

## INSIDE JEB

## Bats tune in to the sound of rain



*Micronycteris microtis* with katydid. Photo credit: Inga Geipel.

When Inga Geipel, from the Smithsonian Tropical Research Institute in Panama, was watching bats foraging for insects in an outdoor flight cage, she noticed something strange. Every time it started raining, the bats basically tucked up in a corner of the roof and wouldn't do anything. The odd thing about their behaviour was that the bats weren't getting wet. The flight cage allowed forest air to move through freely, but it was covered with a tin roof; Geipel became intrigued. She knew that rain can be a problem for bats: 'Rain', she says, 'particularly in the tropics, is really loud'. Bats primarily rely on their hearing for navigation and finding food, so rain could be a nuisance background noise masking the sounds that bats are trying to hear. Geipel and her collaborators began to wonder whether rain noise might also serve as a cue. Could it provide information about environmental conditions that helps bats to make decisions?

The team headed out in the Panamanian dry season to see whether rain noise alone was a cue for bats. They videotaped the

emergence of two species of bat at 20 roosts over a period of 3 nights at each roost. The first night, the researchers simply recorded the bats emerging. The next 2 nights, the team either played an audio recording of rain or treated the bats to a playback of ambient night sounds recorded on a clear night.

Geipel and her colleagues predicted that while the sound of a stormy night would be an important cue for the bats, the energetic requirements of each species might also play into when the bats decide to emerge. One of the species that they were observing isn't able to get through the night without eating – they must head out at some point to snack – but the other species can weather the storm and stay inside for the entire night. The two species also have different hunting styles, which could affect how much the smacking of raindrops on vegetation affects their acoustic abilities.

But what the researchers discovered was surprising. 'When I planned the experiment, I thought the bats should just stay in the roost until the rain playback

stopped, because the sound cue is there', Geipel says. However, the bats did eventually emerge, despite the rain noise. Geipel says this is because bats are smart and do not rely on a single source of information. She suspects that as acoustic specialists, the bats seem to use rain noise as a primary environmental cue and probably use other sensory systems to support that information. 'They figured out that it sounds like rain, but there are other things that are missing. It's not getting colder; it's not getting wetter. They figured out that it's actually not raining'.

And, while the sound of rain delayed the emergence of both species, there was no difference in the amount of delay between the species. The team believes this may suggest that, more generally, even very different bat species may be affected by rain noise in similar ways.

Geipel says that she thinks about noise differently now; although it is often considered a nuisance, it can provide useful information. To her, she says, it's a nice twist. It also opens up a suite of other questions about whether bats can distinguish between different types of noise and what bats do with the many forms of informational cues they receive from their environment. For now, though, one thing is certain; when the tropics give bats acoustic lemons, the bats tuck up and make lemonade.

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**Geipel, I., Smeekes, M. J., Halfwerk, W. and Page, R. A.** (2019). Noise as an informational cue for decision making: the sound of rain delays bat emergence. *J. Exp. Biol.* **222**, jeb192005.

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