan, M. D. Houslay. (2005). Identification and characterization of PDE4A11, a novel, widely expressed long isoform encoded by the human PDE4A cAMP phosphodiesterase gene. *Molecular Pharmacology* 67(6), 1920–1934.

Talks & presentations

2019

Benefits of cooperation in Damaraland mole-rats. Talk presented at the ASAB Winter Meeting 2019, London, UK.

2018

Individual variation and genetic integration in stress-related hormones and behaviour. Invited seminar at Anglia Ruskin University, UK (host: Dr. Jacob Dunn)

The quantitative genetics of stress coping styles. Talk presented at the Society for Integrative & Comparative Biology Annual Meeting 2018, San Francisco, USA.

2017

Untangling variation in coping styles: individual and genetic variation in stress response. Invited seminar at the University of Roehampton, UK (host: Dr. Harry Marshall); Behavioural Ecology seminar series, University of Cambridge, UK.

'Coping styles': Quantifying individual variation in stress response. Talk presented at the Wild Animal Modelling BiAnnual Meeting (WAMBAM), Montreal, Canada.

Pre-2017

How does danger affect personality? Talk presented at the 30th Congress of the International Society for Behavioural Ecology (2016), Exeter, UK.

Savings plans or budget constraints? Causes and consequences of age-dependent allocation patterns in sexual signalling. Talk presented at the 15th Congress of the European Society for Evolutionary Biology (2015), Lausanne, Switzerland.

Savings plans or budget constraints? Causes and consequences of age-dependent allocation patterns in sexual signalling. Invited seminar at the Evolutionary Genetics Laboratory (2014), University of Cambridge, UK (host: Dr. Ben Longdon).

Causes and consequences of resource storage and allocation to a sexually selected display. Talk presented at the Scottish Ecological Ageing Research Group Meeting (2014), Glasgow, UK.

Savings accounts and ready cash: resource storage and allocation to a sexually selected behavioural display. Talk presented at the Scottish Animal Behaviour Conference (2014), Edinburgh, UK.

Does phenotypic plasticity undermine the reliability of sexual advertisement or help sustain adaptive mate choice? Poster presented at the 14th Congress of the European Society for Evolutionary Biology (2013), Lisbon, Portugal; the Royal Entomological Society International Symposium, St Andrews, UK.

Does phenotypic plasticity undermine the reliability of sexual advertisement or help sustain adaptive mate choice? Invited talk at the University of Basel (2013), Switzerland (host: Dr. Lukas Schärer).

The effect of juvenile and adult diet on age-dependent reproductive effort and mortality. Talk presented at the 1st Joint Congress on Evolutionary Biology (2012), Ottawa, Canada; the Scottish Ecological Ageing Research Group Meeting (2012), Durham, UK; the Scottish Animal Behaviour Conference (2012), Stirling, UK.

The effect of diet on ageing and reproductive effort in the decorated cricket *Gryllobates sigillatus*. Invited talk given as part of the Behavioural Ecology seminar series (2012), University of St Andrews, UK (host: Dr. Nathan Bailey).

The condition-dependence of calling effort in decorated crickets (*Gryllobates sigillatus*). Poster presented at the 13th Congress of the European Society for Evolutionary Biology (2011), Tuebingen, Germany.

Teaching experience

Guest lecturer, University of Exeter.

Wrote and delivered lectures on life history evolution, sexual selection, and sexual conflict for undergraduate course BIO1424 (organised by Prof. Tom Tregenza).

Instructor, 'Advancing in R' workshop.

5-day residential workshop teaching statistical analysis using R, aimed at ecologists and evolutionary biologists (running twice yearly from 2014 – 2017).

Teaching assistant, University of Stirling.

Animal physiology; Biodiversity; Evolution & genetics; Field and lab techniques; Phylogenetics; Proteomics; Statis-

tics and data visualisation in R.

Overseas field course instructor, University of Stirling.
Ecology and animal biology in the Swiss Alps.

Skills

Statistical programming in R.

Including mixed-effects models and random regression, multivariate mixed-effects modelling, analysis of longitudinal datasets, and Bayesian inference.

Quantitative genetics.

Experience of quantitative genetic analyses (including the estimation of trait heritabilities and correlations and genotype-by-environment interactions, and multivariate approaches) using both maximum likelihood and Bayesian methods.

Organisational skills.

Experience of running large-scale animal behaviour experiments, including quantitative genetic designs.

Funding awarded

ESEB Outreach Initiative. (2014).

€900 awarded for the project 'Breaking Bio: video and audio podcasts with leading scientists.'

Public outreach

I have discussed my research in both live and pre-recorded interviews for television (BBC World News) and radio (including BBC Radio 4's 'Today' show, BBC Radio Scotland, BBC Radio Wales, and CBC's 'As it happens'). My research was also featured in a variety of international newspapers and magazines (including the Washington Post, the Independent, the Daily Mail, and Newsweek).

I am active amongst the scientific community on Twitter, and my period running the 'RealScientists' Twitter account (hosted by a different scientist each week) led to coverage in several international newspapers.

I previously co-hosted the 'Breaking Bio' podcast, in which we interview academics of all career stages about their research. I am a firm believer in the importance of public engagement with science, and have volunteered at events such as the BBC's 'Bang Goes the Theory' exhibition at the Edinburgh Science Festival and the University of Cambridge Science Festival.

Service to the profession

Invited and hosted external seminar speakers, including Prof. Trine Bilde (Aarhus University), Prof. Phyllis Lee (University of Stirling), Dr. Nathan Bailey (University of St. Andrews, UK), Dr. Susan Johnston (University of Edinburgh, UK), Dr. David Shuker (University of St. Andrews, UK), and Prof. Douglas Futuyma (State University of New York at Stony Brook, USA).

Assisted with the organisation of the 30th Congress of the International Society for Behavioural Ecology.

Ad hoc reviewer for journals including: Animal Behaviour, Behavioural Ecology, Heredity, Journal of Animal Ecology, Journal of Evolutionary Biology, Journal of Experimental Biology, Nature Ecology & Evolution, Proceedings of the Royal Society B: Biological Sciences. *View my Publons profile.*

I am currently an Associate Editor for Functional Ecology.