European Network for the durable exploitation of crop protection strategies

IA3 Activity: *Human resource exchange*

ENDURE - Internal Mobility

Final activity report

(This form has to be completed and sent to the activity leader – the message should be sent to his p.a. elisa.scanzi@ibaf.cnr.it – within 15 days of the end of the visit)

Topic of the visit
Spatial distribution of codling moth within orchard

1. Information about researcher and sending partner

Name and surname: Daniel Casado González

Professional status: *(PhD student, post-doc, junior or senior scientist)*
Post-doc

Sending partner:
Universitat de Lleida (University of Lleida)

Institute/Department/Research Unit:
Producció Vegetal i Ciència Forestal (Department of Crop and Forest Sciences)

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*Supervisor information only for PhD student, post-doc and junior researchers

2. Information about hosting partner

Hosting partner:
INRA-Avignon

Institute/Department/Research Unit:
Plant et Systèmes de Culture Horticoles

Address: *(street, postal code, city)*
site Agroparc, F-84914 Avignon cedex 9, France

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Supervisor phone number*:
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***** For senior scientist indicate the name of the collaborating colleague

3. Information about the visit

Duration: *(number of weeks or months)*
3 months

Start date:
7 January 2008

End date:
3 April 2008

4. Description of the activities and outcomes

Background and context: *maximum 10 lines*

There is an increasing interest on the spatial distribution of pests at landscape level, as well as on the study of the factors that influence it. *Cydia pomonella* is a key pest of pome fruits in almost all pome fruit production areas. During the seasons of 2006 and 2007, Dr. Claire Lavigne's group at INRA-Avignon have sampled *C. pomonella* larvae and their parasitoids in more than 80 apple and pear orchards in the Vallée de Durance, in South-eastern France. These samples were made by placing corrugated cardboards on tree trunks, which were georeferenced. On the other hand, the landscape was also georeferenced, including hedgerows, crop distribution, urban areas, roads and paths, and many other landscape elements. Special attention was paid to hedgerows, which were not only georeferenced, but also described regarding to their height, thickness and composition.

Objective: *maximum 10 lines*

The main objective of the stay was to advance in the analysis of the spatial distribution of *C. pomonella*, and their larval parasitoids, distribution within orchards, and the factors that can influence it.

Activities carried out: *maximum 20 lines*

All the activities carried out during the stay were related to the data processing and analysis. The first step was to get familiarized with the GIS software and the possibilities that it gives. I learnt the use of this software both to introduce and to manage data. A series of parameters that were considered *a priori* as factors influencing larval distribution were calculated: distances to the closest hedgerow; density of abandoned, organic or conventional managed orchards, distance to isolated hosts; and others.
Data analysis was decided to be started by checking the existence or not of aggregation. This analysis was done by the construction of both a map of sampling density and capture density for each orchard. These maps were constructed by means of a 2 x 2 m grid and a smoothing function. An important part of time was dedicated to understand how the smoothing parameter in this function influenced the obtained maps and in consequence the outcoming of the statistical analysis. Finally, both maps were compared through the Hellinger's distance, which tests if 2 density maps are distributed in the same way.
A few simulations were also run to compare our method analysis with SADIE, which is very often used to study aggregation. SADIE works on distance to the uniform and the completely aggregated distributions, and it does not directly involve sampling distribution.
Finally, a similar algorithm was used to compare *C. pomonella* larval and parasitoid densities.
I will keep in touch with my hosting group to further study the influence of landscape features on *C. pomonella* distribution, and differences between SADIE and our method. We expect to later write a scientific manuscript.

5. Links between visit activity and ENDURE

Describe links and relevance of your visit in relation to a specific ENDURE activity(ies) and sub-activity(ies) – maximum 15 lines

My activity in the INRA-Avignon is related with several ENDURE sub-activities. From my point of view it has been an important training for me as a junior researcher, and in this way it can clearly match with SA1 'Joint training and education programmes'. On the other hand, the topic of my activity is related with RA1.2 'Pomefruit CS', RA2.5 'Orchard System Study', RA2.3 'Exploitation of Landscape and Community Ecology'. Both UdL and INRA-Avignon are involved in these activities.
The relevance for SA1 is related to the training and education of junior scientist, as I finished my PhD last year, and I consider that I am still under formation as a future researcher. The Pomefruit CS was focused on two diseases and *C. pomonella*, which is the most important pest of these crops worldwide. Important information has been collected about *C. pomonella* control through Europe, and a necessity of taking into account wider areas for decision making has been pointed out. In this way, in the coming soon RA2.5 aspects of landscape distribution and area-wide management of *C. pomonella* will be studied and discussed. Finally, in RA2.3 those aspects will be also dealt.
I also consider that my stay will strengthen the relationship between my group in UdL and INRA-Avignon.

6. Impact

Added value for the researcher: *maximum 10 lines*

My stay in Avignon allowed me to introduce on spatial analysis of pest distributions. Previously I had not expertise at all in this kind of experiments. During my stay I have learnt important concepts of experiment design, data handling, and data analysis in this field.
On the other hand, the stay has allowed me to establish relationships with other researchers that work on the same pests and crops than I do. These relationships are not only useful to enrich my know ledges and training, and to see new approaches and points of view, but also they will facilitate future cooperations.
Finally, I had the opportunity of improving my French level, what can facilitate my interactions with other researchers and stakeholders, especially in Europe.

Added value for sending partner and hosting partner: *maximum 10 lines*
The research group of the University of Lleida (sending partner) has been working on the study of the spatial distribution of pests using a different approach; the use of Geostatistics. The knowledge acquired by Dr. Casado is then complementary and will be of help for further development of our data analysis.
On the other hand, the group at INRA-Avignon has benefit from the expertise of Dr. Casado in *C. pomonella* topics. He also gave a different point of view and some good ideas for the analysis of data, and the parameters to be considered as distribution-influencing.

Date of submission

April 18th, 2008

endure
diversifying crop protection

Dr. Maurizio Sattin
IA3 activity leader

Approved