Neighborhood watch and more: How reed warblers watch out when there's a cuckoo about

January 22 2016

A cuckoo chick ejects a reed warbler egg from a warbler nest. Credit: Richard Nicoll

It's a risky business being a reed warbler. Not only do these tiny birds embark on an annual migration of some 5,000 km from their West African winter quarters to breeding grounds in the north, but they are also 'hosts' to the cuckoo, a species that lays its eggs in other birds' nests and takes no further part in raising its offspring. When the cuckoo chick hatches, it pushes the reed warbler eggs and young out of the nest. As sole occupant, it tricks its warbler 'parents' into supplying its voracious appetite until it fledges.

Cuckoos are expert tricksters: their eggs mimic those of their hosts in pattern though they are a little bigger. If the reed warbler detects an alien egg in its nest, or spots a cuckoo nearby, it may eject the odd-looking egg. But cuckoos are so swift in laying their eggs (only one is laid per nest and the process is over in as little as 10 seconds), and so clever at disguising their eggs, that warblers are often uncertain whether an odd egg in the clutch is a cuckoo egg or one of their own.

Research into the relationship between cuckoos and reed warblers has to date concentrated on the behaviour of individual birds and their interactions with cuckoos, described as parasites. A new study published today (22 January 2016) in *Scientific Reports* looks at wider interactions between neighbouring communities of reed warblers, their strategies for coping with cuckoos, and, in particular, how warblers assess levels of risk by gathering information from a variety of sources.

After two years of observation of warblers that spend the breeding

season at Wicken Fen in Cambridgeshire, authors Rose Thorogood and Nicholas Davies (Department of Zoology) reveal that a kind of "neighbourhood watch" exists out in the reed beds, keeping birds up-to-date with the latest threats. Using a series of controlled experiments, involving model cuckoos and broadcasts of reed warbler alarm calls, the researchers revealed that reed warblers factored information gathered from close surveillance of the neighbourhood into their decision-making when assessing whether or not to eject an egg.

When reed warblers spot a cuckoo, they may mob it and emit alarm calls that carry up to 40 metres. These alarm calls attract neighbours, who come to investigate the cause of the commotion. But the sound of neighbourly mobbing of a cuckoo alone is insufficient to prompt warblers to eject a suspect egg from their own nests. They also need clues that suggest a more close-up and personal threat.

"We found that warbler pairs ejected an odd egg only when there was strong evidence that it might not be one of their own. For action to be taken, the clues had to add up: the warblers needed to be alerted by their neighbours' behaviour that there was a cuckoo at large in the neighbourhood and they needed to be aware of a more local and imminent threat, by seeing a cuckoo near their own nest. " said Thorogood.

"Neither personal encounters nor social encounters alone were sufficient to stimulate egg rejection. Instead, information was combined from both these sources. This is fascinating because we have assumed previously that animals favour one type of information over the other - for example, experiments show that some fish species will ignore where their shoal mates forage if they already have information about the location of food themselves, even when it is less profitable. Here we show that combining information is the best way to take the most appropriate course of action."

The use of multiple sources of information has important consequences for cuckoos too. With their neighbourhood abuzz with information, cuckoos need to be wary of alarming potential hosts.

"Because the information warfare between cuckoos and their hosts extends well beyond individual interactions, there's pressure on cuckoos to be increasingly secretive, not only to avoid alerting their target host pair, but also other host pairs in the local neighbourhood" said Thorogood.

Cuckoo numbers have declined by as much as 60% in the past 30 years for reasons that remain unclear. At Wicken Fen, where several hundred warblers arrive to breed each May, between 10% and 20% of reed warblers nests were used by cuckoos. Today only 2% of warbler nests at Wicken host cuckoos. This rapid drop in cuckoo numbers, which contrasts with a stable warbler population, has enabled Thorogood and Davies to track how the warblers have dropped their defences in concert with the dramatic decrease in cuckoo threat.

Davies has been researching cuckoos and their hosts at Wicken Fen since the 1980s. He said: "Reed warblers are much less likely to eject an egg from their nest today than they were in the 1980s. This makes complete sense. They have matched their behaviour to the changing level of risk. Most reed warblers have just one or two summers in which to breed. So every opportunity to mate, construct a nest and raise a clutch of eggs is precious. If a pair of warblers mistakenly identifies one of their own eggs as a cuckoo egg and chucks it out, or deserts the nest, the loss is great. Our work shows how they match their defences to the risk of parasitism."

Provided by University of Cambridge