HiRAD

Harmonizing and integrating Radar-based approaches for monitoring Aerial bioDiversity

DURATION
1/04/2024 – 30/06/2027

BUDGET
211 447 €

PROJECT DESCRIPTION

Why monitor the airspace?

Trillions of birds and insects use the airspace for key activities of their life cycle, such as daily foraging movements and seasonal migrations. Their movements link otherwise separated ecosystems, raise human-wildlife conflicts, and provide services and disservices that are relevant to human agriculture, economy, and health. Although the airspace is increasingly recognized as an essential habitat for a large proportion of the global biodiversity, aerial biodiversity is poorly monitored and largely absent from legislation and policy, despite it playing a similarly important role to other habitats for biodiversity and ecosystem functioning. This is in part due to the fact that monitoring aerial biodiversity remains a challenge. It involves many individual organisms, with movements often taking place at night and over a large area.

Radars as remote-sensing tools for biodiversity

Remote sensing technologies such as radar can provide detailed information on aerial biodiversity, including the intensity, timing, altitude, and spatial scale of mass movements, for the full range of taxa and all individuals passing through the sensor's measurement range. Various types of radar systems exist - from small-scale radars to large-scale weather radars - that are largely complementary in spatiotemporal and taxonomic resolution and coverage.

While **small-scale radars** (e.g. vertical looking or tracking radars) can identify individual animals and characterize their body shape, wing beat frequency, and other individual characteristics, they only monitor smaller spatial areas. In contrast, **weather radars** survey the atmosphere above many of the world's large landmasses and are therefore often organized in continental networks (such as NEXRAD in the US or OPERA in Europe), covering regions of several hundred to thousands of kilometers. They also detect biological targets, albeit at coarser spatial and taxonomic resolution.

How will HiRAD contribute to establishing a standardized monitoring system?

The greatest challenges for establishing weather- and small-scale radars as a standardized monitoring system of the airspace are the currently scattered distribution of radar data, biodiversity data products and software tools and the diverse formats of radar data and biodiversity products. In HiRAD, we will address these challenges, demonstrate the value of radar data in monitoring aerial biodiversity (specifically the interaction of birds and insects with biotic and abiotic factors) and create radar-based tools for various stakeholders.

To do so, we will:

1. Provide access to biological data products derived from radar data across Europe (WP1)
2. Develop and improve tools for the visualization, exploration and analysis of radar data (WP2)
3. Harmonize data from different radar systems (WP3)
4. Demonstrate their capacity for biodiversity monitoring of birds and insects (WP4)
5. Provide data products and tools for stakeholders (WP5)

Expected results and impact

The unprecedented declines of insects and birds have not only raised concerns among ecologists, but their services and disservices are increasingly recognized by the general public, national and regional governmental agencies, and various stakeholders, in particular those from aviation, wind energy, agriculture, and public health. Combatting the biodiversity crisis requires a systematic monitoring of aerial biodiversity, which is still lacking but urgently needed for effective management and conservation of a crowded airspace, e.g. for sustainably expanding wind energy in the course of decarbonizing the global energy system.

The radar-derived biodiversity data products, tools and knowledge generated in HiRAD will assist scientists, practitioners, policy makers and other stakeholders in developing management strategies, reducing human-wildlife conflicts, improving the use of services and avoidance of disservices that bird and insect movements may provide. Through our engagement with stakeholders from relevant sectors (see WP5), we will ensure that knowledge is transferred among different communities to:

- Design and improve national and international biodiversity monitoring (e.g. via EuropaBON) with the production of Essential Biodiversity Variables (EBV)
- Produce biodiversity products that are relevant for the spatial planning of, e.g., wind energy infrastructure, conservation, etc.
- Tailor our biodiversity data products and tools for scientists, practitioners, stakeholders, and policy makers, make these available through a public access portal and ensure their long-term sustainability through our collaborators at national meteorological institutes and the owners of small-scale radars.

CONTACT INFORMATION

General coordinator

Silke Bauer
Federal Research Institute (WSL)
silke.bauer@wsl.ch

Belgian contribution

Peter Desmet
Research Institute for Nature and Forest (INBO)
peter.desmet@inbo.be
https://oscibio.inbo.be

Partners

Judy Shamoun-Baranes
University of Amsterdam
Institute for Biodiversity and Ecosystem Dynamics (IBED)
j.z.shamoun-baranes@uva.nl

Nadja Weisshaupt
Finnish Meteorological Institute (FMI)
nadja.weisshaupt@fmi.fi

Eva Knop
Agroscope
eva.knop@ieu.uzh.ch

LINKS

https://hirad.science