

Laboratoire d'Éthologie Expérimentale et Comparée (LEEC)
Université Sorbonne Paris Nord, France

Advertisement of a fully funded PhD position

Paternities and spatial kinship structure in a population of South African bush Karoo rats

We are looking for a highly motivated and competent candidate for a fully funded 3-year PhD position. Studies will be carried out at the Laboratoire d'Éthologie Expérimentale et Comparée (LEEC), Université Sorbonne Paris Nord (Campus Villetaneuse) in France, and for the field work at the Succulent Karoo Research Station in South Africa.

Application procedure. Applicants should send their CV and motivation letter, in one single PDF file, to rodel@univ-paris13.fr by the **15/03/2025**. In the CV, the names of two references including their contact details should be provided. Applications after the 15/03/2025 may also be considered until the position is filled. The thesis will start between April and July 2025.

Direction of PhD thesis. Dr. Heiko G. Rödel, Professor. **Co-supervision.** Dr. Chantal Poteaux, Associate Professor; both are at the Laboratoire d'Éthologie Expérimentale et Comparée (LEEC), Université Sorbonne Paris Nord, France. Website: <http://leec.univ-paris13.fr>

In collaboration with. Dr. Carsten Schradin, Research Director, and Dr. Lindelani Makuya, post-doctoral researcher; both are at the Institut Pluridisciplinaire Hubert Curien, CNRS Strasbourg, France. Both are board members of the Succulent Karoo Research Station in South Africa. Website: <https://www.strippedmouse.com>

Context. Male spacing behavior including the spatial patterns of paternities can affect genetic relatedness in different subsets of a population. For example, neighboring matrilineal lines can be closely related when several females have the same father. On the other hand, multiple paternities can decrease relatedness within a matriline. Such effects can shape the spatial kinship dynamics of the entire population (*cf.* Solmsen et al. 2011; Sommaro et al. 2024), and as such social interactions via kin selection. Field studies exploring such patterns are still scanty, as long-term population studies with individually marked animals are needed.

We propose such a study in the solitary bush Karoo rat (*Otomys unisulcatus*), using individual-based data collected over seven years at the Succulent Karoo Research Station in South Africa. Bush Karoo rats construct and maintain stick lodges using dry plant material. These are used as refugia, protecting the animals from the harsh ambient environment (Vermeulen and Nel 1988). Adults live solitary in their lodges and aggression among conspecifics is usually low, in particular between closely related neighboring females (Makuya et al. 2024). Further investigations on ecology, reproduction, behavior and physiology of this small rodent are ongoing at this field site since 2018 (e.g., Agnani et al. 2000; Schradin 2005; Wolhuter et al. 2022; Qiu et al. 2024).

Research questions. We (*i*) aim to investigate seasonal and sex differences in spacing behavior including the timing and possible drivers of male dispersal. Important predictors tested in multifactorial models include population density, age, body mass and features of neighboring conspecifics. Parts of this study will be done by the analysis of existing long-term data, and parts based on data collected by the candidate in the field (details below).

Furthermore (*ii*), using the existing long-term data set, we aim to study how the spatial distribution of paternities within the population, including the potential occurrence of multiple paternities, affects the degree of relatedness

among and within matriline. Therefore, we will explore female natal dispersal via the spatial distribution and distances among stick lodges they inhabit in relation to their matriline. We predict that information on the spatio-temporal paternity distribution will contribute to explain individual-based and population-level changes in kinship patterns among females over space and time.

For the third thesis chapter (iii), the student can develop either a research question focussing on population genetics or on behavioural ecology, depending on the student's preferences.

Data collection and available long-term data. As part of the PhD project, the candidate will collect data on male bush Karoo rat spacing behavior at the Succulent Karoo Research Station in South Africa. Furthermore, the candidate will work in France at the LEEC/Université Sorbonne Paris Nord to analyze our existing long-term data set from this bush Karoo rat population. The data set includes individual-based information on life histories including body masses and space use, and tissue samples for genetic analysis from a large number of males and females during seven years of study.

Methods. In the field, at the Succulent Karoo Research Station in South Africa (<https://www.stripedmouse.com>), the candidate will trap wild bush Karoo rats from our study population and will equip a sufficiently high sample size with mini-GPS transmitters (Makuya and Schradin 2023). Methods of trapping and individual marking are well established at the field station. The candidate will work as part of a team of researchers and students and will also participate in the collection of long-term data.

At the LEEC (<http://leec.univ-paris13.fr>), Université Sorbonne Paris Nord, France, the candidate will assess paternities, maternities and matrilinear relationships via microsatellite markers and by adequate computational techniques in our fully-equipped genetics lab. Furthermore, the candidate will organize the existing long-term data set and will apply methods of multilevel statistical modelling in relation to the different research questions. The candidate will receive proper training and supervision in all methods applied. Dr. Poteaux is an expert of various molecular techniques including parental assessment. Prof. Rödel is an expert in applied statistical modelling of life history and spatial data and in the analysis of long-term data sets.

Candidate. We are seeking a creative, and highly motivated candidate with a Master degree in behavioral sciences (ethology, behavioral ecology) or in a related field, preferably with experience in animal field studies and with some notions or background in molecular techniques. The candidate should be able to work independently as well as part of a team, and to handle wild small mammals. A good knowledge and interest in applied statistics (preferably using R) and in data base management (Excel) will be advantageous. The candidate should have good English communication skills (written and spoken, min. B2); proficiency in French is not a necessary precondition.

References.

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