

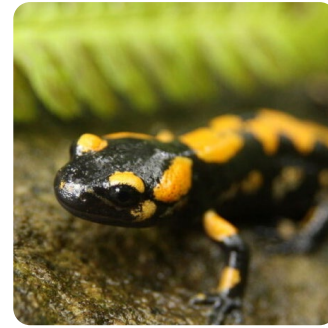
Catalogue of Master thesis topics offered by the staff of the Institute of Environmental Sciences, Faculty of Biology, Jagiellonian University in 2026

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

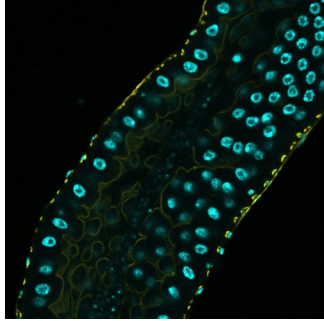
Students with their own ideas are also very welcome!

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



Barriers to *Wolbachia* transinfection



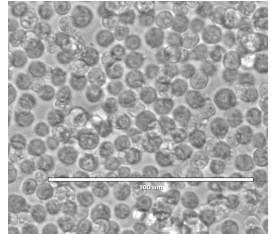
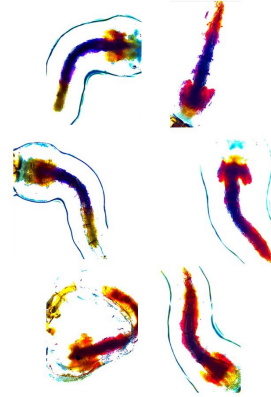
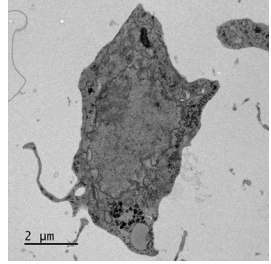
Research problem: *Wolbachia* causes one of the most prevalent intracellular bacterial infections on the planet. Yet, it is mostly transmitted from mother to offspring inside insect eggs. Horizontal (individual-to-individual) *Wolbachia* transmission can occur on the evolutionary timescale, it is also possible to achieve experimentally. ***What are the barriers to horizontal *Wolbachia* transmission? Is immune system responsible for restricting newly acquired *Wolbachia* infections?***

Description: Rearing insects, growing bacteria, *Wolbachia* purification, microinjections, PCR and qPCR, statistical analysis of data.

Schedule and place of work: Schedule is flexible. Insect rearing requires daily/every second day presence in the laboratory, while molecular biology will consume a few hours at a time. Work will be performed in the insectaries and molecular laboratory of the Institute of Environmental Sciences.

Other: You cannot fear insects, including mosquitoes. Mosquito bites are rather rare, but you will have a better time if you are not allergic.

Supervisor: dr Ewa Chrostek, ewa.chrostek@uj.edu.pl



Establishing a model of antiviral protection in dengue vector

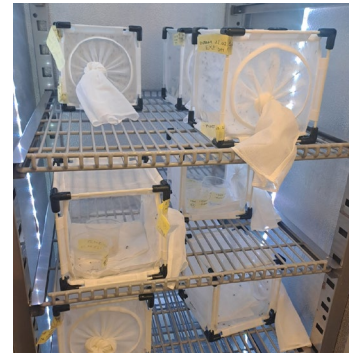
Research problem: *Wolbachia* is an antiviral bacterium which can prevent mosquito vectors of human diseases from infecting humans. The mechanism of antiviral protection is currently unknown. Studying *Wolbachia* in mosquitoes is expensive and laborious due to the demand for a biological safety 3 level (BSL3) facility. **The aim of this project is to establish a non-human-pathogenic model of virus infection and *Wolbachia*-conferred antiviral protection in dengue and Zika vector, *Aedes aegypti*.**

Description: Rearing insects, working with virus, microinjections, PCR and qPCR, statistical analysis of data.

Schedule and place of work: Schedule is flexible. Insect rearing requires daily/every second day presence in the laboratory, while molecular biology will consume a few hours at a time. Work will be performed in the insectaries and molecular laboratory of the Institute of Environmental Sciences.

Other: You cannot fear insects, including mosquitoes. Mosquito bites are rather rare, but you will have a better time if you are not allergic.

Supervisor: dr Ewa Chrostek, ewa.chrostek@uj.edu.pl





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*

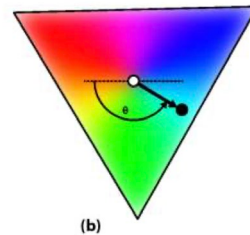
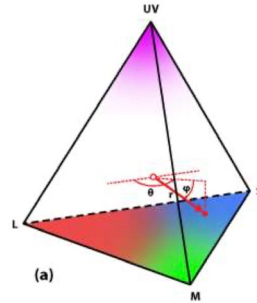
Description Work on existing data, there is also a possibility to work on additional unmeasured feathers, to collect additional data, using our spectrophotometer.

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*





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



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

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!*

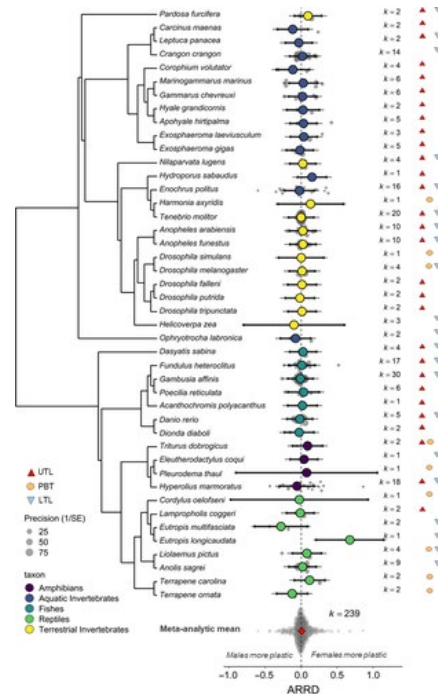
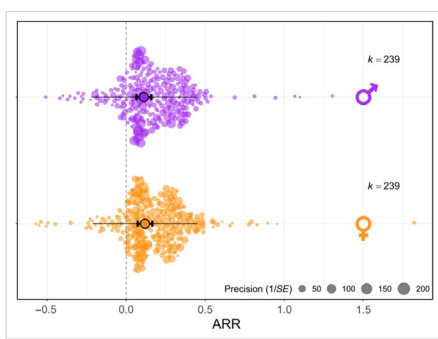
Description You will learn how to perform literature search and screening, how to extract relevant data from papers and databases and how to perform the actual meta-analysis.

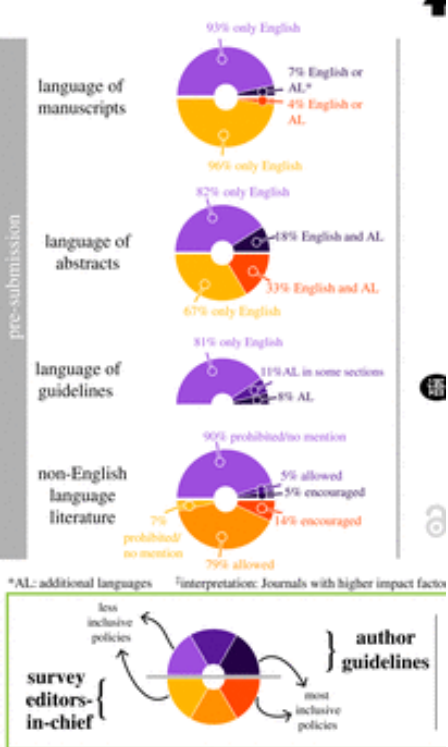
Schedule and place of work You'll join our team and its meetings, and will also regularly meet with your supervisor. Details of work schedule to be agreed upon individually. Most of your work will be computer-based.

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 Drobniak – szymek.drobniak@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!*

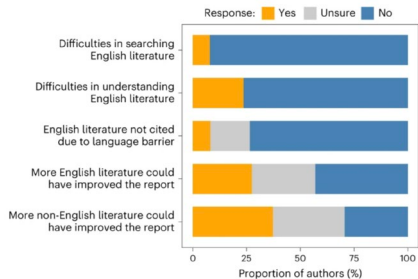
Description You will learn how to perform literature search and screening, how to extract relevant data from papers and databases and how to map the collected information in relation to the variables describing the analysed studies.

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



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 Tusznió
Socio-environmental Research Team

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]



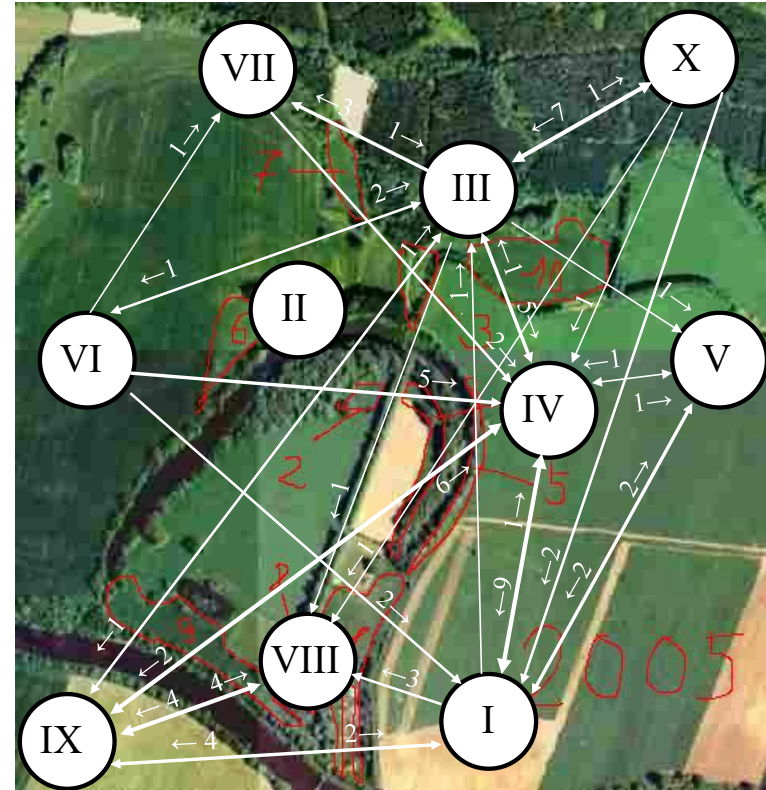
Impact of dispersal parameters on its success

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]



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.

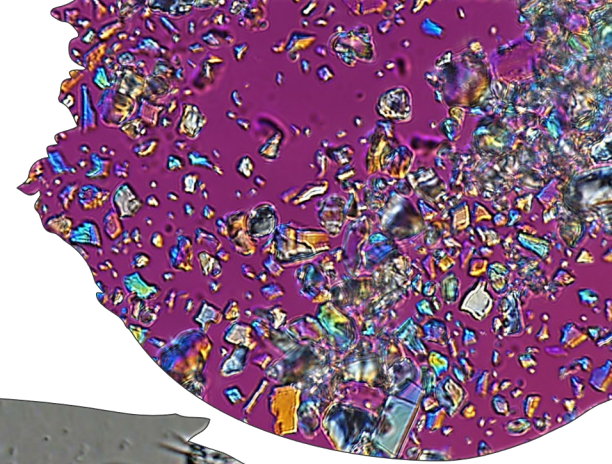
Description of activities: Working in the laboratory, conducting protozoan cultures, performing experiments, microscopic analyses.

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*)

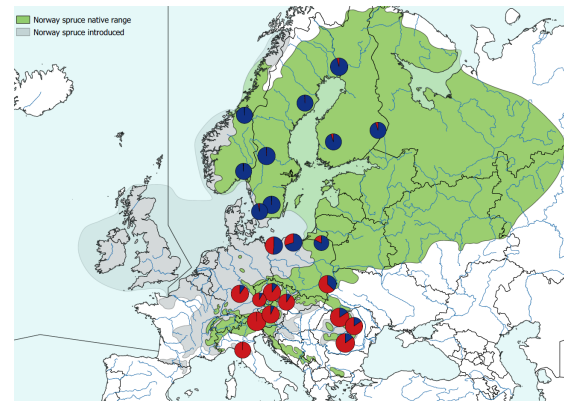
Research problem: Are European populations of the bark beetle divided into genetically diverse populations? Is the genetic structure of the bark beetle similar to that of the spruce? What is the level of genetic variation in the bark beetle? Is it possible to delineate refugial areas and recolonization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



- [illegible]

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

Spatio-temporal distribution of wildlife species in different habitats

- **Research problem:** Determination of the main factors contributing to geographical range and temporal activity of wildlife species such as large and medium-sizes predators (eg., Eurasian lynx (*Lynx lynx*), grey wolf (*Canis lupus*), brown bear (*Ursus arctos*), red fox (*Vulpes vulpes*), European badger (*Meles meles*) and ungulates (red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*) in urban and wild areas.

- **Description:** Work in field and in the office. Deployment and collection of records from camera-traps.

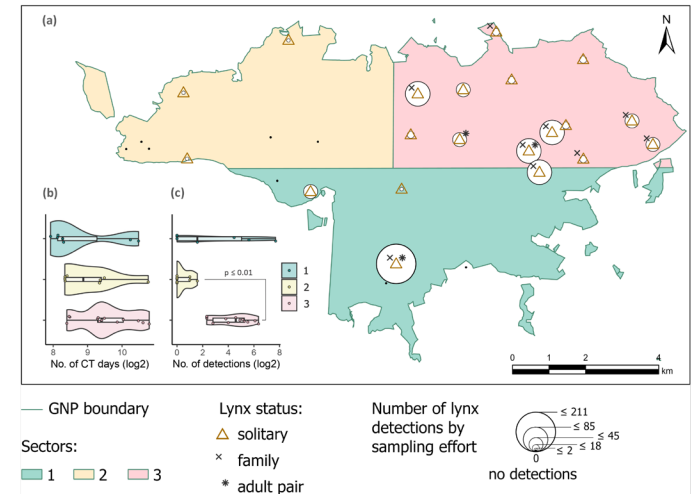
- Creating data-bases and analysing seasonal, diel activity and geographic distribution (work with ArcGIS Pro, RStudio)

- **Schedule and place of work:** Regular meeting of the research team (at least once a month), individual schedule of work upon agreement with a project coordinator in the office – field work once a month, computer work – once a week

- **Other:** English fluency minimum level B1

- **Supervisor:** Dr hab. Izabela Wierzbowska

- i.wierzbowska@ui.edu.pl



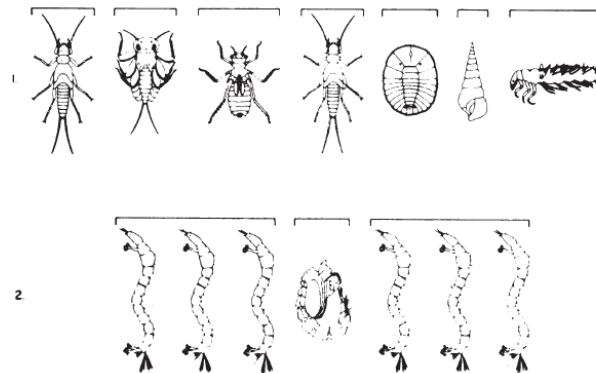
How to assess the ecological status of aquatic biota without identifying macrobenthic species?

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



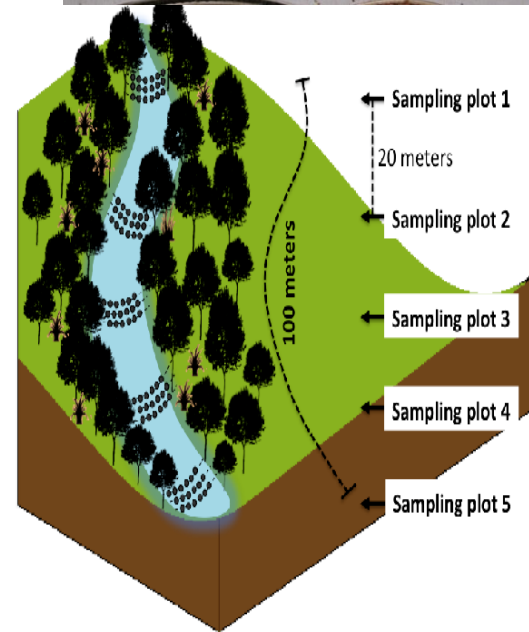
Artificial substrata as an aid in the assessment of watercourses' ecological status

Macroinvertebrates 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

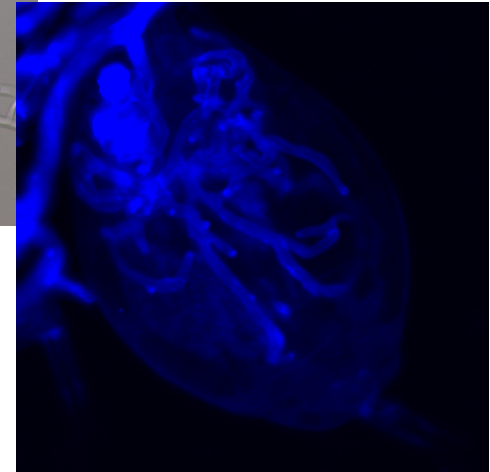
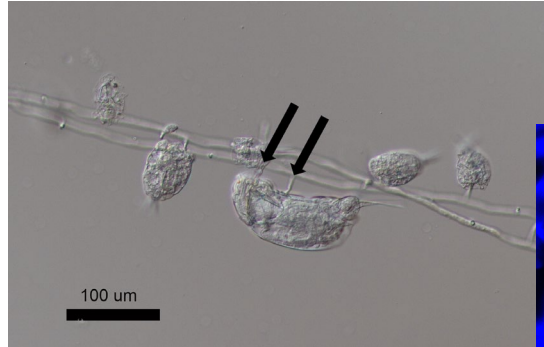
Research problem: Predatory fungi, specialized in feeding on rotifers, pose a serious threat to the population of these valuable animals in activated sludge in Wastewater Treatment Plants (WWTPs). By feeding on filamentous bacteria, rotifers prevent the phenomenon of active sludge bulking, which is one 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 program.

Schedule 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

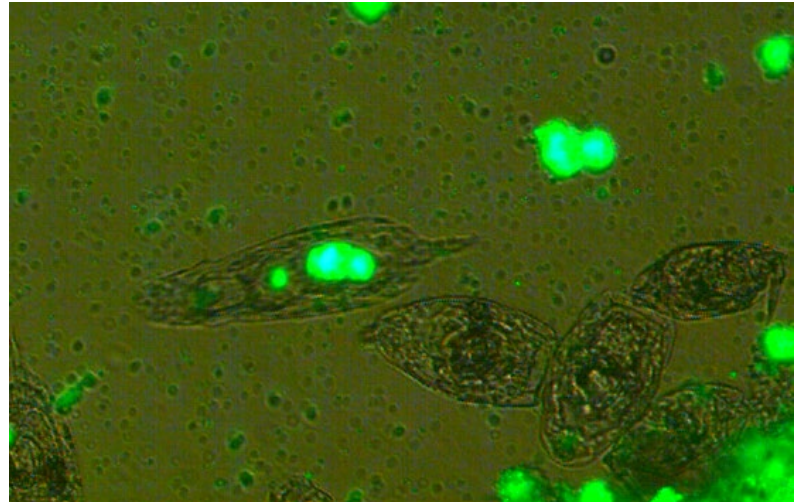
Research problem: One of the biggest environmental problems is the pollution of the environment with microplastics. Microplastics are found in both natural water reservoirs and wastewater treatment plants (WWTPs). Despite many studies, the impact of microplastic particles on aquatic organisms is still 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



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

Variability of Major Histocompatibility Complex (MHC) genes in the Eastern newt (*Notophthalmus viridescens*)

MHC genes encode proteins that play a key role in the **adaptive immunity**. The arms race with pathogens drives their variability (polymorphism) in populations, making them the **most variable genes in vertebrate genomes**. The theses will be part of a larger research project conducted within the team, and its aim will be to determine the **variability of MHC genes in *N. viridescens***.



Description: DNA isolation, PCR, preparation of libraries for NGS sequencing, bioinformatics analysis.



Schedule and place of work: Molecular work in laboratories at Gronostajowa 7 and on a computer. 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)



Variability of Major Histocompatibility Complex (MHC) genes in the Ryukyu newt (*Cynops ensicauda*)

MHC genes encode proteins that play a key role in the **adaptive immunity**. The arms race with pathogens drives their variability (polymorphism) in populations, making them the **most variable genes in vertebrate genomes**. The theses will be part of a larger research project conducted within the team, and its aim will be to determine the **variability of MHC genes in *C. ensicauda***.



Description: DNA isolation, PCR, preparation of libraries for NGS sequencing, bioinformatics analysis.



Schedule and place of work: Molecular work in laboratories at Gronostajowa 7 and on a computer. 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)



Toll-like receptor genes in newt genomes

Toll-like receptors (TLR) are an important component of **innate immunity**. Their knowledge in salamanders is very limited, which we can improve thanks to the recent acquisition of reference genomes for several newt species. The aim of the work will be **to identify all TLR genes in these genomes**.



Description: bioinformatic analysis of genome sequences and phylogenetic analysis of TLR genes.

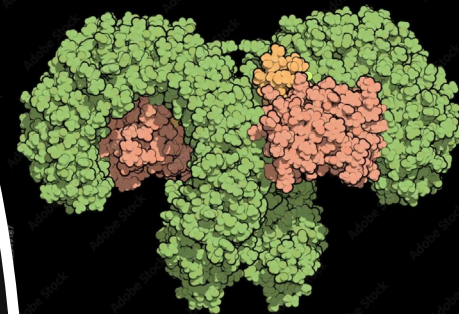


Schedule and place of work: Computer-based work. Working hours are arranged individually, and we offer flexibility in shaping the schedule.



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

```
31 self.file = None
32 self.fingerprints = set()
33 self.logdups = True
34 self.debug = debug
35 self.logger = logging.getLogger(__name__)
36 if path:
37     self.file = open(os.path.join(path,
38     self.file.seek(0)
39     self.fingerprints.update(x.rstrip())
40
41
42 @classmethod
43 def from_settings(cls, settings):
44     debug = settings.getbool('SUPERVISOR_DEBUG')
45     return cls(job_dir(settings), debug)
46
47 def request_seen(self, request):
48     fp = self.request_fingerprint(request)
49     if fp in self.fingerprints:
50         return True
51     self.fingerprints.add(fp)
52     if self.file:
53         self.file.write(fp + os.linesep)
54
55 def request_fingerprint(self, request):
56     return request_fingerprint(request)
```



Ontogenetic expression profile of Toll-like receptors in newts

Toll-like receptors (TLR) are an important component of **innate immunity**. The ontogeny of innate immunity in salamanders is poorly understood. The aim of the work will be to use **RNAseq data from various developmental stages**, already obtained in our laboratory, to investigate the **ontogenetic expression profile of TLR genes** in several newt species.



Description: bioinformatic analysis of RNAseq data.

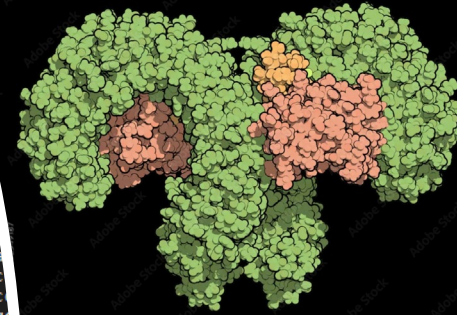


Schedule and place of work: Computer-based work. Working hours are arranged individually, and we offer flexibility in shaping the schedule.



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

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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
dr hab. Beata Klimek 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

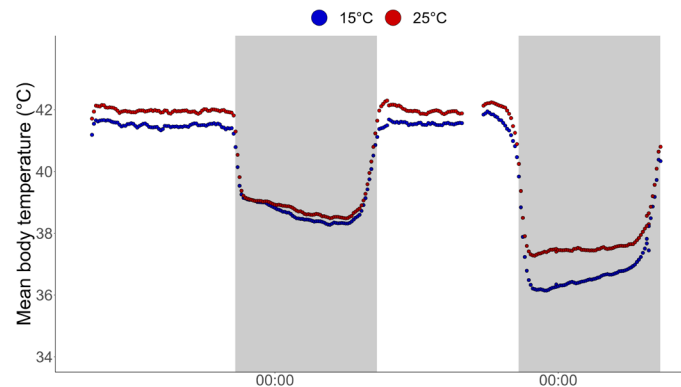
Research problem: Most so-called endothermic mammals and birds are, in fact, heterothermic, and modulate their body temperature to varying degrees. Birds, in particular, are capable of cooling down significantly when entering a state of rest-phase hypothermia.

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.

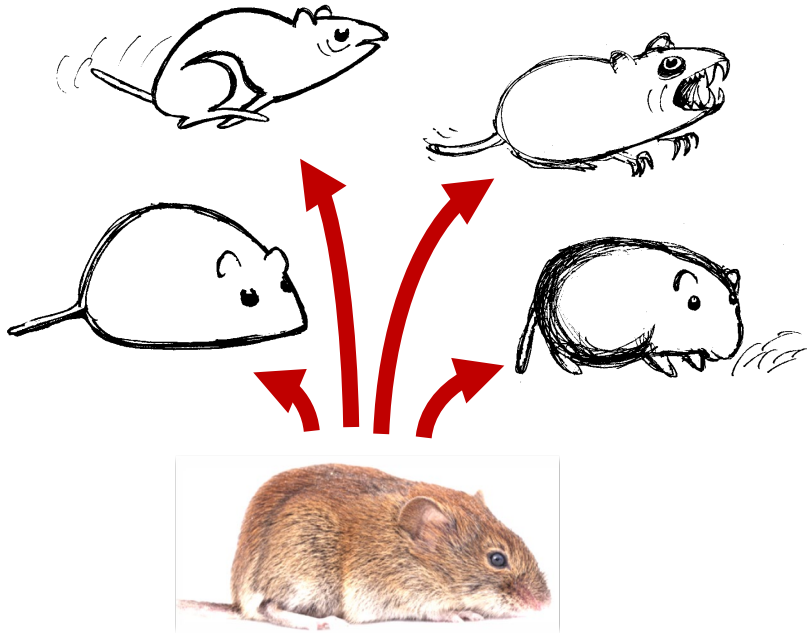
Tasks : Handling, feeding and observing birds in the lab

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), prof. Paweł Koteja (pawel.koteja@uj.edu.pl)

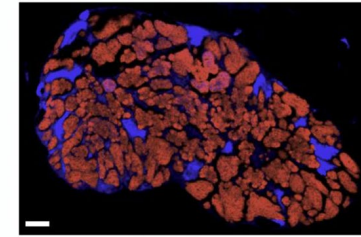
The evolution and function of bacteria with ultra-reduced genomes

Research problem: Symbiotic bacteria that inhabit insect tissues and provide them with essential nutrients often have a highly reduced set of genes and functions. However, the work of our Symbiosis Evolution Team has led to the discovery of bacteria with genomes containing only a few genes—smaller than even the genomes of animal mitochondria! However, so far, we know very little about the evolution and biology of these unique microorganisms.

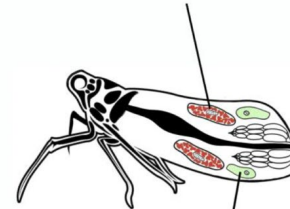
Tasks: Use of sequencing techniques (marker gene amplicons, metagenomes), bioinformatic analyses, and microscopy will enable comparisons of microbiome composition and symbiont genome organization, and reconstruction of their functions, in diverse species of hemipteran insects. The detailed scope of work is to be discussed.

Schedule and workplace: Work in the molecular laboratory (INoS – Gronostajowa 7) and at the computer. Working hours are arranged individually.

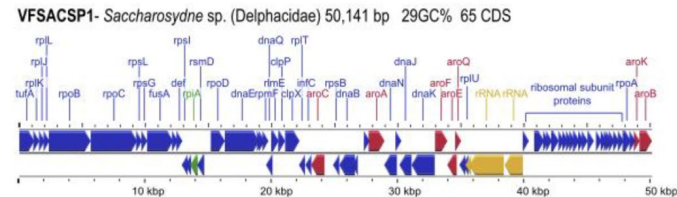
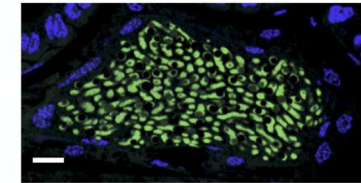
Contact: dr hab. Piotr Łukasik (p.lukasik@uj.edu.pl)



Vidania



Sulcia



Biodiversity, distribution, and microbiome of insects from Greenland

Research problem: Modern sequencing techniques have created unprecedented opportunities for describing biodiversity—including the presence of species, intraspecific variation, and biological relationships. Extensive collections of diverse insects from across Greenland, gathered by our team in 2021–25, allow us to describe the diversity of this group at the scale of the entire island. We are discovering entire taxa new to Greenland, linking their origin, for example, to the colonization of the island by the Norse in the early Middle Ages.

Tasks: Use of high-throughput sequencing techniques of insect and microorganism marker gene amplicons (metabarcoding, barcoding) with diverse insect collections from Greenland—including laboratory work, bioinformatic analyses, and result interpretation. There may be possibilities of fieldwork.

Schedule and workplace: Work in the molecular laboratory (INoŚ – Gronostajowa 7) and at the computer. Working hours are arranged individually.

Contact: dr hab. Piotr Łukasik (p.lukasik@uj.edu.pl)



Prevalence of gastrointestinal nematodes in ungulates in wild and urban habitats

- **Research problem:** Investigating the prevalence, diversity, and distribution of gastrointestinal nematodes in wild boar (*Sus scrofa*) and roe deer (*Capreolus capreolus*) populations across the Polish Carpathians and the urban environment of Krakow city.
- **Description:** Fieldwork for sample collection from the national parks (Babia Gora NP and Gorce NP) and Krakow. Laboratory work for faecal sample examination with the light microscope and molecular techniques (PCR, AGE).
- **Schedule and the place of work:** Regular meetings of the research team (at least once a month), individual schedule of work upon agreement with a project coordinator in the field and laboratory work.
- **Supervisor:** Dr hab. Izabela Wierzbowska, prof UJ.
- i.wierzbowska@uj.edu.pl



Roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*) recorded by camera traps.



Haemonchus contortus is known as the 'barber's pole' worm, because of its distinctive stripes.
<https://www.scops.org.uk/internal-parasites/worms/haemonchus-contortus/>

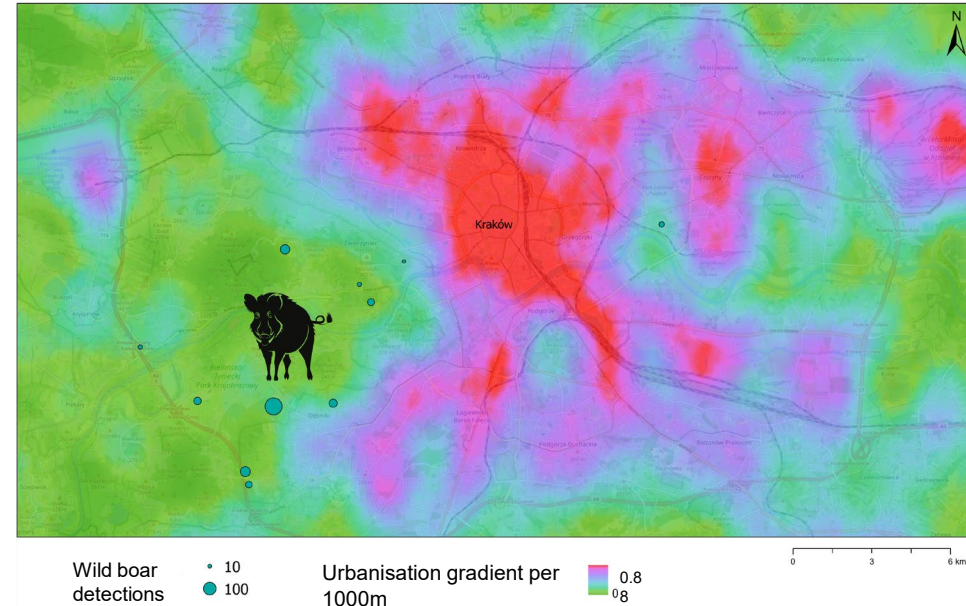
The conflicts and dangers for small vertebrates in an urban area

- **Research problem:** Determination of the most common injuries and main sources of threat to small wild vertebrates such as hedgehogs (*Erinaceinae* spp.), birds and others in urban areas.
- **Description:** Work in the office. Data processing and analysis of the records from a veterinary clinic. Creating databases and analysing the temporal and geographic distribution of wildlife injuries and fatalities (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.
- **Other:** Fluency in Polish.
- **Supervisor:** Dr hab. Izabela Wierzbowska, prof. UJ
- i.wierzbowska@uj.edu.pl



Comparative analysis of distribution and activity patterns of wildlife species in urbanised areas

- **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.
- **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.

Mammalian activity and population density: comparison of a national park and a managed forest

- **Research problem:** Effect of different habitats on wildlife species presence, population densities, spatial and temporal distribution with the use of camera traps.
- **Description:** Field and office work. Deployment of camera traps in the field and collection of records. Data processing using AI-powered tools, within the international project under European Observatory of Wildlife. Data analysis including seasonal, diel activity, geographic distribution and movement patterns, using ArcGIS Pro, RStudio.
- **Schedule and place of work:** Both office and field work. Regular meetings of the research team at least once a month, and individual schedule of work computer work, at least once a week. Four days of field work in Niepolomice Forest (in summer) and in Babia Gora NP (in autumn).
- **Supervisor:** Dr hab. Izabela Wierzbowska, prof. UJ
i.wierzbowska@uj.edu.pl



Perceptions and attitudes towards wildcat in Poland: social study on public awareness

- **Research problem:** As the European wildcat (*Felis silvestris*) population is recovering in the Polish Carpathians, it is crucial to evaluate public awareness and perceptions on this elusive and protected Felid.
- **Description:** Preparation and distribution of questionnaires. Data processing and analysis (MS Excel, 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.
- **Other:** Fluency in Polish.
- **Supervisor:** Dr hab. Izabela Wierzbowska, prof. UJ
i.wierzbowska@uj.edu.pl



European wildcat (*Felis silvestris*) recorded by camera traps.



Domestic cat (*Felis catus*) presented as a wildcat in a newspaper.

<https://parenting.pl/zbik/6956454787410464a>



Lynx (*Lynx lynx*) presented as a wildcat in a newspaper.

<https://www.o2.pl/informacje/gdzie-w-polsce-spotkamy-zbika-drapieżny-ssak-z-podrodziny-kotow-6855133880601504a>