

North-South divide

climate impacts on UK ground beetles



Insect populations in the UK face considerable pressures from both a decline in the availability of suitable habitats and from the effects of climate change, a possibility recently confirmed for British butterflies and moths¹. ECN monitoring includes butterflies, moths², spittle bugs and ground beetles (Carabidae), a group of predatory invertebrate species. They are a useful group to study because, as well as responding directly to environmental factors, changes in their populations may reflect changes in prey populations.

To date, 135 species of carabid have been found at terrestrial ECN sites³. Lowland sites have a greater abundance and diversity of carabids than upland sites. Most carabid species have very specific environmental requirements and this is reflected in their distribution, and in the differences observed between sites. Over half of all species recorded are found at only one or two sites, 25% at only one site. At all sites a few species (<5) dominate the species mix, with other species generally found in much lower numbers.

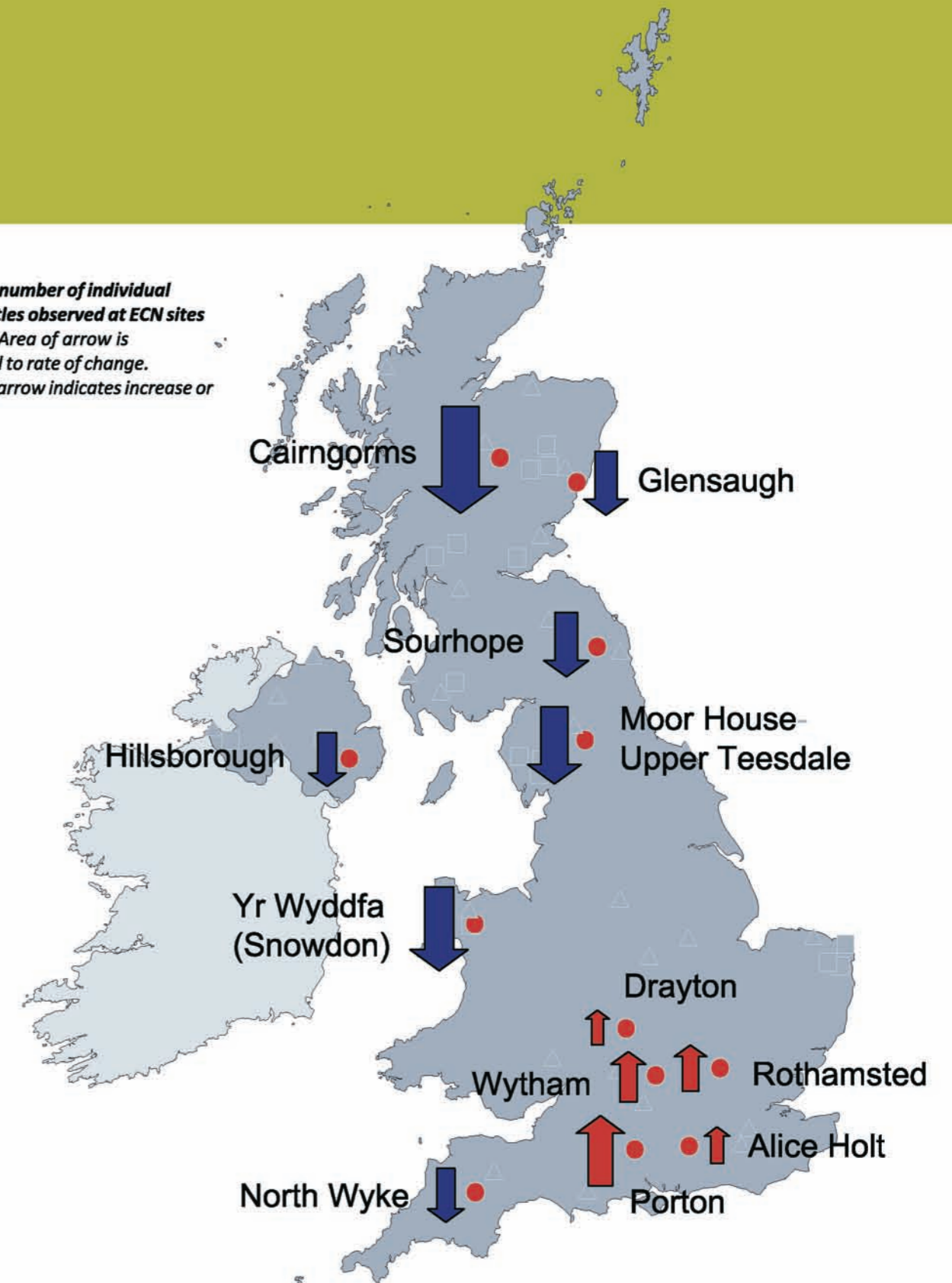
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Significant temporal trends in carabid numbers are seen at most ECN sites and they show a very striking geographical pattern: numbers are increasing at sites in the south-east but are decreasing elsewhere (see map).

Carabid numbers at ECN sites appear to be increasing in the south-east and decreasing in the north-west. Temperature change is a possible cause

The reason for the pattern of response observed is still uncertain. Many environmental factors, such as temperature, rainfall, pollution and altitude, vary along the same south-east to north-west gradient and hence it is difficult to separate out their relative importance. Our analysis suggests that these trends are best explained by the effect of rising air temperature on beetle populations in different parts of the country. The upland ECN sites show a more pronounced rise in temperature over the study period and the more northerly populations may be more vulnerable to the impacts of such warming. Whatever the cause, the ECN signal is clear, and it raises a number of questions. For example, do trends in carabids' prey species also show north-south differences?

► Trends in number of individual ground beetles observed at ECN sites 1993-2005. Area of arrow is proportional to rate of change. Direction of arrow indicates increase or decrease.



ECN monitoring of beetles involves pitfall trapping, an extensively used and well-tested method. Pitfall traps consist of sunken polypropylene cups, with wire mesh to prevent inadvertently catching small mammals and amphibians. Three transects (lines), each comprising ten pitfall traps are set out at each site in early May and are emptied and replaced fortnightly until the end of October. Most ECN terrestrial sites started carabid trapping in 1993 or 1994; Snowdon and the Cairngorms joined the network later and have data only from 1999. More details on the approaches used are available³.

Monitoring beetles