PRANAV UNNIKRISHNAN

PhD candidate

Contact

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Profile

I am a PhD candidate at the Jagiellonian University, having submitted my thesis and currently awaiting defense. My current work focuses on environment-dependent balancing selection in a sexually selected gene. I have experience in working with different study species such as Drosophila, birds, squirrels and currently on bulb mites. Over time, I've developed strong analytical and research skills, and my broad foundation makes me something of a 'jack of all trades'—comfortable adapting to new methods and ideas. In addition to my research, I have mentored undergraduate students and contributed to teaching, enhancing my ability to communicate complex scientific concepts.

Looking ahead, I am particularly interested in how environmental variation shapes individual behavior and life-history traits. I aim to explore these questions using a combination of phylogenetics, population genetics, and functional genomics to build a more mechanistic and evolutionary understanding of organismal responses.

Education

PHD IN BIOLOGY (2021 - PRESENT)

Jagiellonian University, Krakow, Poland

Doctoral Thesis: "Testing for factors maintaining 6Pgdh

polymorphism in bulb mites"

Supervisor: Prof hab. Dr. Wiesław Babik

Assistant supervisor: Dr. Agata Plesnar-Bielak

INTEGRATED BS-MS (2015 - 2020)

Indian Institute of Science Education and Research, Tirupati, India

Masters Thesis: "Evolution of coat color and pattern in

squirrels of the world"

Supervisor: Prof. Dr. Nandini Rajamani

SECONDARY EDUCATION

BSS GHSS, Palakkad, Kerala, India

First author publications

1) Title:- *6Pgdh* polymorphism in wild bulb mite populations: prevalence, environmental correlates and life history trade-offs

Journal name:- Experimental and Applied Acarology

Year:- 2024

Author list:- <u>Pranav Unnikrishnan</u>, Szymon Grzesik, Magdalena Trojańska, Beata Klimek & Agata Plesnar-Bielak https://doi.org/10.1007/s10493-024-00909-4

2) Title:- The interplay of environmental and social factors influences balancing selection: 6Pgdh in bulb mites

Journal name:- Currently in review (Ecology and Evolution)

Year:- In review

Author list:- <u>Pranav Unnikrishnan</u>, Anna Spaeth, Magdalena Trojańska, Wiesław Babik, Agata Plesnar-Bielak https://doi.org/10.21203/rs.3.rs-4835969/v1

Research experience

PHD

Title:- Maintenance of 6Pgdh Polymorphism in Bulb Mites: Insights from Field Studies, Experimental Evolution, and Life-History Trade-Offs

Keywords:- Sexual selection, experimental evolution, balancing selection

Study system:- Bulb mites (*Rhizoglyphus robini*)

- Investigated the **maintenance of polymorphism** at the *6Pgdh* gene in bulb mites, where wild populations remain polymorphic but lab populations tend to become monomorphic.
- Combined field data with experimental evolution and lifehistory assays to show that environment-dependent balancing selection—driven by interactions between temperature and sexual selection—maintains the polymorphism.
- Conducted RNA-seq to compare gene expression between 6Pgdh genotypes, identifying distinct expression profiles linked to stress response and reproduction, supported by GO enrichment and Drosophila-based pathway analysis.

MASTER'S THESIS

Title:- Explaining the evolution of color and patterns in squirrels using meta-analyses and experimental approaches **Keywords:**- Coat color evolution, phylogenetics, meta-analysis **Study system:**- Squirrels

- Investigated the **evolutionary drivers** of coat color and pattern diversity in squirrels, with a focus on their ecological function and macroevolutionary patterns.
- Used phylogenetic comparative methods and meta-analysis across >200 Sciuridae species to reconstruct ancestral color traits, revealing support for Gloger's rule and habitatassociated pattern evolution.
- Designed computer-based visual detection simulations using human participants as model predators, showing that patterned coats significantly enhance camouflage efficiency in visually complex environments.

Awards & Scholarships

2023 Visibility and Mobility module (travel grant) to attend SMBE 2023

2022 Outstanding student poster in ESEB 2022

2020 NCN Scholarship for three years

2020 All India Rank of 52 in GATE (Graduate
Aptitude Test in Engineering) in Ecology and
Evolution

2015 DST Inspire Scholarship for five years

Major Presentations & conferences

PEC 2023 :- Oral + Poster presentation

EMPSEB 28 :- Oral + Poster presentation

SMBE 23 :- Poster presentation

PEC 2022 :- Poster presentation
ESEB 2022 :- Poster presentation

Skills

- Experienced in working with multiple study systems (Mites, flies, birds, squirrels) in both lab and field settings.
- Research background spans phylogenetics (IQ-TREE, phytools), behavioral ecology, population genomics (PoPoolation2, DESeq2), and sexual selection studies using experimental evolution frameworks.
- Personally mentored and supervised 4 undergraduate and MSc students through independent research projects, including training in experimental design, data analysis, and presentation.
- Experienced in optimizing laboratory protocols (RNA extraction, qPCR, DNA/RNA library prep) and field methods (live-trapping, behavioral assays, tagging, and GPS tracking).
- Built species- and genus-level phylogenies using concatenated mitochondrial and nuclear gene alignments with IQ-TREE, including model selection with ModelFinder and support estimation via ultrafast bootstraps.
- Ability to develop and adhere to project timelines and budgets.
- Active member of professional networks including EMPSEB, ESEB, and local evolutionary biology associations; experienced in presenting at international conferences and workshops.

Software and languages:-

- R, Python
- FastQC, Trimmomatic, STAR, PoPoolation2
- QGIS
- IQ-TREE, MEGA X, Geneious
- ImageJ, RAVEN, BORIS

Lab techniques:-

- DNA & RNA extraction
- PCR, RT-PCR, gel electrophoresis
- RNA-seq library preparation
- Animal handling & tagging

INTERNSHIP

Title:- Effects of stress (chemical and physical) on the migration ability of experimentally evolved fruit flies

Keywords:- stress response, behavioral ecology, life history traits

Study system:- Drosophila melanogaster

- Applied experimental stress treatments to base and dispersalselected *Drosophila* lines, targeting sleep disruption (via caffeine) and mechanical disturbance (via vibration).
- Assessed behavioral and reproductive traits post-stress, including activity levels, development time, sperm competition, and copulation duration.
- Evolved lines exhibited greater reproductive performance and activity under stress, suggesting enhanced tolerance linked to dispersal adaptation.

INTERNSHIP

Title:- Territory ranges of two newly discovered bird species **Keywords**:- Territory mapping, ecological hotspot, bird watching

Study system:- Birds

- A **field based study** on Kodaikanal, an ecological hotspot in India rich in biodiversity.
- The study was on **two newly discovered bird species**, to map their territories and to find the extend of their range.
- The data obtained from the project helped **conservation efforts** and also in planning for further studies on the species.

Other activites

ORGANIZATIONAL ACTIVITIES

1) Name:- EMPSEB29 (29th edition of the European Meeting for PhD Students in Evolutionary Biology)

Role:- Organizer

2) Name:- PEC 2023 (Polish Evolutionary Conference)

Role:- Volunteer

3) Organizing activities for events such as Science day, mini workshops on biodiversity, R-workshop, in university

TEACHING EXPERIENCE

1) Course name:- Effective research communication

Institution:- Jagiellonian University

Role:- Tutor **Duration**:- 3 years (Summer semesters)

2) Course name:- Ecology and evolution (I and II)

Institution:- IISER, Tirupati

Role:- Teaching assistant **Duration**:- 1 year (full year)

3) Mentored and supervised multiple students involved in the project related to the PhD. Additionally, I have completed courses on effective teaching and student communication.

References

Prof hab. Dr. Wiesław Babik wieslaw.babik@uj.edu.pl +48 12 664 5171 Dr. Agata Plesnar-Bielak agata.plesnar@gmail.com

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