Habitat quality is better than quantity for species survival

A new study suggests that *improving* the quality of existing wildlife habitat is more important than creating *new* habitat, when attempting to counteract the negative effects of climate change on species survival. This suggests that resources would be better directed towards habitat rehabilitation and reforestation than building new habitat features.

Two main drivers of biodiversity loss are climate change, which causes shifts in temperature and precipitation patterns, and the destruction of natural habitat for agriculture and urban development. However, most studies look at these drivers independently of each other when, in fact, they often happen in combination and can be strongly linked.

In the new study, which received funding through the EU FEMMES project[1], scientists used a conceptual model to simulate the effects of a gradual improvement or deterioration in habitat quality over time on a hypothetical regional population. They represented this by changing the total number of individuals that the habitat could support, known as the ‘patch capacity’.

The scientists also considered the effect of decreasing or increasing the total area of high-quality habitat, representing habitat loss or gain. In each scenario, the scientists imposed the same reduction in growth rate for the population to represent a negative response to climate change. The scenarios were compared by calculating the mean time taken for the population to reach extinction.

As expected, the scientists found that habitat changes could accelerate the negative effects of climate change (in the case of deterioration or loss) or slow them down (in the case of improvement or gain). In reality, these effects can be direct, i.e. where a climate shift affects the distribution and diversity of habitat forming vegetation, or indirect. This could be where habitat loss or fragmentation restricts the movement of a population, preventing its natural reaction to a climate shift, which would be to expand its geographical range. This isolates the population,

making it more vulnerable to further environmental change.

To make their investigation applicable to a broad range of species, the researchers looked at the response of four different groups of species, taking into account common species, rare species, species that have a high number of offspring and species that have a low number of offspring. Interestingly, they found that given equal climate change scenarios, the positive effects of habitat improvement lead to higher survival times than habitat gain for all four groups.

Groups with low population densities and the ability to reproduce quickly (i.e. high growth rate and number of offspring) were the most sensitive to negative habitat changes, with a variation in estimated extinction time of up to 50%, compared to 10% or less in the other three functional groups. This is because they depend heavily on the colonisation of new, suitable habitat. The relative importance of habitat degradation and habitat loss varied between functional groups and was further complicated by the influence of additional factors in the model, such as the level of habitat fragmentation and the ability of an individual to search for suitable habitat if its initial choice was sub-standard.

These results suggest that focusing on improving existing habitat at a regional scale is a more promising strategy for reducing the environmental impact of climate change than establishing new habitat, because it allows a population more time to adapt to changing conditions. It is important that the relative benefits of each approach are carefully analysed in the context of the financial resources available for conservation efforts, say the researchers.

1. FEMMES (FEedback Mechanisms in Models for Ecological forecastS) was supported by the European Commission through the Marie Curie Host Fellowships for Transfer of Knowledge. See: www.bio.uni-potsdam.de/professors/ecology-and-ecosystem-modelling/research/femmes_cobo_/femmes_/

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