PhD project: Phylogeography of the Neotropical soil-feeding termite *Embiratermes neotenicus* (Termitidae, Syntermitinae) in South America

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State of the art

Genetic structures of colonies and populations of social insects are mainly shaped by dispersal strategies of individual species. In the majority of termite species, new colonies are founded by a pair of primary reproductives, which leave the natal nests as flying winged dispersers (alates) during a mass exodus called swarm. Then, male and female alates can meet partners from other swarms by using sex pheromones (Sillam-Dussès 2011) and therefore can establish a new colony as king and queen (Eggleton 2011). They copulate and give birth to immatures individuals (called larvae). Once growing up, these larvae will become workers, which undertake the most labour within the colony, being responsible for foraging, constructing, food storage, and brood and nest maintenance (Eggleton 2011). Some workers can become soldiers which defend their colony against predators, or nymphs which become later alates and fly during a new swarm. Such flights can be synchronized among conspecific nests over distances of several 100 km (Martius 2003). Synchronization is vital for the maintenance of outbreeding, together with sufficient dispersal distance and mechanisms of outbred mate preference (e.g. Shellman-Reeve 2001). Records on dispersal distance most often vary from a few to hundreds of meters, in some cases up to nearly 1 km (Messenger and Mullins 2005; Hu et al. 2007). Molecular studies on population genetic structure generally support the low dispersal by flying alates but these studies are, with rare exceptions, dedicated to subterranean pest species of the Rhinotermitidae family only (Vargo and Husseneder 2009; Vargo and Husseneder 2011).

It was proposed that soil feeders (i.e. termite feeding on soil) were poor passive dispersers over water gaps because their colonies are usually located in the soil and are unlikely to raft over water gaps, contrary to wood feeders frequently drifting in wood pieces (Gathorne-Hardy et al. 2000; Eggleton and Tayasu 2001). Up to date, only two genetic study investigated the dispersal potential of alates in soil feeders in pristine habitats, i.e. Fournier et al. (2016) in *Cavitermes tuberosus* and Fougeyrollas et al. (2018) in *Embiratermes neotenicus* and *Silvestritermes minutus*. In this last publication, we have investigated how mating and dispersal behaviors can shape the genetic structure of *E. neotenicus* at small (< 10 km) and very small (< 300 m) spatial scales only. Therefore, it remains to be investigated at a large scale, i.e. in South America where this species occurs.

Aims of this project

We aim to study population genetics and phylogeography of *Embiratermes neotenicus* in South America. This will allow us:
(1) to determine whether it includes genetically and geographically distinct lineages
(2) to elucidate its demographic history (diversification events)
(3) to infer biogeographic scenarios

Material and methods

Samples from Brazil, Colombia, French Guiana, Suriname, and Ecuador have already been collected and they are enough for this study at large scale. DNA from one soldier per colony will be extracted in order to amplify the standard barcode fragment (i.e. ~650 bp of the cytochrome oxidase I) and to check species type. Fifteen soldiers per colony will be extracted using the DNeasy Blood & Tissue Kit (Qiagen, France) following the manufacturer's recommendations. Then, genotypes of these individuals will be obtained by using 12 microsatellites previously described by in our previous study (Fougeyrollas et al. 2015). Molecular analyses and standard population statistics DNA will be performed by using several programs like Arlequin, Genepop on the web, Relatedness, Structure and Geneland.

Preliminary results and feasibility of the project

Since all the samples have already been collected in all countries needed, the feasibility of this project is very high. Part of the genetic and molecular equipment have been paid by the chaire d'excellence of D. Sillam-Dussès before it ended last October. More equipment will be hopefully bought thanks to the BQR asked this year.