PhD project submitted to GAIA Doctoral School (Université de Montpellier)

Parasites and dispersal evolution in dynamic landscapes

Current global changes cause massive habitat alteration, destruction and fragmentation, which makes landscapes increasingly dynamic. Predicting the large-scale consequences for biodiversity and species distributions is a major challenge for today's biologists [1–3]. Key to this question is an understanding of the role of dispersal. While it has long been recognized that dispersal is an important determinant of demographic and evolutionary processes, recent work indicates that adaptation to changing landscapes critically depends on evolution of dispersal itself [4–6]

I propose a **PhD project of experimental evolution to investigate the role of dispersal in host-parasite interactions**. Spatial structure and landscape complexity can have a profound impact on the epidemiology and coevolution in such systems [7], and outcomes are likely modulated by rates of dispersal and gene flow [8]. However, we still know very little about dispersal evolution and parasitism.

Building up on classic theory [9], the project investigates how dispersal evolution under variable landscape scenarios (e.g., spatio-temporal variation in local extinction) is affected by the presence of parasites. Conversely, we will test for evolutionary change in the capacity of parasites to modulate the dispersal of infected hosts and thereby their own dispersal. Outcomes are expected to depend on the demographic interplay between local transmission and global dispersal [10], but also on the underlying (and evolving) trade-offs between dispersal traits and interaction traits, such as resistance, infectivity, or virulence. Understanding these relationships can therefore provide novel insights in the evolutionary processes determining the geographic ranges of hosts and their parasites. It breaks new grounds through its focus on dispersal evolution and its potential consequences for the evolution of host resistance or the severity of disease under different landscape scenarios.

The project will investigate these questions through experimental evolution, using interconnected microcosms of the freshwater protozoan *Paramecium caudatum* and bacterial parasites of the genus *Holospora*. In this system, biotic forcing imposed by parasite migration has profound effects on metapopulation stability [11,12] Moreover, there is scope for rapid evolutionary responses, given ample genetic variation in dispersal rates and parasite resistance [1314]; we also know that parasite infection influences host dispersal [15].

We are looking for a highly motivated, creative and autonomous student with a thorough background in evolutionary ecology and interested in understanding the drivers of coevolutionary processes. Even though the focus of the project is on experimental evolution, it also offers the possibility to conduct computer modeling of the system, together with theoreticians in our group (Emanuel Fronhofer) and with external colleagues (Sébastien Lion). It is important that the student has some experience in writing in English and is comfortable interacting in a team (collaborative) environment.

Application procedure: Deadline for applications (via the GAIA website) is May 16, 2018. Applicants will be interviewed by the doctoral school jury in early July 2018. Note that the jury will evaluate the quality of the candidate and not that of the PhD project!

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