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Index of Suitability for Culex pipiens sl. Mosquitoes in Portugal Mainland

Authors : Maria C. Proença, Maria T. Rebelo, Marília Antunes, Maria J. Alves, Hugo Osório, Sofia Cunha and REVIVE team

Abstract : The environment of the mosquitoes complex Culex pipiens sl. in Portugal mainland is evaluated based in its abundance, using a data set georeferenced, collected during seven years (2006-2012) from May to October. The suitability of the different regions can be delineated using the relative abundance areas; the suitablility index is directly proportional to disease transmission risk and allows focusing mitigation measures in order to avoid outbreaks of vector-borne diseases. The interest in the Culex pipiens complex is justified by its medical importance: the females bite all warm-blooded vertebrates and are involved in the circulation of several arbovirus of concern to human health, like West Nile virus, iridoviruses, rheoviruses and parvoviruses. The abundance of Culex pipiens mosquitoes were documented systematically all over the territory by the local health services, in a long duration program running since 2006. The environmental factors used to characterize the vector habitat are land use/land cover, distance to cartographed water bodies, altitude and latitude. Focus will be on the mosquito females, which gonotrophic cycle mate-bloodmeal-oviposition is responsible for the virus transmission; its abundance is the key for the planning of non-aggressive prophylactic countermeasures that may eradicate the transmission risk and simultaneously avoid chemical ambient degradation. Meteorological parameters such as: air relative humidity, air temperature (minima, maxima and mean daily temperatures) and daily total rainfall were gathered from the weather stations network for the same dates and crossed with the standardized females' abundance in a geographic information system (GIS). Mean capture and percentage of above average captures related to each variable are used as criteria to compute a threshold for each meteorological parameter; the difference of the mean capture above/below the threshold was statistically assessed. The meteorological parameters measured at the net of weather stations all over the country are averaged by month and interpolated to produce raster maps that can be segmented according to the meaningful thresholds for each parameter. The intersection of the maps of all the parameters obtained for each month show the evolution of the suitable meteorological conditions through the mosquito season, considered as May to October, although the first and last month are less relevant. In parallel, mean and above average captures were related to the physiographic parameters – the land use/land cover classes most relevant in each month, the altitudes preferred and the most frequent distance to water bodies, a factor closely related with the mosquito biology. The maps produced with these results were crossed with the meteorological maps previously segmented, in order to get an index of suitability for the complex Culex pipiens evaluated all over the country, and its evolution from the beginning to the end of the mosquitoes season.

Keywords : suitability index, Culex pipiens, habitat evolution, GIS model
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