

The Problem of Prediction in Invasion Biology

Abstract

Invasion biology is a relatively young discipline which is important, interesting and currently in turmoil. Biological invaders can threaten native ecosystems and global biodiversity; they can incur massive economic costs and even introduce diseases. Invasion biologists generally agree that being able to predict when and where an invasion will occur is essential for progress in their field. However, successful predictions of this type remain elusive. This has caused a rift, as some researchers are pessimistic and believe that invasion biology has no future, whereas others are more optimistic and believe that the key to successful prediction is the creation of a general, unified theoretical framework which encompasses all invasion events. Although I agree that there is a future for invasion biology, extensive synthesis is not the way to better predictions. I argue that the causes of invasion phenomena are exceedingly complex and heterogeneous, hence it is impossible to make generalizations over particular events without sacrificing causal detail. However, this causal detail is just what is needed for the specific predictions which the scientists wish to produce. Instead, I show that a limited type of synthesis (integration of data and methods) is a more useful tool for generating successful predictions. An important implication of my view is that it points to a more pluralistic approach to invasion biology, where generalization and prediction are treated as important yet distinct research goals.