Fossil cricket reveals Jurassic love song

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The love song of a long-extinct cricket that lived during the reign of the dinosaurs has been brought back to life by scientists.

Bush cricket.

The discovery lets us listen to a striking sound that echoed through Jurassic forests during the night, and which would've been heard by dinosaurs and other pre-historic creatures.

The song may be the oldest musical song documented yet.

The researchers made their discovery using an exceptionally well-preserved 165 million-year-old fossil found in Inner Mongolia. It is so perfect that using a microscope, they could clearly see the wing structures the cricket rubbed together to make a singing sound.

'This fossil wasn't the only one, but both wings in this one were entirely preserved,' says Professor Daniel Robert from the University of Bristol, co-author of the study, published in *Proceedings of the National Academy of Sciences*.

Watch

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The musical calls of a Jurassic bushcricket

The earliest bushcrickets were among the first animals to produce loud sounds by rubbing different parts of their bodies together. This behaviour is most common in insects, but some fish, lobsters, snakes, and spiders do it too. Modern-day bushcrickets – also called katydids – make mating calls by rubbing a row of teeth on

one wing against a plectrum on the other.

But exactly how their ancestors did this, and what their songs sounded like, was completely unknown until now.

After finding the fossil, palaeontologists from the Capital Normal University in Beijing contacted Robert and his University of Bristol colleague Dr Fernando Montealegre-Z, both experts in the biomechanics of singing and hearing in insects.

'Even the undersides of the wings were perfectly preserved, because the silt the fossils were found in was so fine, so we could see the ridges of teeth,' says Robert.

Montealegre-Z had already shown in living bushcrickets that the biomechanics of the wing structures dictate what sounds they'll make when rubbed together. He developed a mathematical model that could predict the pitch of the sound from the structure of the teeth on the wings.

> 'The file, or ridges, on one wing is so complete that if you measure the distance between the teeth, they'll tell you the type of song they sang.'
> **Professor Daniel Robert, University of Bristol**

'Fer had established in earlier studies that if the wings are symmetrical, and the row of teeth is organised in a certain way, crickets can sing with single-tone songs at low frequencies – with a few exceptions,' says Robert. 'In this fossil, we could see both features, so we had a strong indication that this katydid would have produced single-tone songs.'

Working with an expert in insect evolution from the University of Kansas, the scientists analysed the singing structures on the fossil's wings and compared them to those of 59 living bushcrickets. They concluded that the insect would have produced musical songs, broadcasting pure, single frequencies pitched at 6.4 kHz. Every bout of singing would have lasted 16 milliseconds.

The scientists decided it was a new fossil species, and named it *Archaboilus musicus*.

'The file, or ridges, on one wing is so complete that if you measure the distance between the teeth, they'll tell you the type of song they sang,' Robert says. 'We found they would've made a resonant sound - a bit like a violin.'

Modern relatives of *Archaboilus* with symmetrical wings still use this method to produce sound at low frequencies, while katydids with asymmetrical wings make more of a rasping sound and usually at ultrasonic frequencies. A single tone sound at low frequencies like the one made by *Archaboilus* goes a lot further, so the pre-historic cricket's love song would've carried well in a forest.

'Singing loud and clear advertises the presence, location and quality of the singer, a

message that females choose to respond to - or not. Using a single tone, the male's call carries further and better in noisy environments, and therefore is likely to serenade more females,' says Robert.

The only snag with that approach is that other creatures would've heard the cricket too, making it an easy-to-find meal.

The findings suggest that the acoustic landscape of a mid-Jurassic forest was already quite busy, with many animals singing – and hearing – at the same time and competing for a space in the acoustic ecological niche. You might have also had the additional noise of waterfalls, streams and the wind.

'What's striking is that by analysing well-preserved fossils and their mechanics, you can reconstruct behaviours. And you can start to derive the ecology of the environment and the physiology of the animals in it,' adds Robert.

SOURCE [2]

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[1] http://www.macromedia.com/go/getflashplayer
[2] http://planetearth.nerc.ac.uk/news/story.aspx?id=1149