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NON-TECHNICAL SUMMARY

Parasite epidemiology in wild bird populations

Project duration

5 years 0 months

Project purpose

- (a) Basic research
- (e) Research aimed at preserving the species of animal subjected to regulated procedures as part of the programme of work

Key words

birds, wildlife, disease, malaria, trichomonas

Animal types

Wild birds

Life stages

juvenile, adult

Retrospective assessment

The Secretary of State has determined that a retrospective assessment of this licence is not required.

Objectives and benefits

Description of the projects objectives, for example the scientific unknowns or clinical or scientific needs it's addressing.

What's the aim of this project?

The overall aim of this work is to improve our understanding of how parasites interact with their wild bird hosts. We want to understand how variable the associations between parasites and hosts are (i.e. whether parasites can infect different hosts in different locations, and how this varies over time), how changes in the environment – such as changing food availability or climate – affect parasite infection, and how this can be managed for species conservation.

Potential benefits likely to derive from the project, for example how science might be advanced or how humans, animals or the environment might benefit - these could be short-term benefits within the duration of the project or long-term benefits that accrue after the project has finished.

Why is it important to undertake this work?

The proposed work will provide novel insights into how parasite infections fluctuate within and between individuals and species in wildlife populations. The work will look at both vector-borne parasites such as avian malaria, and directly-transmitted parasites such as *Trichomonas gallinae*. The work will look at how parasite transmission is affected by the distribution and availability of food resources, and will have practical implications for management of declining wildlife

What outputs do you think you will see at the end of this project?

This work will result in a greater understanding of the dynamics of parasite infections and health in wild birds, including implications for their conservation. Data and analyses will be published in peer-reviewed journal articles. The work will also result in advice for managing outbreaks of disease in wild bird populations, as well as a greater understanding of what drives these outbreaks.

Who or what will benefit from these outputs, and how?

Researchers in the fields of disease ecology will gain knowledge from the advances this work will make in the broad field. Students will benefit from the ability to conduct undergraduate and postgraduate projects using samples collected under this licence, as well as contributing (quality controlled) data to the research programme and thus being listed as co-authors on publications and outputs.

Conservationists will benefit from advice on managing disease in wild populations, likely to result from the hawfinch element examining how parasite strains vary over time and space.

The public will gain an increased knowledge and understanding of health and disease in wild birds from communications following outputs from the study of parasite epidemiology in a wild swan population, which has a citizen science and public engagement element as part of a wider project.

Full benefits are unlikely to be fully realised until the end of the project.

How will you look to maximise the outputs of this work?

All data from this work will be submitted for publication in peer-reviewed journals, including non-significant results and unsuccessful approaches where this is feasible. All molecular data from parasites will be submitted to open access repositories for genetic data, such as GenBank, where it will be accessible to other researchers.

Work with mute swans forms part of a wider project, examining swan health and welfare in relation to human-animal interactions, meaning that the data collected on health and parasite infection can also be used in association with other observational datasets collected from the same individuals.

Species and numbers of animals expected to be used

- Other birds: No answer provided

Predicted harms

Typical procedures done to animals, for example injections or surgical procedures, including duration of the experiment and number of procedures.

Explain why you are using these types of animals and your choice of life stages.

Birds are abundant, widespread, and diverse, and harbour a remarkably wide range of parasites, but we know surprisingly little about the spatiotemporal dynamics or epidemiology of infection.

Typically, what will be done to an animal used in your project?

Birds will be caught in the wild using standard techniques appropriate to the species, such as mist nets. They will be ringed using an individually numbered metal ring, have measurements taken, and be assessed for health status. If deemed healthy, they will have a small blood sample taken and they may also have an oral swab taken, to screen for parasites. They will then be assessed for health status again, before being released back into the wild.

What are the expected impacts and/or adverse effects for the animals during your project?

The protocols involved in screening birds for parasites are widely used and are known to cause minimal harm. All samples will be collected from each bird within a short space of time, at the capture site. Each bird will then be re-released into the wild without delay. No adverse effects are considered likely.

Expected severity categories and the proportion of animals in each category, per species.

What are the expected severities and the proportion of animals in each category (per animal type)?

The maximum severity expected from the procedure is expected to be mild, with no negative effects beyond transient discomfort during the procedure.

What will happen to animals at the end of this project?

- Set free

Replacement

State what non-animal alternatives are available in this field, which alternatives you have considered and why they cannot be used for this purpose.

Why do you need to use animals to achieve the aim of your project?

We wish to examine the dynamics of parasite infections in wild populations, so we cannot carry out this work without using wild animals in their natural environment.

Which non-animal alternatives did you consider for use in this project?

We considered non-animal systems, laboratory-based systems, and computer simulations.

Why were they not suitable?

The objectives of our work make it impossible to study either a non-animal system, a laboratory-based system, or use computer simulations. As the birds we study need to be exposed to natural levels of disease vector exposure, and environmental stressors in order to achieve our objectives, a captive population cannot be used for this work.

Reduction

Explain how the numbers of animals for this project were determined. Describe steps that have been taken to reduce animal numbers, and principles used to design studies. Describe practices that are used throughout the project to minimise numbers consistent with scientific objectives, if any. These may include e.g. pilot studies, computer modelling, sharing of tissue and reuse.

How have you estimated the numbers of animals you will use?

In order to gain an accurate estimate of disease prevalence and how this fluctuates within and between individuals, we need to collect samples from a relatively large number of individuals across multiple species. This is for two reasons: first, because we need to have confidence in our prevalence estimates, because we know that parasite prevalence can vary markedly between different species, and we need to be confident that we have detected all parasite strains present within each species. Second, because we need to control for environmental variables in statistical models to control for variation caused by these effects and to detect variation caused by the factors we are examining.

What steps did you take during the experimental design phase to reduce the number of animals being used in this project?

The nature of our work means we need to use relatively large numbers of animals. However, the protocol we are using only involves taking a small blood sample from a wing vein. Some birds will also have their throat swabbed. Both procedures are classified as mild and will cause only temporary discomfort to the birds during the procedure. All birds are expected to be released back into the wild at the capture site shortly after samples have been taken, once their health has been deemed satisfactory.

What measures, apart from good experimental design, will you use to optimise the number of animals you plan to use in your project?

Where possible, we will minimise sample sizes through the use of statistical models to control for background variation (in e.g. age, sex, time of year) during analysis.

Refinement

Give examples of the specific measures (e.g., increased monitoring, post-operative care, pain management, training of animals) to be taken, in relation to the procedures, to minimise welfare costs (harms) to the animals. Describe the mechanisms in place to take up emerging refinement techniques during the lifetime of the project.

Which animal models and methods will you use during this project? Explain why these models and methods cause the least pain, suffering, distress, or lasting harm to the animals.

We are using species of wild bird within which previous work has identified that the relevant parasites are present in a large enough proportion of individuals within natural populations, that we can achieve our objectives.

The protocols followed in order to screen birds for parasites (a blood sample, and an oral swab) are well-established, and known to cause minimal harm.

Birds will be captured and handled by experienced individuals with the relevant licences, and will be released as soon as the required samples and measurements have been taken

Why can't you use animals that are less sentient?

We wish to understand the dynamics of parasite infection in wild bird populations, so we need to study wild birds in their natural environment.

How will you refine the procedures you're using to minimise the welfare costs (harms) for the animals?

The protocols followed in order to screen birds for parasites are well-established, and known to cause minimal harm. If any adverse effects are seen, then protocols will be reviewed and revised accordingly. All PIL holders working independently (i.e. also holding bird ringing licences) will work alongside other bird ringers at least once per year, to ensure any refinements in bird capture and handling are incorporated into standard practice.

What published best practice guidance will you follow to ensure experiments are conducted in the most refined way?

We will continue to adhere to guidance from professional bodies such as the British Trust for Ornithology to ensure birds are caught and processed in the most efficient way from a welfare perspective.

How will you stay informed about advances in the 3Rs, and implement these advances effectively, during the project?

We will engage with any relevant continuing professional development opportunities where possible.