Job offer: postdoctoral Fellow

**Project Title:** QUANTICONTROL - Quantifying the ecosystem service of pest biological control

**Research Fields:** Insect crop pests, pest-predator population dynamics, Bayesian hierarchical modelling, decision support tool

**Work Place:** Agrocampus Ouest, Rennes - France

**Research Laboratories:** IGEPP research unit - Institute for Genetics, Environment and Plant Protection & BAGAP research unit - Biodiversity, Agroecology and Landscape Management

**UBL Research Department:** Agro-ecosystem and Food & Environment, Universe, Earth, Ecology, Society

**Heads of the Scientific Project:** Dr Y. TRICAULT (Agrocampus Ouest, IGEPP research unit), Dr S. AVIRON (INRA, BAGAP research unit), Dr S. POGGI (INRA, IGEPP research unit) and Prof. Dr M. PLANTEGENEST (Agrocampus Ouest, IGEPP research unit)

**Offer type:** postdoctoral researcher (short-term contract, 12 months, possibly once renewable)

**Hiring Institution:** AGROCAMPUS OUEST

**Application deadline:** 18 January 2019

**Job Starting Date:** 01 March 2019

**Environment**

Established in the heart of Europe’s leading agricultural and agri-food area, AGROCAMPUS OUEST is an elite public university-level college, for life and environmental sciences and technologies. Offering an impressive potential for training and research in areas ranging from food production to landscape architecture, AGROCAMPUS OUEST has a triple vocation: (1) training its 1900 students (Master, MSc in Engineering, PhD) to a high scientific level in life sciences, (2) conducting academic and applied research based on the sustainable development of resources and territories, in close partnership with national and international research organizations, and (3) transferring knowledge to the socio-economic sector.

**Scientific context**

The postdoctoral project is supported by 2 research units. IGEPP combines academic and applied approaches from genes to agroecosystems, with the final purpose of reducing pesticides. At field to landscape scales, researches are conducted on the functioning of communities in interactions within agroecosystems in order to support the design of new plant protection and crop systems for sustainable agriculture. The challenge of BAGAP research unit is to promote landscape multifunctionality through a diversity of functions (agricultural production, biological control of crop pests, pollination, and maintenance of both rare and common biodiversity) by developing a landscape agroecological approach. Both research units
share expertise in landscape and community ecology, and agricultural sciences, as well as combined approaches from fieldwork to modelling and data analysis.

During the past years, a large part of our research was dedicated to the ecosystem service of biological control, with insect crop pests and their natural enemies as main objects of study. New insights were gained on processes and factors at play in pest regulation, including trophic interactions and networks (Derocles et al., 2014), landscape components (Puech et al., 2015; Aviron et al. 2018; Djoudi et al., 2018), spatio-temporal population dynamics (Bellot et al., 2018), as well as farming practices and systems (Puech et al., 2014; Puech et al., 2015; Djoudi et al., 2018). Habitat management strategies were also tested in grower fields (Albert et al., 2017; Pollier et al., in press). Despite the large number of similar studies published worldwide, conducted in a diversity of agricultural contexts, natural pest control resulting from complex interactions remains hardly predictable. For example, Karp et al. (2018) recently analysed the largest pest-control database, encompassing 132 studies, and concluded in the absence of a general trend between the amount of natural habitats around fields and the level of pest control observed inside fields.

However, we hypothesize that classic measurements of pest regulation might be inappropriate or seriously biased. Although regulation is a dynamic process, it is usually inferred by static variables such as seasonal counts of pests and natural enemies in the field or by experimentally exposing preys to predation (e.g. predation cards). We propose to test a new measurement method, using pest-predator time series for modelling the effects of natural enemies on estimated rate of pest population growth. If successful, this approach can open new avenues for the development of agroecological strategies of crop protection. Indeed, agricultural professionals (e.g. advisory services) working on evaluating and developing innovative cropping systems lack decision-support tools enabling a robust evaluation of pest control from field-collected data. Hence, this ecosystem service is rarely taken into account in crop protection strategies. Our project may help in filling this gap.

**Mission (scientific project)**

The scientific project will take advantage of the available datasets held by research teams. These datasets come from previous projects on natural pest control and include time series of insect pests and natural enemies’ abundances. Different crops were studied (e.g. cereals, oilseed rape, apple orchards) together with their own pests. As aphids were always targeted, they will receive special attention in this study.

The main objective of the project is to conduct a statistical modelling approach on the available datasets. Parameter estimates of a prey-predator population model will be obtained using Bayesian hierarchical modelling. The population model links the rate of pest population growth with the observed densities of different types of natural enemies (e.g. carabids, spiders, parasitoids). This proof-of-concept work should provide an improved way to quantify pest control from field data. The modelling approach should allow more specific questions to be addressed. Firstly, the relative contribution of different natural enemy types to pest control could be compared in different agricultural contexts. Secondly, the Bayesian framework would enable to work on nested spatial scales and identify appropriate scales for activity-density measurements of natural enemies. Hence, the proposed framework will allow testing how predator traits such as dispersal capacity or diet specialization relate to pest control and spatial scales. Depending on how the program advances, modelling of natural pest control could also
be used to revisit factors effects from available datasets comprising factor measurements (e.g. landscapes components, agricultural practices).

The modelling work will form the basis to initiate the work of transferring knowledge to the socio-economic sector. An index measuring biological control intensity at field scale will be developed. Index calculation will be based on field data acquisition (e.g. insect counts at appropriate scales). Methods and protocols will be proposed to and discussed with partners from agricultural cooperatives. This will prefigure the development of decision-support tools for integrating the ecosystem service of biological control into agro ecological systems.

**Required Profile**

Doctor (PhD) in Ecology or Agricultural Sciences or Data Analysis-Applied Statistics, maximum 3 years of experience after thesis defense\(^1\). An international experience in research is required (during or after Doctorate). Candidates must not have carried out their PhD in the hiring institution and not previously worked in the host research units.

The successful candidate will have a high degree of expertise in Data Analysis, ideally with experience relating to statistical modelling in a Bayesian framework. She/he will know the principles of population dynamics. Together with good skills in data management, she/he should display abilities for teamwork and for interacting effectively with databases stakeholders. A previous experience in the field of crop protection, landscape ecology or an agricultural background is welcome. Finally, strong communication skills are required as scientific contributions will be prepared in the course of the research project.

**Usefull References**


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\(^{1}\) The thesis defense must have taken place after 31/08/2015, except where special derogation was granted. Periods of sickness, maternity or parental leave shall not be counted in this 3 years period.

Pollier A., Tricault Y., Plantegenest M. and Bischoff A. (in press) Sowing of margin strips rich in floral resources improves herbivore control in adjacent crop fields. *Agricultural and Forest Entomology*


How to apply?

Please send the following documents by email to:

yann.tricault@agrocampus-ouest.fr, stephanie.aviron@inra.fr, sylvain.poggi@inra.fr, manuel.plantegenest@agrocampus-ouest.fr

- Short Curriculum Vitae and a covering letter showing your interest and especially addressing your professional project
- A list of your major works (2 pages max.): scientific publications, patents and others scientific productions
- Letter(s) of recommendation
- A copy of your PhD diploma

The selection procedure\(^2\) conforms with ‘The European Charter & Code for Researchers’ and includes a pre-selection step then an audition for pre-selected candidates. The selection committee comprises 2 heads of the scientific project, a R&D manager from an agricultural cooperative (representing a funding organisation) and an external scientist (representing the other funding organisation). Pre-selection depends on scientific quality in line with the proposal, according to the documents provided by candidates. During the audition, juries are invited to integrate into their criteria the candidates’ professional projects and their prospects of sustainable integration in the territory of the *Université Bretagne Loire*, in higher education and research or in other R&D sectors within the companies on the territory.

Recruitment schedule:

1) Deadline for the submission of applications on Friday 18 January 2019
2) Information to pre-selected and non-selected candidates on Wednesday 23 January 2019
3) Auditions of pre-selected candidates (by videoconference if needed) between Monday 28 and Thursday 31 January 2019
4) Information to selected and non-selected candidates on Wednesday 01 February 2019

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\(^2\) For doctors graduated from a French establishment, a link to the thesis notice in the [SUDOC Catalogue](https://www.sudoc.fr) or the French official portal [Theses.fr](https://theses.fr) is sufficient.

\(^3\) The general selection process is described here: [https://u-bretagneloire.fr/dossiers/postdoc/candidatures](https://u-bretagneloire.fr/dossiers/postdoc/candidatures)
Further information

Annual Gross Salary: 42.6 k€

This Fellowship is jointly funded by Université Bretagne Loire and “Chaire AEI”.

The Université Bretagne Loire federates 7 universities, 15 "grandes écoles" and 5 research organizations in the West of France (Bretagne and Pays de la Loire). This community of universities and institutions aims to develop the scientific and academic potential of this territory at national and international level.

The Chaire AEI (Ecologically Intensive Agriculture) brings together academic and private partners who share a common interest in developing and promoting more economically efficient and environmentally sound agricultural systems. Based in the West of France, the Chaire involves 3 large agricultural cooperatives (AGRIAL, TERRENA and TRISKALIA), 3 higher education and research institutions (AGROCAMPUS OUEST, ESA, ONIRIS) and INRA (French National Institute for Agricultural Research).