Green, R. 2010. *BOU Proceedings – Climate Change and Birds.*
http://www.bou.org.uk/bouproc-net/ccb/green.pdf

This paper forms part of the proceedings from the BOU conference ***Climate Change and Birds****.*
Other papers from these proceedings can be viewed at www.BOUPROC.net.

ABSTRACT

An overview of the effects of climate change on birds

RHYS E. GREEN

Department of Zoology, University of Cambridge, Cambridge, UK

Email: reg29@hermes.cam.ac.uk

No one doubts that climatic conditions have many effects on the lives of birds, but how do these influences play out and interact to influence their evolution, distribution and abundance? In particular, what will be the impact on bird populations of projected global climate change, caused by humans, over the next few hundred years?

Short-term fluctuations in temperature, precipitation and wind affect bird demographic rates and habitat selection. Winter and summer temperatures affect the energy requirements of birds and the availability of their food and hence survival and breeding success. Rain and snowfall variations also have effects in many ways, for example, by droughts rendering soil invertebrate food unavailable, floods destroying nests and snow preventing access to foraging sites on the ground. Winds affect the flying costs and survival chances of long-distance migrants and seabirds. Effects of short-term variations in meteorological conditions differ in their complexity. For example, a warm spring may increase the food supply and survival of an insectivorous bird and hence its condition and survival during the spring itself, but it may also speed up the larval development of its prey and adversely affect the match between the peak in prey abundance and the peak demand for nestling food. Short-term effects of weather conditions can be incorporated into demographic models to improve our understanding of changes in bird population size and distribution.

Long-term changes in climate affect distribution and abundance both by accumulation of short-term effects on demographic rates of birds and by causing directional changes in the ecological communities which are their homes. These include changes in the distribution, abundance and phenological pattern of the predators, competitors, prey, parasites, diseases and plants which make up the habitat of a species and determine the population density it will support. Of great importance are the changes in human land use and industrial, energy generation and transport infrastructure that climate change will bring about. Because of the difficult-to-predict directional long-term effects, long-term changes in bird populations in response to climatic change are difficult to predict from demographic models based on short runs of observed data from the recent past.

Projections of the impact of climate change on the future distribution and abundance of birds are usually based upon models that assume an unchanging climatic niche for each species and varying degrees to which a species can change its geographical range to occupy all the areas where tolerable climatic conditions are thought to be found. Such models predict large changes in the eventual future range and population sizes of some bird species, and hence their conservation status. Thus, the priorities and methods of bird conservations need to take climate change into account. However, confidence in these projected outcomes, and the rapidity with which they might be realized, is quite low because of lack of stringent validation of model predictions and limited inclusion of information on the mechanisms of population and distributional change and on interactions between climate change and other environmental change. It will be important to take into account constraints imposed on abundance and distribution that will not change, or at most change very slowly, in response to climate. Examples include limits imposed by the availability of safe nesting sites such as cliffs and predator-free islands

for seabirds and suitable soil types for ground-dwelling species that depend upon their plumage, eggs and chicks matching the substrate for anti-predator camouflage. An unusual example is provided by nocturnal insectivorous ground-feeding birds such as the largely tropical and sub-tropical thick-knees and *Rhinoptilus* coursers. The potential extension of their distribution polewards in response to future warming may be limited by the short duration of the night during the warm season at high latitudes.

Development of detailed mechanistic models of responses of populations of a range of exemplar bird species to climatic change is a high priority. It is important to increase the degree to which such models take account, not only changes in the abundance and timing of other species that provide birds with food and cover, but also interactions with competitors, predators and parasites.

CITATION: Green, R. 2010. An overview of the effects of climate change on birds. *BOU Proceedings – Climate Change and Birds*. http://www.bou.org.uk/bouproc-net/ccb/green.pdf

