



Birds and butterflies fail to follow climate change temperature rise

As the climate changes, animal species are predicted to adapt by moving northwards so they can remain within their preferred temperature range. Now, researchers have found that bird and butterfly populations are not keeping up with changing temperatures and, on average, European bird and butterfly species lag around 212km and 135km, respectively, behind climate changes.

As birds and butterflies are more able than many species to travel large distances, terrestrial species that cannot disperse as easily may be slower to adapt to climate change. The findings of this study suggest that, as climate change alters habitats across Europe, bird and butterfly communities are adapting at different rates, potentially disrupting vital interactions between species. For instance, bird species which feed on caterpillars during the nesting season may find it harder to feed their chicks if caterpillar populations have moved north. As a result, climate change could have serious implications for biodiversity and the continued provision of ecosystem services.

Although previous research has demonstrated how species adapt to climate change individually, researchers are unclear about how large-scale environmental changes might affect whole groups of species. To address this, a team of researchers, supported in part by the EU-funded ALARM¹, MACIS² and STEP³ projects, examined how the distribution of bird and butterfly species changed European sites between 1990 and 2008. The researchers catalogued the abundance of birds and butterflies at 9490 and 2130 sites, respectively. Then, for each species present, they established their 'species temperature index', which is the long-term average temperature over each species' range.

Finally, the researchers calculated the average species temperature index at a given location, weighted by abundance, to give the 'community temperature index', or CTI, of all of the bird or butterfly species at each site. A higher CTI shows that a location contains more species that prefer higher temperatures. The researchers also looked at temperature changes over the same time period and region. The results revealed that the average CTI for both birds and butterflies increased steadily over the 28 year period, with bird CTI gaining around 2.6 annually, and butterfly CTI gaining 9.3. The data also revealed that over this period, bird and butterfly species shifted 37km and 114km northwards. In comparison, temperatures had moved 249km northwards over the same period.

To explain the differences between the movements of birds and butterflies, the researchers suggest that the shorter life cycle and the way that butterflies control their body temperature means that they track climatic temperature changes more closely than longer-lived birds, which are less dependent on the environment for body heat. The researchers then repeated their calculations without the abundance data. Instead, they merely indicated whether a species was present at a site or not. They found broadly similar patterns of change, suggesting that species were shifting northwards, rather than just changing in abundance. When the analysis was repeated for individual nations, the researchers found that CTI increased significantly within almost every country. However, there were national differences. For instance, bird CTI in Sweden changed faster than in other nations. In the Netherlands, butterfly CTI was higher than bird CTI, although in the UK there was no difference between the two.

1. ALARM (Assessing large scale risks for biodiversity with tested methods) was supported by the European Commission under the Sixth Framework Programme. See: www.alarmproject.net

2. MACIS (Minimisation of and adaptation to climate change impacts on biodiversity) was supported by the European Commission under the Sixth Framework Programme. See: <http://macis-project.net>

3. STEP (Status and trends of European pollinators) is supported by the European Commission under the Seventh Framework Programme. See: www.step-project.net

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Contact: Vincent.devictor@univ-montp2.fr **Theme(s):** Biodiversity, Climate change and energy

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