H.F.R.I.
Hellenic Foundation for Research & Innovation

Description of the funded research project

2nd Call for H.F.R.I. Research Projects to Support Post-Doctoral Researchers

Title of the research project: Birds migrating in a changing world: movements, regulatory mechanisms and conservation

Principal Investigator: Anastasios Bounas

Reader-friendly title: Birds migrating in a changing world

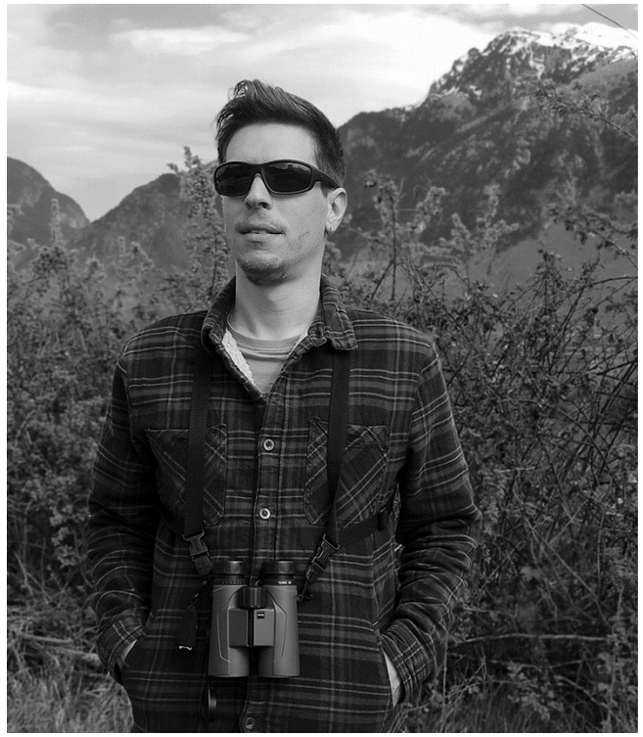
Scientific Area: Life Sciences

Institution and Country:

Host Institution: University of Ioannina

Collaborating Institution(s): Hellenic Ornithological Society / BirdLife Greece

Project webpage (if applicable): routes.project.uoi.gr



Budget: 178.848€

Duration: 36 months

Research Project Synopsis

All organisms live in a changing environment and must adjust their morphology, physiology, and behavior to maximize fitness in any habitat configuration. In this project we will combine the latest radio-tracking technology with gene expression analyses to investigate the adaptive capacity of migratory birds. Specifically, we will track landscape-scale movements of birds and gather data regarding their stopover duration and departure behavior before and after crossing the ecological barrier of the Mediterranean Sea and the Sahara desert. In addition, blood samples will be collected from the same individual birds and gene expression profiles will be generated for genes related to metabolism, physiology and behavior. We will associate gene expression levels with different stopover stages as well as with different migration seasons (spring-autumn) and life cycle stages (migration-breeding) thus unraveling possible regulatory pathways and processes that may be involved in bird migration. Our findings will finally be considered under a climate-change modeling framework where current and future fuel deposition and flight range will be calculated and the implications on a possible mismatch of stopover sites in the Mediterranean will be explored. This integrative approach will significantly aid the conservation of this fascinating albeit continuously disappearing aspect of avian life, migration.

Project originality

In spite of the wealth of information available about migration physiology, there is little known about how migration is seasonally controlled at the molecular level; whether the migratory phenotype is under genetic control or triggered by seasonal traits may vary among different organisms whereas the genes and/or epigenetic changes underpinning migratory behavior remain largely unknown. This project's innovation lies in the fact that it will combine the latest radio-tracking technology and high-throughput sequencing technology. Such integrated approaches that use an accurate characterization and quantification of the migratory phenotype and at the same time consider gene expression levels and their transcriptional control at specific stages of avian migration are needed to gain new insights into the genomic basis and the molecular mechanisms controlling migration.

Expected results & Research Project Impact

Identifying which genes or gene groups are involved in the regulation of the phenotypic variation observed in natural populations, and to what extent, is of broad evolutionary and conservation interest and is a topic that has received little attention due to methodological challenges. Scientists' understanding of the physiological, cellular, and molecular mechanisms underlying the regulation of migration has not progressed far in the past 50 years (at least compared with understanding of other life history stages, such as breeding). In the framework of this project, we will be able to pinpoint migration processes with sufficient accuracy and clarity to not only advance the knowledge on the subject but also to built capacity enabling fellow researchers to design and perform critical experiments that will be required for the effective conservation of avian migration in a changing world. Furthermore, there is much to be gained from researching non-model species. Regulatory or signaling pathways in birds have offered insight to human or medical research whereas it is known that conserved gene regions and associated pathways can be found across different taxa. This could open new research directions in the field of Molecular Biology and help answer complex ecological and evolutionary questions that may support knowledge-based decision making for the conservation of biodiversity and ecosystem functioning.

The importance of this funding

The funding provides the opportunity to integrate cutting-edge technologies in the monitoring of migration over Greece through the creation of the first automated telemetry station in the Balkans. Through funding, the entire research team is given the opportunity to benefit from the development of both their scientific and personal skills. The research project offers the opportunity for a fruitful collaboration with world-renowned experts on gene expression and bird migration. The acquisition of skills along with the dissemination of results through their publication in high impact international journals is expected to have a significant influence on the promotion of scientific knowledge.

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