

PROJECT TITLE: Bee “drifting” in the Amazon and the UK: how forage availability and landmarks affect the tendency of bees to enter the wrong nest

DTP Research Theme: Living World

Lead Institution: University of Bristol

Lead Supervisor: Dr. Christoph Grueter, School of Biological Sciences, University of Bristol

Co-Supervisor: Dr. Emily Bell, School of Biological Sciences, University of Bristol

Co-Supervisor: Ana Rosa de Lima, Meli Bees Network gUG

Project Enquiries: c.grueter@bristol.ac.uk

Project keywords: honeybees, stingless bees, deforestation, beekeeping



Left: A stingless bee guard defending her nest against intruders in the Brazilian Amazon region



Right: A honeybee forager equipped with an RFID tag (white arrow) that allows us to monitor foraging activity

Project Background

Bees are important pollinators of agricultural and wild plants, yet they also face many challenges, including habitat loss, pesticides, diseases, and poor nutrition. Among the most important pollinators in temperate regions are honeybees (*Apis mellifera*) and, in the tropics, the stingless bees (Meliponini). People keep bees in apiaries to facilitate beekeeping and pollination. For traditional communities in the Amazon, beekeeping of native Brazilian stingless bees is of both economic and cultural importance as bees provide food, income, and medicinal products. However, keeping bees in apiaries in highly disturbed environments is challenging as bees might struggle to find enough food, leading to poor health of colonies. Furthermore, the proximity of hives in an apiary promotes “drifting”, which means that bees enter the wrong hive and leads to disease spread and lowers the honey and pollen production of colonies.

Project Aims and Methods

This project brings together an exciting mix of methodological approaches to study how “drifting” in stingless bees in Brazil and in honeybees in the UK is related to their foraging landscape. The project will study drifting in environments varying in human disturbance, particularly different degrees of deforestation and urbanisation. The main aims are (1) to identify the key food sources for bees in modified and natural environments; (2) to investigate if food source availability and diversity affects drifting behaviour; (3) to test whether entrance guarding by guard bees can prevent drifting and (4) whether artificial landmarks in apiaries can reduce drifting behaviour. Results will help us identify the most important food sources for these important pollinators and help improve the health and productivity of bees.

The project will study stingless bee hives kept by traditional communities in the Maranhão state in the Brazilian Amazon region, which has been heavily affected by deforestation and in honeybee hives inhabiting different landscapes in the South West of England. Pollen quantity and diversity will be assessed using DNA metabarcoding, while drifting is studied using Radio-frequency identification (RFID) tracking of bees and behavioural observations. In addition to these aims, the project provides opportunities for the candidate to build on or modify the project and develop their own research ideas within the general research topic.

Candidate requirements

We seek a highly motivated, dedicated, and collaborative student with an interest in behaviour, ecology, and entomology. You should be eager to learn about the natural history of bees, molecular methods, and bioinformatic tools. We welcome and encourage student applications from under-represented groups. We value a diverse research environment.

Project partners

This project provides an exciting opportunity to collaborate with **Meli** (meli-bees.org), a not-for-profit organisation that uses native beekeeping, educational activities, and regenerative agricultural initiatives to support traditional communities in Brazil. The candidate will work with beekeepers to study a fascinating group of social bees, the Meliponini, and their interactions with the environment. With the help of Meli, the student will gain experience in the day-to-day business of an environmental organisation that is passionate about protecting the Amazon region and its human inhabitants, learn about fundraising and generating content for educational projects run by Meli in Brazil. Contingency plans are in place should the pandemic prevent or limit the opportunities to work in Brazil, which include generating content for projects while working in the UK.

Training

The project combines field and laboratory work in the UK and in the Brazilian Amazon:

- State-of-the art molecular tools in biodiversity research (DNA metabarcoding and bioinformatics)
- Radio-frequency identification (RFID) to track the behaviour of bees in Brazil and the UK
- Plan and perform behavioural experiments to study the role of nest entrance guarding by bees and visual landmarks on the tendency of bees to “drift”
- Training in the activities of an environmental organisation that works closely with traditional communities in Brazil

Background reading and references

- Grüter, C. 2020. *Stingless Bees: Their Behaviour, Ecology and Evolution*. Springer, Switzerland.
- Jones, L., Brennan, G.L., Lowe, A., Creer, S., Ford, C.R. & de Vere, N. 2021. Shifts in honeybee foraging reveal historical changes in floral resources. *Communications Biology* **4**: 1–10.
- Oliveira, R.C., *et al.* 2021. Foraging and drifting patterns of the highly eusocial Neotropical stingless bee *Melipona fasciculata* assessed by radio-frequency identification tags. *Front. Ecol. Evol.* 9:708178

Useful links

<http://www.bristol.ac.uk/biology/courses/postgraduate/>

NERC GW4+ DTP Website:

More information about the NERC GW4+ Doctoral Training Partnership: <https://www.nercgw4plus.ac.uk>

Bristol NERC GW4+ DTP Prospectus:

<http://www.bristol.ac.uk/study/postgraduate/2022/doctoral/phd-great-western-four-dtp/>

How to apply to the University of Bristol:

<http://www.bristol.ac.uk/study/postgraduate/apply/>

The application deadline is **Monday 10 January at 2359 GMT**.

Interviews will take place during the period **23 February – 9 March 2022**.

General Enquiries:

Bristol NERC GW4+ DTP Administrator

Email: bristol-nercgw4plusdtp-admin@bristol.ac.uk