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Keywords Asian house gecko, biosecurity, info-gap decision theory, invasive species, robustness, uncertainty.

Abstract

1. Biosecurity activities primarily include pre-border and border quarantine, post-border surveillance and post-border eradication. Budget allocated to quarantine and surveillance activities ultimately influence the expenditure and success rate of eradication campaigns. Optimal portfolio allocation examined in previous research is susceptible to potential severe uncertainties existing in ecology and in the behaviour of invasive species itself. These uncertainties, together with a limited budget, make it difficult for decision makers to allocate the total management budget to each biosecurity activity in a robust manner.

2. Info-gap decision theory is applied to model the severe uncertainty in invasive species management, and robust optimize the total management cost.

3. This research shows that using a combination of pre-border and border quarantine (to reduce the incursion probability) and post-border surveillance (to enable early detection and rapid response), enables decision makers to be more robust to potential uncertainty. Further, it is reported that investment in quarantine that is more cost-effective should outweigh that in surveillance, in line with precautionary principle.

4. Increasing the estimated population threshold for surveillance detection also gains more robustness.

5. Synthesis and applications: Portfolio allocation options developed in this research provide decision makers with a way to manage the invasive species spatially, cost-effectively and confidently by allocating the total management budget in a robust manner. The methods outlined in this research can not only be applied to invasive species, but also the conservation of endangered species that are constrained by severe uncertainty in ecological modelling and limited resources.