

Title: Genetic connectivity of two carabid beetles in heterogeneous agricultural landscapes in Brittany and Picardy

Summary: In fragmented landscapes, functional connectivity plays a key role for long-term population viability by allowing the recolonization of habitats which have been emptied by local extinction, augmenting population sizes, reducing inbreeding depression and negative effects of genetic drift. Enhancing structural connectivity through the preservation or restoration of migration corridors is therefore a primary objective in species conservation to maintain functional connectivity of populations. However, the impact of landscape fragmentation on dispersal and gene flow is challenging since it depends on both species- and landscape-specific effects.

This project is part of a multispecies project (\$) which targets European temperate forests. It aims at exploring the relationship between structural and functional connectivity and focuses especially on two carabid species: the forest specialist *Abax parallelepipedus*, a species of interest for biocontrol in agricultural landscape, and the generalist predator *Pterostichus madidus*. Genetic analyses will be conducted across heterogeneous landscapes in time and space. Three hypotheses will be tested - all consider dispersal as a trait coevolving with ecological specialization:

- i. generalists are more dispersive than specialists;
 - ii. whatever the dispersal capacity, dispersal is counter-selected in specialists characterized by high movement cost;
 - iii. whatever the dispersal capacity, dispersal is favored in specialists characterized by low movement cost.
- Populations of *both species* have been sampled in Picardy (Thierache) and in Brittany (ZAA long-term study area) linearly along hedgerows (potential corridors) and within forest patches (main habitat). Next, the analysis of mitochondrial sequences and microsatellite multilocus genotypes will permit to assess the historical component of total genetic variation and quantify dispersal through measures of gene flow between populations. Finally, (i) multivariate and Bayesian clustering methods will be used to detect population genetic structure and potential immigrants between favorable habitats, and (ii) correlative analyses and graph theoretic approaches will be performed to understand genetic connectivity between populations and to investigate the relationship between of landscape quality and genetic structuring.

This project is part of the EU (BiodivERSA) project WOODNET (<https://woodnetweb.wordpress.com/project/>) and the regional (Hauts-de-France) project PEGASE (<https://www.u-picardie.fr/edysan/pegase/>).

Duration: 3 months; starting date (flexible): October 1 to December 31, 2019

Salary : traineeship grant (577,50 euros/month)

Required study level: master in ecology and evolution. Strong interest in population genetics, landscape ecology, evolution and biostatistics are recommended, meaning that a good background in those domains is desired, but not mandatory.

Host Institute: EDYSAN (<https://www.u-picardie.fr/edysan/>) is a mixt research unity of CNRS and Université de Picardie Jules Verne.

Supervisor: Annie Guiller (PR), Ronan Marrec (MC).

Potential candidates should send a CV and cover letter (in English or French) to: annie.guiller@u-picardie.fr, ronan.marrec@u-picardie.fr

References :

1. Marcus T, Assmann T, Durka W, Drees C. 2013. A suite of multiplexed microsatellite loci for the ground beetle *Abax parallelepipedus* (Piller and Mitterpacher, 1783) (Coleoptera, Carabidae). *Conservation Genetics Resources*,5: 1151-1156.
2. Garroway CJ, Bowman J, Carr D, Wilson PJ. 2008. Applications of graph theory to landscape genetics. *Evolutionary Applications*;1: 620-630. doi:10.1111/j.1752-4571.2008.00047.x.
3. Marrotte RR, Bowman J, Brown MGC, Cordes C, Morris KY, Prentice MB, Wilson PJ. 2017. Multi-species genetic connectivity in a terrestrial habitat network. *Movement Ecology*. 5:21. doi.org/10.1186/s40462-017-0112-2.