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INSIDE JEB

Attraction and waterproofing could fast track Australian field cricket oily evolution

A mating pair of Australian field crickets, *Teleogryllus oceanicus*. Photo credit: Leigh Simmons.

The Swiss Army knife is a design classic; from handy pocketknives complete with tweezers and tiny pen to tools including saws and bottle openers. Many creatures also depend on versatile structures and compounds that serve multiple purposes for survival, yet some adaptable characteristics may excel in one context, while being less effective in others. For instance, oily hydrocarbon cocktails coating insect bodies can double as attractive scents and waterproofing. But, while some male insects are perceived as being more attractive thanks to their waterproof cocktails – which can contain more than 100 oily compounds – males from other species appear to pay a price for their increased alure, selecting oils with attractive aromas at the expense of their waterproofing. 'Many researchers have studied the appeal of these cocktails to choosy females, but we know less about how being attractive affects a male's ability to avoid water loss', says Leigh Simmons from The University of Western Australia.

In a bid to better understand how insects play off the competing priorities of waterproofing against attracting the right mate, Simmons and colleagues decided to raise Australian field crickets (*Teleogryllus oceanicus*) in dry and humid environments to find out how the insects fine-tune their oily coating and the impact this has on their appeal for females. Would the insects err on the side of caution in dry circumstances and discard their attractive oils in favour of better waterproofing? Or, might they select waterproofing that also boosted their attraction to capitalise on their dry start in life?

Knowing that Australian field crickets go through nine moults before developing into fully mature adults, Simmons and Maxine Lovegrove (The University of Western Australia) selected juvenile crickets that still had one moult to go and isolated individuals in humid (77% humidity) and dry (25% humidity) situations during their final stages of development until the adults were 10 days old. Isolating samples of the oily coatings as the insects matured, Bob Du, Melissa Thomas and Yonglin Ren from Murdoch University, Australia, identified 34 oily compounds and found that the mixtures produced by crickets raised in dry conditions included the most waterproof oils. In addition, when the team compared the adult male and female coatings, the males were using more of the most waterproof oils, which the females also find attractive. The males had not improved their waterproofing mixture at the expense of their allure. In fact, they had boosted the attractive cocktail, improving their chances of surviving drought while also attracting more mates. And Simmons adds, 'the evolution of these types of chemical signals might occur rapidly if they increase both a male's survival and his ability to attract mates'.

However, the team points out the possibility that other components which contribute to different aspects of cricket health may be traded in favour of waterproofing: 'Future research will be needed to explore the interactions between different compounds within the *T. oceanicus* profile', says Simmons. And he is keen to find out whether the oils that female Australian field crickets find attractive actively enhance the males' waterproofing, simultaneously improving their chances of survival by saving them from drying out.

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