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Local management helps species adapt to climate change

As the climate changes, habitat specialist species will be forced to either adapt to new conditions or move to more suitable habitat. Now, researchers from the UK have shown how conservationists can use local management practices to help these species expand into new areas with favourable conditions.

One result of climate change is that existing species habitats will become increasingly unsuitable, particularly for habitat specialists. Conservationists can either help these species cope with changing conditions in their existing range, or help them move to new sites. However, few studies have looked at how such 'facilitated range shifts' would work in practice. Those that have tended to look at large landscape-scale habitat management, rather than local management.

To address this, the researchers studied populations of the silver-spotted skipper butterfly (*Hesperia comma*) in southeast England. *H. comma* has strict habitat requirements, as females only lay eggs on short tufts of sheep's fescue grass, preferably in warm areas next to bare ground. Higher temperatures also increase egg-laying rates. As a result, rising temperatures have allowed *H. comma* to expand its range northwards.

The researchers used a general linear model to study how factors such as patch area, vegetation cover and the proportion of sheep's fescue grass, mean August daily maximum temperature and the amount of sunlight the site received affected *H. comma* populations at 724 patches between 2000 and 2009.

They found that 67 patches were colonised and 48 local extinctions occurred over the study period, as well as 29 temporary colonisations and subsequent extinctions. In particular, populations at the leading edge of the range expansion were most vulnerable to extinction.

The survival of populations of *H. comma* depended on several site-specific factors which could be influenced by local management practices. Larger patches had higher survival rates, as did higher quality patches with more sheep's fescue grass. Sites with around 15 per cent bare earth also had high survival rates. Survival also depended on climactic factors; populations in warmer, south-facing sites had greater survival chances, as did those which received the most sunlight. Connectivity between patches – a landscape-scale issue – improved both the chances of initial colonisation and survival.

The results suggest that, as population survival in occupied patches is important to long-term range shifts, local management practices can help facilitate range shifts by improving the survival chances of populations at the leading edge of expansion. However, local management practices do not improve the chances of a patch being colonised in the first place.

Based on these findings, the researchers proposed management options for sites where either colonisation or survival chances were low. For those where colonisation was a problem, the researchers suggested creating corridors or 'stepping stone' patches between sites to improve connectivity, as well as artificially introducing the butterfly. For sites where survival was low, land managers can increase patch size through habitat restoration or use grazing to improve patch quality.

However, the researchers note that management priorities can change quickly. As climates change, isolated sites may end up better connected to habitable areas, improving the chances of colonisation and suggesting land managers should focus on improving the site to aid survival. Alternatively, sites on the edge of the range where survival rates were low may become more central, so management to improve survival may become less of a priority.

Source: Lawson, C.R., Bennie, J.J., Thomas, C.D., Hodgson, J.A. & Wilson, R.J. (2012). Local and landscape management of an expanding range margin under climate change. *Journal of applied Ecology*. 49, p 552 – 561. doi: 10.1111/j.1365-2664.2011.02098.x
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