

# Highs & Lows

**Climate change is of most conservation interest when it starts to impact upon the abundance of species, and the size of populations. In the second of his series of articles for BTO news, James Pearce-Higgins assesses the evidence for climate change having driven recent changes in UK bird populations.**



**Bird populations change** primarily as a result of changes in either breeding success or survival rates. If either of these parameters are affected by climate change, then that may result in significant changes to populations of that species. A range of scientific studies have examined how breeding success and survival rates vary in relation to temperature and rainfall, and can be used to indicate how populations are likely to respond to climate change.

## VARIATION IN BREEDING SUCCESS

As you might expect, changes in the weather can have a strong impact upon the growth and survival of chicks and therefore overall breeding success. Young chicks of most species tend to suffer when it is cold and wet, as they use more energy to keep warm and require more brooding, reducing the amount of time for feeding. Food availability, particularly of insects, may also be reduced when it is cold, making foraging less efficient. The precocial

▲ These Lapwing chicks are dry and warm, but cold and wet weather has a dramatic effect on the survival chances of young precocial chicks such as these. A series of wet springs, as may happen due to climate change, will be reflected in reduced breeding success of some species, and subsequently as population decline.

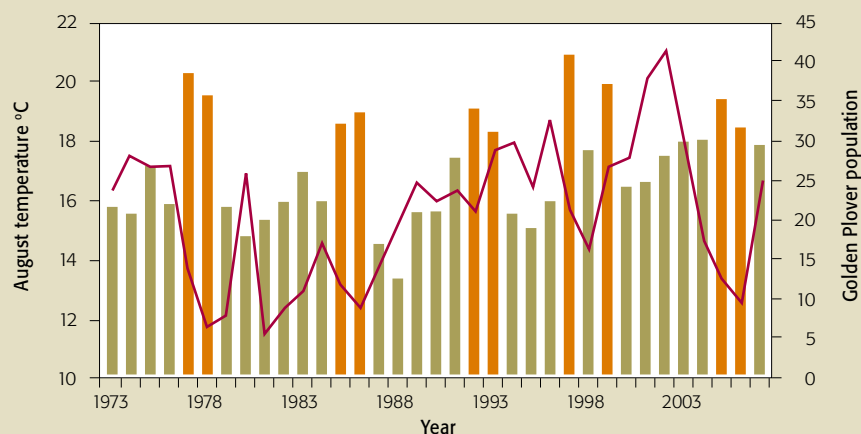


## 1. High temperature: perils for Golden Plover

Golden Plovers are at the southern edge of their global range in the UK, where they breed on upland moorland and peatland habitats and craneflies provide an important food source. Golden Plover breeding success is linked to cranefly abundance. However, high summer temperatures kill young cranefly larvae living in the surface of the peat soil, resulting in few craneflies for the Golden Plover chicks to eat the following year, and leading to a subsequent plover population decline. As craneflies

are an important prey species for many upland birds, these patterns are likely to be widespread.

Below shows annual fluctuations in the abundance of Golden Plovers at Snake Summit in the Peak District recorded by Derek Yalden (line) in relation to August temperature two years previously (bars). Population declines were more likely to occur following hot years (the ten hottest years are indicated in orange).



chicks of gamebirds and waders, which leave the nest after they hatch and forage on their own, are particularly vulnerable to such poor weather.

Cold, wet conditions in the spring are therefore detrimental to most chicks, and yet climate change may make conditions warmer and drier. Does this mean that climate change will be largely beneficial? Possibly, yes, for some species. For others, climate change may reduce food availability, which often determines breeding success. We have already looked at how this may occur through changes in timing of biological events (BTO News 294), but perhaps more importantly, food availability may be reduced through declines in prey populations themselves. If the abundance of prey is linked to particular temperature or rainfall patterns, and those patterns alter in response to climate change, then that may cause reductions in the productivity of birds which feed on that species. This has been best studied in the marine environment, where increasing sea temperatures have led to northward shifts in the distribution and abundance of fish species. For example, around the UK the abundance and condition of Sandeels, a key prey for Kittiwakes, auks and terns, has been reduced, leading to a decline in productivity at a number of breeding colonies in eastern Britain. If sustained, these reductions may cause long-term population declines. Recent studies in the UK uplands suggest that such effects may not be restricted to our seas, but that here, rising temperatures may also reduce prey abundance and threaten bird populations (Box 1).

### VARIATION IN SURVIVAL RATES

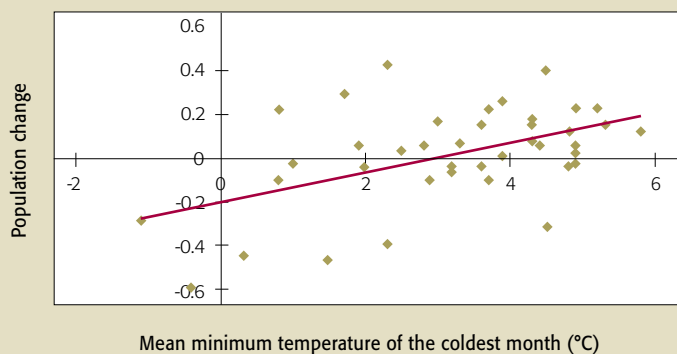
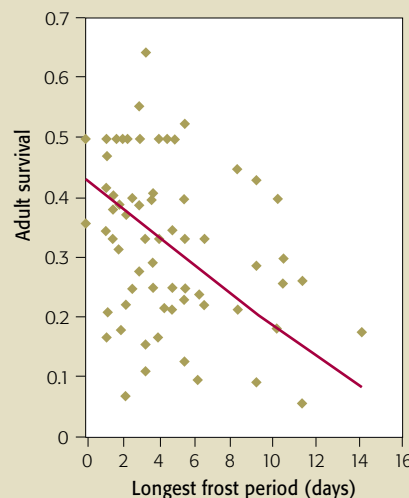
The survival of many UK resident birds is dependent upon winter weather, when energetic demands are greatest, and food resources at their lowest. An individual bird may lose 10% of its mass overnight by burning fat. Analyses of BTO ringing data shows that the survival of seven of ten common bird species is lower in severe winters (Box 2). Other studies show that raptor, wader and waterfowl species are also sensitive to such conditions. Similarly, the survival of many summer migrants is also dependent upon weather conditions on the wintering grounds. BTO analyses of data from the RAS and CES ringing schemes have shown that populations of a wide range of long-distance migrants, including House Martins, Sand Martins, Sedge Warblers and Whitethroats decline in response to drought in the regions of Africa where they overwinter.

Variation in temperature and precipitation affects the breeding success and survival of many birds, either directly or indirectly. In response to recent changes in the climate, we are beginning to detect changes in our bird populations. All of us who monitor nests, ring or count birds



## 2. Low temperature: Woes for Wrens

The survival rate of small-bodied species such as Wrens is strongly related to winter severity. Adult Wren survival, as estimated from ringing recoveries, is significantly reduced in winters with extended periods of frost (right) which means that the national Wren population tends to decline following cold winters (below).



contribute to the detective work of tracking the potential impacts of climate change through time, which are anticipated to become increasingly severe. Quite how severe will be the topic of the next article, when we anticipate likely future changes in the abundance and distribution of species if climate change projections are realised.

These analyses use data from the BTO/JNCC/RSPB Breeding Bird Survey and the BTO Ringing Scheme funded by BTO, JNCC, The National Parks Service (NI) and the ringers themselves.

### FIND OUR MORE

James Pearce-Higgins is currently co-authoring a book on birds and climate change with Rhys Green, to be published by Cambridge University Press.

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