Bioclimatic models predict pests of the future

"Sleeper" pests

Many pests of the future are already present within New Zealand's borders. Known as "sleeper" pests, they are currently restricted in their range and breeding opportunities. Climate change will unleash their potential to cause greater economic, ecological and human health problems.

Using modern methods of bioclimatic modelling we calculate the likely range expansions arising from 2℃ of warming. The two case study species both feature on the ISSG's list of *100 of the World's Worst Invasive Species.*

Case study 1. Argentine ants

First detected in New Zealand in 1990, Argentine ants are widespread in towns north of Auckland. A warmer, drier climate would likely create optimal conditions for this species in New Zealand, facilitating spread to a much wider range of locations, and non-urban habitats.
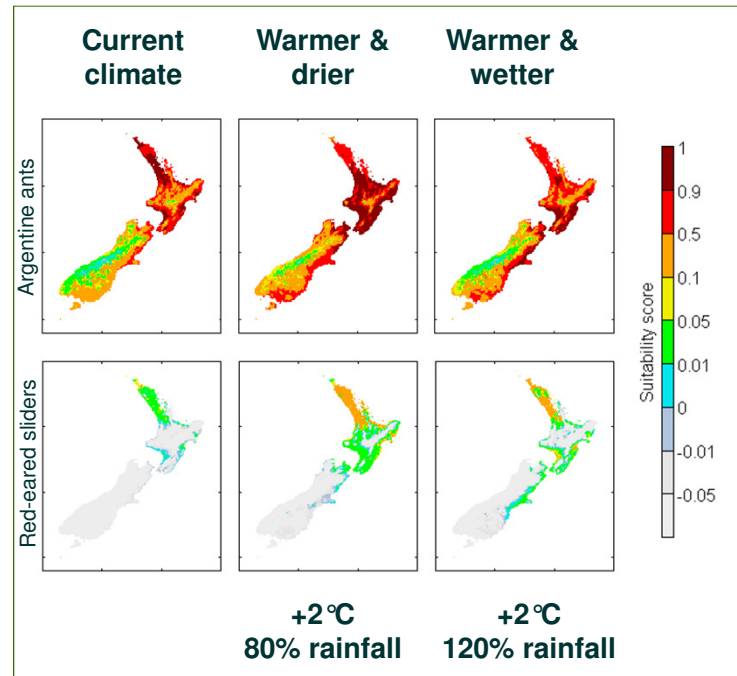
Impacts: Encourage pest insects in horticulture, such as scale, aphids and mealy bugs. A household nuisance. Alters structure of invertebrate communities.

2. Red-eared slider turtles

Unwanted pets are regularly released into the environment. Adults can survive over-winter, but so far there is no evidence of successful breeding in feral populations. Warmer climates will increase nest temperatures and may permit populations to establish and expand.

Impacts: Predation of waterfowl chicks and competition with native wetland biodiversity.

Bioclimatic suitability

Current climate | Warmer & drier | Warmer & wetter

Argentine ants

Red-eared sliders

Suitability score

+2℃ 80% rainfall | +2℃ 120% rainfall

Argentine ants tending aphids

Red-eared sliders in captivity

Best practice in climate envelope modelling

• Multimodel averaging – more reliable for complex problems where the single "true" model is unknowable.

• Predictive ability assessed on geographically independent test data - reduces over-fitting and spurious fits to spatially autocorrelated data.

• A measure of predictive ability that recognises the different costs of false negative versus false positive predictions – increased relevance to decision-makers.

• Suitability expressed on an intuitive scale relative to all occupied locations - allows direct comparison between species and modelling techniques.

Further information

Hartley S, Harris R, Lester PJ (2006) Quantifying uncertainty in predicting the potential range of invasive species: climate and the Argentine ant. *Ecology Letters* 9: 1068-1079.

Kikillus KH, Hare KM, Hartley S. (2009) Minimising false-negatives when predicting the potential distribution of an invasive species: a bioclimatic model for the red-eared slider at global and regional scales. *Animal Conservation* (in press).

IUCN/SSC Invasive Species Specialist Group (ISSG) www.issg.org

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Enquiries welcome for modelling of further species.

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