Developing agri-environmental indicators to monitor the impact of human-driven landscape changes on biodiversity in European farmland (MOTIVER)

Location: FRB – CESAB, 5, rue de l'École de Médecine, 34000 MONTPELLIER
Salary: between 2620 and 2801 € gross per month

Contract: 24 months position, full time

Closing date: May 31, 2024
Starting date: ideally, September 2, 2024

Job information

- **Host structure**

About FRB

The **Foundation for research on biodiversity (FRB)** was created in 2008. It gathers public research institutions, environmental NGOs, land and genetic resources managers and the private sector. It provides a forum where science meets society in order to address the current challenges related to biodiversity research.

About CESAB

The Centre for Synthesis and Analysis of Biodiversity (CESAB) is FRB's main programme and a leading research organization in Europe, with an international reputation. Launched in 2008 after the "Grenelle de l'Environnement" by the Ministries for research and for ecology, it was created by eight public research institutions (BRGM, CIRAD, CNRS, IFREMER, INRA, IRD, IRSTEA and MNHN), joined in 2014 by LVMH and in 2017 by the University of Montpellier.
Its aim is to implement the innovative work of synthesis and analysis of existing data in the field of biodiversity. Advancing knowledge, developing culture and collaboration, facilitating links between scientific disciplines and with the stakeholders, are the main objectives of CESAB, which welcomes every year a large number of researchers from all continents.

For more information about CESAB: *https://www.fondationbiodiversite.fr/en/about-the-foundation/le-cesab/*

- **The MOTIVER project**

European agroecosystems are being destabilized by long-term anthropogenic pressures whose effects are detectable and increasing. Four **megatrends** are likely to be the main drivers of future agriculture and to have significant impact on agricultural landscapes and the biodiversity they support: (i) **climate change**; (ii) **demographic trends**, with Europe's farming population ageing, and the hindrance to generational renewal leading either to an increased risk of land abandonment, or to the expansion of intensive cluster farms, depending on the region; (iii) **opposing ideological shifts** between locally-reinforced productivism and post-productivism — to achieve the goals of developing multifunctional agroecosystems; and (iv) **sociological changes**, which are driving the implementation of increasingly stringent environmental regulations. **All of these drivers have interdependent consequences** on the structure of agricultural landscapes and their ability to provide resources for biodiversity as well as on their likely transformation in the near future.

Until now, the impacts of these factors on biodiversity have mainly been studied at patch scale and considered individually. More recent studies and monitoring programs integrate the landscape-to-regional environmental influence in their rationale and highlight the crucial relevance of considering drivers measured at larger spatial scales (i) when monitoring the link between human pressures, ecological impacts, and biodiversity patterns and trajectories, and (ii) for implementing relevant initiatives for preserving agricultural areas. However, the predominant focus on land cover metrics and coarse crop-management indicators (e.g., organic/non-organic farming) has resulted in the availability of a narrow range of solutions, such as reducing field size, diversifying cropland, and increasing semi-natural habitat proportion. These land cover-based solutions seem rather insufficient to be fully effective, partly because they omit most **consequences of the pressures induced by the aforementioned megatrends, which have proven their impact on biodiversity**. Several research and application fields highlight this mismatch and the **dearth of available multifactorial landscape indicators** to monitor the environmental and ecological consequences of driving human pressures and their impacts on biodiversity. The main goal of the MOTIVER project is to develop the **"eco-landscape" indicator** as a tool for action. In a given spatial area (e.g., region or country), eco-landscapes define ecologically and geographically delimited areas of land or water, split into classes, in which the diversity of ecosystems and impacts of each megatrend individually are relatively homogeneous, and which tend to be distinct from one another.

Ecological and policy studies suggest that the management of agricultural systems and its policy should be implemented at the landscape scale — from one to a few dozen kilometers — in order to plan a more coherent landscape structure, in line with the movement of living organisms between the habitat patches within the mosaic. By combining this information, the main objectives (**Os**) of the project are:

- (**O1**) for each megatrend, to integrate specific land cover metrics and under-evaluated multifactorial metrics related to human pressures affecting agroecosystems in space and time (e.g., microclimate, fertilizer, pesticide use) in order to create four one-dimensional indicators ("eco-landscapes");
- (**O2**) to link eco-landscapes to patterns and trajectories of farmland biodiversity, depending on data availability in each case—with a particular focus on macroinvertebrate communities;
- (**O3**) to provide assessment tools to help practitioners integrating eco-landscapes in their monitoring of human activities and their impact on biodiversity.

To achieve these objectives, and highlight the versatility of our approach, we will consider study areas of various extents—from landscape to region and country—and different agricultural contexts. We will focus both on taxa already widely surveyed in monitoring programs (e.g., vascular plants, breeding birds, butterflies) and on biodiversity often neglected despite their considerable interest for farmers and ecosystem functioning (e.g., above/below-ground macroinvertebrates, wild bees).

- **The MOTIVER Consortium**

The consortium is led by Ronan MARREC (Assoc. Prof., UMR EDYSAN CNRS-Université de Picardie Jules Verne, Amiens, France) and Gaël CARO (Assoc. Prof., UMR LAE INRAE-Université de Lorraine, Nancy, France). R. MARREC is a landscape ecologist interested in evaluating the role of the spatial structure and temporal dynamics of landscapes and human activities on biodiversity and ecosystem services, with increasing interest in using remote sensing data to inform landscape heterogeneity and understand macroecological patterns and processes. G. CARO is an ecologist specialized in invertebrates whose goal is to optimize agricultural landscapes in order to preserve ecological functionality provided by invertebrate communities and improve the working conditions of farmers and local stakeholders.

They work is in tight collaboration with 10 other researchers (core group) from three different countries:

- Benjamin BERGEROT (U. Rennes, Rennes, France)
- Hugues BOUSSARD (INRAE, Rennes, France)
- Majid IRAVANI (ABMI, Edmonton AB, Canada)
- Marianne LASLIER (U. Picardie, Amiens, France)
- Gaëtane LE PROVOST (INRAE, Bordeaux, France)
- Céline PELOSI (INRAE, Avignon, France)
- Sandrine PETIT (INRAE, Dijon, France)
- Sarah REDLICH (U. Würzburg, Würzburg, Germany)
- Adrien RUSCH (INRAE, Bordeaux, France)
- Helene WAGNER (U. Toronto, Mississauga ON, Canada)

The core consortium is supplemented by several other researchers as well other stakeholders with strong interests in monitoring biodiversity and human pressures for a better landscape-scale land management.

- **Your role**

As a core member of the MOTIVER's consortium, you will be responsible for:

- identifying variables representative of megatrends with the help of the consortium;
- collecting the data required for the cartographic representation of megatrends, with the help of internal support;
- producing eco-landscape maps by implementing the procedure described by the consortium;
- coordinating the management of databases (environmental, biodiversity) along with database managers;
- carrying out statistical analyses linking biodiversity patterns and eco-landscape context;
- writing and coordinating the main scientific articles that will emerge from this project;
- participating in the dissemination of the deliverables (symposia, popularization meetings, etc.).

As it is a collaborative project, you will have the opportunity to achieve these tasks with a close contact with the coordinating group and all the scientists of the consortium. In this context, the two PI will be regularly in touch (weekly meetings) with you.

In addition, the project has an applied angle. Presentations to a non-academic audience may be required to introduce the project, its objectives and methodologies. In addition, a workshop will be organized at the end of the project, during which we plan to hold a training session on the use of the eco-landscape indicator. You are expected to contribute to these communication activities.

Qualifications

1. **Ph.D. in environmental science, ecology, geography, or related field:**
   - Ph.D. or equivalent doctoral degree at the time of recruitment in a relevant field with a strong background in environmental science, ecology, geography, or a related discipline.

2. **Research experience in spatial ecology and agroecosystems:**
   - Proven expertise in spatial ecology and agroecosystem dynamics, demonstrated through a publication record in peer-reviewed journals.
   - Experience in integrating land cover metrics and multifactorial metrics related to human pressures affecting (agro)ecosystems, including but not limited to microclimate and farming practices, to develop comprehensive ecological indicators.
   - Proficiency in GIS (ArcGIS, QuantumGIS).

3. **Data integration and analysis skills:**
   - Proficiency in integrating diverse datasets to analyze patterns and trends in land cover dynamics and farmland biodiversity.
   - Strong quantitative skills and experience with statistical analysis and modeling techniques relevant to spatial and temporal ecological data.
   - Proficiency in modelling using the R software.

4. **Optional relevant scientific skills:**
   - Experience in managing complex and heterogeneous databases of biodiversity and environmental data.
   - Familiar with biodiversity assessment methods, particularly in relation to farmland ecosystems.
   - Experience in applying ecological indicators to assess biodiversity patterns and trajectories in response to environmental changes.

5. **Interdisciplinary collaboration:**
   - Interest in collaborating across disciplines, working effectively with researchers from diverse backgrounds, including ecologists, geographers, agronomists, and lawyers.

6. **Communication and outreach skills:**
   - Excellent communication skills, both written and verbal, essential for presenting research findings to diverse audiences and engaging with stakeholders.
   - Ability to disseminate research outcomes through academic publications, presentations at conferences, and outreach activities targeted at practitioners and policymakers.
   - Group leadership skills.

Application instructions:

- A cover letter
- Your curriculum vitae (including contactable references and a list of publications)

Applications must be sent no later than May 31, 2024 to: ronan.marrec@u-picardie.fr and gael.caro@univ-lorraine.fr