

Nestlings' phenotypic polymorphism and co-evolutionary arms race in a host – brood parasite system in New Caledonia

It is a well-known fact that parasite cuckoos use other birds as hosts to raise their offspring. For a long time researchers have been wondering why certain hosts can differentiate between the eggs of the cuckoo and their own but cannot differentiate between cuckoo's nestlings and their own once they hatch. However, some hosts of bronze-cuckoos (*Chalcites spp.*) from Australasia discriminate against parasite nestlings, which in turn promoted the evolution of visual mimicry in bronze-cuckoo nestlings to evade detection by the host.

We discovered that in New Caledonia the Fan-tailed Gerygone (*Gerygone flavolateralis*) ejects nestlings of Shining Bronze-cuckoo (*Chalcites lucidus*) from the nest. Nestlings of the Fan-tailed Gerygone have either a bright or dark skin colour and can occur in bright, dark or mixed broods. In theory, mixed broods should increase the risk of ejecting a gerygone nestling instead of the parasite. However, we never observed gerygone parents ejecting a gerygone nestling from any type of brood, while the parasite was always ejected. It appears that host parents do not rely solely on their nestlings' appearance, but use additional cues such as nestlings' odour or begging calls to discriminate the parasite. Curiously, gerygone parents eject the parasite nestlings but not the eggs, which is puzzling since there are significant differences between the host and parasite eggs.

Our first objective is to understand if gerygone parents discriminate nestlings via their appearance, odour or sound or a combination of these cues. We expect that gerygone parents use a combination of cues from the nestlings and that the light available in the nest affects which cue is the most reliable. For example, in darker nests visual cues should be less reliable than olfactory or auditory cues. We will study the level of cuckoo nestlings' visual and auditory mimicry by measuring the differences in colour and luminance between host and parasite nestlings and comparing their begging calls. The second objective is to study whether Fan-tailed Gerygone do not eject cuckoo eggs because they are too large to remove or because they do not recognize them in the nest. Finally, our third objective is to quantify the variation in host nestling polymorphism, frequency of parasitism and frequency of parasite ejection across 4 populations of Fan-tailed Gerygone from New Caledonia.

The co-evolutionary interaction between Fan-tailed Gerygone and Shining Bronze-cuckoo in New Caledonia has reached levels of complexity not found anywhere else in the world. This research will provide novel insights into the cognitive mechanisms underlying the evolution of host defence strategies against brood parasitism and improve our current theories on the co-evolutionary arms race between brood parasites and their hosts.