antbook

Don't trust your friends!

ant social network in banana agrosystems

Carval D., Cotte V., Resmond R., Perrin B. and Tixier P.
CIRAD, Banana, Plantain & Pineapple Cropping Systems Research Unit

Ants are a key component of ecosystems, may represent the major part of the animal biomass[1] and are involved in several **ecosystem services** such as pest regulation[2,3]. The understanding of mechanisms involved in **the structuring of local communities** is therefore an important issue in **agroecology**. These mechanisms can be separated into physiological & **ecological factors**[3] (habitat-related factors & ecological interactions). We disentangled here some of the ecological factors that drive the **ant social network**.

Spatially homogeneous banana monoculture.
D. Carval, CIRAD

Solenopsis geminata
Myrmicinae

Monomorium ebeninum
Myrmicinae

Pheidole fallax
Myrmicinae

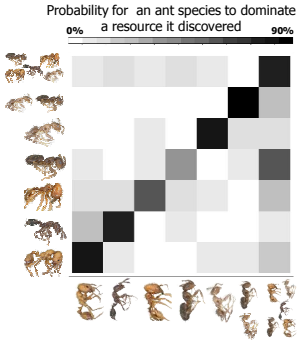
Brachymyrmex patagonicus
Formicinae

Nylanderia guatemalensis
Formicinae

How do ants exploit a **temporary resource** ?

We assessed the ability of ant species to **discover** and **dominate** a resource (baits) at small spatial and temporal scales

Ants do not share their snack... but you can wait for the crumbs !

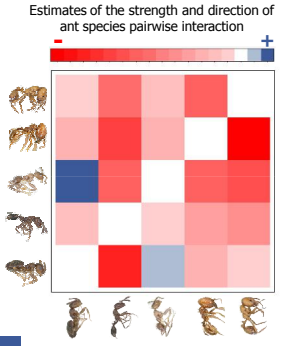


We showed that **discovery** and **dominance** of a resource at a site are positively related rather than linked by a trade-off. These results confirm that the **discovery–dominance trade-off** is **the exception**[4] **rather than the rule**[5]
Each ant species had a **high probability to stay and dominate** a resource which it discovered When dominance of resource is lost by a species, we generally observed that no other ant species dominated the resource. Instead, several species shared the resource simultaneously
Nylanderia guatemalensis seems to **have the lowest ability to discover and dominate** the resource but may take advantage of non-dominated sites

Is there an **exploitative** or **interference** competition ?

Through data of abundances at sites, we assessed the **nature of interactions** between ant species

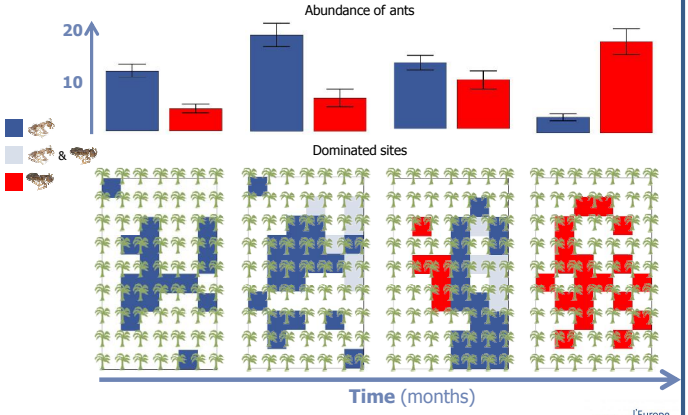
You have **1 friend** request on antbook



We found that **interspecific interactions** are **mainly negative**, which reflects the importance of **interference competition** in ant communities
But, 2 species, ***Nylanderia guatemalensis*** and ***Brachymyrmex patagonicus*** displayed **positive interactions** during the exploitation of the temporary resource at sites

Do local interactions at the **small temporal scale** reflect the outcome of **assemblage of ant community** at a **higher temporal scale** ?

Remove *Nylanderia guatemalensis* as a friend ?



At a longer term, ***N. guatemalensis*** **lost the dominance of sites**, principally **to the benefit of *B. patagonicus***, which has **taken 10 sites** previously dominated by *N. guatalemensis*

Our results suggest that **exploitative competition** occurs between these 2 species and that the **positive interactions** at small temporal scale **do not reflect** the outcome of **ant community assemblage**

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References : [1]Hölldobler & Wilson 1990; [2]Perfecto & Vandermeer 2006; [3]Philpott & Armbrecht 2006; [4]Parr & Gibb 2012; [5]Perfecto & Vandermeer 2011
Credits of ant photos : AntWeb (http://www.antweb.org/) ; F. Blard; M. Deyrup; J. Longino; B. Garcete;

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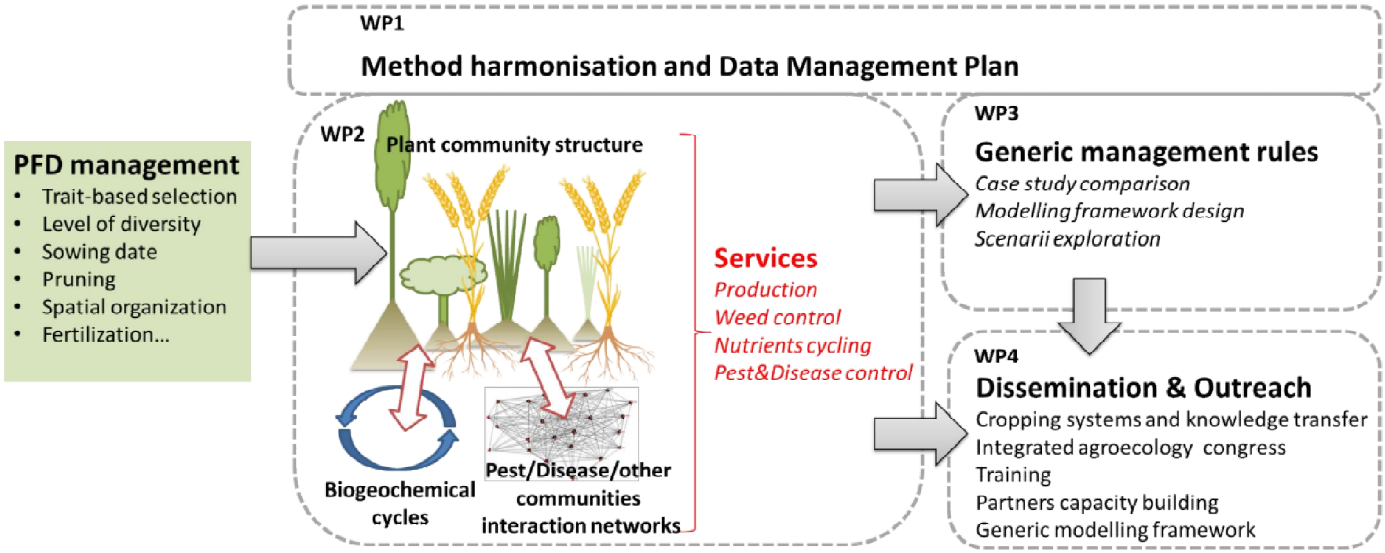
The banana pest team

Agroecology & modelling

To disentangle the functionning of agroecosystems to identify ecosystemic services

Plant Functional Diversity (PFD) in agroecosystems provides and promotes important services to humanity such as durable food, fiber, and energy production, pollination, biological control, and nutrient cycling. There is currently a huge lack of integrated research for providing a **systemic approach**, based on **ecological and biophysical processes**, to manage PFD at the **field scale to orient these processes** towards ecologically intensive systems.



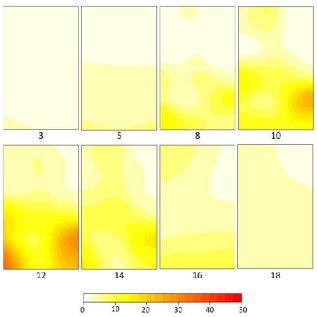
Toolbox: arthropod communities, trophic network, spatial & behavioural ecology

We use field data (abundances, presence/absence) isotopic approach and molecular methods to identify trophic links and define the structure of trophic networks.
For instance, we evidenced with Next Generation Sequencing method that *Euborellia caraibea* (Dermaptera) and the ants *Solenopsis geminata* and *Camponotus sexguttatus* are predators of the banana best *Cosmopolitis sordidus* (Mollot et al 2014). Recently, we demonstrated how intercropping influenced ant abundance and pest damage in plantain fields (Dassou et al 2015). **We invite you to have a glance to the poster of Anicet Dassou during the BSE-FSE congress!**

We use spatial ecology, radiotracking or capture-mark-recapture methods to understand the mechanisms acting on the dispersal and the movements of pest (thrips, weevil) or predators (dermaptera, ants, aranea).

The banana weevil (Cosmopolites sordidus) was the first crawling insect to be set up with a radio frequency identification (RFID) tag to track its movements. The information was used to inform the placement of pheromone traps in banana fields (Vinatier et al 2010).

Spatiotemporal population dynamics of *Elixothrips brevisetis* on banana suckers. Each panel represents the study site in a banana plantation in French West Indies. Panels correspond to eight observation dates (from week 3 to week 18) as indicated. The colour scale indicates the number of observed adult thrips. Note that thrips abundance increased from week 3 to 10, peaked on week 12 and then declined (Carval et al 2014)



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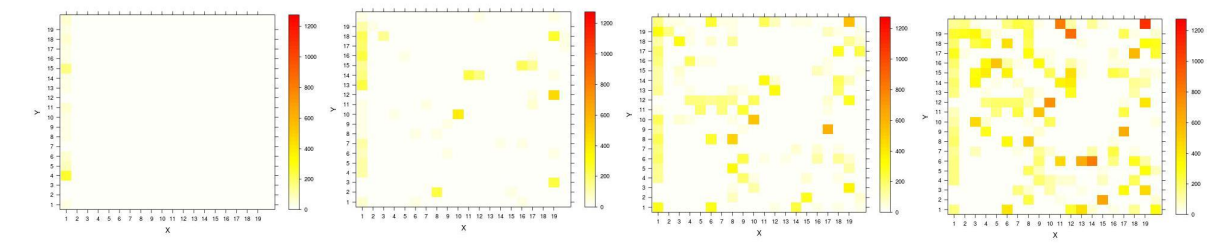
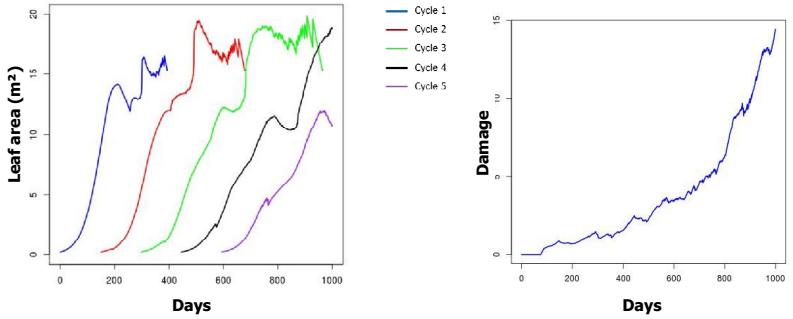
Modelling of the agroecosytems using individual-based models

We use the results of lab or field experiments to design **individual-based models (IBMs)**, which enable to simulate different scenarios based on innovative agricultural practices.
For instance, IBMs of dispersal of *C. sordidus* are combined with banana crop model (Tixier et al 2004, 2006) to assess the damage caused by the pest.



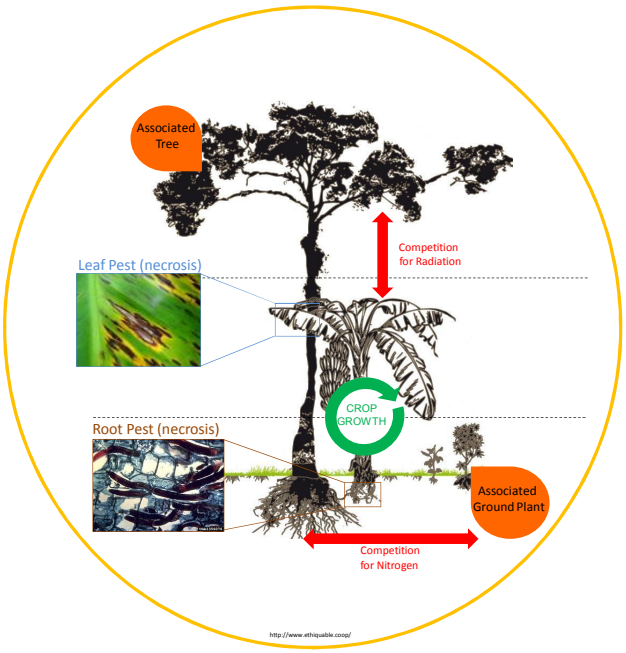


Colonization of a banana field by *C. sordidus*. The four lattice graphics (above) display how the banana weevil spread in the crop. The 2 line graphics (aside) display the crop growth and damage caused by the banana weevil (Cotte & Carval 2013).

Multipest approach : theoretical & experimental studies

We are interested in the ecological intensification of agrosystems. We study the multipest and damage regulations that provide agroecosystems ranging from monoculture to agroforestry. Our studies are realized in Martinique, Costa Rica and Cameroun.

Particularly, we aim to identify and quantify the ecosystemic services that could compensate the competition for resources (light, water, …) in ecologically intensified agrosystems. **We invite you to have a glance to the poster of Charlotte Poeydebat during the BSE-FSE congress!**



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Agroecology & modelling

Contact us !

Dr Philippe Tixier, Head of Banana Pest Team, CATIE, Turrialba, COSTA RICA – philippe.tixier@cirad.fr

Dr Dominique Carval, Multipest & Generalist Predators, CAEC, Le Lamentin, MARTINIQUE – dominique.carval@cirad.fr

Dr Anicet Dassou, Pest & Generalist Predators, CARBAP, Njombé, CAMEROUN – anicet.dassou@cirad.fr

Charlotte Poeydebat (Phd Student), Multipest Regulation, CAEC, Le Lamentin, MARTINIQUE – charlotte.poeydebat@cirad.fr

Rapahël Achard, Weeds & Cropping Systems, CAEC, Le Lamentin, MARTINIQUE – raphael.achard@cirad.fr

Dr Jean-Michel Risède, Head of Banana, Plantain & Pineapple Research Unit, Montpellier, FRANCE – risede@cirad.fr

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