Assessing the potential impact of invasive species on native biota: a case study on the invasion of ring-necked parakeets in Belgium

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Predicting the impact of species invasions on native biota is one of the biggest challenges facing invasion ecologists. In Europe, ring-necked parakeets (*Psittacula krameri*) have been widely introduced, and their growing populations are raising concerns for the loss of native biodiversity, as they are known to compete with native cavity-nesters such as nuthatches (*Sitta europaea*). Given this threat, we applied species distribution modelling to predict the potential impact of parakeets on other species. In Belgium, ring-necked parakeets currently occur only around Brussels, and we applied a regression model on a regional dataset of parakeet and nuthatch abundances to obtain a competition coefficient, quantifying the parakeets' impact on nuthatches. Spatially explicit predictions of parakeet and nuthatch abundance across Flanders were obtained using Boosted Regression Trees (BRT). Based on environmental variables that influence parakeet abundance in its current range, we predicted parakeet abundance across Flanders while Bird Atlas data were used to obtain predictions of nuthatch abundance. Parakeet impact was then quantified by superimposing these abundance maps and applying the competition coefficient, resulting in an estimate of the number of nuthatches that will be lost when parakeets have occupied all suitable sites. Results show that there is ample suitable habitat for the parakeets to spread into, and that they could become one of Flanders most numerous cavity-nesters. However, the expected impact on nuthatches is only moderate, with a maximum loss of ±25 % of nuthatch pairs, probably because parakeets reach their highest densities in urban areas while nuthatches prefer larger, more natural forests.

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