### **Understanding Superspreaders in a Wild Population**

**Who Drives Disease Spread in a Wild Population?**

Our project aims to enhance understanding of the role of "superspreaders" in disease transmission within natural systems, focusing on the central question: *Who drives disease spread in a wild population?*

Superspreaders are individuals within a population who disproportionately contribute to the transmission of infectious agents. Regarding this study, individuals highly infected with parasitic helminths may act as superspreaders by shedding many infective stages into the environment.

### **Project Overview**

This project focuses on wild wood mice (*Apodemus sylvaticus*) infected with the parasitic helminth *Heligmosomoides polygyrus*. Aiming to investigate how certain individuals may act as superspreaders by either shedding large numbers of *H. poly* eggs into the environment or having high contact with other individuals in the population.

The fieldwork involves monitoring wood mouse populations using grid systems to identify highly infected individuals. Captured mice are assessed for health and demographic data, tagged with PIT-TAG IDs for future identification, and subjected to regulated procedures including ear punches, blood samples, and dosing with ivermectin, which is an antiparasitic drug. The data collected allows us to analyse the influence of individuals on parasite transmission at the population level.

### **Methods and Project Details**

The study is conducted at Bilston wood, using three 6x7 grids approximately 50 meters apart. Each grid contains 84 traps, totaling 252 traps per trapping occasion. Mice are trapped every three weeks for three consecutive nights, followed by a week of laboratory work. Trapping occurs at a lower section of the wood one week and an upper section the next.

Sherman traps filled with bedding and food (seeds, mealworms, and carrot) are used, which are humane traps using a trigger mechanism that closes the trap door upon entry. Non-target species such as bank voles and shrews that may be caught are released immediately. Captured mice are then processed for demographic data and regulated procedures as mentioned previously.

Target individuals are identified via faecal egg counts (FECs) and social contact patterns. Egg counts are done using a faecal flotation method, allowing us to scan for eggs under a microscope. Loggers are devices placed in the field that record mice that pass under them via their PIT-ID tags to give us information about an individual’s movement so that we can estimate home ranges and infer contacts. Based on this data, mice are categorized into treatment or control groups. Treatment assignment refers to administering ivermectin to an individual upon recapture and control group assignment is water.

**Alignment with Broader Thematic Areas**

This project is relevant to thematic areas of disease ecology and epidemiology, including:

**Superspreader Dynamics:** Examining the behaviors and characteristics of superspreader individuals and their influence on disease transmission within the population to understand which individuals contribute most significantly to disease spread.

**Parasitology and Host-Parasite Interactions:** Exploring how the parasite load of individual hosts and their behaviors affect parasite spread, contributing to a broader understanding of host-parasite relationships in natural systems and wild populations.

**Population Ecology:** Addressing how individual variations in infection levels impact the overall parasitic burden within a population, allowing connections to be made between individual-level dynamics to population-wide effects.

**Wildlife Disease Management:** Insights gained from this research could inform strategies to manage wildlife diseases, which can be crucial for conservation efforts, particularly when parasitic infections significantly impact species health.

**One Health Perspective:** The findings may have broader implications for understanding disease transmission in between species, including zoonotic diseases that affect humans.

**Individual Focus Areas**

I have particularly valued the opportunity to engage in fieldwork-based research, expanding my experience beyond previous laboratory work. Working outdoors was enjoyable and gave me an opportunity to develop practical skills in both field and lab settings, supporting my goal to have a well-rounded skill set. This experience has been invaluable for my career development, enabling me to consider and apply for similar roles in the future. The project’s focus on individual host-parasite interactions and the effects on the parasite burden of the population has been especially interesting to investigate.

### **Additional Knowledge and Skills Acquired**

The unpredictable nature of field-based research has highlighted the challenges of managing confounding variables such as harsh weather and interference with equipment. This experience has enhanced my problem-solving abilities and my appreciation for planning and adaptability in research. I have also gained new skills in laboratory techniques, including improved proficiency with microscopes from FEC analysis, and field skills in mouse handling, which increased my confidence in working with live animals.

### **Future Skills Development**

I aim to continue expanding my laboratory and field skill set, particularly by learning to use more specialized equipment and working confidently with a variety of animal species. This project has laid a solid foundation for further development in these areas.

### **Benefits from Working with the Research Team**

Being integrated into the research team has been a highlight of the internship. Collaborating with my supervisor and lab members has boosted my confidence in my abilities and taught me the value of teamwork and independent problem-solving in a research setting.

### **Training Received and Project Goals**

### I received training in setting traps, handling mice, collecting demographic data, and conducting FEC analysis. My main goal was to fully immerse myself in the fieldwork and enjoy the experience, which I achieved while also enhancing both new and old skills. I was involved in all aspects of the project, which allowed for a comprehensive experience of working as a part of the research team.

### **Conclusions**

### This research project provides a valuable contribution to the field of disease ecology by focusing on the role of superspreaders in natural populations. It offers insights that could inform wildlife disease management and broader epidemiological studies, particularly in understanding disease transmission dynamics across varied species. This project also allowed me to gain an invaluable opportunity to work with a research team spread between both lab and field work to further develop my own individual skills while contributing to the project.