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Butterflies: indicators of climate change

Climate change poses a large risk to biodiversity, acting upon other drivers. By using European butterflies as an early warning indicator, a recent large-scale study maps the effects of three different future climate change scenarios.

Butterflies have already suffered huge losses in population levels across Europe. They are highly sensitive to changes in habitats and provide an established means of assessing risk of biodiversity loss resulting from climate change.

The study was the result of long-term research by an international team of scientists, many of whom were working within a framework of projects funded by the European Commission. It examined the effect of three policy scenarios on 293 species of European butterflies, using data derived from the Mapping European Butterflies project[1]. The scenarios were developed within the ALARM project[2]:

1. SEDG scenario – 'Sustainable Europe Development Goal', which aims to achieve a socially, environmentally and economically sustainable development
2. BAMBU scenario – 'Business As Might Be Usual', which is a continuation of currently known socio-economic and policy trajectories
3. GRAS scenario – 'Growth Applied Strategy', which is driven by economic imperatives such as free trade and globalisation.

As temperatures rise in any of these scenarios, most butterfly species will be forced to head north. However, changes in land use may cause the areas of suitable habitat to be small and too distant for butterflies to travel between them. According to the model, the GRAS scenario would produce an average European temperature rise of 4.1˚ C by 2080 and over 95 per cent of the present land occupied by 70 different butterflies would become too warm for survival.

A specific example of this loss is the rare Spanish Festoon *Zerynthia rumina*, which would experience a 97 per cent reduction in distribution in Spain and Southern France. In the best case scenario, SEDG, Europe would experience a 2.4˚C rise in temperature. This would still cause 95 per cent of the land occupied by 9 butterflies and 50 per cent of the land occupied by 147 different butterflies to become too warm for survival.

In order to mitigate the worse effects, policy should aim to maintain large populations in diverse habitats and encourage mobility across landscapes. Approaches could include: changes to the Common Agricultural Policy so that it rewards farmers for conserving biodiversity. For example, they suggest better resourced and more targeted agri-environment schemes. Full implementation of the EU Habitats and Species Directives[3] and sustainable management of Natura 2000[4] sites would also be effective tools.

Alongside these measures, the authors suggest focusing on short term reductions in greenhouse gas emissions, which would allow maximum time for species to adapt to the changing climate.

1. Mapping European Butterflies (MEB). See: www.**map**eurbutt.de. Findings from the MEB project have been previously published: Kudrna, O. (2002). The distribution atlas of European butterflies. *Oedippus* 20: 1-342.
2. ALARM: Assessing LArge-scale Environmental Risks for biodiversity with tested methods was supported by the European Commission under the 6th Framework programme project. See http://www.alarmproject.net
3. See http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
4. See http://ec.europa.eu/environment/nature/natura2000/index_en.htm

Source: Settele, J., Kudrna, O., Harpke, A. *et al.* (2008). Climatic Risk Atlas of European Butterflies. *Biorisk.* Doi: 10.3897/biorisk.1 Available from: http://pensoftonline.net/biorisk/index.php/journal/issue/current
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