

Visualizing danger from songbird warning calls

January 29 2018



Japanese tit looking for snakes when hearing specific alarm calls. Credit: Kyoto University / Toshitaka Suzuki

"Watch out! Snake!" Hearing this, people cannot help but imagine a snake as they prepare for a possible attack. In human conversation, hearing a particular word (e.g., "snake") can cause a listener to retrieve a specific mental image, even if there is nothing in the field of vision.

This cognition was once thought to be unique to humans. Now, it turns out that songbirds have a similar ability. A new study in *PNAS* reveals that a small songbird, the Japanese tit (*Parus minor*), can retrieve a visual image of a predator from specific alarm calls, providing the first evidence that nonhuman animals can 'see' a reference to certain vocalizations.

"The Japanese tit produces particular alarm calls when, and only when, encountering a predatory [snake](#)," explains Toshitaka Suzuki at the Center for Ecological Research, Kyoto University, and author of this study.

Using audio playback of calls and a short stick cut from a tree branch, the researcher discovered that simply hearing snake-specific calls causes the birds to perceive an otherwise inanimate object as a real snake.

In the experiment, snake-specific alarm calls were played while the birds approached a stick being moved in a serpentine fashion—up a tree trunk or along the ground. The birds notably did not respond to the same stick when hearing other calls, or if the stick's movement was not snake-like, indicating that, before seeing a real snake, they retrieve a snake image from specific alarm calls, causing them to become more sensitive to objects resembling snakes.

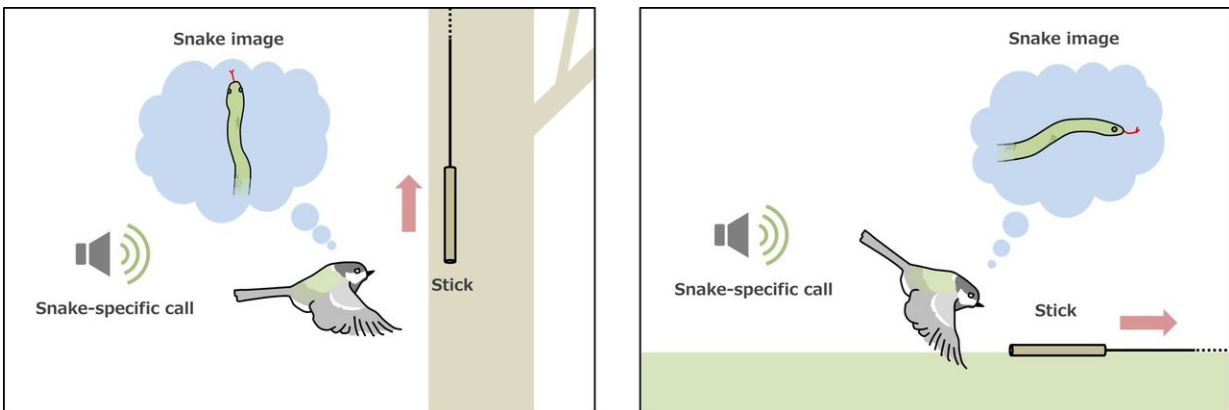
"With a snake's image in mind, tits can efficiently search out a snake regardless of its spatial position," says Suzuki.

Upon encountering a real snake, the birds typically make a close

approach, hovering over it and spreading their wings and tail, as if to deter the snake from attacking. The birds in this study likewise made an approach, but did not exhibit such distraction behavior.

"They may have realized that the stick was not a real snake once they got close enough."

Suzuki was inspired by his previous work showing that the Japanese tit alters its response to snake-specific alarm calls depending on circumstances. If such alarms are heard while in a nest cavity, the birds immediately flee as if to evade an attack. In contrast, when outside the nest, they look at the ground near the nesting tree as if searching for a snake.



During playback of snake-specific alarm calls, the Japanese tit approaches the wooden stick being moved in a serpentine fashion (left: moved up a tree trunk; right: along the ground). Credit: Kyoto University / Toshitaka Suzuki

"These [birds](#) do not respond to the calls in a uniform way, but appear to retrieve a snake image and then decide how to deal with the predator

according to the circumstance," he explains.

Over the last three decades, field biologists have revealed that many animals, such as monkeys and meerkats, produce specific calls for specific types of food or predators.

"Retrieval of mental images may also be involved in other animal communication systems," adds Suzuki. "Uncovering cognitive mechanisms for communication in wild animals can give insights into the origins and evolution of human speech."

More information: Alarm calls evoke a visual search image of a predator in birds, *PNAS* (2018).

www.pnas.org/cgi/doi/10.1073/pnas.1718884115

Provided by Kyoto University

Citation: Visualizing danger from songbird warning calls (2018, January 29) retrieved 18 April 2024 from <https://phys.org/news/2018-01-visualizing-danger-songbird.html>

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