Pitch perfect: How fairy-wrens identify other species' alarm calls

February 5 2013, by Pamela Fallow & Robert Magrath

New research shows that superb fairy-wrens are terrific eavesdroppers. Credit: Steve Igic

When you're a 10-gram fairy-wren living with the constant threat of being killed and eaten it's important to stay alert, and understanding which calls of other species signal danger can help you stay one step ahead of predators.

But how do fairy-wrens identify alarm calls among the abundance of calls they hear throughout the day?

In a recent study with Ben Pitcher, published in Proceedings of the

Royal Society B in January, we showed how superb fairy-wrens (Malurus cyaneus) can identify the alarm calls of other species even when they haven't heard them before.

Cause for alarm

Birds and mammals use alarm calls as a quick and effective way to warn others that a predator is nearby, and individuals that hear the alarm calls typically respond by fleeing to safety.

Some animals not only understand the alarm calls of their own kind but can also identify the alarm calls of other species, gaining a better chance of avoiding predators because they receive warnings from more individuals on the lookout.

Animals can eavesdrop on the alarm calls of very different species, for example birds eavesdrop on mammals and lizards eavesdrop on birds.

While animals that eavesdrop on the alarm calls of other species often need experience to learn which calls signal danger, sometimes no experience is required.

A few bird species respond to recordings of the alarm calls of species that live far away, showing that familiarity is not necessary for identifying alarm calls. These birds appear to respond to unfamiliar alarm calls that sound similar to their own, but because alarm calls have numerous variable features it is unclear which features are important.

A superb eavesdropper

The superb fairy-wren is an Australian bird that lives in small groups and is often on the ground when foraging for food. Fairy-wrens on the

ground are vulnerable to attack by predators, such as raptors and currawongs, and so immediately flee to cover after hearing alarm calls.

Previous studies have shown that fairy-wrens eavesdrop on the alarm calls of many other birds and seem to use both learning and call similarity to identify alarm calls.

Superb fairy-wrens need to stay alert to the presence of predators. Credit: Simon Bennett

One study showed that fairy-wrens fled to broadcast of noisy miner alarm calls in locations where there was a miner colony, but ignored the calls if they were unfamiliar with miners. So the fairy-wrens needed to learn how to recognise miner alarm calls, which sound quite different to fairy-wren calls.

Another study showed that fairy-wrens respond to the broadcast of unfamiliar alarm calls made by species living in different areas, but only if the calls are similar to their own alarm calls.

Alarming features

To figure out which call features were important for alarm call identification and why birds respond to only some unfamiliar alarm calls, we asked the fairy-wrens. We synthesised a range of artificial calls on computer, broadcast them to fairy-wrens and recorded their responses.

Fairy-wrens used call pitch to identify certain calls as alarm calls, and then modified their responses according to more subtle call differences.

They immediately fled to artificial calls that had a pitch similar to their own alarm calls, and responded more strongly as pitch became more similar.

Superb fairy-wrens (right) respond to the alarm calls of noisy miners (left) only

in locations where miners are present. Credit: Geoffrey Dabb/Steve Igic

They then spent more time hiding when the rate of pitch modulation was closer to that of their own alarm calls.

Fairy-wrens also fled to artificial calls with a pitch much lower than their own alarm calls but similar to that of a species they live with, and whose calls they had probably learned to recognise.

They paid no attention to artificial alarm calls that were practically the same as their own except for having a very different pitch.

Beyond eavesdropping

Our study shows that fairy-wrens use call pitch as a rule of thumb to quickly identify alarm calls, and then use other features to decide how soon to emerge from cover.

Our findings imply that fairy-wrens must learn to identify alarm calls that have a different pitch to their own alarm calls, such as those of noisy miners.

Together with other studies looking at learning, our study suggests that both learning and call structure play important roles in eavesdropping on the alarm calls of other species.

These findings allow us to predict which alarm calls a species should respond to without having to learn them. This, in turn, might influence decisions on the release of captive-bred animals so they benefit from the alarm calls of local species.

More information: rspb.royalsocietypublishing.or … 54/20122539.abstract

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