Severe droughts could lead to widespread losses of butterflies by 2050

August 10 2015

Speckled wood butterfly. One of six drought sensitive species analyzed in this study. Credit: Jim Asher

Widespread drought-sensitive butterfly population extinctions could

occur in the UK as early as 2050 according to a new study published today in the scientific journal *Nature Climate Change*.

However, the authors conclude that substantial greenhouse gas emission reductions combined with better management of landscapes, in particular reducing habitat fragmentation, will greatly improve the chances of drought-sensitive butterflies flying until at least 2100.

The study was led by Dr Tom Oliver from the UK's Centre for Ecology & Hydrology (CEH) in collaboration with colleagues from CEH, the charity Butterfly Conservation, Natural England and the University of Exeter.

Lead author Dr Tom Oliver from the Centre for Ecology & Hydrology said, "The results are worrying. Until I started this research, I hadn't quite realised the magnitude and potential impacts from climate change. For drought-sensitive butterflies, and potentially other taxa, widespread population extinctions are expected by 2050. To limit these loses, both habitat restoration and reducing CO2 emissions have a role. In fact, a combination of both is necessary."

The team identified six species of drought-sensitive butterfly - ringlet, speckled wood, large skipper, large white, small white and green-veined white - as having a low probability of persistence by 2050 even under most favourable emissions scenario. Butterflies were chosen for this study as they are amongst the best studied groups of species with good records of year-to-year changes in abundance, but there are many other drought sensitive groups which may be similarly affected.

Dr Oliver adds, "We consider the average response across Great Britain. Losses are likely to be more severe in drier areas with more intensive land use, whilst wetter areas with less fragmented habitat will provide refugia. We assume that butterflies won't have time to evolve to become

more drought-tolerant, because their populations are already small, and evolution would need to be very rapid. The study looked at butterflies but the conclusions are potentially valid for other species such as birds, beetles, moths and dragonflies."

The study combined data from data from 129 sites for 28 species monitored as part of UK Butterfly Monitoring Scheme, with historic climate data from the Central England Temperature and the England and Wales Rainfall monthly series, habitat data from UK Land Cover Map, and climate model projections from 17 global circulation models in the CMIP5 database. Impacts of four Representative Concentration Pathways (different global CO2 emission trajectories) were investigated.

Co-author Mike Morecroft from Natural England said, "There's good news and bad news here. The good news is that we can increase the resilience of species to climate change by improving our natural environment, particularly increasing areas of habitat and we are working hard at this. However, this approach will only work if climate change is limited by effective controls on greenhouse gas emissions."

Co-author Tom Brereton from Butterfly Conservation said, "The study highlights the pressing need to investigate local conservation measures that may help drought-sensitive butterflies to adapt and persist in our changing countryside."

Co-author Dr Chris Huntingford also from the Centre for Ecology & Hydrology said, "Many climate projections indicate rapid increases in the frequency of severe drought events under all scenarios, but especially under the steepest rise in CO2 emissions. There is uncertainty in these projections, which we captured by considering outputs from seventeen different climate models. The overall results suggest that drought-sensitive butterflies are only likely to avoid widespread extinctions if CO2 emission levels are reduced below business-as-usual and,

furthermore, this in combination with habitat restoration measures"

Co-author Dr Christel Prudhomme from the Centre for Ecology & Hydrology said, 'This study highlights the benefits of much tighter discussion between researchers from physical and environmental science disciplines- between those who develop simulations of expected levels of future climate change, and those who can translate those projections into local impacts and potential adaptation strategies'

More information: *Nature Climate Change*, DOI: 10.1038/nclimate2746

Provided by Centre for Ecology & Hydrology