THEORICAL MODEL OF AEDES ALBOPICTUS ENTRANCE AND ESTABLISHMENT IN SPAIN INTEGRATED IN EU CLIMATE PROJECTS: THE CASE OF NAVARRA

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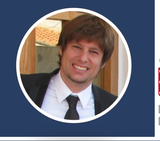


• Introduction

• The Asian Tiger Mosquito (*Aedes albopictus*) has colonized large areas in the Iberian Peninsula, mainly in the Spanish Mediterranean strip. Its ecological plasticity and multiple mechanisms of dispersion, among which human communication routes stand out, has helped it to colonize multiple and dispersed urban areas. The knowledge of the factors favoring its dispersion and establishment have allowed the elaboration of theoretical models.

• Navarra is a region located in the north-east of Spain, with no recorded establishment at the time of the study (2019) of *Aedes albopictus* but adjacent to other regions with proven activity, both in Spain and France.

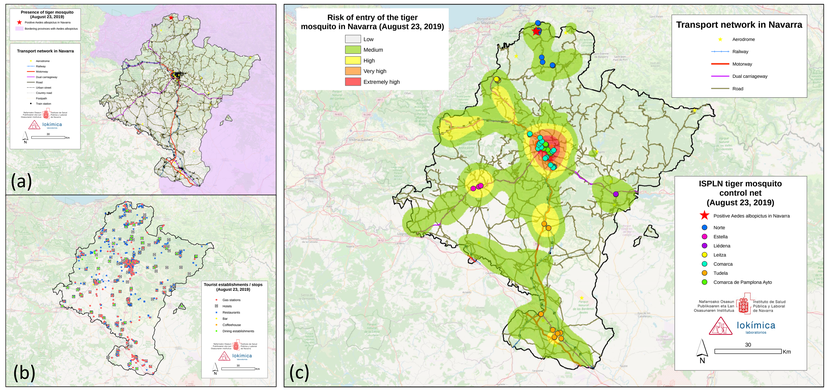
• This study is endorsed into the EU Integrated Projects CLIMA, as a part of the LIFE Nadapta project headed by the Government of Navarra. Which promotes resilience to climate change in the Region.

• Material and Methods

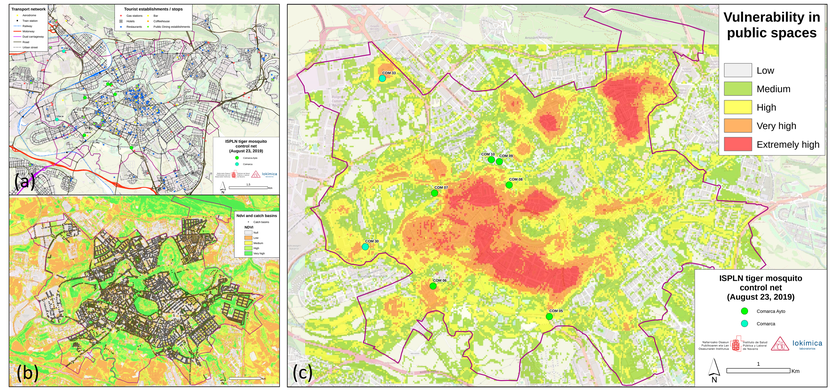
• Cartographic information was collected from different public sources, including communication routes, stops (gas stations, hotels, etc.), scuppers (main breeding points on public roads), green areas (shelter and food of adults) and private plots.

• By means of geographic information systems (GIS), these layers were overlaid and weighted to determine the entry and establishment of *Aedes albopictus* in the territory through geoprocessing tools.

• With the hierarchy of the communication routes based on the expected traffic by type of road and the analysis of the accumulation of stop points, areas with highest probability of vector entry into the territory were obtained. Whereas, with the analysis of the areas with accumulation of catch basins and vegetation, breeding site were determined and thus establishment areas.



•Fig. 1. (a) Transport network in Navarra, bordering provinces with *Aedes albopictus* and positive case of *Aedes albopictus* in Navarra; (b) Touristic establishments / stops in Navarra; (c) Risk of entry of the tiger mosquito in Navarra and ISPLN tiger mosquito control net. August 23, 2019



•Fig. 2. (a) Transport network in Pamplona and ISPLN tiger mosquito control net; (b) Normalized difference vegetation index and location of catch basins; (c) Vulnerability in public spaces. August 23, 2019

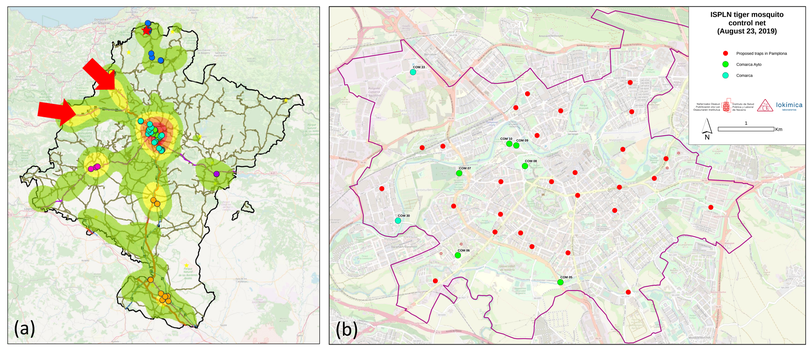
• Results

• The analysis of potential establishment areas allows the zoning of vulnerable areas and the prioritization of trapping, inspection and future control efforts, be it larvicide, adulticide or both. Even determining the areas where other actions must be carried out, for example citizen awareness.

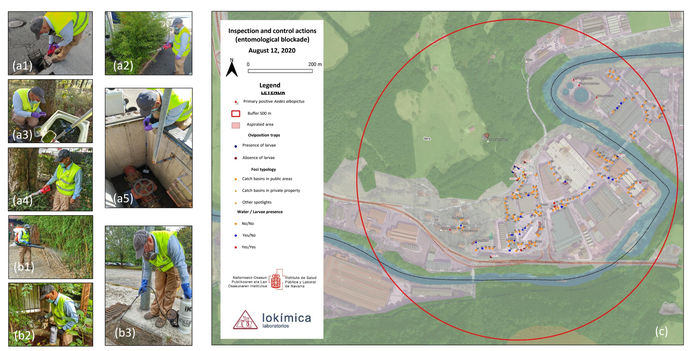
• In general, the distribution and number of oviposition traps in the entomological network of Navarra were adequate to exercise an optimal approach to the possible early detection of the species. The traps were placed in adequate places, covering the main potential areas of entry and, above all, maximizing the efficiency of the review and collection routes (a very important factor to consider in order to obtain an optimal cost-benefit balance of the surveillance system). However, as an improvement, based on the modeling study of the vulnerability of entry of the species, a proposal of additional traps in the areas was established (**Fig.3a**).

• In the Municipality of Pamplona, taking into account the initial risk it had, an expansion of the tiger mosquito monitoring network was proposed (**Fig.3b**).

• As a result of this risk study, inspection and control tasks were carried out. During the years 2019 and 2020, entomological blockade tasks were carried out in the places of the original appearance in Navarra. As a result of this work, a series of breeding points and resting places for adults were found, in which the pertinent control tasks were carried out. (**Fig.4**).



•Fig. 3. (a) Proposed places for the placement of tiger mosquito traps at the western entrances of Navarra (red arrows); (b) Proposal for expansion of traps in the city of Pamplona (red dots)



•Fig. 4. Carrying out the entomological blockade. (a1 to a5) Location of larval and adult foci; (b1 to b3) Treatments against larvae and adults; (c) Work zone map

• Conclusions & Further Research

• The use of geographic information systems to model the entry of a highly important vector such as *Aedes albopictus* in a region is possible, if the appropriate risk factors are used. For this reason, it is vitally important to have adequate sources of information to be able to replicate this study, so the involvement of public entities to provide reliable and free sources is essential. In addition, these studies should serve to implement rapid response teams, in which larval and adult control tasks are decisive for success.