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x000B BUTTERFLIES MOVE NORTH DUE TO GLOBAL WARMING

A study published in the June 10 issue of the journal *Nature* clearly demonstrates changes in species ranges as butterflies shift north to track a changing climate as the planet warms up.

Camille Parmesan, Ph.D., who conducted the research while she was a post-doctoral fellow at the National Center for Ecological Analysis and Synthesis at the University of California, Santa Barbara, has filled an important gap with this new multi-species study. Previously she had studied one species, the Edith's checkerspot, which is particularly sensitive to climate, and has also moved northward in the Western United States.

Parmesan and her co-investigators found that out of 57 species studied in Europe and North Africa, 35 of which there were data for both the northern and southern range boundaries, two thirds had shifted northward.

Most of the remaining one third remained stable. "This puts the nail in the coffin," said Parmesan of the results. "It's black and white."

"These findings are highly significant," she explained. "They are definitely not random results."

Parmesan went all over Europe to find historical data as well as current data from government monitoring projects. While at the British Museum she joined forces with

scientist John Tennent who had just finished an exhaustive study of butterflies of Morocco, Tunisia and Algeria, and was able to include his results in the study.

The 22 (out of 35) species that shifted northward, moved between 35 to 240 kilometers over this century, according to Parmesan. This corresponds in magnitude to the shift in temperature isotherms of .8 degrees of warming that have occurred in this century in Europe.

Parmesan was able to account for land use changes in several ways, in order to rule it out as a variable. She says, "We selected species least likely to have been affected by modern habitat alterations. For Great Britain, we tested whether this selection might have biased our conclusion. We reanalyzed the data to incorporate all 38 non-migratory species that have northern boundaries within Great Britain, including those known to be severely habitat-restricted or to have suffered severe habitat loss. We still found 47 percent with northward extension and only 8 percent with southward retraction in the past 30 years."

She went on to say that her research has implications for many climate-sensitive organisms including beetles, grasshoppers, rodents and frogs. She concludes, "Given the relative slight warming in this century compared with predicted increases of 2.1 to 4.6 degrees Centigrade for the next century, our data indicate that future climate warming could become a major force in shifting species' distribution."

NCEAS is a think tank established in June 1995, at the University of California, Santa Barbara, to advance the state of ecological knowledge by identifying general patterns and principles and by organizing and synthesizing ecological information in a manner useful to researchers, resource managers, and policy makers. It is funded by the National Science Foundation with approximately \$10 million over a period of five years.

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