Time series identify population responses to climate change

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Biologists have for several years modeled how different species are likely to respond to climate change. Most such studies ignore differences between populations within a species and the interactions between species, in the interest of simplicity. An article in the June issue of *BioScience*, by Eric Post of Pennsylvania State University and five colleagues, shows how these limitations can be avoided.

Their approach, which relies on multi-stage analyses of how populations fluctuate over time, could allow biologists to model responses to climate change with improved accuracy. In particular, the approach could help identify regions where local populations are vulnerable to climate change, and it could elucidate species interactions that may not be obvious.

The article concentrates on recent analyses by Post and others of yellow-billed cuckoos, caribou/wild reindeer, elk and red deer, and wolves and moose. Continent-wide and hemisphere-wide responses depended both on local weather and on broader climate patterns, and all species showed marked variation among populations. The pattern of responses, Post and colleagues report, "suggests a strong role for species interactions in buffering responses to climate." For example, local populations near the northern edge of a species' range often seem to be more directly affected by climate than do populations near the southern edge, where biological interactions typically complicate responses to climate change.

The time series approach described by Post and colleagues is intended to

supplement simpler methods rather than replace them. It can only be used on species for which there are detailed abundance records extending over, ideally, 25 years or more. Still, the authors note, refinements in statistical techniques are starting to allow more imperfect data to be analyzed, and data are accumulating, so the outlook for time-series analysis is promising.

More information: Read the full article (PDF)

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