*A Eurasian Reed-Warbler dutifully feeds a Common Cuckoo chick.*

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# DUMPED & BUMPED

## *Chick recognition & rejection*

Cuckoos and their hosts provide one of the best examples of the evolutionary arms race, with cuckoos producing ever better copies of their hosts' eggs, while the hosts become increasingly discriminating in detecting and rejecting cuckoo eggs.

Have you ever wondered why host birds will feed a cuckoo chick that bears very little resemblance to their own chicks and often ultimately dwarfs its adoptive parents? It is a question that has long challenged ornithologists and behavioural ecologists. Among the possible explanations suggested, perhaps the most plausible is that the risk of incorrectly imprinting on a cuckoo chick as the 'norm' is so great that it prevents the evolution of rejection behaviour.

We know that learning plays a key role in egg rejection. Hosts learn during their first breeding attempt what their eggs should look like and use this as the model to reject other birds' eggs. The risk of mis-imprinting is low because brood parasites rarely target a nest before the host lays its first egg. However, there is a real risk that a first-time parent will imprint on a cuckoo chick as the norm because many cuckoo chicks typically hatch first and eject all the hosts' eggs and chicks. The risk of a host rejecting its own offspring in all future breeding attempts may be sufficiently great to prevent the evolution of chick rejection.

Testing this hypothesis is tricky because it requires explaining the absence of an adaptation. What we can test is whether species that do exhibit chick recognition use it to defend against brood parasitism and whether they use learning to recognise their chicks. Coots are an ideal model for this work because they often suffer high levels of brood parasitism by conspecifics. Egg dumping in other birds' nests is frequent in several species of waterbirds, including coots and moorhens, and evolution has favoured individuals that can recognise their own offspring.

In a recent study, Shizuka and Lyon (2010, *Nature* 463: 223–226) found that foreign American Coot *Fulica americana* chicks suffered much higher mortality than host chicks. An elegant series of cross-fostering experiments showed that this was not simply inherent differences in chick quality. The coots use their first-hatched chick as a standard against which to judge subsequently hatched chicks. By deliberately causing the first-hatched chick to be unrelated to the parents, coots could be taught to discriminate against their own chicks. However, this is unlikely to occur in nature because, like cuckoos, coots seldom dump their eggs in other birds' nests until there are already some eggs in the nest.

But not all hosts tolerate cuckoo chicks in their nests. In Australia, Superb Fairy-wrens *Malurus cyaneus* will often abandon nests that contain chicks of Horsfield's *Chrysococcyx basalis* and Shining bronze-cuckoos *C. lucidus* (Langmore et al. 2003, *Nature* 422: 157–160). The arms race may have extended past the egg stage in this case because the fairy-wrens are cooperative breeders and so there is less chance of a naive fairy-wren becoming imprinted on the wrong chick. Fairy-wrens view single-chick broods as problematic, often rejecting their own chick if only one egg hatches.

But other factors also play a role. The chance of rejection increases in years when there are more cuckoos present, and established breeders are more likely to discriminate cuckoo chicks from solitary fairy-wren chicks (Langmore et al. 2009, *Behavioral Ecology* 20: 978–984). However, current theory can't explain the bizarre case of Large-billed Gerygones *Gerygone magnirostris* that ignore Little Bronze-Cuckoo *C. minutillus* eggs, but actively remove cuckoo chicks from their nests (Sato et al. 2010, *Biology Letters* 6: 67–69). Such findings indicate that we still have more to learn about the fascinating interplay between brood parasites and their hosts.

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