The dynamics of population release

Professor Richard Duncan[1], Dr Nick Dexter[2], Professor Jim Hone[1], Dr Adrian Wayne[3]
[1]Institute for Applied Ecology, University Of Canberra, , Australia, [2]Booderee National Park, Jervis Bay, Australia, [3]Department of Parks and Wildlife, Manjimup, Australia

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Biography:
I am an ecologist with interests in population dynamics, particularly the processes of invasion and extinction.

What happens when populations are released from a strong limiting factor? This can occur in the context of invasions (populations are introduced to locations without their natural enemies) and conservation management (populations increase after removal of an introduced predator). Previous studies of herbivore introductions reveal that populations often display eruptive dynamics associated with resource overshoot: populations increase sufficiently fast that they overexploit the available resources and subsequently decline in abundance. A simple consumer-resource model highlights that we might anticipate a variety of outcomes when populations increase from low levels, ranging from population increase and stabilisation to strong eruptions and population crashes. We tested for the prevalence of eruptive dynamics in data from >100 time series documenting changes in population abundance arising from herbivore introductions around the world and in response to predator removal in Australia. We found evidence for eruptive dynamics in over one-third of cases. This has implications for conservation management: releasing populations from a strong limiting factor, such as removing predators, should allow populations to increase but the default expectation may not be that populations will stabilise at a higher level. Instead, consumer-resource dynamics, along with other factors, could generate a range of outcomes including subsequent population crashes. An additional result of our study is that we may be able to predict the years till the peak of an eruption. Such a prediction would help managers plan translocations from erupting populations.

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