

Four PhD positions available at the Department of Biology

Four PhD positions are available at the Department of Biology. The appointments are funded for 3 years each. They could be extended by up to one year, subject to acceptance of 25% teaching duties in agreement with the department. Detailed information regarding the individual projects can be found below.

Information about the department

The strategy of the Department of Biology is to understand biological processes of life to preserve the environment. The current research fields at the Department include aquaculture, ethology, evolutionary biology, environmental toxicology, plant and animal physiology, marine biology, molecular biology, natural resource management and general ecology. Further information about the department can be found at <http://www.ntnu.edu/biology>

The PhD Projects

PhD project 1: The physiological and ecological challenges faced by small bats in summer

Supervisor: Associate Professor Clare Stawski, clare.stawski@ntnu.no

Co-supervisor: Professor Jonathan Wright

Bats in Norway face a particularly challenging life. Firstly, they spend much of their life hibernating to survive the long and cold winters. Secondly, this is followed by a short active season, during which they must obtain enough energy to produce young and to prepare for the next hibernation season. This is compounded for nocturnal bats in Norway by the reduced length and even absence of a true night during summer. Therefore, bats in Norway must forage when it is still light and with an increased predation risk in comparison to bats at lower latitudes. This project aims to determine what combinations of variables, such as temperature and day length, allow bats to use torpor to decrease energetic requirements and avoid starvation whilst reducing exposure to predators.

The project will entail extensive fieldwork gathering original data on body temperature, body mass and foraging behaviour. Statistical analyses using mixed models, SEM and Path Analyses will provide a comprehensive understanding of causal relationships. Further, these data will be used to develop stochastic dynamic state-dependent models to provide a deeper understanding of the adaptive decisions made by small bats to cope with Norwegian summers. Therefore, we seek a PhD candidate with some background in ecophysiology, fieldwork and statistical/programming software (such as R).

PhD project 2: A mechanistic basis for the effects of pollutants on disease susceptibility and severity in the house sparrow

Supervisor: Associate Prof. Veerle Jaspers, veerle.jaspers@ntnu.no

Co-supervisors: Professor Henrik Jensen, Professor Atle M. Bones, Dr. Courtney Waugh

The PhD project will expand investigations into the combined impact of pollution and disease susceptibility on songbirds. The specific hypothesis of the project are that: 1) susceptibility to disease will increase in a host due to high exposure to environmental pollution; 2) pollutants modulate the immune system in a specific manner that facilitates infection prevalence and/or disease severity; 3) microRNA profiles can be used as a predictive tool to assess disease outbreaks and severity.

The field component of this project will consist of a large-scale study utilising a model species and its pathogen (the house sparrow, *Passer domesticus*, and its nematode parasite, *Synagamus trachea*). Secondly, the project will elucidate the mechanisms driving pollutant-induced immunomodulation that relate to increased disease susceptibility in the host (targeting microRNAs and inflammation markers). Lastly, the obtained data will be used to develop diagnostic biomarkers to assess infection and exposure that will allow to improve disease outbreak predictions for the future.

The applicant must have a MSc (or equivalent) in (one of the sub disciplines of) Biology or Environmental Science and a documented background with toxicology, immunology and/or disease ecology. Previous experience with wet lab molecular techniques (such as PCR, western blot) is a

must. The candidate should also have some experience with statistical analyses, be able to work both independently and in a team, and have a keen interest in doing experiments in the laboratory and in the field.

PhD project 3: Interactive effects of ecological and chemical disturbance on individuals and populations in the model organism *Daphnia*

Supervisor: Professor Sigurd Einum, Sigurd.einum@ntnu.no

Co-supervisors: Associate Professor Erik Muller, Associate Professor Veerle Jaspers

Accelerating rates of global change cause concerns about the cumulative impacts of multiple environmental stressors. In the current project we will study interactions between ecological and chemical stress. Regarding ecological disturbance, we will focus on changes in trophic control. Populations may be controlled by (1) resource limitation (i.e. bottom-up), or (2) predation/parasites (i.e. top-down), and human activities (e.g. harvesting, species introductions, climate change) can lead to shifts in the dominating trophic control. For chemical disturbance, one type of particular emerging concern is pharmaceutical products. Antidepressants are among those most commonly detected in the environment, and can have wide-ranging effects on physiology of both vertebrates and invertebrates. In the current study we will target one such compound, bupropion, which have effects on aquatic life at environmentally relevant concentrations. Bupropion acts to increase the effect of the endogenously produced neurotransmitter dopamine (which is also produced by *Daphnia*) via inhibition of its reuptake. We hypothesize that the type of trophic control impacts how chemical pollutants influence populations. We will combine experimental work with Dynamic Energy Budget (DEB) models to study this in the ecologically important freshwater zooplankton *Daphnia*. DEB models describe the rates at which individual organisms acquire resources from their environment and use the energy and nutrients therein for maintenance, growth, maturation and reproduction. Thus, DEB models can integrate the combined impacts of multiple stressors on organismal performance in a single framework. These models can then serve as the basis of structured or individual-based population models to generate testable predictions about the impacts of toxicant and trophic control on populations.

We are seeking a candidate that has the required qualifications to work at the interface of experimental organismal biology and mathematical modelling. We therefore ask that candidates highlight this aspect of their qualifications in their applications. The candidate is expected to have knowledge about one or more of the important topics of the project, including bioenergetics, life history trade-offs, evolution and population dynamics. Experience with relevant experimental work, and use of a programming language (e.g. R, Matlab) to analyse experimental data and/or use of mathematical models in a biological context will be an advantage, as will be publications in scientific journals.

PhD project 4: The role of energy budgets in eco-evolutionary dynamics of natural bird populations

Supervisor: Professor Henrik Jensen

Co-supervisors: Associate Professor Clare Stawski, Bernt Rønning, Stefanie Muff (University of Zuerich), Katja Räsänen (EAWAG, Switzerland).

Knowledge about how ecological and evolutionary processes are linked is crucial to understand how natural populations and ecosystems respond to environmental change. Traits related to obtaining and using energy are particularly likely to mediate eco-evolutionary feedbacks, because of the need to allocate energy to growth, self-maintenance, reproduction and survival. The overall goal of the project is to merge eco-evolutionary dynamics, individual energy budgets, quantitative genetics and genomics. The project will use natural populations of house sparrows (*Passer domesticus*) along the Norwegian coast as a model system, and will combine state-of-the art genomics and collection of novel individual data on thermoregulatory curves and energy use.

We seek a PhD-student with a keen interest in evolutionary ecology to work in a dynamic and ambitious international research group. The candidate should have some background in eco-physiology, evolutionary biology and/or genetics/genomics, be familiar with the statistical software R, be able to work both independently and in a team, and have an interest in doing fieldwork.

Qualifications

The regulations for PhD programmes at NTNU state that a Master degree or equivalent with at least 5 years of studies and an average grade of A or B within a scale of A-E for passing grades (A best) for the two last years of the MSc is required. Candidates from universities outside Norway are kindly requested to send a Diploma Supplement or a similar document, which describes in detail the study

and grade system and the rights for further studies associated with the obtained degree:
http://ec.europa.eu/education/tools/diploma-supplement_en.htm

Terms of employment

The appointment of the PhD fellows will be made according to Norwegian guidelines for universities and university colleges and to the general regulations regarding university employees. Applicants must agree to participate in organized doctoral study programs within the period of the appointment and have to be qualified for the PhD-study.

NTNU's personnel policy objective is that the staff must reflect the composition of the population to the greatest possible extent.

The position as PhD is remunerated according to the Norwegian State salary scale. There is a 2% deduction for superannuation contribution.

The application

Applications with CV, certificates from both Bachelor and Master, possible publications and other scientific works, copies of transcripts, (copies of documentation on English language proficiency test) and reference letters should be submitted.

Applications must be submitted electronically through www.jobbnorge.no.

Applications submitted elsewhere will not be considered.

The reference number of the position is: NV- 93/18

Application deadline: 15.10.18

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