

# Sympatric speciation

Sympatric speciation in plants frequently happens via genome duplications, but what about animals? Biologists Robert Spooner and Raksha Gohel explore the situation in grasshoppers and mechanisms occurring in other animals

Sympatric is derived from the Greek meaning 'from the same area'. Sympatric speciation occurs when populations of a species become reproductively isolated from each other in the absence of physical or geographical separation.

## Plants

In plants, this often occurs through polyploidy, where some offspring have multiples of the normal number of chromosomes. If an individual is normally diploid (with two copies of each chromosome), then polyploid offspring could be tetraploid (with four copies). They themselves subsequently often perform meiosis poorly but can sometimes reproduce asexually. Even if successful in making gametes, then a mating between tetraploid and diploid individuals does not generate fertile offspring. The tetraploid becomes reproductively isolated from the parental diploid species. Sometimes the plant can self-fertilise and a new tetraploid species is created. The situation in animals is different.

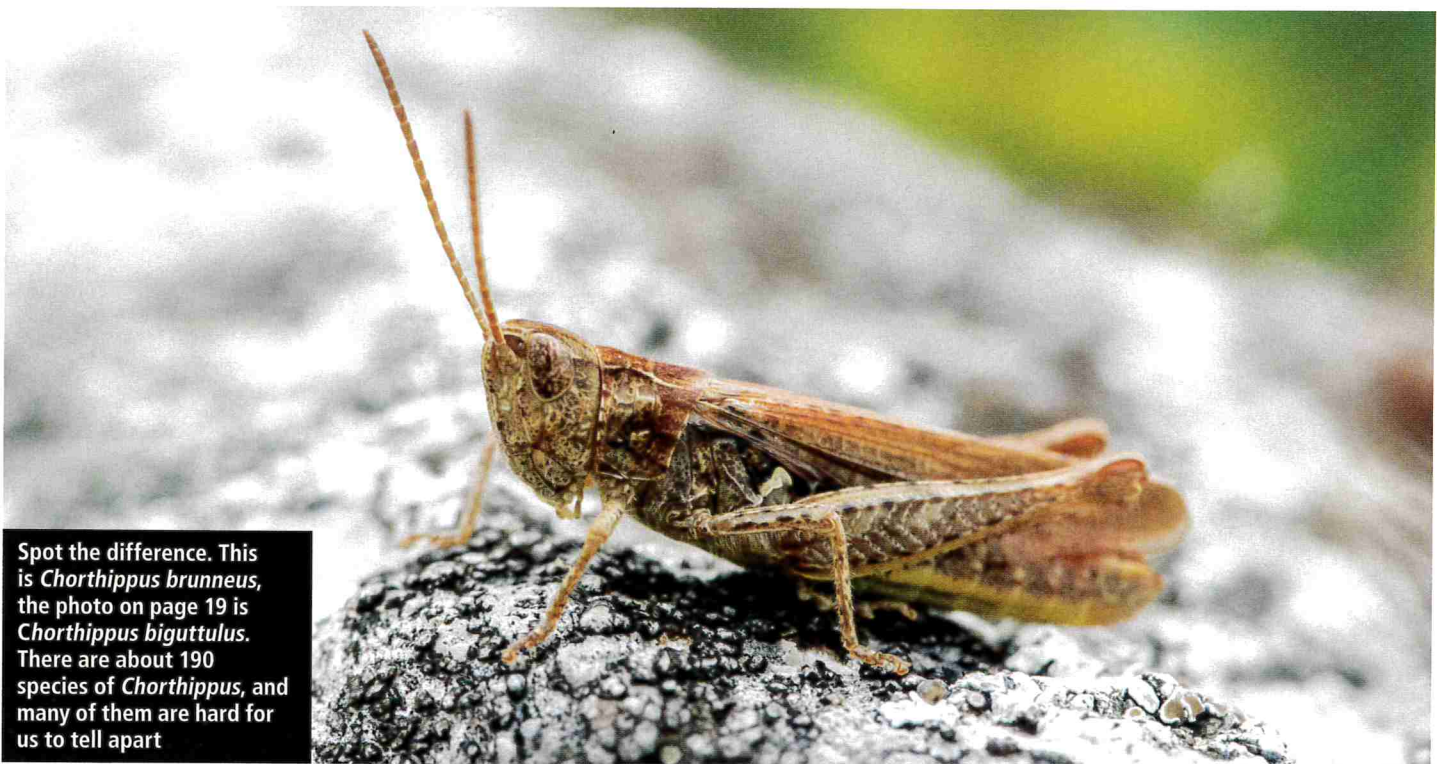
## European grasshoppers

It is not unusual to find pairs of closely related species that occupy the same geographical range and that do not interbreed naturally, but which can interbreed under experimental conditions. Some *Chorthippus* grasshoppers are so similar that without a microscope, it is hard for

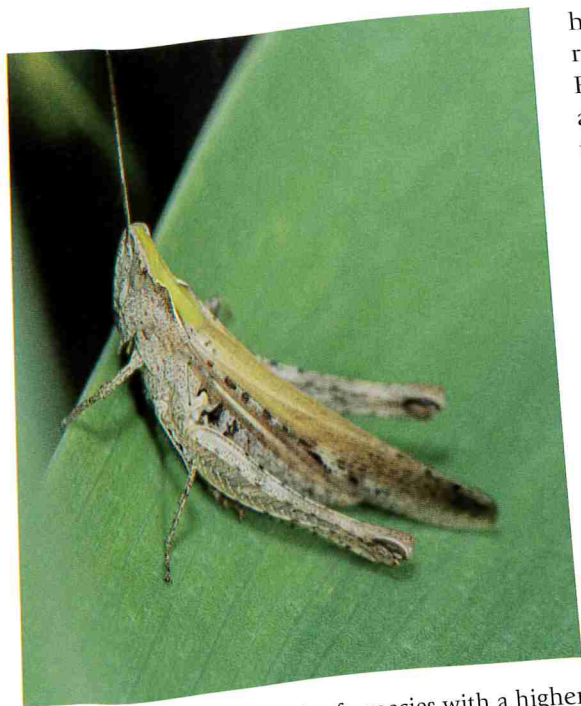
humans to determine which species they belong to. But the grasshoppers themselves have no difficulties.

Female grasshoppers do not rely on looks when choosing a mating partner, but instead they listen. The males have courtship calls made by stridulation (the scraping of their back legs against their wing-cases), but different species stridulate at different frequencies. In the wild, females will only choose males that stridulate at the correct species frequency. This choice of courtship call is a powerful species separator. However, in captivity a female will mate with a male from a different species if she can hear the courtship call of a male from her own species, and the offspring are usually fully fertile.

The choice of frequency preferred by a female grasshopper depends on the temperature of her head. A male of any grasshopper species stridulates over a temperature-dependent range of frequencies (as the temperature rises, so does the stridulation frequency). The female's choice is temperature-sensitive, so she will pick a male of the same species no matter what the ambient temperature. Experimentally, she can be fooled. If her head is heated using a tiny thermocouple, her choice switches to higher



Spot the difference. This is *Chorthippus brunneus*, the photo on page 19 is *Chorthippus biguttulus*. There are about 190 species of *Chorthippus*, and many of them are hard for us to tell apart



frequencies, and so she will mate with a male of a species with a higher frequency call.

What might be the mechanism of sympatric speciation in grasshoppers? Both stridulation frequency and female preference are variable genetic traits. In any collection of grasshopper males, some will stridulate at a slightly higher frequency than the average, and some will stridulate at a slightly lower frequency. Similarly, some females of that species will

have a genetic range, and some Female choice and nowhere in their chromosome

### Other species

Are grasshoppers undergone sympatric speciation (which scrape ants (which scrape against each other not restricted to rats. Here, different others prefer in separation being discovered echolocation whale population is more common

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