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Socio-economic factors affect risk of alien species invasion

Omitting socio-economic factors from invasive alien species (IAS) risk assessments could result in serious underestimations of the area at risk, new research suggests. Including factors such as population density and proximity to ports in risk assessments was found in this UK study to increase the size of the area predicted as suitable for invasion by up to six times.

Species distribution models (SDM) are often used to predict areas most susceptible to colonisation by IAS. By considering environmental factors, such as climate and geology, which affect local water chemistry, SDM can be used to identify areas similar to the preferred habitat of the species. Other research has shown that socio-economic factors are related to the number of IAS in a region, but despite their potential to improve predictions, they have not been used to predict invasion risk.

This study evaluated how well environmental and socio-economic factors predicted the risk of invasion of 12 aquatic invasive alien species. These so-called 'dirty dozen' were chosen on the basis of the large potential ecological and economic impacts they would cause if they became widely established in Great Britain and Ireland. Some of these, such as the killer shrimp and the bloody red mysid, have already reached the UK but have yet to spread. Others, such as the Asian clam and the marmorkreb crayfish, have not yet arrived.

In order to model the risk of invasion in Great Britain and Ireland, the study used environmental data on the climate (e.g. temperature and rainfall) and geology (e.g. type of rock). The model also included four socio-economic factors. Firstly, the Global Human Influence Index, which groups relevant factors, such as population density, urban extent and roads into one measure. Secondly, to identify the specific effects of population density alone, this was also considered as a separate factor, and the third factor was land cover (e.g. forest, grassland, wetland, crops). Proximity to ports was the fourth socio-economic factor considered and was included as ports are the main entry point for aquatic invasive species.

The most important factor influencing the risk of invasion according to the model's results was minimum temperature, followed by proximity to ports. The inclusion of socio-economic factors resulted in an increase in areas at risk, compared to predictions that considered only environmental factors. In the case of the quagga mussel, the area considered suitable for invasion increased by six times, and for the Ponto-Caspian amphipod, it increased more than fourfold. The importance of these socio-economic factors is likely to be because they reflect possible routes of introduction, such as ports, roads, railways and the pet trade.

The maps produced by the study show that coastal, densely populated areas and those near transport routes are at most risk of invasion by the 'dirty dozen'. They also highlight which species are of particular concern in certain areas. The study's authors conclude that this approach provides a useful tool for preventing and controlling potential and existing invasions by helping prioritise areas and species.

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