

Performances of nine models for predicting the distribution of *Diabrotica virgifera virgifera* (western corn rootworm)

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Several different types of models can be used to predict the presence/absence of invasive species. Their performance depends on the model characteristics, the number and type of input variables, the extent of the presence area, and the size of the training dataset. In this paper, we compare the performance of nine models for predicting the presence of *Diabrotica virgifera virgifera* in North America and Europe. Ten types of training datasets of various sizes (from ten to 428 presence data) and three sets of input climatic variables (19 variables, six variables and three linear combinations of 19 variables derived from Principal Component Analysis) were evaluated. The nine models were fitted to each training dataset in turn and their performance was assessed using independent data located in North America and Europe. The models were ranked according to several criteria: Area under the ROC curve, likelihood ratio and proportion of the predicted presence area. The results showed that four models (Climate Space Model, Envelope Score, Desktop GARP, OM GARP) perform better than the others. Model performance was highly sensitive to the area used for calibration, but the effect of the size of the training dataset was also significant in some cases. The performance of some models was highly variable, but others, e.g. Envelope Score were more robust. In some situations, no model performed better than a random classification, especially when the training dataset was defined from a very restricted geographical area. Our results also showed that Principal Component Analysis was useful in reducing the number of model input variables for the models that performed poorly with 19 input variables. The methodological framework defined in this study could be used to assess other models and could be implemented with other invasive species in the future.