Can we predict which species will be able to move far or fast enough to track changing climate?

May 12 2011

As global temperatures rise, suitable sites for many plants and animals are shifting to cooler and higher ground. Can we predict which species will be able to move far or fast enough to keep up? A new study says the secrets to success in the face of a warming world are still elusive.

Rather than sticking around and sweating it out, some groups of plants and animals are responding to rising temperatures by migrating northward and upward to higher latitudes and elevations, studies show.

But when researchers working at the National Evolutionary Synthesis Center and the National Center for Ecological Analysis and Synthesis took a closer look at recent range shifts, they noticed a peculiar pattern: some species are migrating much farther and faster than others.

"Some species are moving well ahead of the curve, while others seem to be stuck behind," said lead author Amy Angert, a biologist at Colorado State University.

Pinpointing what sets the fastest-shifting species apart from the stragglers could help scientists and policymakers predict which species are likely to be left behind in a warming world, the researchers said.

"The species that aren't able to expand their range are the ones we need to spend more resources protecting," said co-author Sarah Gilman of

Claremont McKenna College in California.

The researchers wondered if general traits such as body size, diet and lifespan might help scientists predict which species are likely to keep pace as weather warms.

To find out, they looked at data gathered from more than 400 species of birds, plants, insects and mammals known to have shifted their ranges to different degrees in the last century in response to warming.

The data set included North American birds such as house finches and bald eagles, dragonflies and damselflies in Europe, grasses and other plants in the Swiss Alps, and small mammals such as shrews, mice and chipmunks in the Sierra Nevada of California.

The species quickest to expand their range should be those that reproduce the fastest, disperse the farthest, and are the least picky about food, shelter, or mates, models predict.

To find out if predictions hold true, the researchers compiled data on how far each species had shifted, and compared it to various intrinsic features of the species themselves, such as their mode of dispersal, breeding rate, and dietary preferences.

The result? Global warming's winners and losers may be hard to predict based on broad traits related to dispersal ability or reproduction, the researchers explained.

"For each group we found one or more traits that do explain some variation in recent range shifts, but none with clear influence across all groups," wrote Angert, who studies the effects of climate change on range shifts in monkeyflowers.

One possibility is that the traits that really matter for a species' ability to move to more suitable sites — such as temperature tolerance — are difficult to measure or find a proxy for, the authors argue.

Another possibility is that external factors, such as habitat fragmentation and availability, may be just as important as the species themselves. Plants and animals on mountain peaks or near the poles may simply have nowhere cooler to go, the researchers explained.

The findings were published last week in *Ecology Letters*.

More information: Angert, A., L. Crozier, et al. (2011). "Do species' traits predict recent shifts at expanding range edges?" *Ecology Letters*. DOI: 10.1111/j.1461-0248.2011.01620.x

Provided by National Evolutionary Synthesis Center