PhD: Evolution of movement and host searching behaviors in parasitoids of genus *Trichogramma*

Duration: 3 years
Start date: November 2015
Host lab: Institut Sophia Agrobiotech, UMR INRA-CNRS-Université de Nice
                     400 route des Chappes, 06903 Sophia Antipolis
Training school: Ecole Doctorale Sciences de la Vie et de la Santé (85)
Funding: ANR project TriPTIC (100%)
Supervisors: Vincent Calcagno and Ludovic Mailleret
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Project description:

Trichograms are minute parasitoids (<0.5 mm) that lay eggs inside the eggs of other insect species, then develop in the host egg and kill it. As such they are important biocontrol agents used for crop protection worldwide. Their study has long been compromised by their small size, but recent technological innovations have alleviated several limitations. The proposed PhD project consists in taking advantage of recent developments in high-throughput image-analysis techniques (computer-vision, machine-learning) in order to study the behavior of several Trichogram species and populations. Systematic behavioral assays will be conducted using experimental mini-landscapes developed in the host lab. The range of behaviors to be studied will encompass orientation (e.g. phototaxy/geotaxy), movements and decision-making when searching for host eggs, and inter-individual interactions (contests, interference, prezygotic barriers among lineages).

The PhD will be funded by the ANR project TriPTIC (2015-2018). TriPTIC is a collaborative effort to characterize the European diversity of trichograms at the genomic (phylogeny and intra-population variation with NGS RAD-seq techniques), individual, and populational levels. During this project a range of Trichogram species and populations will be sampled from various geographic areas and ecological habitats. They will be characterized molecularly, and reared at the Biological Resource Center on egg parasitoids hosted by UMR ISA at Sophia Antipolis.

The PhD will benefit from this material to conduct his(her) research. The observed strategies and behavioral syndromes will be used to (i) understand their evolutionary dynamics, using the molecular phylogeny developed within TriPTIC, (ii) detect patterns of ecological specialization, by contrasting different ecological compartments (e.g. canopy versus herbaceous stratum) and/or main host species, and (iii) challenge theoretical predictions derived from optimal foraging and movement ecology models. Besides, as the studied traits are thought to be tightly connected to the efficiency of trichograms when released for crop protection, the acquired dataset will help identify species/strains potentially useful as biocontrol agents.

Anticipated collaborations:
   – Institut Pasteur, Paris
   – Institut d'écologie et des sciences de l'environnement, Paris
   – CBGP, Montpellier
   – INRIA Sophia Antipolis-Méditerrannée Center

Skills needed: experimental manipulation of insects in the lab, evolutionary and behavioral ecology, statistical analysis using R. Knowledge of imaging tools such as ImageJ and some inclination to programming will be a bonus.

How to apply: send CV + motivation letter