

Avia-GIS NV, Risschotlei 33
2980 Zoersel, Belgium
October 7, 2022

Short Term Scientific Mission (STSM) Report

COST Action: CA17108

Reference: E-COST-GRANT-CA17108-b36e4335

STSM Title: "Modelling the spatio-temporal distribution of *Aedes* mosquitoes in Croatia"

Home Institution: Croatian Institute of Public Health (Environmental Health Division), Zagreb, Croatia

Host Institution: Avia-GIS NV, 2980 Zoersel, Belgium

STSM Start and End Date: September 26, 2022 – October 7, 2022

Working group: WG1, Task 1.2

Purpose of this STSM

The aim of this STSM was to provide hands-on training in (I) data acquisition and processing, (II) setting up a spatial database, (III) modeling the spatial distribution of invasive *Aedes* species using machine learning algorithms, (IV) basic model verification and uncertainty assessment.

Description of the work I did during my STSM

During my stint at Avia-GIS I followed a comprehensive schedule prepared by my mentor, Dr. Mina Petrić. Seeing as I had little to no understanding of Geographic Information Systems, or GIS for short, I spent the first half of my first week at Avia-GIS learning the basics of GIS and QGIS, a free and open source GIS suite, so as to gain insight into the interaction between spatial and non-spatial data. I completed the Avia-GIS QGIS tutorial and it helped me tremendously.

The next logical step was learning how to deal with spatial data in R, a programming language used for statistical computing. My previous experience in R proved to be quite useful during the course of this STSM, and my time here has helped me expand my knowledge of R even further. I spent the remaining portion of my first week reviewing base R, learning how to manipulate spatial data using R's *raster* and *terra* packages, and running a mechanistic MCDA model (short for Multi-Criteria Decision Analysis) in R so as to gain even more insight into R's capabilities when it comes to spatial data analysis.

During my second week at Avia-GIS, I learned even more about data acquisition in R, and we even discovered a "bug" (malfunction) in R's *raster* package that was dealt with in short order after we filed a "bug report" with the developers. I was also introduced to VECMAP, a proprietary software package used for risk mapping, developed by Avia-GIS. I learned how to prepare data for VECMAP not just in R and QGIS, but also using VECMAP itself, as well as how to use its integrated machine learning algorithms to produce models of mosquito spread. And at the end of the STSM, we turned to models involving climate data.

Results

Because of the time I spent at Avia-GIS, my knowledge of statistical programming, as well as statistics in general, has expanded by leaps and bounds. I am a much more capable statistical programmer now. In addition, I now have a proper understanding of how GIS systems work, and I now know how to directly apply my knowledge to existing data because of my newfound familiarity with QGIS and VECMAP. I also believe that the education I have received here will make me a better medical professional because it has conferred on me a greater understanding of the use of data and statistics in medicine, particularly when it comes to data with a geographic or spatial component.

While the work was more theoretical than practical in my case – I used GBIF's (the Global Biodiversity Information Facility) datasets, rather than datasets specific to the spread of *Aedes* mosquitoes in Croatia itself, to generate vector maps of mosquito presence and absence for subsequent modeling work in VECMAP – I still believe that the skills I have acquired here will help me further the effort of curbing invasive mosquito spread in Croatia and beyond.

Future collaboration with the host institution

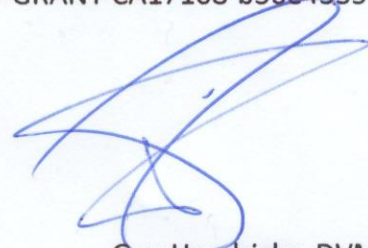
Future collaboration may involve more modeling and projection work related to invasive mosquito spread in Croatia. Not just *Aedes*, but other genera as well.

Confirmation by the host institution of the successful completion of the STSM

With this report, I confirm the successful completion of the E-COST-GRANT-CA17108-b36e4335 STSM mission at Avia-GIS (Belgium).



Kresimir Cohar, MD
Croatian Institute of Public Health
Environmental Health Division
Zagreb, Croatia



Guy Hendrickx, DVM, PhD
Managing Director
Avia-GIS NV
Zoersel, Belgium