Joe Millard— Leverhulme Early Career Fellow
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Summary

I'm a Leverhulme Early Career Fellow at the University of Cambridge, broadly interested in the causes and consequences of global biodiversity change, ecological economics, digital metrics for monitoring human-nature interactions, evidence synthesis, and the application and ethics of AI in research. Prior to my current position I worked at the Natural History Museum as a postdoctoral researcher, and prior to that at the Leverhulme Centre for Demographic Science as a data scientist and honorary non-stipendiary research fellow (Nuffield College). I completed a PhD in computational ecology jointly between UCL, the Institute of Zoology, and the RSPB. I have also worked at UNEP-WCMC building automated data handling systems for wildlife trade data, and at the journal Scientific Reports in manuscript peer-review and decisions.

Education and qualifications

PhD Computational Ecology (Minor corrections) – UCL London NERC DTP (2017-2021)
Thesis: Causes and consequences of global pollinator biodiversity change in the Anthropocene
- CASE (Collaborative Award in Science and Engineering) PhD in collaboration with UCL (Dr Tim Newbold), the Institute of Zoology (Dr Robin Freeman), and the RSPB (Prof Richard Gregory).
- Taught statistical programming on two computational biology modules, for a total of more than 100 hours. Covered statistical methods (lme4, anova, lm), programming (basic Python), data handling (piping, dplyr verbs), and functional programming in R.

MSc Biodiversity and Conservation (Distinction, 1st) – The University of Leeds (2014-2015)
Thesis: A Satellite Telemetry Investigation of Caspian Seal *(Pusa caspica)* Activity Budgets (77)
- Awarded the second highest overall mark in the year for my data science research project and the highest thesis mark at 80.5%.

BSc Zoology, Upper second-class honours (2:1) – The University of Leeds (2011-2014)
Thesis: Of Molecules and Morphology: An Extended Review of the Eutherian Radiation (69)

Employment and volunteering summary

Leverhulme Early Career Fellow and Bye-Fellow of St Edmund's College – University of Cambridge (October 2024-October 2027)
Title: Novel AI and economic mechanisms to solve the biodiversity crisis
- Primary Investigator on a 3 year Fellowship, focussing on the potential future role of ensemble biodiversity models, spatial finance, global biodiversity monitoring systems, and central bank digital currencies, in solving at least some dimensions of the problems emergent from biodiversity change.
- Core member of the OpenNature Initiative, a consortium of leaders in ecological data science pushing to develop foundational models for ecology, and to develop new funding mechanisms to further the openness of nature data (see https://medium.com/vizzuality-blog/opennature-initiative-its-time-for-accessible-actionable-nature-data-f1ee63864ce3).

Visiting Researcher – University of Cambridge (March-September 2024)
- Funded by the Natural History Museum to join the Agroecology group of Prof Lynn Dicks for a period of 6 months.

Postdoctoral researcher – the Natural History Museum, London (March 2022-October 2024)
- Funded on the NERC project GLiTRS (https://glitrs.ceh.ac.uk/), a consortium building a global threat-response model for insect biodiversity change.
- Lead post-doc on meta-analyses and in combining multiple data types (expert elicitation, space-for-time, and meta-analyses) to develop the core threat-response model for insect biodiversity.

- Supervised 26 students (8 primary supervisor; 18 co-supervisor), led catch-up meetings with groups of masters students and post docs, introduced new starter students to the museum, and NHM-side lead on GLiTRS recruitment during period of line manager absence.
- Project lead on the Species Awareness Index (https://doi.org/10.1111/cobi.14096) and Dynameta (https://doi.org/10.1016/j.softx.2023.101439)

Postdoctoral data scientist and honorary non-stipendiary research fellow – Leverhulme Centre for Demographic Science & Nuffield College, University of Oxford (September 2021-March 2022)
- Lead on three research projects: 1) a systematic text-analysis review of the causes of human sleep disturbance; and 2) changes in Twitter activity following the COVID-19 pandemic; and 3) the effects of extreme night-time temperature on sleep disturbance, using ERA-5 hourly temperature data and Twitter scraping.
- Helped design a set of data management plans for the collection of multiple forms of publicly donated data (e.g. social media, genetic, genealogy, GPS), and worked with external companies to ensure a secure backend database.
- Co-authored a SAGE Number 10 briefing on the reintroduction of COVID-19 preventative measures.

Programme Assistant – UNEP-WCMC (September 2016-June 2017)
- Collaborated with Dr Aly Pavitt to develop two new automated systems in R for the processing of CITES data, replacing a previous system built in VBA, and bringing processing time down from 3-4 hours to 5-10 seconds.
- Delivered workshops on Shiny to the Species Programme, the wider centre, and a specialist technical GIS hub.
- Involved in producing a data handling guide for the Ecuadorian environmental ministry and an Amazonian regional trade overview, and wrote ~12 trade reviews for the European Commission.

Publishing Assistant – Nature Publishing Group (November 2015-September 2016)
- Applied my broad academic knowledge to rapidly assign manuscripts to the editors at Scientific Reports, and then responsible for manuscripts to decision.
- Trained in the handling and identification of clinical trials and responsible for vetting trials before acceptance.
- Responsible for the growth and maintenance of the Ecology and Evolution section of the editorial board.
- Presented accepted ecological papers to the editorial team and wrote paper summaries for our Facebook page, published to more than 100,000 followers.

Major invited talks, symposia, and workshops

- **Royal Society UK-China bilaterial international meeting 2025 –** invite only scientific meeting, fully funded by the Royal Society and the Chinese Academy of Sciences for outstanding early career researchers working on biodiversity and climate change.
- **Royal Society Recovering Nature event: building on Georgina Mace's work to ensure a biodiverse and liveable future** – invited as one of 12 upcoming biodiversity scientists building on Georgina's work https://www.youtube.com/watch?v=Np6Ei_KQXIk&list=PLKYTvTbXFuCj0S4IOnfnRqseSE2y3lgzJ&index=11&t=29s&ab_channel=TheRoyalSociety
- **BES Hackathon 2024** – lead organiser on 'Next-generation monitoring of human-nature interactions' hackathon, including submitting a BES grant proposal and handling all aspects of organisation and logistics.
- **St Edmund's Bye-Fellow inaugural talk June 2025** – delivered a talk at St Edmund's College introducing my research as a new Bye-Fellow
- **CCI (Cambridge Conservation Initiative) Collaborative Workshop; Food, Agriculture and Biodiversity: emerging agendas 2025** – invite only workshop planning future work and strategy for the CCI

- **Nature Finance CCI workshop 2025** – invite only workshop planning future nature finance work and strategy in the CCI
- **ICCB 2023 round-table symposium: Large scale monitoring of perceptions of nature: state of the art and ways forward** – co-author on accepted proposal (unable to attend in person)
- **NACCB 2024** – invited speaker for symposium "Analysing text data for conservation", including panel member in a closing discussion
- **Taming complexity in ecology 2024** – 2.5 day invite only workshop in Bad Blankenburg
- **Nature data unlocked 2024** – 2 day invite only workshop in Cambridge on future biodiversity model needs
- **A conversation with Sir Patrick Vallance (Chair of the Board of Trustees)** – invited to speak 1-1 with Sir Patrick Vallance about the biodiversity modelling work of the Natural History Museum
- **NHM & Turing AI Lunch Series 2023** – invite only lunch for AI scientists working in the natural and environmental sciences
- **Linnaean Student Conference 2019** – The importance and diversity of animal pollination (https://www.youtube.com/watch?v=qn0sCxJiTdI&t=5854s)
- **Seminars:** University of Durham (2025), University of Cambridge (2024), Natural History Museum (2022), University of Oxford (2021), University College London (2019), University of São Paulo, Brazil (2019)

Prizes, awards, and grants (£276,342 as of June 2025)

- **Leverhulme Early Career Fellow (October 2024)** – 3 year full-time fellowship (total £171,837)
- **BES hackathon "**Next-generation monitoring of human-nature interactions" – (total registration income £3,065)
- **Programme Enhancement Fund for EntSoc 2025 (May 2025)** – awarded £1,000 for travel and registration
- **Masters project funding to date (March 2024)** – secured 8 primary supervisions, contributing £1,500 each to the museum (total £12,000)
- **Royal Society UK-China bilaterial international meeting** – fully funded by the Royal Society to attend the meeting, including flights, visa, accommodation, and all additional travel and subsistence expenses (£2,000)
- **Taming complexity in ecology** – fully funded by workshop convenors (total ~£1,500)
- **GEOBON 2023, Montreal** – fully funded on the NHM Science Investment Fund (total ~£3,000)
- **PhD Conference travel fund** – contribution towards BES Ecology Across Borders 2021 (total £500)
- **London NERC PhD studentship (2017-2021)** – fully funded PhD scholarship on the environmental science London NERC DTP (total ~£77,000)
- **CASE (Collaborative Award in Science and Engineering) funding (2017-2021)** – additional PhD funding from the RSPB (total £3,000)
- **Cambridge University bench fees –** fully funded to join the University of Cambridge as a visiting researcher (total £1,440)
- **Capgemini Tech4PositiveFutures challenge 2022** – finished as one of the top 6 pitches for a €100k prize applying tech to biodiversity problems
- **BES Quantitative Ecology Hackathon 2020** – awarded "best presentation" for our plant species identifying AI Shiny app (https://methodsblog.com/2020/03/12/quantitative-sig-hackathon/)
- **Linnaean Student Conference 2019** – won a place as speaker for my abstract on pollinator biology
- **Leeds University Science Magazine Writing competition 2015** – won first prize for my piece "The polar bear: a tale of two futures"
- **IEMA Student Sustainability Conference 2015** – won a committee place for my essay on sustainability issues, and later invited to meet CEO of IEMA

- Conservation Letters; Ecosystem Services; Ecography; Scientific Reports; Global Ecology and Biogeography; Communications Earth & Environment; PLOS ONE; Conservation Biology; Nature Ecology and Evolution; Insect Conservation and Diversity; Nature Reviews Biodiversity; BBSRC

Publications (6 first author, 2 last author)

Published:

1. **Millard, J.**, Skinner, G., Bladon, A. J., Cooke, R., Outhwaite, C. L., Rodger, J. G., Barnes, L. A., Isip, J., Keum, J., Raw, C., Wenban-Smith, E., Dicks, L. V., Hui, C., Jones, J. I., Woodcock, B., Isaac, N. J., Purvis, A. (2025). A multi-threat meta-analytic database for understanding insect biodiversity change. *Diversity and Distributions*

2. Cooke, R., Outhwaite, C. L., Bladon, A. J. , **Millard, J.**, Rodger, J. G., Dong, Z., Dyer, E. E., Edney, S., Murphy, J. F., Dicks, L. V., Hui, C., Jones, J. I., Newbold, T., Purvis, A., Roy, H. E., Woodcock, B. A. and Isaac, N. J. B. (2025). Integrating multiple evidence streams to understand insect biodiversity change. *Science*.

3. Johnson, T.F., **Millard, J**. and Evans, L.C., (2025). More work is needed to identify how people perceive and value nature. *Nature Reviews Biodiversity*

4. Williams, J., Newbold, T., **Millard, J.**, Groner, V., Pearson, R., (2024). Important pollinators respond less negatively to anthropogenic land use than other animals. *Ecology and Evolution*

5. **Millard, J.,** Christie, A., Dicks, L., Isip, J., Johnson, T.F., Skinner, G., Spake, R., (2024). ChatGPT is likely reducing opportunity for support, friendship, and learned kindness in research. *Methods in Ecology and Evolution*

6. Johnson, T.F., Simmons, B**., Millard, J.,** Strydom, T., Danet A., Evans, L., Pressure to publish introduces LLM risks. (2024). *Methods in Ecology and Evolution*

7. Scheepens, D., **Millard, J.**, Farrell, M., Newbold, T., (2024). Large language models help facilitate the automated synthesis of information on potential pest controllers. *Methods in Ecology and Evolution.*

8. Veríssimo, D., Johnson, T.F., **Millard, J.,** and Roll, U., (2023). Adopt digital tools to monitor social dimensions of the global biodiversity framework. *Conservation Letters*.

9. **Millard, J.**, Outhwaite, C.L., Ceaușu, S., Carvalheiro, L.G., da Silva e Silva, F.D., Dicks, L.V., Ollerton, J. and Newbold, T., (2023). Key tropical crops at risk from pollinator loss due to climate change and land use. *Science Advances*.

10. Johnson, T.F., Cornford, R., Dove, S., Freeman, R. and **Millard, J.**, (2023). Achieving a real-time online monitoring system for conservation culturomics. *Conservation Biology*.

11. Skinner, G., Cooke, R., Keum, J., Purvis, A., Raw, C., Woodcock, B.A. and **Millard, J.**, (2023). Dynameta: A dynamic platform for ecological meta-analyses in R Shiny. *SoftwareX*.

12. Cornford, R., **Millard, J.**, González-Suárez, M., Freeman, R. and Johnson, T.F., (2022). Automated synthesis of biodiversity knowledge requires better tools and standardised research output. *Ecography*.

13. **Millard, J.**, Gregory, R.D., Jones, K.E. and Freeman, R., (2021). The species awareness index as a conservation culturomics metric for public biodiversity awareness. *Conservation Biology*.

14. **Millard, J.**, Outhwaite, C.L., Kinnersley, R., Freeman, R., Gregory, R.D., Adedoja, O., Gavini, S., Kioko, E., Kuhlmann, M., Ollerton, J. and Ren, Z.X., Newbold T., (2021). Global effects of land-use intensity on local pollinator biodiversity. *Nature Communications*.

15. **Millard, J.**, Freeman, R. and Newbold, T., (2020). Text-analysis reveals taxonomic and geographic disparities in animal pollination literature. *Ecography*.

16. Newbold, T., Adams, G.L., Albaladejo Robles, G., Boakes, E.H., Braga Ferreira, G., Chapman, A.S., Etard, A., Gibb, R., **Millard, J.**, Outhwaite, C.L. and Williams, J.J., (2019). Climate and land-use change homogenise terrestrial biodiversity, with consequences for ecosystem functioning and human well-being. *Emerging Topics in Life Sciences*.

Book chapters:

17. Outhwaite, C.L., Cooke, R., **Millard, J.** and Bladon, A.J., (2024). Pervasive and synergistic effects of climate change. In Routledge Handbook of Insect Conservation (pp. 92-107). Routledge.
18. Bladon, A.J., Cooke, R., **Millard, J.** and Outhwaite, C.L., (2024). Practical solutions to climate change for insect conservation. In Routledge Handbook of Insect Conservation (pp. 108-118). Routledge.

Preprints:

19. **Millard, J.**, (2023). Mobilising central bank digital currency to bend the curve of biodiversity loss. *EcoEvoRxiv*.
20. **Millard, J.**, Akimova, E., Ding, X., Leasure, D., Zhao, B. and Mills, M., (2023). Stringent COVID-19 government restrictions were associated with a marked increase in Twitter activity in Europe. *bioRxiv*.
21. Dorm, F., **Millard, J.**, Purves, D., Harfoot, M. and Mac Aodha, O., (2025). Large language models possess some ecological knowledge, but how much? *bioRxiv*.

In prep:

22. Barnes, L., Wenban-Smith, E., Dicks, L., **Millard, J.,** Bladon, A., Meta-analysis shows livestock farming reduces aquatic insect species richness but not total abundance
23. Skinner, G., Cooke, R., **Millard, J.,** Global meta-analysis reveals overall negative impacts of invasive species on terrestrial insects, despite highly variable responses
24. Cooke, R., Outhwaite, C., Bladon, A., **Millard, J.**, Rodger, J., Dong, Z., Dyer E., Edney, S., Murphy, J., Dicks, L., Hui, C., Jones, I., Newbold, T., Purvis, A., Roy, H., Woodcock, B., & Isaac, N. J. B. Insect Time Series (IN-TIME), a database of worldwide insect trends
25. Wenban-Smith, E., Barnes, L., **Millard, J.,** Dicks, L., Turner, E,. Bladon, A., Meta-analysis of extreme temperature effects on the abundance and survival of Hymenoptera and Lepidoptera
26. Outhwaite, C., Purvis A., Newbold, T., Bladon, A., Cooke, R., **Millard, J.,** Dicks L., Isaac, N., The response of Hymenopteran (Bees, Wasps & Ants) biodiversity to a changing world
27. **Millard, J.**, Varah, A., Isip, J., Tudge, S., Contu, S., Burton, V., Johnson, T., Purvis, A., De Palma, A., Predictions of biodiversity change are question dependent
28. **Millard, J.**, Dicks, L. V., Autonomous biodiversity credits on the horizon.