



# When perfect isn't enough

Egg signatures and forgeries in the cuckoo–drongo arms race

TEXT & PHOTOGRAPHS **JESS LUND**

In the miombo woodland of southern Zambia, a pair of Fork-tailed Drongos tend to their nest. Within a sparsely woven cup slung between two thin branches lie three pale cream eggs, each one marked with tan speckles. Suddenly a flash of grey appears as a female African Cuckoo darts towards the nest. With raucous alarm calls, the drongos attack the cuckoo as she hunches over the nest for a few seconds, surrounded by a flurry of feathers and wings. Then, as quickly as she came, the cuckoo shoots off. The

drongos inspect their clutch – it still contains three identical eggs. Little do they know that in the chaos the cuckoo removed one of their eggs and laid one of her own in its place. In about two weeks' time the cuckoo's egg will hatch and the chick, blind and naked, will push the remaining two drongo eggs out of the nest. Now the only chick in the nest, the imposter will be the sole recipient of the food brought by the unsuspecting drongo parents. The African Cuckoo's tactic of off-loading the costs of parenthood onto

another species, termed 'brood parasitism', is rare; only one per cent of bird species rely on this strategy. But sub-Saharan Africa is particularly rich in brood-parasitic bird species. Cuckoos, honeyguides, whydahs, indigobirds and the Cuckoo Finch all avoid parental care by tricking other species, the 'hosts', into incubating their eggs and raising their chicks. Host species such as Fork-tailed Drongos are not always duped into accepting a cuckoo's egg though. Because of the high cost of being parasitised,



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some species have evolved the ability to recognise parasitic eggs that look unlike their own and remove them from their nest. This is a behaviour known as egg rejection. For example, Great Reed Warblers are more likely to remove Common Cuckoo eggs if the cuckoo's eggs look dissimilar to their own. Similarly, Tawny-flanked Prinias will only accept a Cuckoo Finch egg if it is a close enough match to the prinia's own eggs. This means that many brood parasites must mimic the eggs of their hosts in order to trick them into accepting the imposter egg as one of their own. The better the parasite's mimicry, the harder it is for hosts to identify the parasitic egg. Fork-tailed Drongos face a particularly difficult task because among brood parasites, African Cuckoos display some of the most accurate mimicry of their host eggs. On several occasions while monitoring drongo nests in southern Zambia for our research, we have revisited a drongo nest we thought contained three drongo

eggs, only for one of them to hatch into a cuckoo. The highly accurate mimicry that we see in African Cuckoos evolved due to the egg rejection behaviour of Fork-tailed Drongos. In the past there would have been some cuckoo females that laid eggs dissimilar to drongo eggs. These eggs are likely to have been rejected and the cuckoo's genes would not have been passed on. However, other cuckoos that laid eggs looking like drongo eggs would have been more successful. Their offspring would themselves carry the genes for laying eggs that look similar to drongo eggs. Through this process, cuckoo mimicry would have improved over time. The ability of drongos to recognise and reject cuckoo eggs from their nests would have evolved in a similar process. Drongos that happened to be better at spotting a cuckoo's egg would have produced more offspring than those that were duped, and these offspring would have inherited the ability to recognise an imposter egg.

ABOVE A Fork-tailed Drongo, the host species of the African Cuckoo.

ABOVE, LEFT Fork-tailed Drongos lay eggs with highly variable colours and patterns. Each of these eggs was laid by a different female. Although there is great variation in the appearance of the eggs, a drongo female will lay only one type of egg throughout her life. The colours and patterns on her eggshell make up her egg 'signature'.

OPPOSITE A Fork-tailed Drongo nest containing two drongo eggs and one imposter: an African Cuckoo egg at bottom right. The cuckoo happened to lay her egg in a drongo nest containing eggs that matched her own and her egg will probably be accepted by the drongo parents.

The battle between cuckoos and drongos can be likened to an arms race. Just as cuckoos become better at mimicking drongo eggs, the drongos evolve to be better at spotting cuckoo eggs. Ultimately, this has led to African >





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ABOVE Collins Moya, a senior field worker in the research group, lowers an African Cuckoo chick from a tree so it can be measured before being returned to the nest.

ABOVE, RIGHT, TOP A freshly hatched African Cuckoo chick in a Fork-tailed Drongo nest, in the process of throwing a drongo egg out of the nest.

ABOVE, RIGHT, BOTTOM One of the lucky ones. This African Cuckoo hatched from an egg that happened to be a good match to the drongo clutch its mother laid it in.

Cuckoos evolving near-perfect mimicry of drongo eggs. On average, there are almost no differences in colour, pattern or size between the eggs of the two species.

It would seem then that African Cuckoos have won the arms race, but this may not necessarily be the case. Drongos

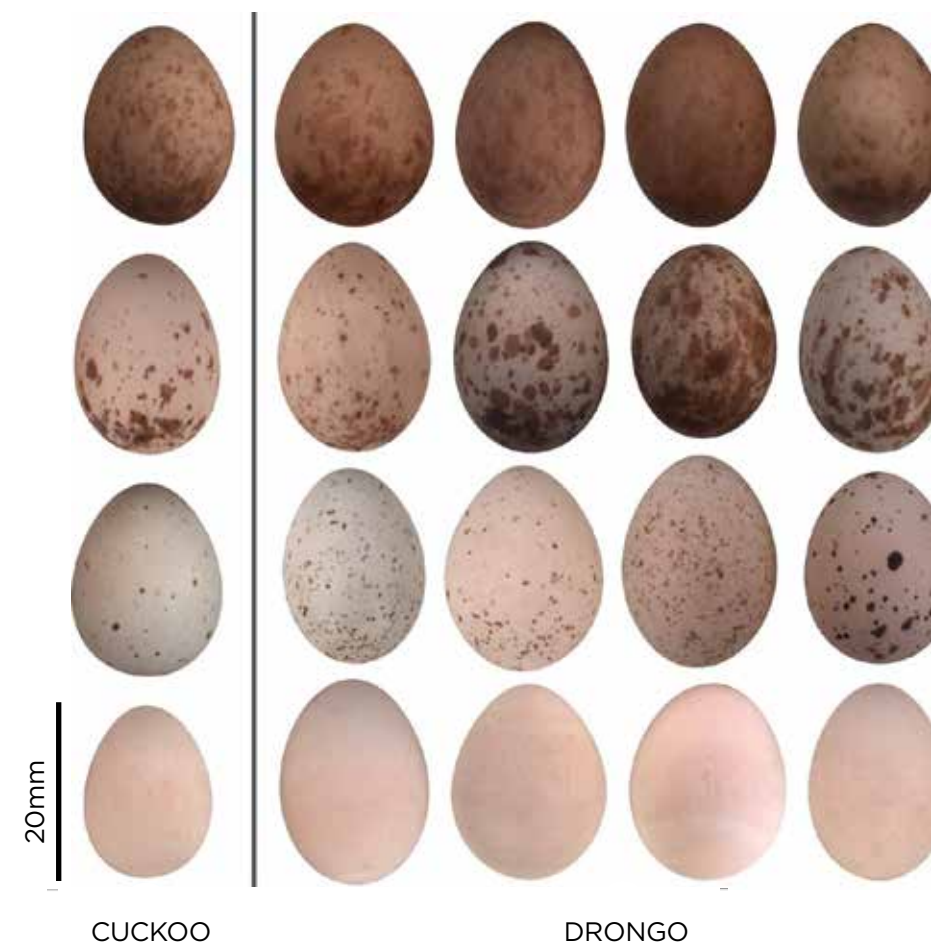
have found an escape in the form of 'egg signatures'. Just as we have signatures and passwords that are unique to us, each female drongo prints her signature onto her eggshell in the form of different colours and patterns. Peer into two drongo nests and you are unlikely to find that the two clutches look the same. A drongo female will lay eggs with a fixed appearance throughout her life (since the colour and markings on her eggs are controlled by her genes), but different females lay eggs that look markedly different. The eggs of a given female may be white and unmarked; white with tan, brown or black speckles; white or cream with tan, brown and/or slate blotches; or reddish brown in colour with darker brown blotches. So although cuckoos mimic all these egg types with a high degree of accuracy, the eggs of a given cuckoo female will only be a good match

to a small number of drongo eggs in the population, just as a given signature forgery will be a bad match for most people's signatures.

Our aforementioned cuckoo female with speckled eggs was lucky because she happened to lay her egg in a drongo nest containing eggs that matched her own. On other occasions she may lay in nests containing drongo eggs that are unmarked or blotched, in which case her egg will almost certainly be identified as an imposter by the drongo parents and thrown out of the nest. It is not necessarily the case that Fork-tailed Drongos are particularly adept at identifying tiny differences between their eggs and cuckoo eggs. Rather, it is the variation in the appearance of eggs of different drongo females that means it is unlikely that a cuckoo egg will be a good match.



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Since cuckoo eggs that don't match a drongo clutch are invariably rejected, we might expect a cuckoo to preferentially target drongo nests with eggs that are similar to her own. But this does not seem to be the case. Drongo nests often contain cuckoo eggs that are a poor match, though these eggs are soon rejected. This is also the case for most other species of brood parasites – they lay their eggs randomly among host nests available to them. One population of Common Cuckoos in north-eastern China has, however, developed the ability to parasitise nests selectively. This population parasitises Daurian Redstarts, which lay eggs that are either pink or blue. The Common Cuckoos that parasitise these redstarts only lay blue eggs and are more likely to lay in redstart nests containing blue eggs than nests containing pink eggs.

African Cuckoos mimic the full range of Fork-tailed Drongo eggs with remarkable accuracy. Each of these eggs was laid by a different cuckoo or drongo female.

Perhaps the African Cuckoo will evolve such an ability in future, but for now the combination of drongo egg signatures and random laying by cuckoos means that most cuckoo eggs are quickly recognised and rejected. For the African Cuckoo, even perfect mimicry is not good enough in this arms race. ♦

Jess Lund is a PhD student studying brood parasites in Zambia and Mozambique under the supervision of Prof. Claire Spottiswoode. To find out more about African Cuckoos and the fascinating lives of other brood-parasitic species, you can visit the research website [africancuckoos.com](http://africancuckoos.com)

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