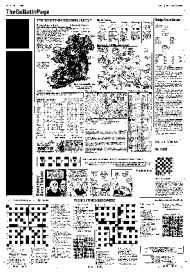

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Climate change and the Butterfly effect

CLIMATE CHANGE is forcing Europe's butterflies northward, with many at risk of dying out in the face of warming temperatures, researchers said yesterday.

Rising temperatures are already having an impact on butterflies such as the Comma, which is spreading north in the UK at a rate of six miles (10km) a year.

The majority of butterflies will try to move north as the continent warms, the authors of a new book, the *Climatic Risk Atlas of European Butterflies*, said.

But the loss of habitat and changes to forestry and farming practices, which have already led to sharp declines in butterflies, will mean many suitable areas are too small and too far apart to allow the insects to travel between them.

Those which can move will need to shift hundreds of kilometres in some cases to find suitable habitat, the researchers said.

Moreover, some butterflies which already occupy the more northern extremes of the continent, such as the Lapland fritillary and the Arctic ringlet, may simply run out of places to move to.

The UK looks set to gain several new species as they head north, including the bath white butterfly, the European map and the European swallowtail.

But some species, including the northern brown argus and the large heath which are more northerly butterflies, could be badly hit by the changes.

The small pearl bordered fritillary and the pearl bordered fritillary have already suffered rapid declines, and now face the threat of running out of areas with a suitable climate.

Another danger facing many species is that they are dependent on a particular species of plant for survival, and while some plants are widespread, others occur only in small pockets of habitat.

The atlas, which used climate models and data collected by thousands of volunteers, laid out best and worse-case scenarios for the coming years.

Under the worst-case scenario average European temperatures could rise by 4.1 degrees by 2080, making 95 per cent of the land occupied by 70 species too warm for their continued survival.

And even under the best case scenario of rises of just 2.4 degrees, half the land occupied by 147 different butterfly species would be uninhabitable for them.

Many butterflies will disappear from existing habitats, with the small tortoiseshell eliminated from middle and southern Europe and restricted to northern areas.

Moreover, rare species like the Spanish festoon and the apollo would experience huge losses from their existing habitats.

Co-author of the atlas Dr Martin Warren, chairman of Butterfly Conservation Europe, said: "Evidence points to an acceleration in climate change unless there is a significant decrease in global CO_2 emissions. This accelerated change would be the final nail in the coffin for many European species."

But he said the good news was there was a time lag before species began to respond to the effects of altered climate, presenting conservationists with a "window of opportunity" to preserve and link up habitats to help butterflies survive.

"We need to place more emphasis on maintaining large diverse populations on existing habitats while reconnecting habitats to allow species to move across the landscape. "This will mean working closely with farmers and planners," he said.

Maintaining larger populations of species will give them a better chance of surviving and adapting to the new conditions, he said.

The study's chief author, Dr Josef Settele of the Helmholtz Centre for Environmental Research in Germany, said: "The way butterflies change will indicate the possible response of many other insects, which collectively comprise over two-thirds of all species."