

Abstract

How complex is complex enough? Impact models of invasive plants

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Quantitative impact assessment of non-native species is becoming increasingly important for identifying high-impact species and setting management priorities. Recent studies have shown that relationships between invader abundance and ecosystem traits are modified by environmental co-variation and may take non-linear forms. Further, effects of invasive species can vary among ecosystem components. Regarding diversity, for instance, some species groups are adversely affected, while others might even be facilitated. Therefore, simple linear models are unsuitable for impact assessment of biological invasions.

We modelled effects of three invasive plants (*Heracleum mantegazzianum*, *Lupinus polyphyllus*, *Rosa rugosa*) on species richness of invaded communities using both simple linear effect models and more complex (non-)linear models including environmental co-factors. These models were calculated for total richness of vascular plants and for different plant species groups. Then, we calculated impact scores for each invasive species as the average reduction of species richness predicted by basic and full effect models.

All three non-native species had adverse effects on species richness, but the full effect models also indicated significant influence of habitat types. Impact scores were overestimated by basic effect models for *H. mantegazzianum* and *R. rugosa* due to disregard of habitat effects and non-linearity, respectively. In contrast, impact of *L. polyphyllus* was underestimated by the simple model that did not account for the strong interaction of invader cover and habitat type. Impacts varied among species groups. In general, early-successional species were more strongly affected than later-successional ones.

We conclude that simple linear models often yield inaccurate impact scores of non-native species. Hence, effect models should consider environmental co-variation and non-linearity of the effects of biological invasions on native ecosystems.

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