**Ecological and genetic analyses of two invading bark beetles in Mediterranean ecosystems and development of control methods.**

**Background**: In September 2016, major attacks of two invasive bark beetles, *Xylosandrus compactus* and *Xylosandrus crassiusculus*, were discovered in the Circeo Italian National Park. Both species are already invasive on the African and American continents and seem very polyphagous. These insects dig galleries in young branches (*X. compactus*) or trunks (*X. crassiusculus*), and are associated with symbiotic fungi. They cause a general decline of the attacked plants, and a global desiccation of the Mediterranean maquis could occur, as was observed on the 13 hectares of the park of Circeo. In Europe, *X. compactus* is now present in several Italian regions as well as in St Tropez, St Jean Cap Ferrat and Antibes in France, while *X. crassiusculus* has been detected in northern Italy, in southeast of France and in the region of Valencia in Spain. The high level of damage in the Circeo Park, the rapid expansion of both beetles along the Tyrrhenian coast and the vulnerability of many species of evergreen scrub have led scientists to set up a European project to (i) study the expansion pathways of both species, (ii) characterize biotic interactions (plant-insect and insect-fungal associations) and (iii) experiment containment or eradication methods at local scale.

**PhD description**: The PhD will focus on invasion pathways through ecological approaches (trapping, characterization of biotic interactions), genetic studies (tracing the invasion routes using molecular markers), and species distribution modeling (SDM). The PhD objectives will also include the development of risk assessment tools and will include a component in applied entomology (trapping, monitoring, and outreach).

The PhD is funded by the European LIFE project "SAMFIX: SAving Mediterranean Forests from Invasions of *Xylosandrus* beetles and associated pathogenic fungi" which aims (i) to establish effective protocols for prevention, early detection and control, (ii) to eradicate or contain current infestations and (iii) to prevent future expansions. The dissemination of knowledge to local organizations, park managers, and experts involved in the control of invasive alien species, will also be a main objective of the project.

Most of the PhD work will take place in Orléans (France) with field trips in southern France and stays in Montpellier for genetic analysis.

**Supervision**:

PhD supervisor: Marie-Anne Auger-Rozenberg, INRA URZF Orléans (<https://www6.val-de-loire.inra.fr/urzf/Les-personnes/Personnels-permanents/AUGER-ROZENBERG-Marie-Anne>)

Co-supervisor: Carole Kerdelhué, INRA CBGP Montpellier (<https://www6.montpellier.inra.fr/cbgp/Personnel/Personnel-permanent/Kerdelhue>)

**Schedule and selection process:** This PhD will run from November 2018 to October 2021.

Before July 20th, candidates must send to M.-A. Auger-Rozenberg (marie-anne.auger-rozenberg@inra.fr) and C. Kerdelhué (carole.kerdelhue@inra.fr) a CV and a letter of motivation describing their skills, interests and expectations for this PhD, and indicating the contact details of people who can recommend them. After a pre-selection phase, candidates will be auditioned by Skype the first week of September.

The candidate must have a Master's degree in biology of organisms or equivalent and a general education in ecology and population genetics. The candidate will have an important motivation for interdisciplinarity and teamwork, field work, as well as good writing skills. He / she will also participate in the scientific events and communication towards the partners involved in the project (dissemination of results to local authorities, general public, citizen science ...), and must have a good English and French level. Autonomy, organizational skills and methodological rigor are essential. Driving licence is required.

**Information on the laboratories involved in the supervision**

The URZF is a research unit focusing on the responses of forest insect populations to anthropic and climatic changes with specific emphasis on range expansion of forest pests, either invasive or native, and on the development of tools for a better pest control by forest managers. More information: <https://www6.val-de-loire.inra.fr/urzf>

The CBGP, Center for Biology for Population Management, develops research in systematics, genetics, ecology and evolution of populations and communities of forest and agricultural pests. The goal of the CBGP is to characterize the diversity of these organisms, to understand populations structure and to predict their evolution in a context of global changes. The CBGP conducts academic-type research that can lead to decision support tools for pest management. More information: <https://www6.montpellier.inra.fr/cbgp/>

For any further information before application, do not hesitate to contact the supervisors (M.-A. Auger-Rozenberg (marie-anne.auger-rozenberg@inra.fr) and C. Kerdelhué (carole.kerdelhue@inra.fr)