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ABSTRACT

A worked example of climate change adaptation for southern range margin populations

JAMES W. PEARCE-HIGGINS

BTO, The Nunnery, Theford, Norfolk IP24 2PU, UK
(formerly: RSPB, Dunedin House, 25 Ravelston Terrace, Edinburgh, EH4 3TP, UK)

Email: james.pearce-higgins@bto.org

The distribution and abundance of birds is being increasingly affected by climate change. Not only are some species advancing their range northwards in Europe, but there is increasing evidence for declines at the southern range margin for a number of populations. There is considerable uncertainty about the potential for conservation action to be able to prevent or manage such changes that threaten the long-term viability of vulnerable populations. This is an area of considerable research interest, which has largely focussed on the potential for increasing connectivity to facilitate the movement of species to track their changing climate. However, there is also potential for the management of individual sites and populations to increase their resilience to climate change, which has received little scientific attention.

I use the example of golden plover to illustrate how such adaptation management might operate. This is a species for which increasing summer temperatures are projected to threaten populations at the southern range margin in the UK, through effects on their tipulid prey. Using an existing demographic model for a southern range margin population in the South Pennines, England, I examine the potential for adaptation management to increase the temperature threshold beyond which the population is predicted to decline. Firstly, I simulate the ability of habitat management to directly counter the negative effects of warming upon tipulid abundance, by incrementally increasing or decreasing abundance by a simple multiplier. Secondly, I simulate the effects of incrementally increasing and decreasing rates of nest and chick losses to predation, examining the potential of management, such as predator control, to reduce the severity of other pressures on vulnerable populations.

Simulations varying baseline tipulid abundance had little impact upon productivity and population change at low temperatures, but increased the threshold of mean maximum August temperature at which the population is projected to decline in any one year from 18 to 20°C, based on a four-fold increase in tipulid abundance. However, at higher temperatures, there was little difference between simulations. Simulations of varying predation levels suggest that, at low temperatures, when cranefly abundance is not limiting productivity, population growth is highly sensitive to predation. A nominal halving of the observed predation rates on which the model was built raises the temperature threshold for decline to 20.75°C, whilst at high temperatures, there was little difference between simulations. Given that the South Pennines site used to parameterise the model supports a high density of golden plovers, and is subject to existing predator control, I use the literature to assess the likely potential magnitude of increase in tipulid abundance and reduction in predation rates that would be possible at this site. This information is used to provide a realistic assessment of the likely potential for, and limits to, the ability of adaptation to increase the resilience of vulnerable golden plover populations to future climate change. Exactly, what adaptation management options might be available are outlined, and include some

which may also contribute to climate change mitigation. Finally, the potential wider benefits and limitations of this adaptation management approach to increase the resilience of vulnerable sites and populations are discussed.

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