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Impact of climate change on the establishment and seasonal acitivity of Aedes albopictus in Europe

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Vector Borne Disease (VBD) is a pressing health issue for Europe with many invasive vector species being introduced by climate change. Air temperature and precipitation are the main factors limiting the establishment of invasive mosquito species and driving the seasonal activity and abundance for climatologically suitable areas. *Aedes albopictus* has vector competence for a range of VBD viruses such as Chikungunya, Dengue, Zika and Rift Valley fever. The vector originated in Asia but has since then spread to the temperate regions of Europe as well as North America. Climate Normals can be used to assess regional vulnerability and inform VBD related adaptation. In this study we use Multi Criteria Decision Analysis algorithms in combination with sigma membership empirical functions resting on expert advice coupled with basic research complementing the gaps in climatological dependence of specific vector species, including laboratory data related to essential experimental knowledge concerning VBD transmission biology and dependence on climate and key environmental factors. Sigma fuzzy membership functions were employed for the following variables: mean January temperature (T_{Jan}); Annual accumulated precipitation (H_{an}); Photoperiod (C_{pp}), mean temperature for the spring, hatching, period (T_{spr}), mean temperature for the autumn, diapausing, period (T_{au}) and mean temperature for the summer JJA period (T_{sum}). The membership function defines how each value of the environmental variable is mapped to a membership value corresponding to climatic suitability. These continuous, smooth, sigma function defined by maximum and minimum empirically determined threshold values which are passed onto the Markov chain Monte Carlo (MCMC) basin-hopping algorithm generating high-probability posterior modes which are sampled for Bayesian inference. The results of this work should be applied to all regions with the risk of establishment and spread of the mosquito vector.