

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA17108

STSM title: Modeling of *Aedes koreicus* spatio-temporal spread and distribution in Hungary

STSM start and end date: 16/09/2019 to 22/09/2019

Grantee name: Kornélia Kurucz

PURPOSE OF THE STSM:

The main purpose of this STSM was to take a short visit at the Research and Innovation Centre, Fondazione Edmund Mach (San Michele all'Adige, Trento) in Italy, at the Applied Ecology Research Unit, Department of Biodiversity and Molecular Ecology, in order to become familiar to statistical analyses generally used in *Aedes* Invasive Mosquito research.

Primarily, my aim was to learn new statistical methods - from simple analyses to distribution modeling - needed to the spatial and temporal spreading analyses of invasive mosquitoes, and secondly, apply these methods for *Aedes koreicus*' spreading in Hungary. Moreover, I came here to broaden my knowledge about mosquito monitoring and surveillance program in this Region, and about different laboratory techniques needed to pathogen-related investigations.

Generally, our common purpose with the colleagues of the host institute was to assess each other's research interest and opportunities related to *Aedes* Invasive Mosquitoes for further collaborative research in the future.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

During my stay, the focus was mainly on getting to know all the members and research activities of the Department of Biodiversity and Molecular Ecology, in addition, to prepare the analyses mentioned above.

First of all, I gave a seminar presentation about the *Aedes* Invasive Mosquitoes in Hungary and our activities in their research, with special regard to *Aedes koreicus*, which is the target species of the mission. In this seminar, I introduced my home institute, my research group, and our facilities, as well as, I provided a brief summary of the current situation of AIM species in my country. I presented the local mosquito monitoring program and our recent scientific results on *Aedes koreicus* research. At the same time, the colleagues of the host institute presented the state of art of their research relating to *Aedes koreicus* in the form of seminars.

I got insight into the AIM surveillance program in the Province of Trento (types of mosquito traps and sampling methods, data collection in detailed) and the mapping database operated among others by the host group.

I had a short visit in the laboratories, where I got general information about the molecular biological and genetic methods they use for screening and characterizing mosquito-borne pathogens (NA extraction, PCR, sequencing, blood-meal analysis, etc.). Furthermore, I visited the insectarium with the laboratory colonies of *Aedes albopictus* and *Aedes koreicus*, where I got more information about the practice of laboratory colony maintenance and about their preparation for further experiments (e.g. temperature tolerance, testing repellent agents, etc).

We checked the *Aedes koreicus* database available so far from Hungary, including presence-absence data come from oviposition trapping or active larvae collection and abundance data come from adult trapping as well. Based on that, we planned to apply a mathematical model for the population dynamic of *Aedes koreicus* already developed at host institution. As a preliminary step, we run generalized linear models looking for correlation between the abundance of *Aedes koreicus* and mean temperature (or precipitation) along the monitoring seasons (2016-2019). Furthermore, we run distribution models to picture the spatio-temporal dispersal of *Aedes koreicus* within the city of Pécs (Baranya county, Southwestern Hungary) from the first emergence of the species (in 2016) until now (September 2019). We also investigated two other native mosquito species: *Aedes vexans* and *Culex pipiens* as well, that were the most abundant species in the city, to see the possible differences or similarities compared to *Aedes koreicus*.

Furthermore, we checked the presence-absence data available for the other two invasive mosquito species established in Hungary, namely the *Aedes albopictus* and *Aedes japonicus*, to see their co-occurrence or possibly competition with *Aedes koreicus* in Hungary. Unfortunately, the lack of countrywide AIM surveillance in Hungary and the random monitoring year after year did not allow to analyze any dispersal pattern of *Aedes koreicus* within the country, neither in case of *Aedes albopictus* or *Aedes japonicus*.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

After running the preliminary statistical models for *Aedes koreicus* data obtained from Hungary, we did not find any meaningful correlation between the temperature and abundance of captured mosquitoes, neither the precipitation had no effect on the number of individuals. Our aim is to extend the analysis including further variables (factors) in the models such as microhabitat as well as to check differences or similarities between the sampling sites. We make contact with the GIS experts at FEM which will provide CORINE Land Cover maps and data about citizen population size in the future. In light of these results, we discussed the potential problems of dataset and took suggestion for main modifications in future monitoring of invasive mosquitoes (large scale monitoring, higher number of repetition and more measured factors are necessary). Finally, we prepared the dataset to calibrate the population dynamics model and discussed the research questions of interest.

During the one week I spent at the Department of Biodiversity and Molecular Ecology, FEM in San Michele all'Adige, I believe that accomplished the main goal of my Short Term Scientific Mission. All the purposes mentioned above were fulfilled and will significantly contribute to further involvement of the Szentagothai Research Centre, University of Pécs (Hungary) in activities of AIM Cost Action, particularly in monitoring and surveillance of AIMs (WG1).

FUTURE COLLABORATIONS (if applicable)

After knowing each other's research activities, facilities and future plans regarding to invasive mosquito species, we see several common points, which is clearly pointing towards working together, particularly in case of *Aedes koreicus*. As a first step, we plan to write a paper based on the population dynamic model developed at FEM and applied to Szentagothai Research Centre data. Moreover, I get help in further analyses of data obtaining from Hungary, and after synchronizing our monitoring methods, or even starting our own mosquito colony in Hungary, it would be possible to compare several aspects of the species, from their genetics to their behavior, environmental needs and competitor abilities as well.

The STSM grantee

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Signature