European Commission

Science for Environment Policy

New tool can help predict the impact of invasive alien species on native flora and fauna

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Researchers have developed a new metric to predict the ecological impacts of invasive alien species. The metric was calculated for a number of known invasive alien species and successfully predicted their impact on native species. The tool could be used to help inform the global management of invasive alien species.

Invasive alien species can have major negative impacts on biodiversity. For example, introduced predators can decimate native prey populations. The EU Regulation on invasive alien species[1] aims to prevent and reduce the harm caused. A list of invasive alien species of concern to the EU is determined based on 'available scientific evidence' and the assertion that the species is 'likely to have a significant adverse impact on biodiversity or ecosystem services'. Predicting the ecological impacts of invasive species is, therefore, necessary for risk assessments. The impact of species that have already colonised an area can inform the likely effect of future invasions. However, there is currently no means of predicting the ecological impacts of emerging or future potential invaders.

This latest study developed a new metric — the Relative Impact Potential (RIP) — using a combination of measurements that assess the impacts of invasive alien species on native species. The metric compares invader and native species' 'functional responses' — the relationship between the food available for a species and how much it consumes. The metric also incorporates the abundances of both the invading species and the existing similar native species. The invader impact is thus being compared to the existing baseline impact of native species. An RIP score of less than one indicates the invader is expected to have less of an impact than similar native species; an RIP over one indicates that the invasive alien species is expected to have a greater impact than similar native species. As the RIP metric increases above one, the invader impact is also predicted to increase.

The metric was used to calculate the RIP for 24 different invasive alien species relative to the native species found in the areas. These case studies covered different species groups, including predators, herbivores, animals and plants. The case studies included the invasive alien crustacean *Gammarus pulex* and a similar native crustacean *Gammarus duebeni celticus,* which is likely to be replaced by the invader, and also two prey species — mayfly nymphs (*Baetisrhodani*) and blackfly larvae (*Simuliidae*) — that are reduced in abundance by the invader.

The high RIP scores for the two prey species —10.96 for the mayfly nymph larvae and 13.94 for the blackfly larvae — are in keeping with the dramatic declines of both these species. These declines occurred following the invasion by *Gammarus pulex,* and replacement of the native *Gammarus duebeni celticus.* The RIP was also greater than one for all 22 cases calculated, which reflected the actual observed effects of these species in the real world.

The researchers say the value of the RIP metric is in its consideration of species abundance, which can be estimated in the field or may already be available from monitoring data. Considering the functional response is also necessary, because the rate at which an invasive alien species consumes native species strongly influences their ecological impact. For example, a highly efficient predator in low abundance can decimate a population of the prey species, such as an individual fox preying on turtle nests in Australia, while several invasive alien fish have impact primarily through their high abundance.

Continued on next page.

Source: Dick, J.T.A., Laverty, C., Lennon, J.J., *et al.* (2017). Invader Relative Impact Potential: a new metric to understand and predict the ecological impacts of existing, emerging and future invasive alien species. *Journal of Applied Ecology*. DOI:10.1111/1365-2664.12849.

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1. http://ec.europa.eu/environment/nature/invasivealien/index_en.htm

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New tool can help predict the impact of invasive alien species on native flora and fauna *(continued)*

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The metric was successful at associating invasive alien species with significant impacts on native populations in the case studies investigated and it also corresponded with other independent measures of the impact of invasive alien species[2,3]. But the researchers say that the RIP metric should also be tested on invasive alien species which have little impact on native populations in order to check whether RIP values of one or lower are found. There are, however, limited studies available for such species. The metric also requires a native species with a similar ecological role, to use as a comparison to the invasive alien species, which is commonly available but may not always be possible.

Overall, the researchers say the new metric provides a quantitative means of rapidly assessing the potential impacts of invasive alien species and can, therefore, be used as part of conservation management and planning. For example, the RIP tool can be used for species on the EU list of invasive alien species and those that may potentially be added to the list.

2. Laverty, C., Dick, J.T.A., Alexander, M.E. & Lucy, F.E. (2015a). Differential ecological impacts of invader and native predatory freshwater amphipods under environmental change are revealed by comparative functional responses. *Biological Invasions*, 17, 1761–1770.

3. Ricciardi, A. & Cohen, J. (2007). The invasiveness of an introduced species does not predict its impact. *Biological Invasions*, 9, 309–315.