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The sensitivity of species distribution models to new data and the utility of putting uncertainty on the map

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Abstract: Biodiversity decline and the impact of climate change on species are two of the most important environmental issues our society faces. We are simultaneously experiencing substantial increases in volumes of biodiversity data and major advances in cloud computing. These have enabled the development of new tools to provide solutions to environmental inquiries of increasing scope. These include infrastructure scale tools such as virtual laboratories, an example of which is the recently established EcoCommons platform architecture that can support any modelling workflow, with a focus on ecology.

Currently, the most highly developed workflows on EcoCommons are related to species distribution models and future projections of those distributions under climate change. One of the largest remaining challenges for the generation of species distribution models relates to the available occurrence data, as these are often not representative of the variety of environments used by a species. While there are a variety of modelling methods to help overcome bias in occurrence data, the best solution is to gather more representative data.

Here we demonstrate the profound impact new data can have on a species distribution model, by comparing a Powerful Owl distribution model built with existing occurrence records, and one in which we assume the owls were present at an additional 45 locations where they are suspected to occur. These models are extremely easy to run on EcoCommons and are common in the literature.

The mapped distributions being generated by researchers are often interpreted as being accurate by audiences who may be looking to use these maps for different purposes than they were intended. Here we demonstrate one simple way to add uncertainty to SDM map predictions that can also inform where future surveys would increase certainty in both geographic and environmental space.

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