



FA1203: Sustainable management of *Ambrosia artemisiifolia* in Europe (SMARTER)

## Short Term Scientific Mission Report

Setup analysis workflow, data validation and preliminary analysis of *Ambrosia artemisiifolia* population dynamics data.

### STSM details

COST STSM Reference Number: COST-STSM-FA1203-27507

Timing of STSM: 21-05-2015 to 31-05-2015

### Applicant details

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### Summary of the STSM

This document describes the output from the short-term scientific mission (STSM) to Fribourg, Switzerland between 21 and 31 May 2015. The aim of this particular STSM was to establish a workflow for checking, validating, pre-processing, summarizing and statistically analysing the data generated by the large-scale demographic monitoring scheme of *Ambrosia artemisiifolia* populations in Europe. The workflow is intended to provide the necessary information to parameterise mathematical demographic models, in order to shed light on the population dynamics of *Ambrosia artemisiifolia* across a large geographical area and over a large number of habitats.

## Purpose of the STSM

Within the SMARTER network, the main goal of the Task Force Population Dynamics is to shed light on the spatio-temporal population dynamics of *Ambrosia artemisiifolia* populations in Europe. The task involves (1) the monitoring (empirical data collection) of populations across a large number of countries within Europe, (2) the data assembly, data validation, pre-processing and statistical analysis of generated data, and (3) the parametrization and analysis of population-based demographic mathematical models. The resulting model is intended as a tool that can be used for the evaluation of management options for (bio)control of *Ambrosia artemisiifolia*, in a diverse range of geographical locations and habitats.

So far, the Task Force has successfully accomplished the collection of the first year's data across 51 populations in 17 countries based on a detailed and extensive field monitoring protocol, and has readily developed the necessary mathematical modelling tools (see [http://ragweed.eu/wp-content/uploads/STSM\\_2013\\_Lommen\\_Report.pdf](http://ragweed.eu/wp-content/uploads/STSM_2013_Lommen_Report.pdf)). The generated data provide the basis upon which demographic quantities can be derived, which in turn match the requirements of the demographic models. The intermediate steps of the pre-processing, validation, and analysis of the generated data are crucial to accomplishing of the whole process.

The purpose of the present STSM, is to preliminary analyse data collected in 2014, and establish a workflow for the automatic validation, pre-processing and statistical analysis of the generated data.

In particular the goals set out at the beginning included:

- Validation of the data from 2014,
- Inventory of frequently occurring problems and pitfalls,
- Pre-processing of datasets for the statistical analysis,
- Improvement in the quality of data provision process for the 2015 and 2016 field seasons,
- Preliminary statistical analysis with emphasis on identifying patterns in life-history traits/vital rates across and within populations based on the 2014 data
- Inventory on accuracy of data,
- Development of an improved protocol to be used for the 2015 survey, and
- Establishment of software with a standardized workflow for automatic data validation, pre processing, and analysis of datasets.

## Description of the work carried out during the STSM

The work carried included meetings and discussions about the protocol of data collection, the preliminary data validation and analysis of the 2014 batch of data, brainstorming sessions on avoiding data collection and archiving pitfalls, construction of data validation algorithms, construction of data analysis algorithms, and production of scientific output aimed at informing both the participants and the general scientific world (through peer-reviewed publications).

### **Description of the main results obtained**

This particular STSM has generated the following output:

- We identified common and less common errors and pitfalls during collection and subsequent archiving of datasets by participants.
- We identified and derived statistical methods suitable for the analysis of the collected datasets.
- We performed preliminary analysis based on the data generated in 2014.
- We improved the ongoing monitoring scheme through a number of adjustments in the collection protocol.
- We established algorithms to automatically validate datasets for common errors and pitfalls, and to assess suitability of the data for the analysis.
- We established algorithms to provide automatically generate population-specific results, used to send as feedback to the participants of the monitoring scheme.
- A lecture was given to the staff and students of the host institution about the ongoing work of the SMARTER Task Force Population Dynamics, in particular on the analysis of the population dynamics of *Ambrosia artemisiifolia*.

### **Future collaboration with the host institution**

The future collaboration with the host institution is eminent and much required in light of fulfilling the aims of the SMARTER Task Force Population Dynamics. Foreseen plans on the short turn include a visit by Suzanne Lommen to the Netherlands in the coming autumn to discuss and evaluate current developments, and further frequent contact for the preparation of two scientific papers. Given the fruitfulness of the present STSM, the ongoing collaboration is expected to develop even further in the time to come.

### **Foreseen publications/articles resulting from the STSM**

The present STSM has contributed to the development of two scientific publications that are to be submitted in due time to peer-reviewed scientific journals. The two manuscripts describe

- 1) Spatial patterns of variation in *Ambrosia artemisiifolia* vital rates (by S. Lommen et al.)
- 2) An Integral Projection Model for the population dynamics of *Ambrosia artemisiifolia* (by C.A Hallmann et al.).

These publications were already planned before, but results and knowledge obtained during this STSM contribute significantly to the information required to finalize the two manuscripts.

### **Confirmation by the host institution of the successful execution of the STSM**

A letter of confirmation (sent by email to Maurizio Vurro) by the host institution is attached to the present document (Appendix 1).

### **Acknowledgements**

I am very grateful to Heinz Müller-Schärer and Suzanne Lommen for hosting me at the University of Fribourg for this short-term scientific mission, for the fruitful discussions and time they made available for me, and for a very pleasant stay in Fribourg.

Caspar A Hallmann,  
Nijmegen, 19-June-2015.

APPENDIX 1 Letter of confirmation

Dear Maurizio,

I would like to confirm that Caspar Hallmann has visited my lab in Fribourg, Switzerland, in the last two weeks of May 2015 for a Short Term Scientific Mission. Also, I have read the draft of his STSM report and confirm that the tasks stated therein have been accomplished.

Together with Suzanne Lommen, Caspar worked on the preliminary analysis of the 2014 data (including data cleaning), which is vital to both the future coordination of data collection, as well as demographic modelling – one of the core businesses of the Task Force (TF) on Population Dynamics. I am convinced that this STSM has been very useful for this TF and for the SMARTER project in general.

Best regards, Heinz

Prof. Dr. Heinz Müller-Schärer

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