Climate change threatens rare British orchid that tricks bees into mating
Researchers find that warmer temperatures are upsetting the seasonal relationship between the early spider orchid and pollinating bees

By Patrick Barkham/Thu 5 Apr 2018/theguardian.com

It is one of the most cunning and elaborate reproductive deceits: the early spider orchid (*Ophrys sphegodes*) wafts a floral bouquet into the air that mimics the irresistible scent of a virgin female solitary mining bee, tricking gullible male bees into attempting intercourse with several flowers, thereby ensuring the plant’s pollination.

But the sexual success of this rare and declining orchid in Britain is imperilled by climate change, researchers have found.

The orchid’s ruse only works if a female mining bee, *Andrena nigroaenea*, has not emerged from hibernation, because as soon as this happens, the orchid cannot compete with the alluring scent of the real thing – and the plant is ignored by the male bees.

While warmer springs cause the early spider orchid to flower earlier in May, climate warming is also causing female bees to emerge from hibernation even earlier – confounding the orchid’s attempts to dupe the male bees.
Phenology is the study of how plant and animal life cycles are influenced by seasonal variations in climate. Similar phenological mismatches have been observed in other ecological relationships, such as great tit chicks no longer hatching soon enough to coincide with peak supplies of their crucial caterpillar food. They could potentially imperil the reproductive success of many species, including the pollination of plants and crops.

Studying 356 years of central England temperature records, as well as specimens of early spider orchids and *Andrena nigroaenea* from herbariums and museums from Victorian times, researchers from the University of Sussex, the University of East Anglia, Kew and the University of Kent were able to calculate when warm spring conditions caused the female bees to emerge earlier than the orchid.

Their study, published in the Botanical Journal of the Linnean Society, found that the orchid’s trick was always a delicate balancing act – even between 1659 and 1710, the peak flying date for the female bee preceded the orchid’s peak flowering in 40% of the years – but it has become even more inefficient.

Mean spring temperature increased from 7.68C to 8.64C over the 356-year study period, and between 1961 and 2014 the female bee’s emergence preceded the orchid’s peak flowering in 80% of the years.

The researchers found the female bee beat the orchid flower in 26 of the 28 years to 2014. Although one pollinated early spider orchid can produce 10,000 tiny seeds, failure to flower before the female bee emerges makes pollination almost impossible, and each orchid is very short-lived.

Michael Hutchings, lead author and emeritus professor of ecology at the University of Sussex, first noticed the changes in flowering times during 32 years studying the rare orchids on the South Downs. The orchid’s range in Britain has drastically shrunk and Hutchings warned that it could become extinct in this country, with climate change also damaging populations of other less specialist plants and animals.

“For years I’ve been speaking at conferences and writing papers saying if we get the habitat management right everything is going to be fine but then the climate warming actually stops the plant producing the seeds,” he said.

“Ecologists have been saying for a long time that if phenologies are changed by changing climate this might disrupt important interactions in communities of species. This study provides the strongest evidence we have that something nasty is happening. There are probably lots of other undocumented cases where similar detrimental effects on species are occurring.”