

Sujet de stage Mater 2 Année 2026-2027

Laboratoire : LECA

Intitulé de l'équipe : MEEBIO

Directeur : Wilfried Thuiller

Responsable : Sébastien Lavergne

Nom et qualité du responsable du stage : Jean-Philippe DAVID (DR CNRS)

HDR oui ☒ non ☐

Adresse : Laboratoire d'Ecologie Alpine, bat D biologie, 2233 rue de la piscine, 38400 Saint-Martin d'Hères

Tél : 04 76 82 20 39

email : jean-philippe.david@univ-grenoble-alpes.fr

Chromosomal inversions as drivers of adaptation in the invasive tiger mosquito: from genomic characterisation to fitness impact

Objectives: This Master 2 internship at the Laboratoire d'Ecologie of Grenoble (France) aims at characterizing the phenotypic impact of a large chromosomal inversion identified in the tiger mosquito. This will be achieved by combining experiments in tropical insectaries, genotype-phenotype association studies and genomic analyses.

Abstract: Structural variants such as chromosomal inversions can have a key role in adaptation and fitness. In mosquitoes transmitting human diseases, this may affect biological traits of major public health importance. Our group has identified a large genomic inversion carried by the tiger mosquito *Ae. albopictus* in the Indian Ocean region. This 9 Mb inversion, located on chromosome 2, spans more than 100 genes and acts as a *supergene* due to its reduced recombination with non-inverted haplotypes. Recent findings suggest that this inversion has a strong impact on gene expression and may be related to the adaptation of the mosquito to insecticides (Bacot et al. 2026). A qPCR assay allowing the high throughput genotyping of individual mosquitoes for the inversion was developed. Using this assay individuals of known genotypes were mass crossed to create two mosquito lines: one being homozygous for the inversion and the other being homozygous for the non-inverted haplotype. In this context, this Master2 internship will aim at investigating the adaptive potential of this chromosomal inversion on mosquito fitness and biological traits of public health importance such as insecticide resistance, arbovirus transmission and thermal adaptation. This will be achieved by investigating the fitness value of this locus on mosquito lines carrying or not the inverted locus and by assessing its impact on gene expression from RNA sequencing data. Its evolutionary value will be investigated through experimental evolution across multiple generations under different selection regimes. Finally, additional analyses may include exploiting long reads sequencing data to finely characterizing the genomic architecture of the inverted locus, investigating its evolutionary origin and identifying the genetic drivers of its fitness value.

Methods: Mosquito breeding and phenotyping (insecticide resistance, thermal adaptation, fitness traits). Genotype-based controlled crosses, experimental evolution. Molecular genotyping using quantitative PCR assays. Bioinformatics (gene expression and polymorphism).

References: T Bacot, et al. Metabolic resistance of the tiger mosquito to pyrethroid insecticides in La Réunion Island likely results from local adaptation. *Genome Biology and Evolution*, 18, 2026, evag039, <https://doi.org/10.1093/gbe/evag039>

Expected skills: We are seeking for a highly motivated Master2 student with a strong interest in evolutionary biology and adaptation. Expected knowledges include genetics and population genomics, bioinformatics (basic programming), Statistics (Rstudio) and insect biology and ecology. Expected technical skills include Molecular biology (DNA/RNA extraction, PCR, qPCR) and experimentation on insect models. The candidate should also show good skills in English, scientific writing and oral communication. The candidate should also show a positive open attitude and the human skills necessary to work as a team. The candidate will be supported by experienced technical staff for insect experiments (T Gaude), molecular biology (L Nadalin) and bioinformatics (F Boyer).

Additional information: The Laboratory of Alpine Ecology (LECA, UMR 5553 Grenoble) combines scientific excellence across diverse topics with a friendly atmosphere. This M2 internship will be hosted by the MEEBIO team from January to June 2027 and remunerated in accordance with the applicable rates.

How to apply: Application deadline is 30 October 2026. Send a single pdf file containing CV + motivation letter + contact details of two referees to jean-philippe.david@univ-grenoble-alpes.fr