

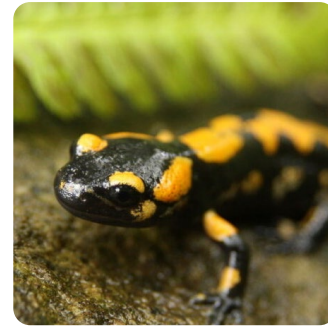
# Catalogue of Master thesis topics offered by the staff of the Institute of Environmental Sciences, Faculty of Biology, Jagiellonian University in 2026

Topics are indicative, final plans will be agreed between supervisor and student. The list is not exhaustive and will be expanded.

Students with their own ideas are also very welcome!

All are invited to contact potential supervisors directly. A full list of the Institute's research teams is available on the website:

[https://studia.eko.uj.edu.pl/en\\_GB/instytut/zespoly-badawcze](https://studia.eko.uj.edu.pl/en_GB/instytut/zespoly-badawcze)





# Ecological and evolutionary role of bird colouration

**Research problem** colours are some of the most widely used signals in the living world – yet we still do not fully understand their genetics, ecology or physiological constraints. In our Team, we have long-term colour data from a wild population of blue tits describing the yellow and blue colouration of these birds. Possible questions to answer are: **What are the long-term trends in colour expression? Are there any fitness correlates (reproductive success, survival) of blue tit colour variation? Is colouration structured spatially? Does it influence assortative mating or extra-pair matings?** *Your ideas are also welcome*

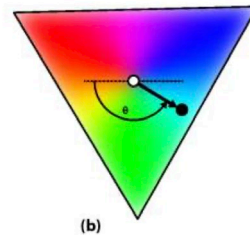
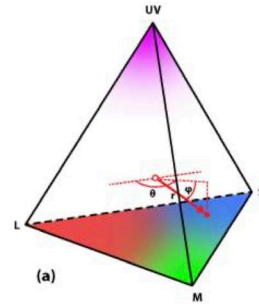
**Description** Work on existing data, there is also a possibility to work on additional unmeasured feathers, to collect additional data, using our spectrophotometer.

**Schedule and place of work** You'll join our team and its meetings, and will also regularly meet with your supervisor. Details of work schedule to be agreed upon individually. Most work happens in our lab and at a computer.

**Other** Good English communication skills.

**What you will get?** You will learn how to analyse long-term, state-of-the-art data, how to approach colour spectra data, and how to perform statistical analyses. You will also be given the possibility to publish your work or become a lead co-author.

**Supervisor** *Dr hab. Szymon Drobniak – [szymek.drobniak@uj.edu.pl](mailto:szymek.drobniak@uj.edu.pl)*





# Ecological role of bird nests

**Research problem** Blue tits build very rich nests decorated with colourful feathers. There are hypotheses that those feathers serve as a signal of female quality. To test this hypothesis we can ask questions such as: **Do the same females use similar feathers year by year? Does the presence/amount of feathers correlate with breeding success? Does it vary spatially in the population?**

*Your ideas are also welcome*

**Description** Work on existing data (blue tit nest photographs), there is also a possibility to join us for our fieldwork on Gotland in May-June to perform your own blue tit nest project on real birds.

**Schedule and place of work** You'll join our team and its meetings, and will also regularly meet with your supervisor. Details of work schedule to be agreed upon individually. Most work happens in our at a computer or optionally in the field.

**Other** Good English communication skills.

**What you will get?** You will learn how to analyse long-term, state-of-the-art data, how to approach photography-based, and how to perform statistical analyses. You will also be given the possibility to publish your work or become a lead co-author.

**Supervisor** Dr hab. Szymon Drobnik – [szymek.drobnik@uj.edu.pl](mailto:szymek.drobnik@uj.edu.pl)



# Long-term ecology of a migratory bird

**Research problem** Our team monitors the Gotland flycatcher population – a project that has been running continuously since 1980. Each year, flycatchers are surveyed to collect basic breeding data (clutch size, breeding timing, breeding success). Using this unique data you can ask questions such as: **Does breeding success vary spatially in a wild population? How does climate change impact the breeding success of a wild bird? How do males signal their quality to females and did this change in longer term due to climate change?**

*Your ideas are also welcome*

**Description** Work on existing data, there is also a possibility to work join us during fieldwork on Gotland in May-June, to perform your own small experiment.

**Schedule and place of work** You'll join our team and its meetings, and will also regularly meet with your supervisor. Details of work schedule to be agreed upon individually. Most work happens in our lab and at a computer, optionally in our molecular lab or in the field.

**Other** Good English communication skills.

**What you will get?** You will learn how to analyse long-term, state-of-the-art data, and how to perform statistical analyses. You will also have the opportunity to learn molecular methods used in sexing the birds.

**Supervisor** Dr hab. Szymon Drobniak – [szymek.drobniak@uj.edu.pl](mailto:szymek.drobniak@uj.edu.pl)

# Meta-analysis of published data

**Research problem** Meta-analysis is a method of summarising published data and seeking general patterns in it. By using it you can ask how much support there is for a given research question in all of the data published to date. Research questions you can ask are variable, some examples are: **Are migratory species more sensitive to climate change than sedentary? Does climate change lead to more variable traits? Is it better to have more variable gut bacteria?** *Your ideas are also very welcome – the questions or not limited by anything!*

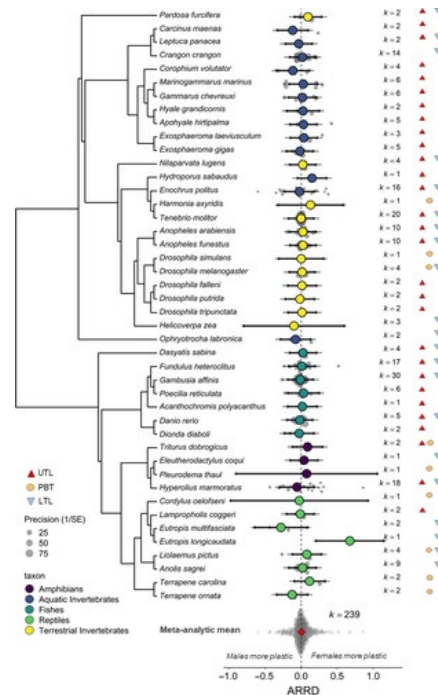
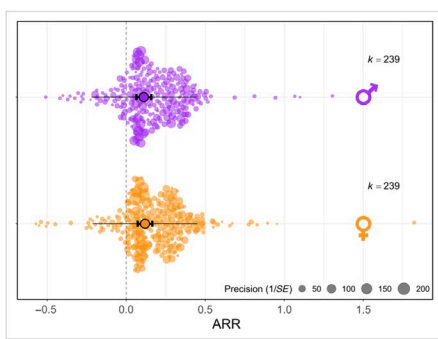
**Description** You will learn how to perform literature search and screening, how to extract relevant data from papers and databases and how to perform the actual meta-analysis.

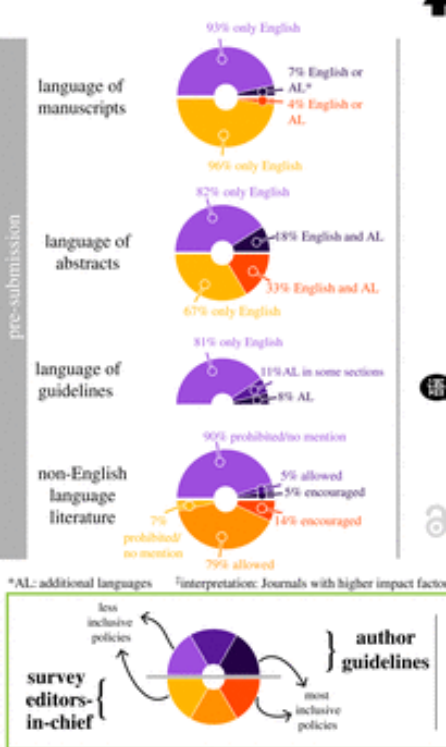
**Schedule and place of work** You'll join our team and its meetings, and will also regularly meet with your supervisor. Details of work schedule to be agreed upon individually. Most of your work will be computer-based.

**Other** Good English communication skills.

**What you will get?** You will learn how to initiate, plan and perform a meta-analysis. Such methods are very desirable in jobs such as clinical trial management, agricultural research, bioengineering methods development, nature conservation.

**Supervisor** Dr hab. Szymon Drobnik – [szymek.drobnik@uj.edu.pl](mailto:szymek.drobnik@uj.edu.pl)





# Meta-science

**Research problem** Meta-science is the study of the scientific method and patterns in the way science is done. It can be explored to learn what are the challenges of scientific method today, how did science practice change or what recommendations are needed to improve it. Some example questions you may ask writing such thesis are: **How unequal is scientific work in terms of gender biases? Are ecologists citing the original papers underlying the referenced ideas? How open are scientific data in published papers? Are some fields of ecology more open and transparent than others?** *Your ideas are also very welcome – the questions or not limited by anything!*

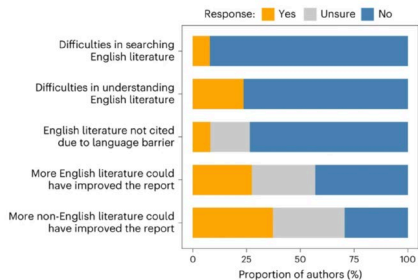
**Description** You will learn how to perform literature search and screening, how to extract relevant data from papers and databases and how to map the collected information in relation to the variables describing the analysed studies.

**Schedule and place of work** You'll join our team and its meetings, and will also regularly meet with your supervisor. Details of work schedule to be agreed upon individually. Most of your work will be computer-based.

**Other** Good English communication skills.

**What you will get?** You will learn how to initiate, plan and perform literature syntheses. Such methods are very desirable in jobs such as clinical trial management, agricultural research, bioengineering methods development, nature conservation.

**Supervisor** Dr hab. Szymon Drobniak – [szymek.drobniak@uj.edu.pl](mailto:szymek.drobniak@uj.edu.pl)



# Sustainable academic dining.

## Evaluation of existing solutions and needs in the context of adaptation to climate change

### Research tasks:

- 1) Evaluation of the food offer available at the Jagiellonian University from the point of view of adaptation to climate change and the quality of study conditions
- 2) Working on proposals to improve the dining conditions at Jagiellonian University from the perspective of adapting to climate change and implementing the UJ climate strategy.

**Research methods:** document analysis, participant observation, survey – citizen science, social experiment, gamification

**Time & place:** flexible timing, research at Jagiellonian University Kampus

### Supervisors:



# Engagement of researchers in addressing local adaptation to climate change

## Research tasks:

- 1) Exploring the motivations and ways in which scientists engage in in pro-climate activities in the local environment.
- 2) Assessing the institutional and structural factors motivating and inhibiting the involvement of scientists in pro-climate activities.

**Methods:** interviews, q-method survey, gamification

**Time and place:** flexible timing, research in Krakow and / or online

## Potential supervisors:

prof. Małgorzata Grodzińska-Jurczak, dr Joanna Tusznio  
Socio-environmental Research Team

[https://natura.wb.uj.edu.pl/en\\_GB/](https://natura.wb.uj.edu.pl/en_GB/)



# Succession and climate change as opposing drivers of microclimatic conditions within meadows

**Research problem:** Succession and global climate change are nowadays the main threats to European meadows, although they may be expected to have opposite effects and mitigate each other to some extent. The aim of the study will be to determine their interaction impact on microclimatic conditions within mesophilic meadows at their distribution edges, which are particularly vulnerable to environmental changes.

**Description of tasks:** Programming, reading, field placement and collection of temperature loggers. Analyses of earlier data from meadows at varying stages of succession.

**Location and timing:** Fieldwork in specific periods (3-4 days in both early April and early October) in the 3rd JU Campus surroundings. Lab work with loggers (ca. 8 h in both March and November). Other tasks: to be agreed - flexible working schedule.

**Supervisor:** Prof. dr hab. Piotr Nowicki [[piotr.nowicki@uj.edu.pl](mailto:piotr.nowicki@uj.edu.pl)]



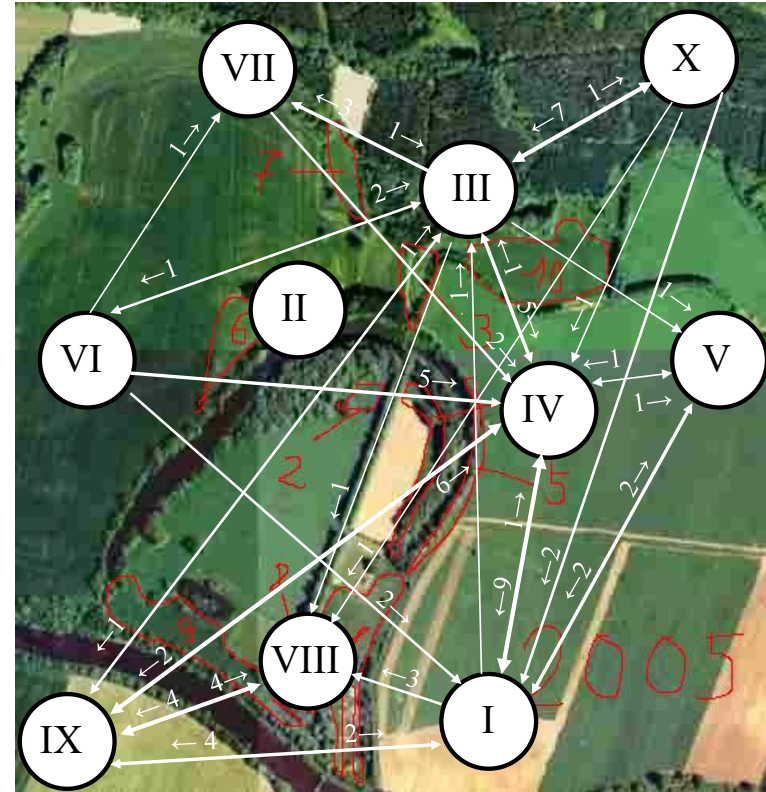
# Impact of dispersal parameters on its success

**Research problem:** The process of dispersal, i.e. movements of individuals between habitat patches, is crucial for the survival of species in fragmented landscapes. The aim of the study will be to evaluate the impact of various elements of this process (emigration rate, movement distance, migrant mortality) on its success level.

**Description of tasks:** Analyses of existing mark-release-recapture data for estimating dispersal parameters and simulations of dispersal in real metapopulations using simple dedicated software.

**Location and timing:** To be agreed - flexible working schedule. All the analyses can be performed remotely after short training.

**Supervisor:** Prof. dr hab. Piotr Nowicki



# Surveys of endangered butterflies within Natura 2000 sites

**Research problem:** Butterflies, as popular indicator species, are among primary conservation targets for Natura 2000 sites, and the knowledge on their population status helps to determine the state of biodiversity in a given area. The aim of the study will be to assess the occurrence and population size of selected butterfly species within protected meadow complexes in the vicinity of Kraków.

**Description of tasks:** Field research, population size estimation, comparative analyses based on historical data.

**Location and timing:** Fieldwork in specific periods (3-6 full days in both the second half of May as well as July) in the Dębnicko-Tynieckie Meadows in Kraków or the Niepołomice Forest. Other tasks: to be agreed - flexible working schedule.

**Supervisor:** Prof. dr hab. Piotr Nowicki  
[piotr.nowicki@uj.edu.pl]



# Egg laying preferences of the extinction prone Alcon Blue butterfly

**Research problem:** Alcon Blue butterfly, once widespread in the Krakow region, is now at the brink of extinction, and the knowledge of its habitat preferences in the few remnant populations would be vital for developing effective conservation programmes. The aim of the study will be to determine the species preferences for egg laying sites.

**Description of tasks:** Field research, including mapping and environmental parameter measurements, simple spatial and statistical analyses.

**Location and timing:** Fieldwork in specific periods (1-2 weeks in the second half of August as well as possibly single days in early April and early October) in the Dębnicko-Tynieckie Meadows in Kraków. Other tasks: to be agreed - flexible working schedule.

**Supervisor:** Prof. dr hab. Piotr Nowicki [[piotr.nowicki@uj.edu.pl](mailto:piotr.nowicki@uj.edu.pl)]



# Effects of various pollutants on soil protozoa

**Research question:** A large number of different pollutants enter the soil as a result of agricultural and industrial activities. These include microplastics, pesticides, fertilisers, petroleum-based substances and many others. However, the impact of these pollutants on soil microfauna is still poorly understood.

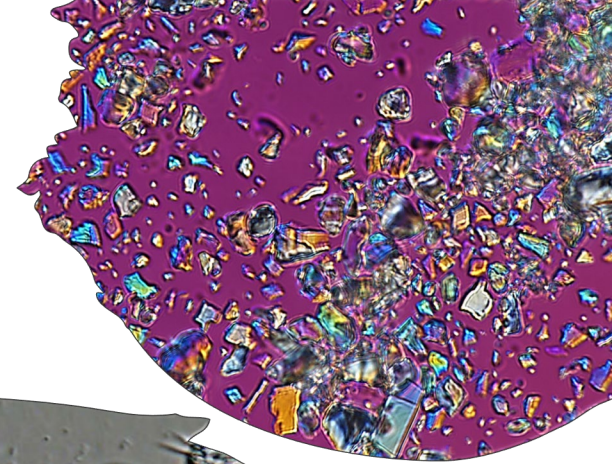
**Description of activities:** Working in the laboratory, conducting protozoan cultures, performing experiments, microscopic analyses.

**Time and place of work:** To be agreed individually. Possibility to work around other commitments and carry out experiments at a convenient time. Work carried out in the Aquatic Ecosystems Team laboratory.

**Other:** Interest in protozoa and microscopic techniques is welcome.

**Supervisor:** dr hab. Janusz Fyda, prof. UJ

janusz.fyda@uj.edu.pl



# Life History Evolution team

## Adaptive consequences of cell size variation in insects



Individuals, populations and species evolve differences in cell sizes, but adaptive consequences of this variance is not well understood. The main **aim of this study is to assess physiological consequences of cell size differences between different phenotypes of fruit flies (*Drosophila melanogaster*)**. Do insects build of smaller or larger cells function similarly across environmental gradients?

**Tasks:** Handling, feeding, and measuring performance of flies in the laboratory. The student will be assisted with statistical analyses.

**Time & place:** Thermal biology & histological labs @Gronostajowa 7. Working time is adjusted flexibly to experimental setups and students' calendars.

**Supervisor:** Prof. dr hab. Marcin Czarnołęski  
marcin.czarnoleski@uj.edu.pl

# Genetic structure of the double-spined bark beetle (*Ips duplicatus*)

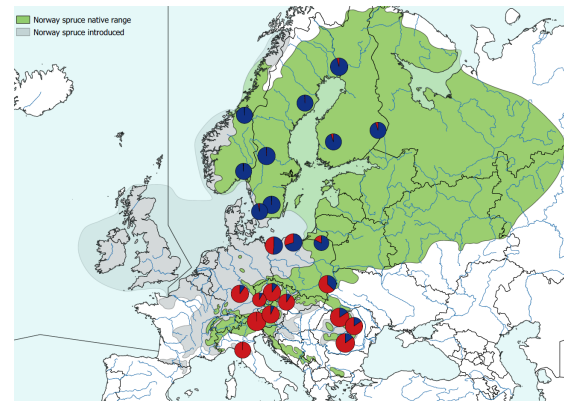
**Research problem:** Are European populations of the bark beetle divided into genetically diverse populations? Is the genetic structure of the bark beetle similar to that of the spruce? What is the level of genetic variation in the bark beetle? Is it possible to delineate refugial areas and recolonization routes of Europe after glaciations?

**Description:** Work in a molecular laboratory. Analyzing whole genome sequencing data.

**Schedule and place of work:** We agree individually. We offer flexibility in shaping working time. Data analysis can be performed remotely.

**Other:** We expect willingness to learn basics of programming.

**Supervisor:** dr Piotr Zieliński  
piotr.zielinski@uj.edu.pl



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**Tasks:** Performing planned wet-lab experiments.

**Time & place:** microbiology and genetics laboratory (IES, Gronostajowa 7)

**Supervisor:** dr hab. Dominika Włoch-Salamon,  
dominika.wloch-salamon@uj.edu.pl

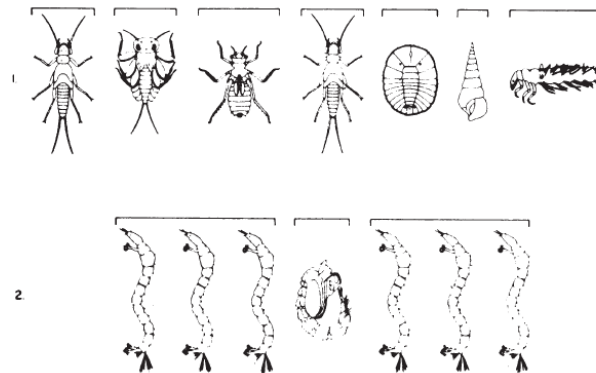
# How to assess the ecological status of aquatic biota without identifying macrobenthic species?

Assessing the ecological health of aquatic biota with biotic indices requires identification of macrobenthic taxa, which slows down analyses. **The aim of the project will be assessing the applicability of diversity indices**, for which species identification is not necessary.

**Tasks:** Field trips to collect samples of macrobenthos. Work in laboratory: sorting of collected specimens and calculating indices. Student will be assisted in data analysis.

**Time & place:** Field trips 2 - 3× per year, laboratory work @Gronostajowa 7

**Supervisor:** dr hab. Wojciech Fiałkowski,  
wojciech.fialkowski@uj.edu.pl



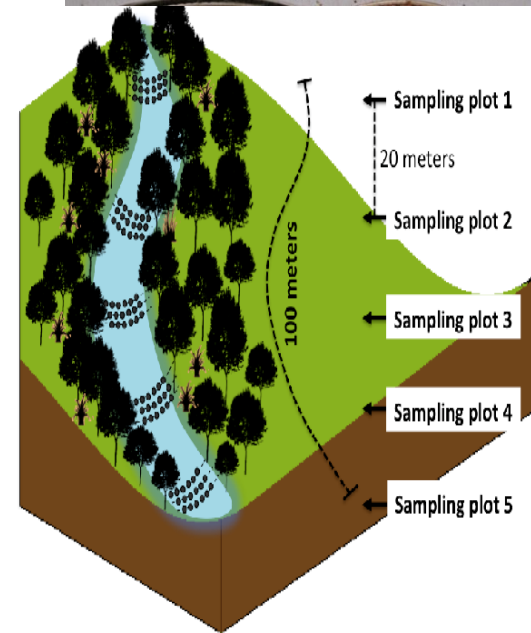
# Artificial substrata as an aid in the assessment of watercourses' ecological status

Macrobenthos community is closely related to the character of the river bottom. This hampers comparisons of sites with different substrata. One of possible solution is the employment of artificial substrata. **The aim of the project will be assessing to what extent artificial substrata aid comparison** of different aquatic biota.

**Tasks:** Field trips to deploy and collect artificial substrata. Identification of collected material in the laboratory. Student will be assisted in data analysis.

**Time & place:** Field trips 4× per year, laboratory work @Gronostajowa 7

**Supervisor:** dr hab. Wojciech Fiałkowski,  
wojciech.fialkowski@uj.edu.pl



# Predatory fungi in activated sludge

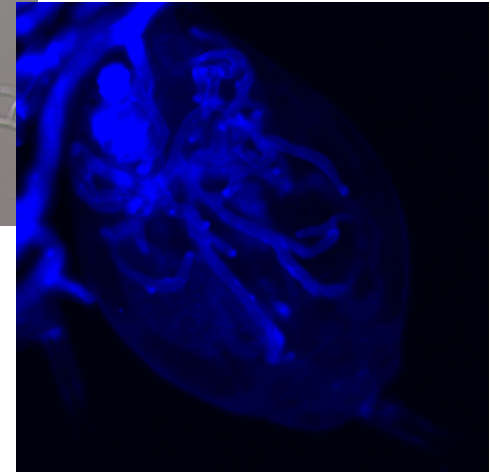
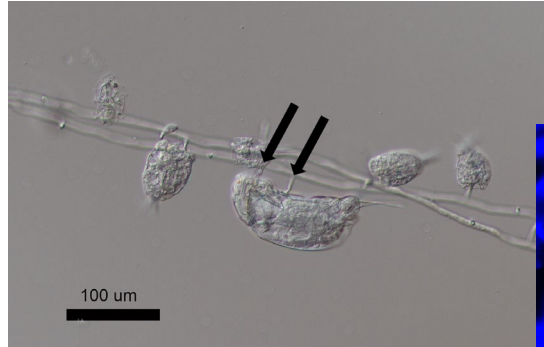
**Research problem:** Predatory fungi, specialized in feeding on rotifers, pose a serious threat to the population of these valuable animals in activated sludge in Wastewater Treatment Plants (WWTPs). By feeding on filamentous bacteria, rotifers prevent the phenomenon of active sludge bulking, which is one of the biggest operational problems in WWTPs. Can commonly used fungicides limit the ability of predatory fungi to “trap” rotifers without harming other microorganisms inhabiting activated sludge? Are different rotifers species equally susceptible to predatory fungi?

**Description:** maintenance of rotifers and fungi cultures,  
work with microscopes (binocular, inverted and fluorescent), work with NIS image analysis programm.

**Scheduel and place of work:** experiments carried out in Laboratory of Protozoology, schedule of experiments is set individually, flexibly.

**Other:** manual skills related to the efficient use of the pipette in activities requiring simultaneous use of stereomicroscope are welcome.

**Supervisor:** dr hab. Edyta Fiałkowska  
edyta.fialkowska@uj.edu.pl



# Microplastics in water habitats- their influence on freshwater microorganisms

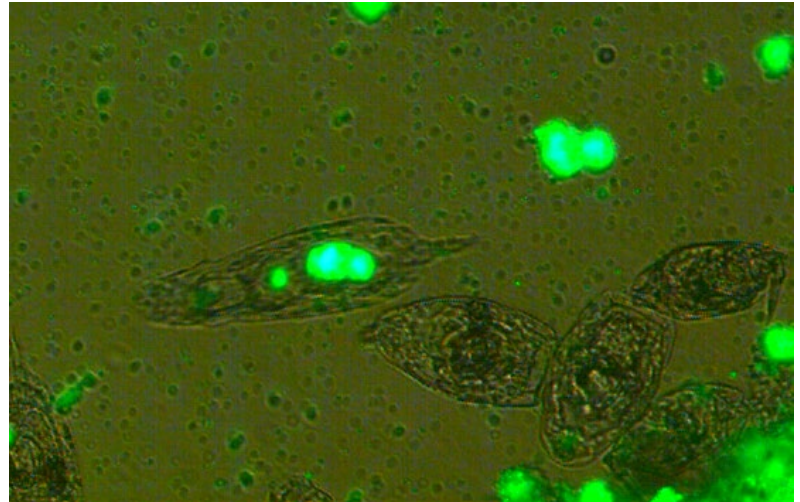
**Research problem:** One of the biggest environmental problems is the pollution of the environment with microplastics. Microplastics are found in both natural water reservoirs and wastewater treatment plants (WWTPs). Despite many studies, the impact of microplastic particles on aquatic organisms is still poorly understood. Do microplastic particles negatively affect aquatic microorganisms such as rotifers or ciliates? Do microplastic particles accumulate in successive levels of the food chain? Can rotifers contribute to the separation of microplastics from water and activated sludge?

**Description:** maintenance of rotifers and ciliates cultures, work with microscopes (binocular, inverted and fluorescent), work with NIS image analysis programm.

**Scheduel and place of work:** experiments carried out in Laboratory of Protozoology, schedule of experiments is set individually, flexibly.

**Other:** manual skills related to the efficient use of the pipette in activities requiring simultaneous use of stereomicroscope are welcome.

**Supervisor:** dr hab. Edyta Fiałkowska  
edyta.fialkowska@uj.edu.pl



# Effects of pollution and natural factors on soil processes and organisms

- **Research problem:** Soil processes and soil microorganisms play an important role in the cycling of elements necessary for life for organisms of different trophic levels. Among the most important processes is organic matter decomposition strongly dependent on climate changes
- **Research objective:** determine the effects of various pollutants and/or natural factors (climate, vegetation, biogens) on the processes and soil organisms of terrestrial ecosystems
- **Description of activity:** field sampling, soil physicochemical and biochemical analyses, measurements of microbiological parameters, modeling of the influence of various factors
- **Work schedule and location:** field work in the autumn or spring laboratory studies immediately after sample collection - flexible working hours in cooperation with other team members
- Kontakt: prof. dr hab. Maria Niklińska [maria.niklinska@uj.edu.pl](mailto:maria.niklinska@uj.edu.pl)  
dr hab. Beata Klimek [beata.klimek@uj.edu.pl](mailto:beata.klimek@uj.edu.pl)



# Thermal environment and reproduction output in nest box-breeding birds on campus

**Research problem:** Both long- and short-term changes in temperature may have significant consequences for avian reproduction. These impacts can manifest through thermal constraints on parental provisioning and chick growth. We aim to investigate whether there is a relationship between the thermal environment and reproductive output in nest box-breeding birds.

**Tasks :** Handling and observing birds in the field, laboratory work, data management and (assisted) analysis

**Schedule and place of work:** Intensive work over a 3-month period during the spring around the UJ Campus

**Supervisor:** dr Edyta Sadowska  
edyta.sadowska@uj.edu.pl



# The burden of heterothermy in birds

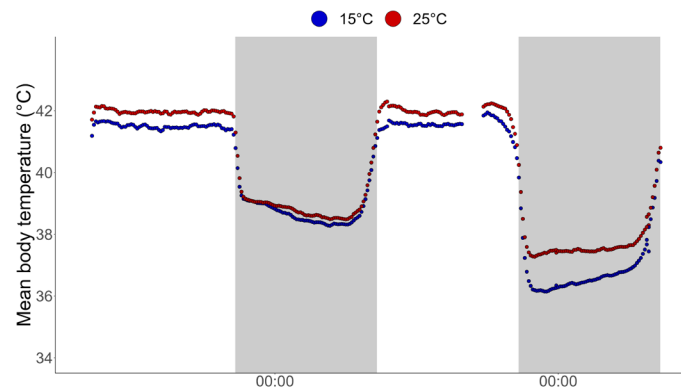
**Research problem:** Most so-called endothermic mammals and birds are, in fact, heterothermic, and modulate their body temperature to varying degrees. Birds, in particular, are capable of cooling down significantly when entering a state of rest-phase hypothermia.

While this state allows for energy conservation in challenging environments, it is hypothesized to increase oxidative stress. We aim to investigate the costs and constraints of this effect.

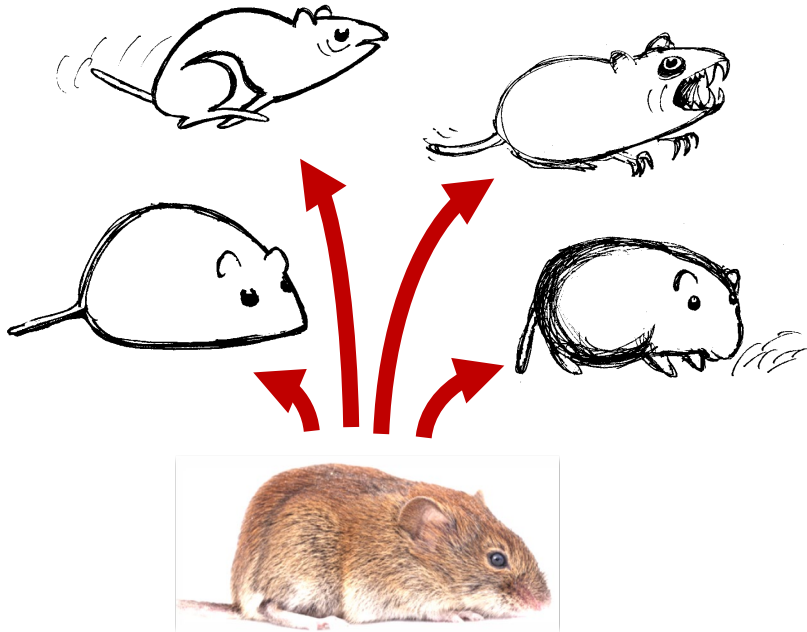
**Tasks :** Handling, feeding and observing birds in the lab

**Schedule and place of work:** Intensive work over a 3-month period

**Supervisor:** dr Edyta Sadowska  
edyta.sadowska@uj.edu.pl



# Laboratory model of adaptive radiation: behavior of bank voles from a selection experiment



**Research problem:** How has the diversity of animal adaptations evolved? We use experimental evolution to study how the selection for increased aerobic exercise performance, predatory behavior and herbivorous capability affects morphology, physiology and behavior of a non-laboratory rodent, the bank vole, and the genetic basis of such changes.

**Description of the work:** 1) Direct observations of behavior (ethograms) in voles from the selected and control lines. 2) Statistical data analysis of observations made in current and in previous generations.

**Schedule and place of work:** The observations on animals (about 60 hours, at different times of day and night) will be performed under laboratory conditions (animal rooms) in 2025 (specific timing to be agreed individually). Data analysis can partly be done remotely.

**Supervisors:** dr Edyta Sadowska ([edyta.sadowska@uj.edu.pl](mailto:edyta.sadowska@uj.edu.pl)), prof. Paweł Koteja ([pawel.koteja@uj.edu.pl](mailto:pawel.koteja@uj.edu.pl))

# Annotation of major histocompatibility complex (MHC) genes in salamander genomes

MHC genes play a key role in adaptive immunity, evolve rapidly, and are encoded in genomic regions that show substantial structural variation between species. Due to these characteristics, automated annotation of MHC genes in genome assemblies is often incomplete and requires manual curation. The aim of this project will be to annotate the MHC region in the genome of a selected salamander species (e.g. *Lissotriton montandoni* or *Desmognathus fuscus*).



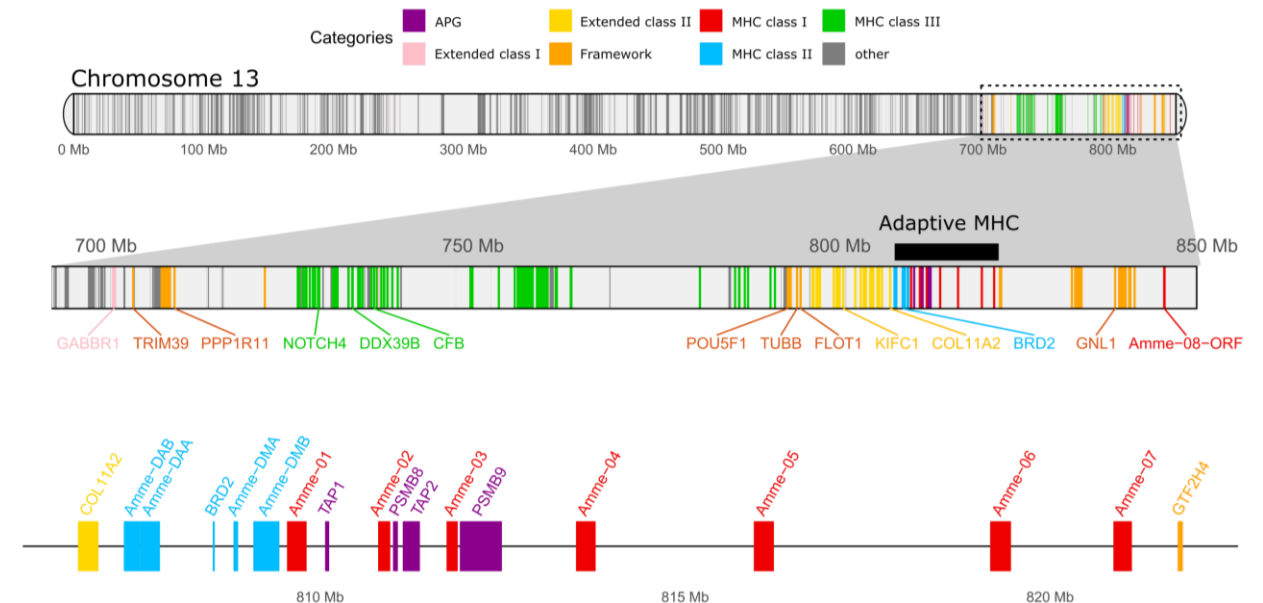
**Description:** bioinformatic analysis of genomes, use of Iso-seq and RNAseq data.



**Schedule and place of work:** Computer-based work. Working hours are arranged individually, and we offer flexibility in shaping the schedule.



**Potential supervisors:** prof. Wiesław Babik (wieslaw.babik@uj.edu.pl), dr Magdalena Migalska (magda.migalska@uj.edu.pl)



# What is the composition of a perfect chemically-defined diet for *Drosophila*?

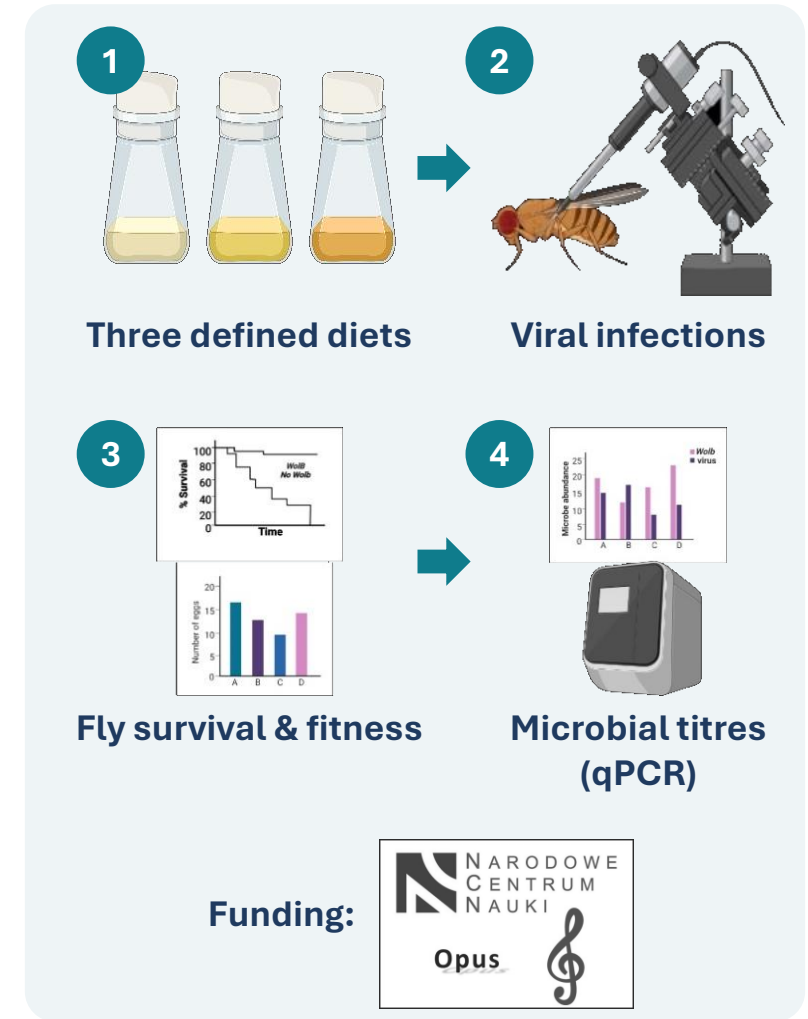
**Research problem.** *Wolbachia* protects insects from viral infections, and *Wolbachia*-carrying mosquitoes are reared for disease- and vector-control programmes worldwide. Which diet is optimal for both the insect and *Wolbachia*, and which dietary factors impair viral replication?

## Student tasks.

- Order compounds and prepare chemically defined diets for *Drosophila*.
- Rear *Drosophila* on three fully chemically defined diets
- Infect flies with viruses and monitor fly survival, *Wolbachia* and virus titres.

**Data & methods.** Holidic diets, fly husbandry, fitness and survival assays, viral infections, qPCR, statistical analysis.

**Place & organisation.** Chrostek lab, Institute of Environmental Sciences, Jagiellonian University, Kraków; hands-on laboratory training and regular supervision.



## Supervisor

**Ewa Chrostek**

[ewa.chrostek@uj.edu.pl](mailto:ewa.chrostek@uj.edu.pl)

[www.chrosteklab.com](http://www.chrosteklab.com)

# How does a single genomic change affect *Wolbachia* phenotypes?

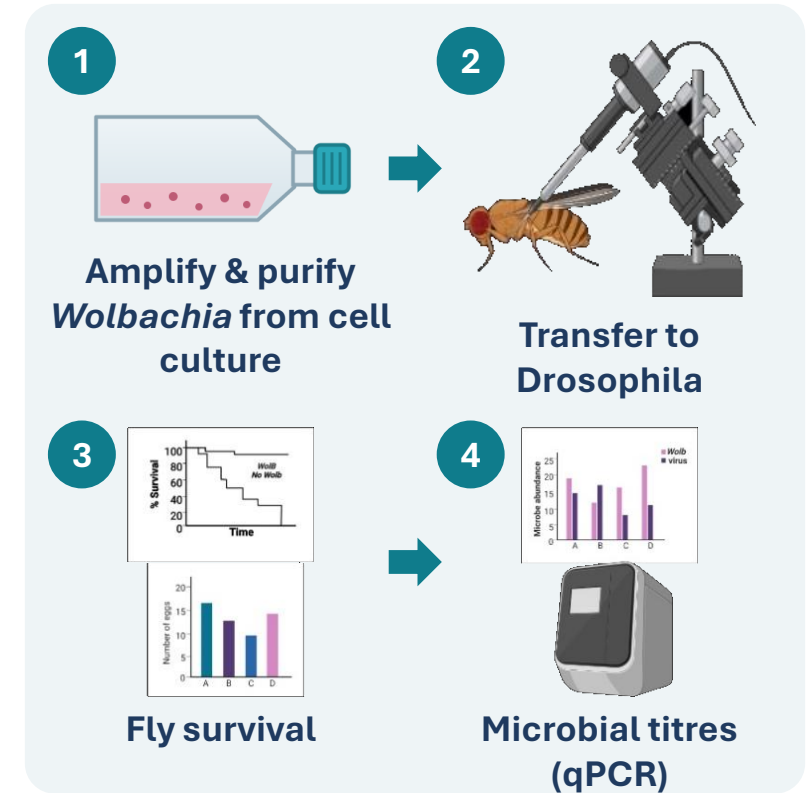
**Research problem.** *Wolbachia* protects insects from viruses and is used in vector-control programmes worldwide, but it cannot be genetically manipulated. Experimental evolution in cell culture produced two variants differing by a single SNP. Do they perform differently in their host?

## Student tasks

- Amplify both *Wolbachia* variants in cell culture and purify them.
- Help transfer them into *Drosophila* flies.
- Compare fly survival, *Wolbachia* titres and antiviral protection in flies.

**Data & methods.** Insect cell culture, bacterial purification, fly husbandry, microinjection, survival assays, viral infections, qPCR, statistical analysis.

**Place & organisation.** Chrostek lab, Institute of Environmental Sciences, Jagiellonian University, Kraków; hands-on laboratory training and regular supervision.



Supervisor

**Ewa Chrostek**

[ewa.chrostek@uj.edu.pl](mailto:ewa.chrostek@uj.edu.pl)

[www.chrosteklab.com](http://www.chrosteklab.com)

# Genetic structure of six-toothed bark beetle (*Ips sexdentatus*)

Is the European population of the six-toothed bark beetle (*Ips sexdentatus*) divided into genetically differentiated subpopulations? What is the level of genetic diversity in this species? Like another bark beetle, the spruce bark beetle, does its genome harbour numerous polymorphic inversions?



Gilles San Martin



Analysis of whole-genome sequencing data. Candidates should be willing to learn basic scripting skills.



Working hours are arranged individually. We offer flexibility in terms of working time and location.



Contact: dr hab. Krystyna Nadachowska-Brzyska  
([krystyna.nadachowska@uj.edu.pl](mailto:krystyna.nadachowska@uj.edu.pl))



# Odorant receptors in polymorphic inversions of the spruce bark beetle

The genome of the European spruce bark beetle is exceptionally rich in polymorphic inversions, which are enriched in odorant receptor genes. This may point to a role of inversions in the beetle's olfactory adaptation. The aim of the project is to test whether recently discovered odorant receptors are also located within polymorphic inversions.



Analysis of whole-genome sequencing data. Candidates should be willing to learn basic scripting skills.



Working hours are arranged individually. We offer flexibility in terms of working time and location.



Contact: dr hab. Krystyna Nadachowska-Brzyska  
([krystyna.nadachowska@uj.edu.pl](mailto:krystyna.nadachowska@uj.edu.pl))



Gilles San Martin

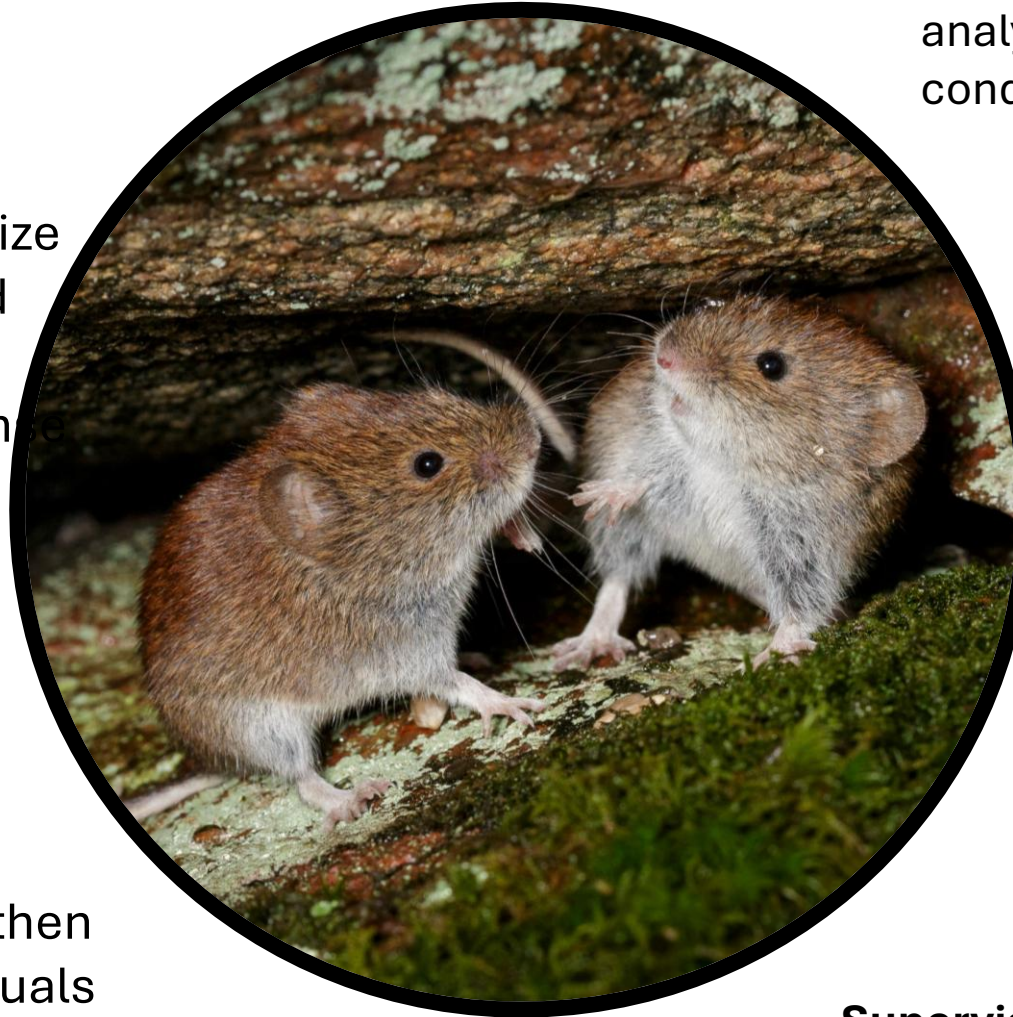
# The role of ultrasounds in social interactions of voles

The main purpose of the research is to **determine the role of ultrasounds in vole communication.**

Are the animals able to recognize conspecifics based on emitted ultrasounds?

What is their behavioral response to ultrasound emitted by other animals?

Ultrasounds emitted during confrontations of voles with varying degrees of relatedness will be recorded and analyzed. The recorded ultrasounds will then be played back to other individuals to examine their preferences, as well as their behavioral and vocal responses.



**Tasks:** Working with voles, recording and analyzing of ultrasounds and behavior, conducting statistical analysis

**Schedule and place of work:** Working in the animal breeding room, mainly in the spring, summer and autumn months, in the morning hours.

**Other:** required training for people working with animals

(possibility to obtain during studies)

**Supervisor:** dr hab. Joanna Kapusta, prof. UJ.  
joanna.kapusta@uj.edu.pl

# Does ambient temperature affect learning in birds?

Most studies are conducted using coloured feeders. In such cases, better learning at cold temperatures may result from the birds having more frequent contact with the feeder, because they eat more often. The research proposed here will focus on **learning the colour of nest material, where contact with the stimulus does not depend on temperature.**

**Tasks:** Caring for and feeding the birds, and observing them in the laboratory. Analysing video recordings. The student will receive help with the statistical analyses.

**Schedule and location:** An intensive 1.5 months of work, including tasks that must be carried out at specific morning or evening hours, @Gronostajowa 7.

**Contact:** Prof. dr hab. Joanna Rutkowska, [joanna.rutkowska@uj.edu.pl](mailto:joanna.rutkowska@uj.edu.pl)



# The diversity, evolution and function of bacteria with hyper-reduced genomes

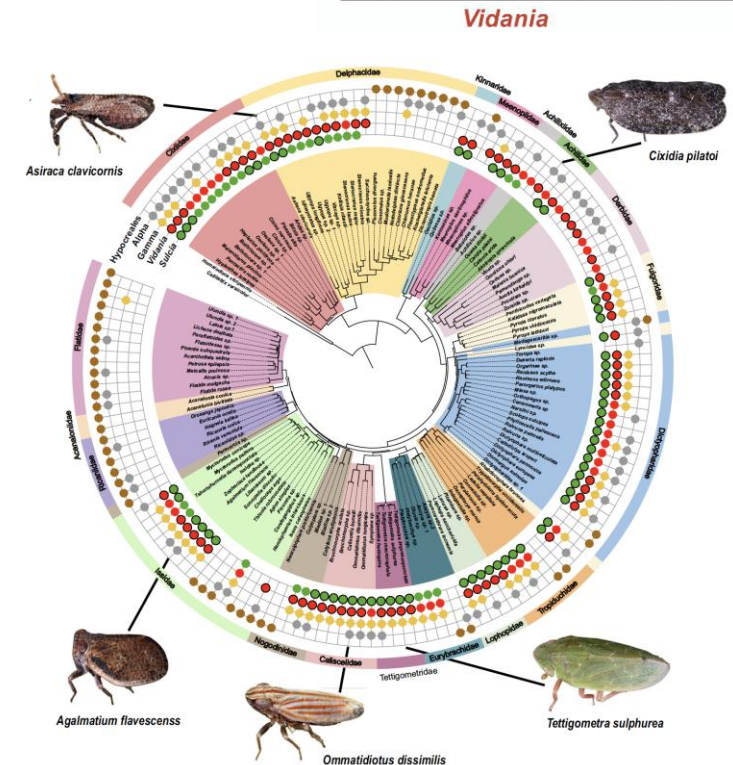
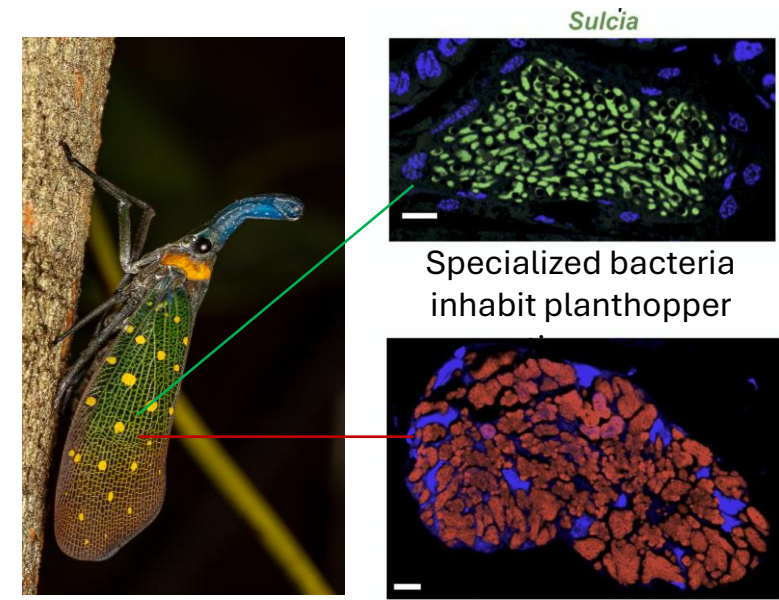
**Research problem:** Some bacteria living inside insects have lost >95% of their genes, yet still supply nutrients essential for their hosts' survival. We have discovered extreme cases in which their tiny genomes lose even more genes, fragment into small DNA molecules, or where the bacteria evolve into unusual cellular complexes. *How do these systems work, and what keeps them from breaking down?*

**Your project:** You will investigate these little-known partnerships in a clade of insects. Depending on your interests, you could generate DNA and RNA data to investigate their composition and evolution, reconstruct and characterize symbiont genomes from sequencing data, and/or use microscopy to explore their cellular organization. Together, we will define a research question and choose an approach that fits your interests and experience.

**What you will gain:** Hands-on experience in molecular biology, bioinformatics and/or microscopy, while contributing to ongoing research on some of the most unusual bacteria known.

**Where and when:** Molecular Ecology Laboratory at INOŚ, and computer-based work. Flexible schedule.

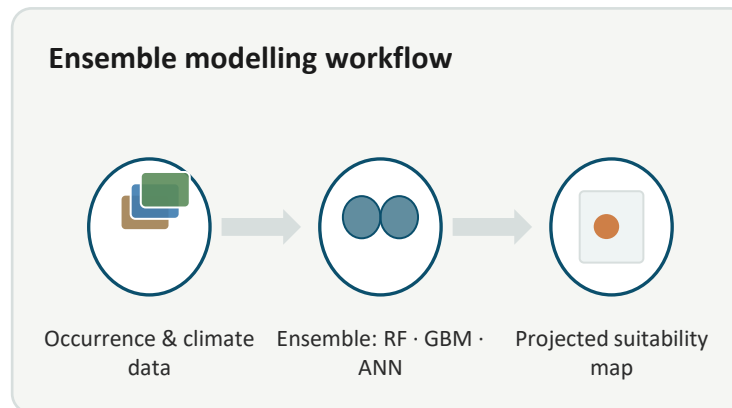
**Contact:** dr hab. Piotr Łukasik ([p.lukasik@uj.edu.pl](mailto:p.lukasik@uj.edu.pl)) – Symbiosis Evolution Group



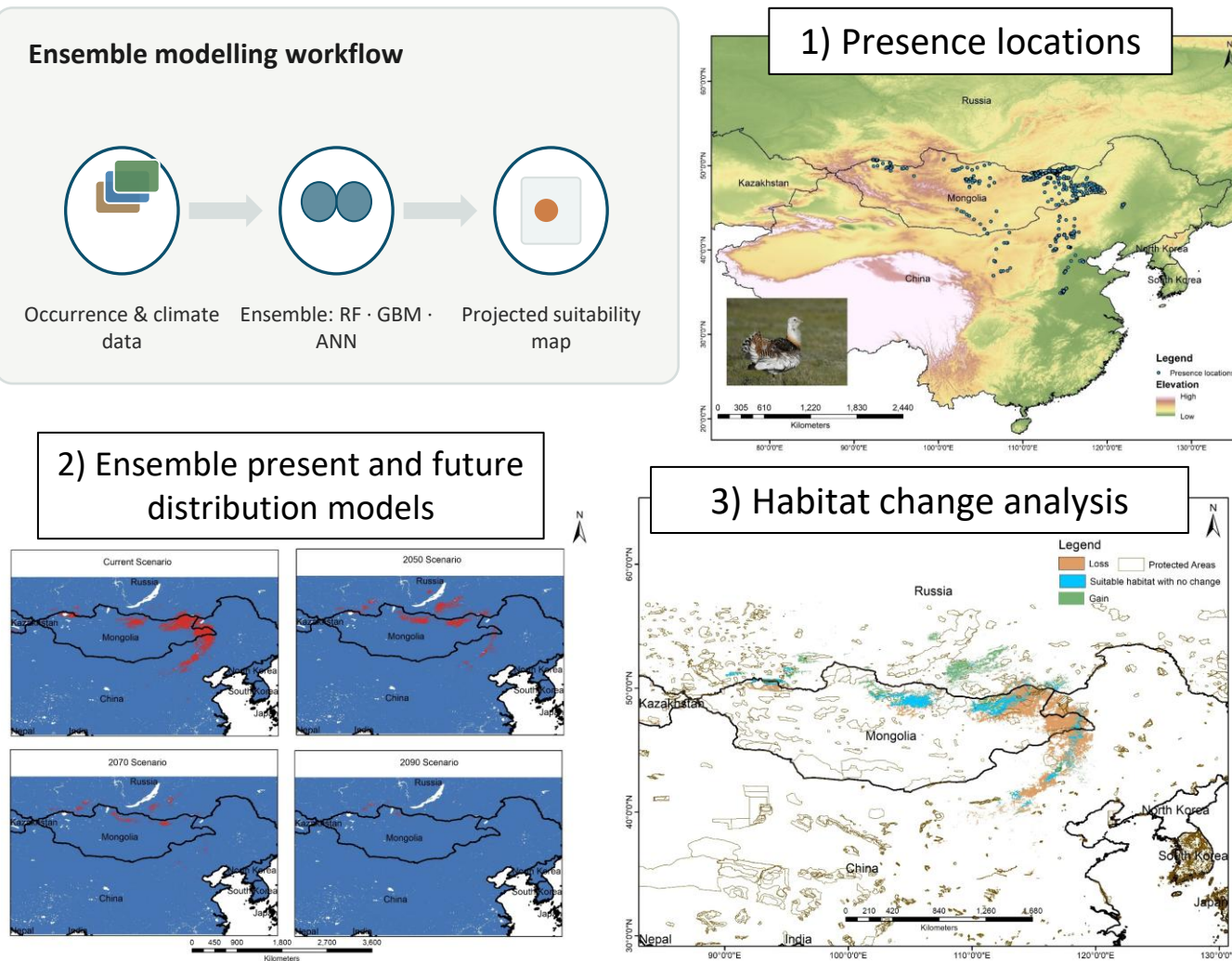
## Diverse insects, extraordinary symbiotic

# The use of citizen science and survey methods in mapping the ranges of protected species

- **Research problem:** Climate change is reshaping the environmental conditions. Modelling where a species (e.g., wild cats *Felis silvestris*) occur now, and where it is likely to occur under future climate scenarios, is essential for conservation planning.
- **Description:** Compilation of occurrence records and environmental predictors. Ensemble modelling with projection for future climate scenarios.
- **Schedule and place of work:** Regular meetings of the research teams.
- **Other:** Basic skills in R, ArcGIS/QGIS and handling datasets.
- **Supervisor:** Dr hab. Izabela Wierzbowska, prof. UJ. [i.wierzbowska@uj.edu.pl](mailto:i.wierzbowska@uj.edu.pl)



Example- Great bustards in Mongolia



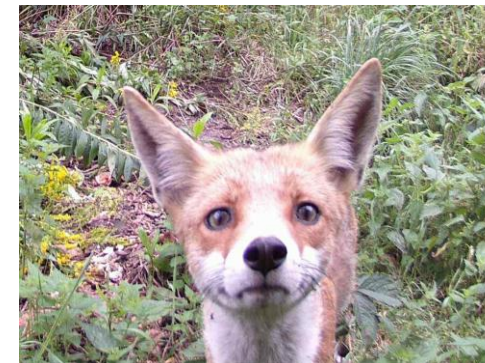
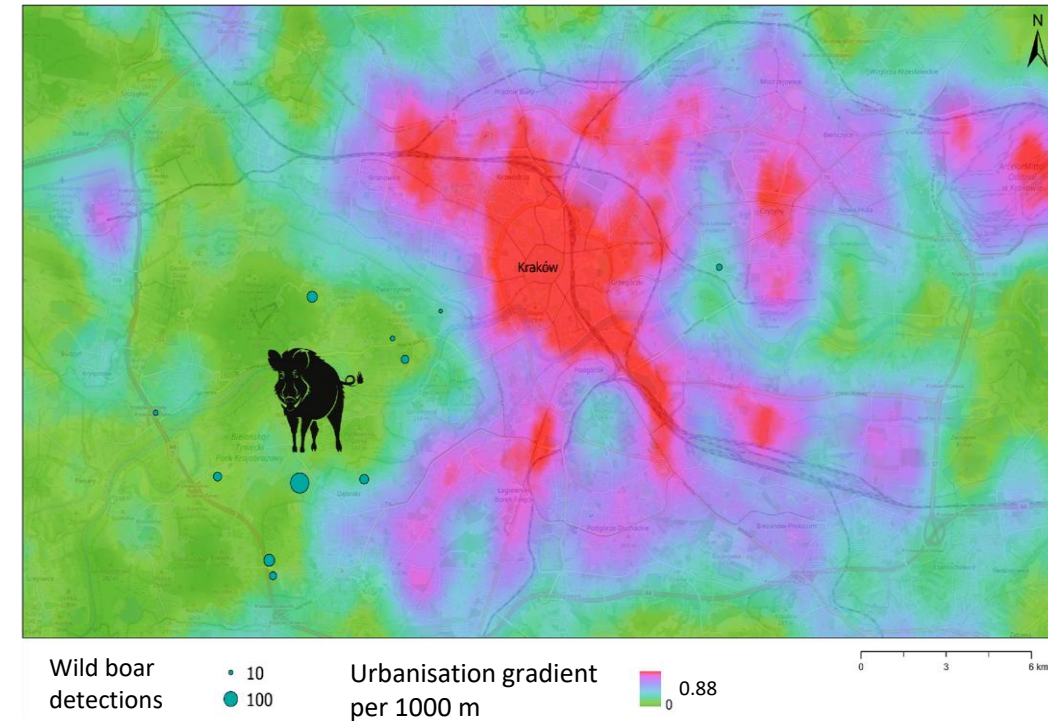
# Use of video surveillance to analyse time budget and daily ethograms of large carnivores

- **Research problem:** Increasing urbanisation and habitat fragmentation have a strong impact on large carnivores. For conservation purposes, it is crucial to develop an understanding of species status and behavioural patterns.
- **Description:** Development of ethograms cataloging distinct behavioural categories. Data processing and analysis (MS Excel, BORIS, RStudio).
- **Schedule and place of work:** Regular meetings of the research team at least once a month, and individual schedule of work upon agreement with a project coordinator in the office.
- **Supervisor:** Dr hab. Izabela Wierzbowska, prof. UJ  
i.wierzbowska@uj.edu.pl



# The impact of urbanization and anthropopressure on wildlife activity and behavior

- **Research problem:** The study of spatial and temporal activity patterns of wildlife species along urbanisation gradient
- **Description:** Field and office work. Deployment and collection of records from camera traps in Krakow. Data processing and analysis of seasonal, diel activity and geographic distribution of wildlife (work with ArcGIS Pro, RStudio).
- **Schedule and place of work:** Regular meetings of the research team (at least once a month), an individual schedule of work upon agreement with a project coordinator in the office. Desk and computer work once a week. One day of fieldwork per month.
- **Required skills:** Working knowledge of the Office programs, and basic understanding of R-Studio and ARCGis
- **Supervisor:** Dr hab. Izabela Wierzbowska, prof. UJ.  
i.wierzbowska@uj.edu.pl



Red fox (*Vulpes vulpes*) and wild boar (*Sus scrofa*) recorded by camera traps.