Postdoctoral Fellow - Ecological Niche and Species Range Shifts Modelling of Snails and snail-borne Parasites

Project: Predicting (or simulating) future lymnaeid snail and fasciolosis distributions in southern France through a species range shift process-based model

Context of the project and position overview

Snail-borne disease dynamics in European settings are expected to shift in relation to global changes. Here, we aim at developing a pioneer process-based model able to simulate the lifecycle and habitant suitability of fasciolosis in metropolitan France by integrating climatic, environmental, management but also biological data through an spatially explicit species distribution process-based model, called *simRShift*. The project integrates biogeography, disease ecology, spatial epidemiology, climate science, and statistical and mechanistic modelling to support risk mapping.

We are seeking a highly motivated postdoctoral fellow to lead the simulation of the species range shift dynamic of the parasite in relation to its invasive and local snail vector species, and in response to environmental changes accounting for the species lifecycle and performance (reproduction, establishment, survivorship) facing multifaceted environments (e.g. informed by ecological niche model), its dispersal considering the landscape rugosity and fragmentation, and stochasticity. Applied on fasciolosis, this approach will allow forecasting the range dynamic of the parasite under different environmental contexts and scenarios (based on different socio-economic trajectories, e.g. SSP scenarios), that we will use as a proxy of infection risk.

The successful candidate will contribute to advancing predictive frameworks for understanding current and future distributions of vector- and parasite-borne diseases under environmental and climate change scenarios. The statistical and mechanistic initial data will be provided by the consortium of the InvaSnail project.

Research Objectives

The successful candidate will:

- Develop and implement ecological niche and the *simRShift* models for host snails and trematode parasites.
- Integrate environmental, climatic, land-use, spatial and ecological datasets into predictive modelling frameworks.
- Conduct model validation, uncertainty analysis, and ensemble modelling.

- Define trajectories of environmental suitability for species (snails and snail-borne parasite) under future global change scenarios, as well as simulate host-parasite species range shift through the simRShift model.

Key Responsibilities

- To model the ecological niches of the local and invasive snails host and of the parasite, i.e. the adjustment of a model aiming to explain species occurrence with climatic (e.g. temperature, rainfall), environmental (e.g. hydrography, land use) and management/social (e.g. livestock movement, pastoralism) factors.
- To develop the simRShift model accounting for host-parasite interactions
- To calibrate and validate the model by assessing the capacity of the model to reproduce the current fasciolosis distribution or to mimic its performance measured in laboratory experiments
- To conduct simulation-based experiments to forecast the host parasite distribution in response to different environmental change scenarios (climate and land use changes scenarios mainly)
- To test the efficiency of a set of management actions aiming to control the expansion of the disease.
- Publish results in peer-reviewed journals
- Present findings at international conferences and stakeholder meetings.
- Collaborate with interdisciplinary teams (ecologists, epidemiologists, parasitologists)
- Contribute to project development including new research proposals and support grant writing
- Mentor graduate and undergraduate students when appropriate.

Required Qualifications

- PhD in Ecological modeling, Ecology, Biogeography, Epidemiology, Environmental Sciences, Geography, or a related quantitative discipline.
- Demonstrated experience in ecological niche modelling and/or species distribution modelling.
- Strong programming skills in R and/or Python.
- Experience with geospatial tools (e.g., GIS platforms).
- Experience working with environmental and climate datasets.
- Experience with modelling (e.g., MaxEnt, Boosted Regression Trees, Random Forest, Neural network)
- Experience handling and processing large-ecological datasets
- Strong publication record appropriate to career stage.
- Excellent written and verbal communication skills
- Autonomy, strong work ethic and team-playing

Preferred Qualifications

- Experience working with vector-borne or parasitic diseases.
- Experience with climate projection datasets (e.g., CMIP scenarios).
- Knowledge of epidemiological modelling or disease risk mapping.
- Experience with large biodiversity databases (e.g., GBIF).
- Experience with reproducible workflows and version control (e.g., Git).
- Experience with freshwater systems, trematode ecology, or vector–parasite modelling is highly desirable.

Contract details and Application Process

- **Institution:** Laboratoire Interactions Hôte – Pathogène – Environnement (UMR 5244), Univ. Montpellier, CNRS, IFREMER, Univ. Perpignan
  Start date: the position needs to be filled by June 1, 2026.
- **Duration:** 2 years (fixed-term contract)
- **Salary:** competitive salary according to institutional and national regulations and candidate experience
- **Application:** CV, cover letter outlining research interests and fit with the position, contact details for 2–3 referees, up to three representative publications, to annia.alba-menendez@umontpellier.fr and romain.bertrand2@utoulouse.fr. Review of applications will begin on March 15th until April 15th. The position needs to be filled by June 1st, 2026.

Research Environment

The successful candidate will join a dynamic interdisciplinary research group working at the interface of ecology and evolution, epidemiology, and global change biology of vector-borne diseases. The position is based in Montpellier, a vibrant scientific hub in Southern France internationally recognized for excellence in ecology and evolutionary biology. Collaboration and visits of Dr. Romain Bertrand (CRBE lab, Toulouse) are expected for ecological niche modelling and the development of the simRShift model for host-parasite interactions. The thematic line is embedded within the regional scientific project InvaSnail led by Dr. Annia Alba, financed by the ExposUM initiative from the Montpellier University.