Novel prediction of Asian Hornet invasion range and impact

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Abstract

Honey bees and wild pollinators play a key role in the pollination of crops and wild plants worldwide. Their populations are currently experiencing drastic declines, due to interactions between multiple stressors: habitat loss and fragmentation, use of pesticides, climate change, pathogens and alien species. The invasion of Europe by the Asian Hornet (*Vespa velutina*) represents an emerging yet rapidly growing additional threat for pollinators. The hornet has already invaded a large part of France and is now spreading over the rest of Europe at an exceptionally high speed, and it is recognized as a major predator of bees. To improve the prediction of its potential future distribution, with respect to classical Species Distribution Models, I used specifically tailored predictive variables. Instead of the 19 bioclimatic variables classically used for any species, I created original expert knowledge based variables (climatic, land use and biotic inteactions), shaped according to the hornet's biological requirements. I used a combination of metrics to evaluate each variable predictive power. Since each variable type affects invasibility at a different spatial scale, I used a hierarchical procedure, applying variables successively at the scale at which they are the most influential, to obtain the final prediction. This model represents a powerful tool to identify the regions at risk of invasion by the hornet and to to help managers target areas where action is needed in priority.

Keywords: invasion, species distribution model, global change, pollinators, Asian Hornet

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