SHORT TERM SCIENTIFIC MISSION (STSM)
SCIENTIFIC REPORT

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

Action number: CA17108 - *Aedes* Invasive Mosquitoes

STSM title: "Modelling the spatio-temporal distribution of *Aedes albopictus* in Greece"
STSM start and end date: 02/03/2020 to 06/03/2020
Grantee name: Angeliki Stefopoulou

PURPOSE OF THE STSM:

(max.200 words)

    Aedes albopictus, one of the most invasive species in the world, is a vector of viruses for dengue, chikungunya, yellow fever, Japanese encephalitis, and zoonoses, such as dirofilarioses (Giangaspero et al., 2013) presenting thus a notable threat to public health (Stefopoulou et al., 2018). Apart from vector of viruses *Ae. albopictus* causes serious nuisance to citizens. Lack of up to date and more precise *Aedes* distributional data and potential distributional modelling hampers effective vector surveillance and control (Ducheyne et al., 2018).

    In the current Short Term Scientific Mission (STSM) the first objective was to become acquainted with VECMAP and R spatial modelling. The second objective was to update the existing presence/absence database of *Ae. albopictus* in Greece and also process and organize in spatial databases the existing mosquito population data from Greece. The overall objective of the accomplished STSM, was to get hands on training experience on modelling the spatial distribution of *Ae. albopictus* using statistical and machine learning techniques such as the random forest machine learning algorithm. For the application of the abovementioned techniques, VECMAP and R were used for spatial modelling and for the assessment of accuracy and uncertainty.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

The Short Term Scientific Mission was accomplished in Avia-GIS, in Zoersel, Belgium. The training included training with case studies using existing data for Greece, as collected through the entomological surveillance conducted the late years by Benaki Phytopathological Institute, in combination with freely available public data.

During the first two days (2-3/3/2020) focus was mainly on VECMAP, QGIS and R training. The particular training session started with the installation of the sofwares and the accomplishment of the tutorial exercises (VECMAP tutorial exersices). The tutorial exercises, among other standard GIS operations, included the following:

- step-by-step process on how to construct a sampling strategy and how to perform field data analysis
- create a probability of presence risk map based on simple presence/absence of the vector
- model actual vector abundances using a zero-inflated model and then as abundance categories with a random forest.

Furthermore, during the first days thorough discussions and training was made on the best way for using VECMAP during the standard entomological surveillance in Greece. Towards this end, a demo project was created in VECMAP with various levels of information (field and laboratory data and their spatial processing).

In the demo project, in-situ entomological surveillance data was recorded via VECMAP mobile application and then the same was done for the laboratory data after the identification and counting of the adults/eggs. During the third day (4/3/2020), training focused on data processing and preparation of the spatial database with the entomological data from Greece. The presence/absence data were updated, while the needed imagery data were processed (climatic data, population data, etc).

During the fourth day (5/3/2020), random forest statistical analysis was performed based on the greek data. The data were re-processed to clear the duplicates and other dubious points. Random forest (RF) is considered the most powerful classifier at the moment (Früh et al., 2018 and references quoted therein). The RF model was applied in both R and VECMAP.

During the fifth and final day (6/3/2020), suitability maps for Greece were created while the results and the confusion matrix of the random forest modelling were discussed.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

During my stay at AVIA-GIS, I believe that I have accomplished the main goal of my Short Scientific Mission, which was to to use the Greek timeseries with entomological data relative to the distribution of *Ae. albopictus* and expand my knowledge in the area of spatial distribution modelling and accuracy and uncertainty assessment. Moreover, the acquired knowledge through the Short Term Scientific Mission in Avia-GIS contributed to the capacity of myself and my group in the Benaki Phytopathological Institute on data analysis and geo-statistical modelling of *Aedes* species. Last but not least, my participation also contributed to the transfer of knowledge and promotion of data sharing between the COST Action partners.

During my STSM in AVIA-GIS, apart from the abovementioned training, I had the opportunity to build the suitability map of *Aedes albopictus* for Greece based on Greek and European data, under the guidance of my colleagues there. The image below presents the suitability map from 0 to 1.
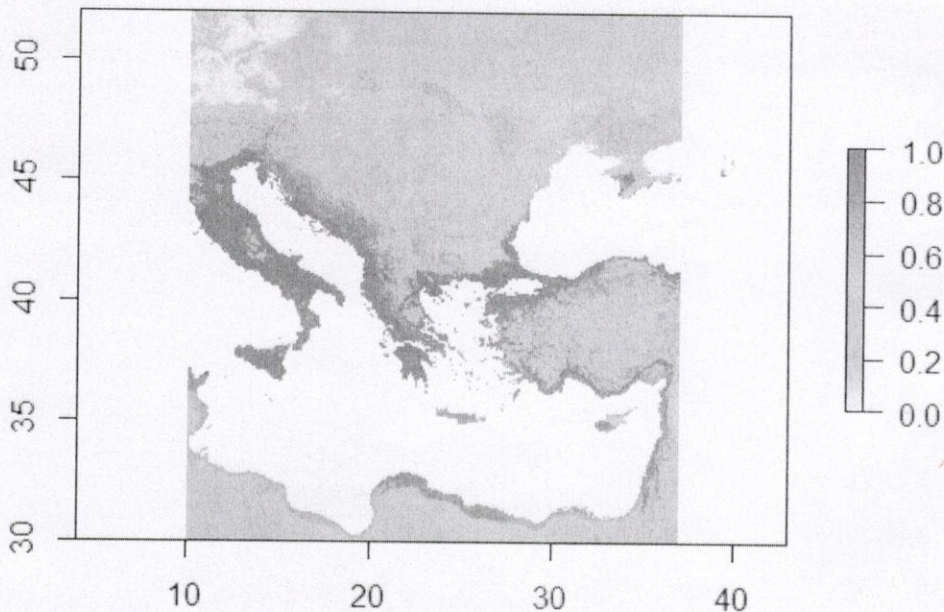
FUTURE COLLABORATIONS (if applicable)

I received an introductory training course on VECMAP and R for spatial analysis which will enable me to process the data from the entomological surveillance accomplished in the Benaki Phytopathological Institute. My collaboration with AVIA-GIS team will continue in terms of spatial analysis of Greek mosquito surveillance databases. Furthermore, we discussed about establishing collaboration for further application of the VECMAP software for the greek surveillance strategy and recording.

REFERECES

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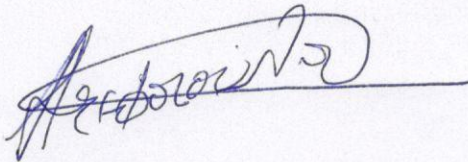
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Signature: