Priority effect and community assembly among soil entomopathogens

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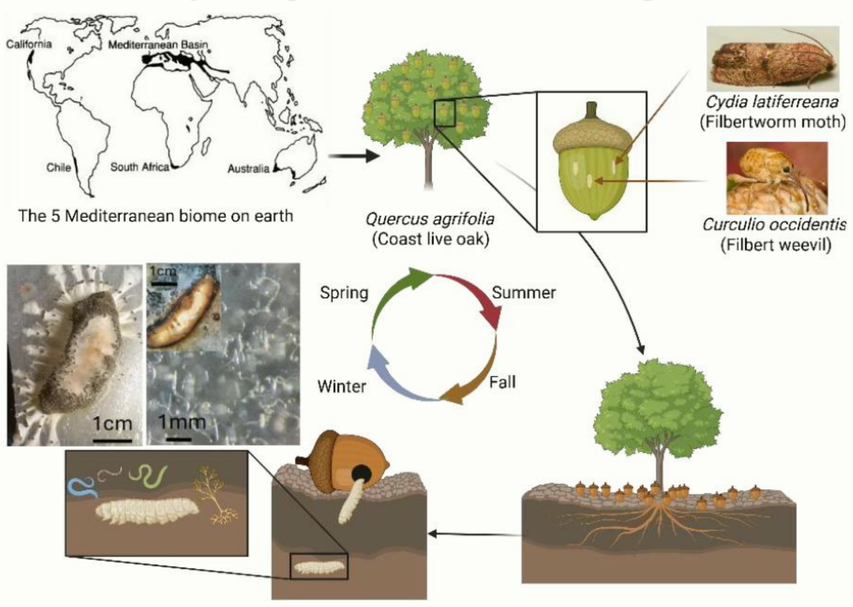
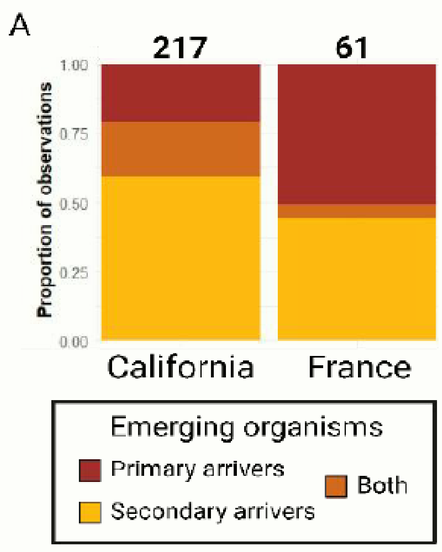
Entomopathogens and acorn feeding insects

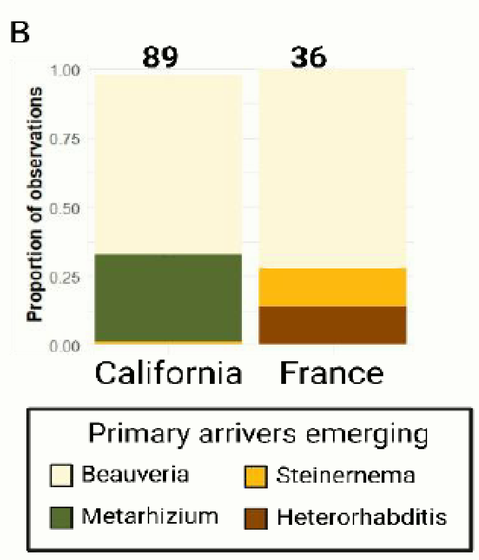


In early winter, insects larvae using acorns fall with them. Then, they dig in soil to pupate and are targeted by entomopathogens.

Nematodes and Fungi are the main organisms using insect larvae



Organisms emerging from insect's cadaver grouped by (A) Primary vs Secondary arrivers, (B) genus inside Primary arrivers' category



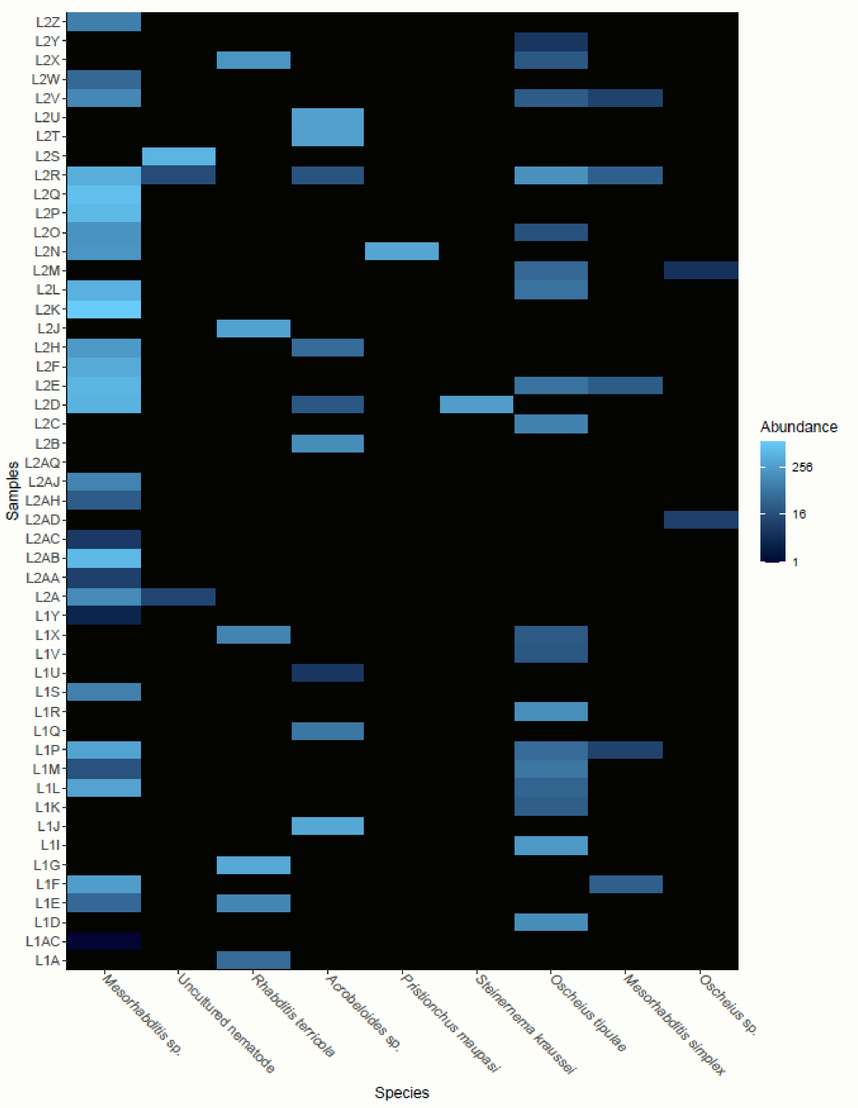
Primary arrivers can kill = entomopathogens
Secondary arrivers cannot = opportunists

Organisms of each category are different between California and France

Preliminary work: Entomopathogen organisms using *Cydia* and *Curculio* larvae feeding on acorn are mainly fungi and nematodes in Mediterranean climate. Our data show that primary arrivers (PA) are in competition with secondary arrivers (SA). If those two categories are conserved among tested Mediterranean climate locations (**A**), the organisms in these categories are different (mostly fungi in the USA, fungi and nematodes in France for the primary arrivers group – (**B**)). Our previous study in California showed that: 1- members of PA group compete by priority effects. 2- nematodes from SA group can outcompete fungi from PA group thanks to bacteria they carry in their microbiota. Those bacteria produce antifungal compounds highly efficient against *Beauveria* and *Metarhizium*.

Internship goal: Characterize the interactions among the organisms detected in south of France to compare them to the results we had in the USA. This work will then be the foundation for a PhD thesis aiming at characterizing in details those interactions in both Mediterranean climates and compare their respective resilience to changes in temperature and soil moisture to better anticipate the effect of climate change on entomopathogen community.

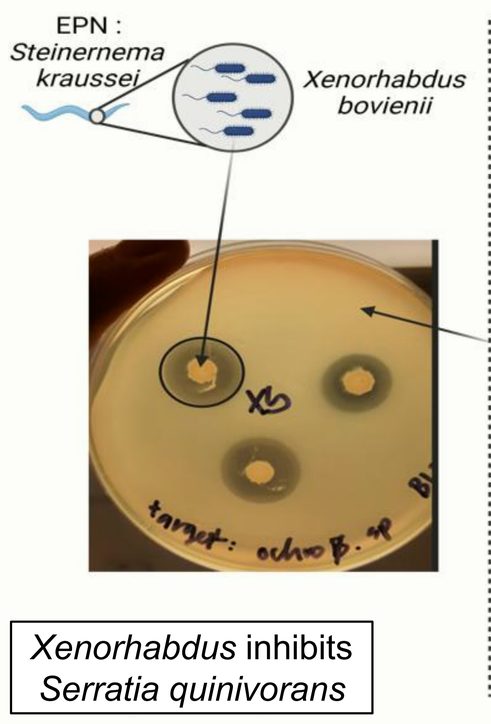
1 – Amplicon sequencing



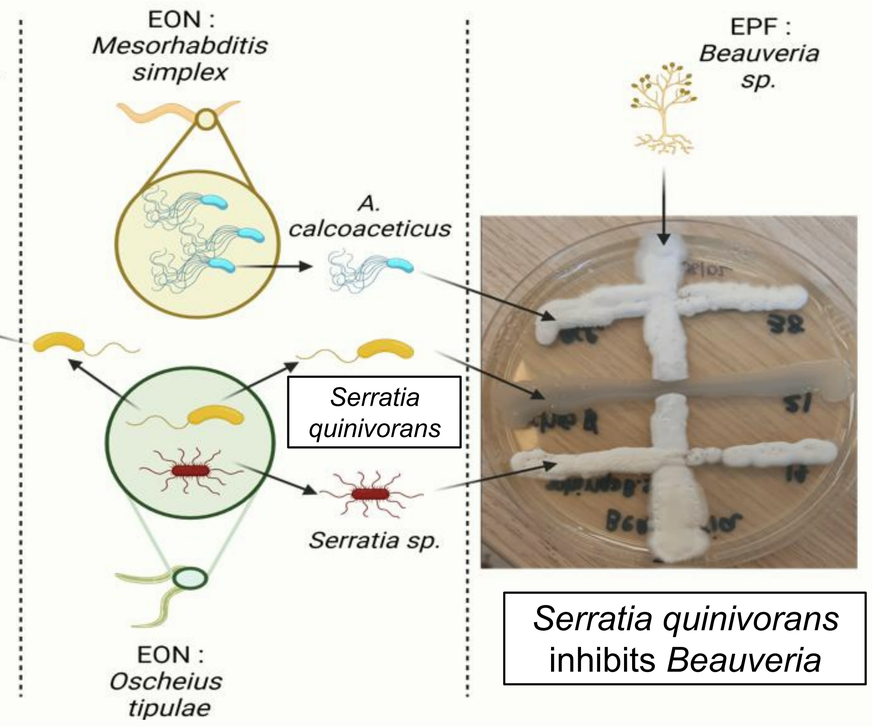
Currently ongoing: The goal is to know what are the nematodes and their associated bacteria. Using this we will then select candidates for step 2.

2 - in vitro competition – Examples below are results from California

Bacteria vs bacteria

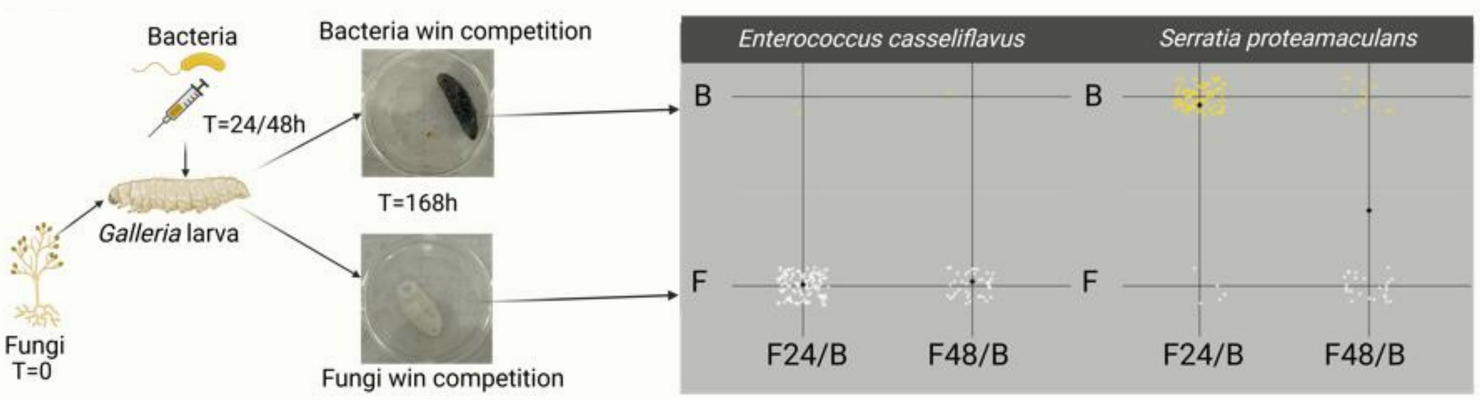


Bacteria vs fungus



Bacteria isolated from nematodes of the SA group will be tested for their ability to compete against other bacteria from PA nematodes or against fungi

3 - in vivo competition – Example from California study



Competition tested and validated in step 2 will then be tested in vivo inside insect larvae to add the context of immune system and host

Skills needed:

- **Curiosity and motivation**
- **Organization**
- **Ability to work in a team**
- **Speaking English fluently** (work with USA)
- **Microbiology/Molecular Microbiology is a +**

No skills are mandatory aside real interest

Take home messages:

- **Soil contains a broad diversity of organisms using insects**
- **They all coexist through a complex network of interaction**
- **Competition in insect cadaver is driven by timing and species-specific interactions**

FRANCE 2030 — INRAE — DGIMI Diversité, Génomes & Interactions Microorganismes Insectes

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