

PHC2018/01: Spatio-temporal modelling great spruce bark beetle (*Dendroctonus Micans*) in Scotland

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Note this work is part of a larger body of work in collaboration with Ross Davidson and Mike Hutchings at SRUC.

Background: *D. micans* (Fig.1) is a significant beetle pest of commercially important spruce species. The beetle is spreading north from England and is now present in Scotland. The spread of the beetle threatens the *D. micans* Pest Free Area (PFA) in west Scotland (Fig. 2). This designation allows the transfer of the Scottish Spruce crop from the PFA to Irish sawmills, as Ireland is a *D. micans* free area. The Central Belt of Scotland is a relatively Spruce free area and may act as a natural firebreak to slow or stop the spread of the beetle. Forestry Commission Scotland currently collect field data in annual surveys and release an obligate predator (i.e. a predator that can only survive in the presence of *D. micans*) at sites with observed *D. micans* infestation and sites believed to be at high colonisation risk. Data assessment and pre-processing were carried out by colleagues at SRUC.

Work under the plant health centre at BioSS: We conducted a proof principle study demonstrating that we can add value to the field data collected in annual surveys by Forestry Commission Scotland (Fig. 3) using Bayesian computational tools developed at BioSS (under the RESAS SRP) to parameterise models of the spread of *D. micans* in space and time. The fitted model was then used to project scenarios of future spread, estimating colonisation risk to inform the control efforts of Forestry Commission Scotland (Fig 4).

Leveraged funding: Based on this proof of principle study the Forestry Commission Scotland have now commissioned a more detailed study to inform control operations in the 2018 field season.



Fig 1. Great spruce bark beetle (*Dendroctonus Micans*).

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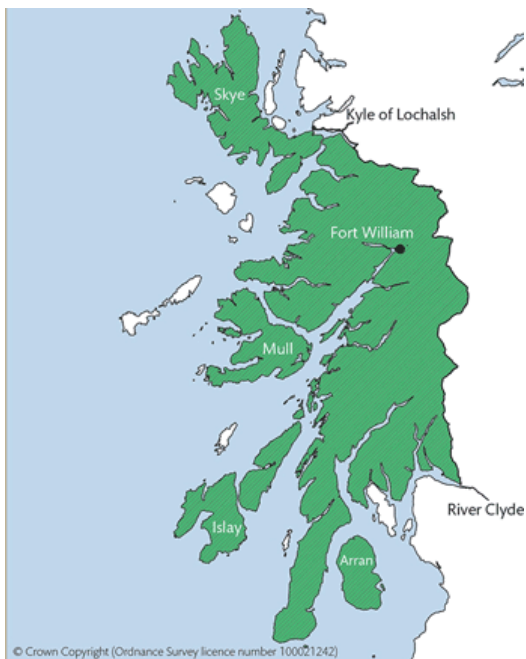


Fig 2. Scottish 'pest free area' under threat from *D. Micans* spread.

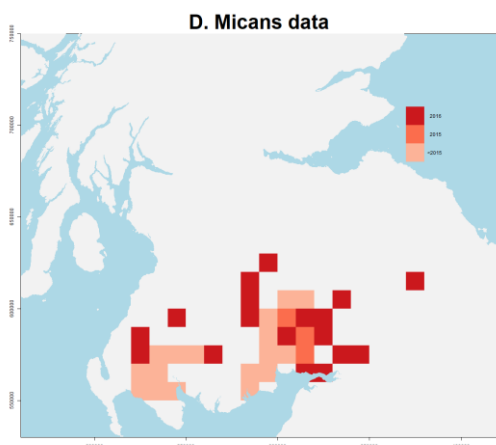


Fig 3. Observations of *D. Micans* in Scotland at 10km resolution until 2016.

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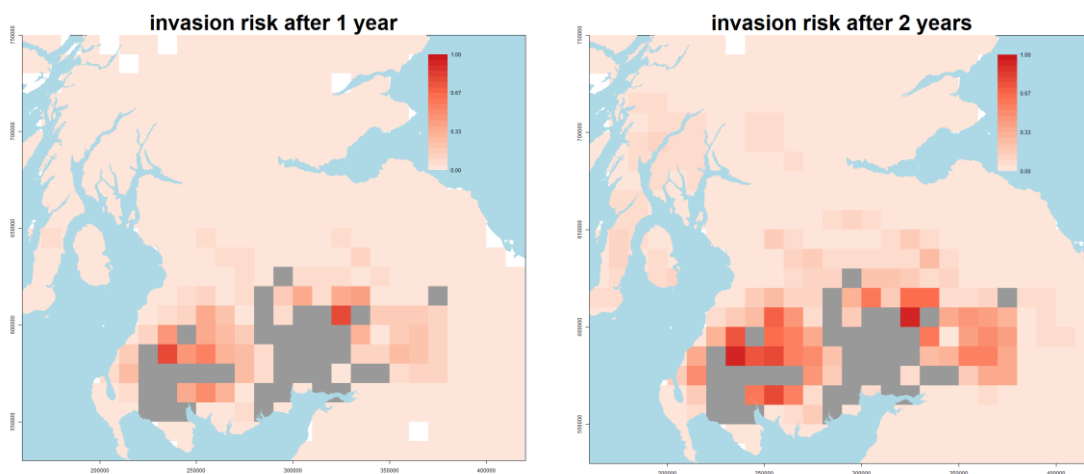


Fig 4. Risk maps: Predicted spread of *D. Micans* in Scotland at 10km resolution for 2017 and 2018. Probability of colonisation (red scale). Grey squares indicate locations of observed *D. micans* populations up to 2016.