



PhD studentship: Genomics of sexual trait expression in black grouse.

With Prof Joe Hoffman (Bielefeld University, Germany), Dr Carl Soulsbury (University of Lincoln, UK) and Prof Kees van Oers (Netherlands Institute of Ecology and Wageningen University, the Netherlands).

An outstanding opportunity is available for a PhD student to work on the evolutionary genomics of sexual trait expression in an iconic avian model system, the black grouse (*Lyrurus tetrix*). The position is available in Joe Hoffman's research group (www.thehoffmanlab.com) at the Department of Animal Behaviour at Bielefeld University and is fully funded for three years.

The PhD project

Since Darwin first coined the term 'sexual selection' to explain the evolution of exaggerated male traits, we have come to understand the complex interrelationships among these traits, the information they encode and the life histories of the animals they are embedded into. Sexual selection is built on the idea that individual quality is signalled by the expression of these traits, yet a clear mechanistic understanding of the genetic architectures of sexual traits and the mechanisms regulating sexual trait expression remains elusive.

We know that inbreeding is an important component of individual quality, and several studies have documented inbreeding depression for sexually-selected traits. Moreover, trait expression can be influenced by dynamic factors such as age and environmental variation, so epigenetic control mediated by body condition has been proposed as a means of regulating genotype-dependent sexual trait expression. Resolving long-standing evolutionary questions about mate choice and sexual selection therefore requires a fundamental understanding of the genetic and epigenetic basis of sexual traits.

This project will combine the genomic inference of inbreeding with genome-wide methylation analysis to investigate the genetic and epigenetic mechanisms affecting sexual trait expression and reproductive success in a classical lek model system, the black grouse. Genomic estimates of inbreeding will be used to quantify the impacts of consanguinity on multiple sexual traits and to evaluate the 'genetic capture' hypothesis, which argues that sexual traits are influenced by the cumulative effects of large numbers of loci distributed across the genome. Finally, we will build upon a recent pilot study linking heterozygosity to sexual trait expression via differential DNA methylation (Soulsbury *et al.* 2017) by using a genome-wide methylation assay, epi-GBS, to identify genome-wide epigenetic signatures associated with inbreeding and sexual trait expression.

Overall, this project will tackle an important knowledge gap by combining detailed data from multiple sexual traits over individual lifespans with genomic and epigenetic data in a classical lekking species. The PhD student will therefore have a fantastic opportunity to tackle sexual selection using a number of innovative and cutting-edge approaches.

Applicant's profile

We seek a bright and highly motivated student who holds a good first degree and an M.Sc. or equivalent in a relevant topic (e.g. molecular ecology, population genomics, bioinformatics). The ideal candidate will have strong quantitative skills, including proficiency in working in R and writing custom scripts. Practical experience of working with next generation sequence data (e.g. RAD sequencing, SNP array or whole genome resequencing) would be advantageous, but full training will be provided. The candidate should also be able to work both independently and as part of a multidisciplinary team. A high standard of spoken and written English is required.

The working environment

The PhD student will be based at the Department of Animal Behaviour at Bielefeld University, Germany (www.uni-bielefeld.de/biologie/vhf/index.html). The department is the oldest of its kind in Germany and currently hosts seven principal investigators, nine postdocs and 15 PhD students. It offers a stimulating, supportive and highly international environment as well as an excellent research infrastructure. The working language of the Department is **English**.

Bielefeld is a city of 325,000 inhabitants with an attractive historical centre and easy access to the Teutoberger Wald for hiking and other outdoor pursuits. It is an affordable and pleasant city to live in and is well connected to most major European cities.

This project is lab based and is located at Bielefeld University, but the PhD will also spend some time at the University of Lincoln (<https://www.lincoln.ac.uk/home>) and at the Netherlands Institute of Ecology (<https://nioo.knaw.nl/en>). The successful applicant will therefore benefit from an integrative, multidisciplinary training that will prepare her/him very well for a scientific career in behavioural ecology, molecular ecology and population genomics.

Remuneration

This generous PhD studentship is funded by the German Science Foundation (DFG) for a period of three years and includes health insurance. The pay scale is TVL E13 (65%) which is roughly equivalent to a minimum of €1,500 per month net depending on tax class, marital status, etc. Funding will also be available for travel and for the student to attend workshops and conferences.

Application procedure

To apply for this position, please provide: (i) a letter of motivation including a maximum 2-page statement of your research interests, relevant skills and experience; (ii) a CV including publication list; (iii) names and contact details of three referees willing to write confidential letters of recommendation; and (iv) please also state where you saw the position advertised. All materials should be emailed **as a single PDF** to: joseph.hoffman@uni-bielefeld.de with 'PhD application' in the subject line.

The application deadline is **30th April 2021** and online interviews will take place shortly afterwards. After the decision, the position should start as soon as possible, although there is some scope for flexibility depending on the timeframe of the most qualified applicant. For further information, please see www.thehoffmanlab.com, www.life-historyresearch.weebly.com and www.nioo.knaw.nl/nl/employees/kees-van-oers#quicktabs-qt_personal_page_nl=5. We also encourage you to contact Joe Hoffman (joseph.hoffman@uni-bielefeld.de), Carl Soulsbury (csoulsbury@lincoln.ac.uk) or Kees van Oers (k.vanOers@nioo.knaw.nl) with any informal inquiries.

Bielefeld University has received a number of awards for its achievements in the provision of equal opportunity and has been recognized as a family friendly university. The University welcomes applications from women. This is particularly true with regard both to academic and technical posts as well as positions in Information Technology and Trades and Craft. Applications are handled according to the provisions of the state equal opportunity statutes. Applications from suitably qualified handicapped and severely handicapped persons are explicitly encouraged.

Representative publications

Wells DA *et al.* (2020) Inbreeding depresses altruism in a cooperative society. *Ecology Letters*, 23: 1460-1467. Doi: 10.1111/ele.13578.

Sepers B *et al.* (2019) Avian ecological epigenetics: pitfalls and promises. *Journal of Ornithology*, 160: 1183–1203. Doi: 10.1007/s10336-019-01684-5.

Soulsbury CD *et al.* (2017) Age and quality-dependent DNA methylation correlates with sexual trait expression in a wild bird. *Ecology and Evolution*, 8: 6547–6557. Doi: 10.1002/ece3.4132.

Kervinen M *et al.* (2015) Life history differences in age-dependent expression of multiple ornaments and behaviors in a lekking bird. *American Naturalist*, 185: 13–27. Doi: 10.1086/679012.

Hoffman JI *et al.* (2014) High-throughput sequencing reveals inbreeding depression in a natural population. *Proc Nat Acad Sci USA*, 111: 3775–3780. Doi: 10.1073/pnas.1318945111.

For further relevant publications and downloadable PDFs, please see www.thehoffmanlab.com.