OECD CALL FOR CO-OPERATIVE RESEARCH PROGRAMME

Summary Report

Beneficiary: Andrea Battisti

Theme II: Managing risks in a connected world

Title of the project: Processionary moths and global change: an increased risk for agriculture and forestry

Host institution: School of Biological Sciences, The University of Queensland, Brisbane, Australia, 4072

Host collaborator: Myron P. Zalucki

Dates: from 28 March 2017 to 10 June 2017, 11 weeks

Consent: I am happy that my report is posted on the Co-operative Research Programme's website

1. Objectives (from the proposal)

The general objective was to share the information that has been accumulated so far in an independent way on the urticating systems of lepidopterans defoliating trees and causing health problems to domesticated animals and humans. Because of the different nature of the species involved and their habitats, the information is complementary and should make the study fruitful and widely applicable to OECD countries and through Africa and Asia.

Specific objectives were:
1.1. To compare the two best known species for their urticating systems and impacts on humans and domesticated animals; in Australia (bag-shelter moth) and in Europe (pine processionary moth).
1.2. To assess how much past and current global change can affect the spread and the life history of the model species, and to anticipate the effects of future scenarios.
1.3. To provide stakeholders of both continents with diagnostic tools based on symptom recognition, and from immunologic assays available for the European species.
1.4. To extend the knowledge available for the two model species to other species of the same group, both in Australia and Europe, that have been neglected so far.
1.5. To disseminate updated information about the risks associated with these species to farmers, foresters, veterinary and medical doctors, and to the general public.

2. Achievement of the objectives

The general objective has been achieved through a fruitful, reciprocal exchange of the knowledge accumulated so far in Europe and in Australia on the relevant model species. The exchange started with the visit of the host collaborator to Italy in 2016 and was strengthened during the visit of the beneficiary to the host institution in Australia, especially through contacts with members of the research group at the University of Queensland. The latter concerned entomologists, veterinary medicine scientists, and geneticists.

Achievements of the specific objectives
2.1. The knowledge available to the beneficiary on the European model species has allowed to help the host institution scientists to identify a few major taxa (probably different species) so far considered within the same species of bag-shelter moth, *Ochrogaster lunifer*. This finding is very important for the measures to be taken to reduce the negative impacts on domesticated animals and humans.

2.2. The experience available on the phenology regulation by climatic factors on the European model has been used to assess the potential impacts of global change on the Australian species complex. General climate differs greatly between the two areas, nevertheless it has been possible to identify the drivers of the emergence periods over large geographic areas and time spans by looking at the catch data of museum specimens. The data indicate future strategies to explore the interactions between climate change and the performance of the bag-shelter moth species and populations in Australia.

2.3. We achieved mutual benefits through the sharing of the major symptoms associated with the exposure of domesticated animals and humans to the urticating setae of the processionary moths. In addition, an immunologic assay based on a key protein of *Thaumetopoea pityocampa* is available for testing in humans and is on the way to being tested for horses as well, thanks to an ongoing collaboration with a Spanish immunologist and an industrial company. The results are expected in about 1 year.

2.4. It has been possible to ascertain the occurrence of at least 5 different taxa, probably species, within the only species of bag-shelter moth taxonomically recognised so far, *Ochrogaster lunifer*. This aim has been reached through morphological, ecological, and genetic data of both caterpillars and moths, including the urticating setae they carry. More taxonomic work is required to better define the taxa, and the material checked during the visits to the Australian National Insect Collection (CSIRO, Canberra), to the Australian Museum (Sydney) and to the Queensland Museum (Brisbane) represents a good starting point. In addition, specimens of other genera of processionary moth from Australia have been collected and identified.

2.5. During the visit the beneficiary had the opportunity to deliver seminars related to the project, with a focus on the European experience, to the scientific community of the School of Biological Sciences, University of Queensland (7 April 2017) and the Australian Museum of Sydney (16 May 2017). The dissemination to the stakeholders of the Hunter Valley (stud managers) was organised during a meeting on 27 April 2017. Research and dissemination papers are on the way to be produced.

3. Major achievements of the fellowship

All the work was very satisfactory for both sides, although I consider the following three being the major achievements.

3.1. Getting familiar with the Australian model species and establishing contacts with the entomologists working on them. This is the first, essential step for the continuation of the work.

3.2. Getting familiar with the impact of the bag-shelter moth on the horse stud farming, with the stud managers, and with the veterinary medicine scientists involved in the research and management of the EAFL.

3.3. Getting familiar with the taxonomists of the group in Australia, which is important for the definition of the taxa and for any measure to be taken to contain the impacts of the insects in agriculture and forestry.

4. Follow-up

At least two publications in international, peer reviewed journals can be envisaged based on the visit. They will address both the ecology of the taxa identified in the bag-shelter moth as well as the impacts they have on agriculture and forestry in Australia. The comparison with the European model will be very important at this regards. In addition, we are currently sequencing the proteome of the urticating setae of two different taxa of the bag-shelter moth, and the preliminary results are interesting and could be either used in the same publications or for a self-standing paper. All the papers will be produce in 1-2 years.
The continuation of the collaboration has been proposed in a project currently submitted to the European Union (Horizon 2020); the results will be available in February 2018. At the same time, an Australian student has already visited my University right after I came back and we are planning for a future stay sponsored by my University.

A possible novel immunological test for horses could become available in the coming months from the collaboration started with the Spanish immunologist group.

5. Benefits to the society

A major benefit from the visit is the possibility to provide the stud managers, veterinary practitioners, and the general public with practical measures to contain the impacts of the processionary moths on the public health (domesticated animals and humans). These measures are heavily based on the new knowledge on the ecology of the different taxa involved and they were already disseminated to the stakeholders, also in the open access EAFL web site (http://equineafl.com.au/). The work will be continued in the coming months as long as the papers will become available. These benefits are valid for both Australia and Europe. Other benefits can be considered at the general scientific level because of the progress made in the knowledge on this group of Lepidoptera.

6. Relevance to CRP

6.1. Contribution to the aims of the programme
A major relevant contribution from the project is the identification of diagnostic tools that can be used in Australia as well as in Europe to assess the risk of animal and human exposure to the urticating setae. Another important contribution is the dissemination to the general public of appropriate information about the nature of the risk and the preventive measures to mitigate the impacts.

6.2. Relevance to the Theme objective
Processionary moths are an emerging problem worldwide for both plants and animals, including humans, because of their response to climate change and the possibility to be moved among countries and continents with plants. By the identification of the species involved, the finding of detection methods and preventive measures, the work has fully addressed the OECD Theme.

7. Satisfaction

I was so happy and excited of my experience in Australia that I wanted to stay more if that could be possible. So the programme now is to find a grant to consolidate the work done. We have plans for that, as indicated above. The OECD fellowship was perfect for this first visit and I will acknowledge it in the results of the work. I liked also the way used for handling the administrative issues, so I do not have suggestions about how to improve, it is already working in a very satisfactory way.

8. Advertising

I was informed of the Programme by my host Myron Zalucki during his visit to Padova in 2016 and I have already recommended it to some colleagues who want to establish a first contact with member countries. I found useful to check the list of the fellowships in the website and I think this is the best way to show potential candidates how to prepare the application.