

PhD thesis (3 years) in Montpellier and Porto

(CEFE, Centre d'Ecologie Fonctionnelle et Evolutive)

BIOPOLIS / CIBIO (Centro de Investigação em Biodiversidade e Recursos Genéticos)

Improving conservation of biodiversity in arid habitats using reptile communities as model

Scientific context

Shortfalls of biodiversity knowledge strongly impede effective conservation, for both species- and area-based strategies. Arid habitats (defined here as deserts to arid steppes) are often perceived as having little conservation value due to their impoverished communities. Yet, these communities are made of many endemic, specialized species with unique adaptations. Many populated arid areas are degraded due to anthropogenic activities. Arid steppes are even amongst the most threatened habitats in North Africa and the Middle East because their fertile soil make them valuable to agriculture (see Fig. 1).

Small terrestrial vertebrates have generally not been integrated into conservation policies in arid areas of the Middle East and North Africa (MENA) due to a lack of knowledge on species identities and distribution in arid MENA habitats. In addition, most small vertebrates have limited dispersal abilities and are thus expected to show large species turnover between the west of the Sahara and the Arabian Peninsula and a series of recent phylogeographic studies suggest that we underestimate species-level diversity in many genera. Consequently, species' ranges, ecological niche breadths, and population sizes, are overestimated while their extinction risk and sensitivity to habitat change are underestimated. We expect many species to display smaller distribution, more specialized niches, and thus higher conservation needs than what is currently understood. The conservation values and level of endemism of the main bioregions of the MENA is probably be severely underestimated.

Objectives

To address these issues, we will use reptiles as models of small terrestrial vertebrates, as they often exhibit restricted dispersal, have stringent ecological requirements in terms of vegetation cover or type of substratum that makes them highly sensitive to change in land use and, like many poikilotherm species, are particularly sensitive to climate change.

The project will be organized in two work packages (WPs). WP1 aims at reducing the shortfall of biodiversity knowledge at the species level. We will test two hypotheses: H1 that the number of reptile species occurring at the NA&ME is higher than the currently described ones; H2 that intra-specific genetic diversity of wide-ranging species is strongly spatially structured. WP2 aims to enhance conservation strategies through systematic conservation planning. We will test two hypotheses: H3 that phylogenetic- and genetic- diversity of reptiles is unevenly distributed across the study area; H4 that priority areas for

conservation identified using phylogenetic diversity differ from the ones identified using species diversity only.

The PhD candidate will gather available samples, visit natural history museums if needed and perform the genotyping (extractions and amplifications, using the collection of nuclear loci we use routinely in CEFE and CIBIO). Sequencing will be outsourced. They will also analyse the data and write the papers related to WP1. Because most of the samples are already available and we have local partners to increase sampling if necessary, we don't anticipate a lot of field work by the PhD but we expect one field trip per year in the first two years to target anticipated contact zones between lineages of our model species, based on the results of previous studies. WP2 will be under the responsibility of the CIBIO partner; the PhD candidate is not expected to lead this part of the project but can participate in the analyses and paper writing, depending on their motivation and time constraints.

Skills

Master degree in evolutionary biology or related fields.

The candidate is expected to work independently and is encouraged to develop their own lines of research within the framework of this project. The ideal candidate should be highly motivated by questions related to the distribution of biodiversity, the biogeography of speciation, the taxonomy of vertebrates or the conservation of biodiversity. Previous experience with phylogeography or population genetics, bioinformatics or genomics, or spatial analyses would be helpful.

Thesis organization

The thesis will be officially hosted at the GAIA Doctoral School of the University of Montpellier and based at CEFE (Centre d'Ecologie Fonctionnelle et Evolutive). The candidate will be co-supervised by Pierre-André Crochet (CEFE) and Duarte Conçalves & Silvia Carvalho (CIBIO/BIOPOLIS). The candidate is expected to spend time every year at CIBIO.

The candidate will interact with members of the Bidesert group in Porto (CIBIO), especially Jose Carlos Brito.

How to apply:

Send a motivation letter, a CV, and two contacts for reference to pierre-andre.crochet@cefe.cnrs.fr before 31 October 2023. The motivation letter should detail research interests, past experiences and main results of previous research experiences. Selected applicants will be invited for an online interview in early November 2023. The thesis will start from January 2024.