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TITLE: Global rise in emerging alien species results from increased accessibility of new source pools

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ABSTRACT:

Our ability to predict the identity of future invasive alien species is largely based upon knowledge of prior invasion history. Emerging alien species-those never encountered as aliens before-therefore pose a significant challenge to biosecurity interventions worldwide. Understanding their temporal trends, origins, and the drivers of their spread is pivotal to improving prevention and risk assessment tools. Here, we use a database of 45,984 first records of 16,019 established alien species to investigate the temporal dynamics of occurrences of emerging alien species worldwide. Even after many centuries of invasions the rate of emergence of new alien species is still high: One-quarter of first records during 2000-2005 were of species that had not been previously recorded anywhere as alien, though with large variation across taxa. Model results show that the high proportion of emerging alien species cannot be solely explained by increases in well-known drivers such as the amount of imported commodities from historically important source regions. Instead, these dynamics reflect the incorporation of new regions into the pool of potential alien species, likely as a consequence of expanding trade networks and environmental change. This process compensates for the depletion of the historically important source species pool through successive invasions. We estimate that 1-16% of all species on Earth, depending on the taxonomic group, qualify as potential alien species. These results suggest that there remains a high proportion of emerging alien species we have yet to encounter, with future impacts that are difficult to predict.

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