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UR0406

Bees and the Environment research department

Mission and objectives

Bee resilience in the Anthropocene age

The weakening of honey bee colonies and the erosion of wild bee populations and diversity are closely linked to global changes, that include intensifying agriculture, simplifying landscapes and diminishing natural habitats, along with the spread of pathogens and invasive species, and climate change.

The Bees and Environment research department aims to advance current knowledge and promote innovative, research-based solutions in the protection of honey bees and the conservation of wild bees within the new concept of the Anthropocene age.

The research program is founded on our multidisciplinary expertise in ecology, toxicology, physiology and behavioral biology, with the scope of studies ranging from genetic to landscape.

Management

Michael Henry, director
Fanny Mondet, deputy director

Research themes

- Bee biology: physiology, neurobiology, behaviour
- Bee health: pathology, toxicology, nutrition
- Bees and land management: agro-ecology, integrated pollination, conservation

In brief

- 13 research engineers and scientists
- 6 research assistants
- 6 technical and administrative support staff
- 6-8 PhD students, post-doctoral and contract researchers
- 20-25 student interns and seasonal workers



(1) Bumblebee *Bombus pascuorum*. (2) Parasitic mite *Varroa destructor* on honey bee pupa. (3) Workers' retinue behaviour around the queen.

Research

Three research axes:

- **Bee biology:** Deepening our understanding of the physiology and behavior of honey bees;
- **Bee health:** Evaluating risks and favoring the resilience of bee populations subjected to environmental pressures (bio-aggressors, pollutants, resource changes);
- **Bees and land management:** Creating and testing agro-ecological and integrated pollination practices that reconcile the needs of beekeeping, agriculture and wild pollinator conservation.

Three main domains of expertise:

- **Pathology:** Evaluation of the impacts of bio-aggressors (microbiology, virology, epidemiology, parasitology);
- **Environmental Toxicology:** Effects and modes of action of human- and agricultural-derived pollutants (toxicology, physiology, neurobiology);
- **Pollination and Ecology:** Plant-bee interactions that relate to pollination services, quality of plant production and biodiversity maintenance (behavioral and spatial ecology, plant biology).



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Provence-Alpes-Côte d'Azur



Domaine Saint-Paul - Site Agroparc
228, route de l'Aérodrome - CS 40509
84914 Avignon Cedex 9 - France
Phone: +33 (0)4 32 72 26 10
<https://www6.paca.inrae.fr/abeilles-et-environnement>



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Experimental equipment and techniques:

- Technical platforms in molecular biology, biochemistry and cellular biology, chemical ecology, histology and neurophysiology (electrophysiology and cellular imaging), and pollen analysis;
- Experimental apiaries in several locations, including an indoor apiary, rearing facilities in laboratory and semi-controlled environments;
- Real-time automated systems to survey foraging behaviour and colony dynamics (optical bee counters, RFID microchips);
- Modeling tools of colony demographic dynamics
- Digital video monitoring of foraging behavior and analysis of stigmatic pollen loads;
- Reference collection of wild bees (close to 80 000 specimens and 640 species);
- Citizen science efforts.

Collaboration and expertise

- UMT PrADE, a multi-approach research and development partnership located in our department, aims to accompany the transition of beekeeping and pollinating service systems in the face of global and socio-economic changes (climate, evolution of agriculture and landscapes, biological invasion risks). For better communication and collaboration, UMT PrADE regroups the following partners:
 - Multiple INRAE departments: Bees and Environment, Bee, Landscape, Interactions and Crop Systems Genetic Physiology and Livestock Farming Systems; Animal Genetics and Integrative Biology
 - CNRS: the Center for Biological Studies in Chizé, France
 - ANSES: the Bee Pathology Department
 - Professional development organisations of the beekeeping sector including:
 - Technical and Research Institute of Beekeeping and Pollination (ITSAP-Institut de l'abeille)
 - Association for the Development of Beekeeping in Provence (ADAPI)
 - Association for Apicultural Development in Occitanie (ADA Occitanie)
 - Association for the Development of Beekeeping in Nouvelle-Aquitaine (ADANA)
 - Professional development organisations in agriculture including:
 - Technical Institute of the Oil and Vegetal Protein and Hemp Sectors (Terres Inovia) and the National Association of Oleaginous Seed Growers (ANAMSO)
- Numerous expert actions in biotechnology, toxicology and agronomy (ANSES, FAO, OCDE, CRITT, HCB);
- Publication of an international scientific journal (Apidologie).



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