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INSIDE JEB

Imposter eggs of pecking cowbirds have stronger shells for protection

An American robin's nest parasitised by a brown-headed cowbird egg.

When Alfred, Lord Tennyson, described, 'Nature, red in tooth and claw', he should probably have thrown in beaks too. Cowbirds that inveigle their eggs into the nests of others often pierce the resident eggs to give their impostors the best chance of a future. But there is nothing to prevent subsequent intruders from meting out the same fate to the eggs of previous interlopers. Analía López from the Universidad de Buenos Aires, Argentina, explains that birds like cuckoos, which lay their eggs in others' nests, tend to have thicker eggshells. But she and her colleagues from Argentina and the USA, knew that other aspects of the eggshell's construction also contribute to its strength. They decided to take a closer look at the eggs from screaming cowbirds and shiny cowbirds – which puncture resident eggs to rid their young of competition – and compared them with the eggs of brown-headed cowbirds – which toss out the eggs of the species upon which they prey – to find out how the arms race between the eggshells of hard-working foster parents and their lackadaisical imposters has played out.

'We spent countless hours in the field looking for hidden bird nests to collect a few eggs', says López, who sometimes used an extendable ladder – and even free climbed a few trees – to locate the eggs. Then, she and Lía Gerschenson (Universidad de Buenos Aires) tested how strong the shells were by recording the force required to puncture the eggs at the widest point, which is usually targeted by the pecking parasites. Sure enough, the shells of the egg puncturing screaming cowbirds and shiny cowbirds were up to 3.2 times stronger than the shells of their unwitting hosts; they were also 2.2 times stronger than brown-headed cowbirds' shells. And when López checked how much energy it took to form the cracks that shatter the shells, the screaming and shiny cowbird's eggs were 1.5 times tougher.

Next López teamed up with Raúl Bolmaro (Instituto Física Rosario, Argentina) and colleagues to compare the microscopic structures of the eggshells, and discovered that the external layer of the shell – known as the palisade layer, which provides the shell's strength – is thicker in screaming and shiny cowbirds than in brown-headed cowbirds. Also, the mammillary cones, which provide calcium for shell development, are packed more densely into the lower layer of the eggshell. And when López compared how calcium carbonate crystals are arranged in the shell, she found that the packing is far more complex in screaming and shiny cowbird eggs than in the shells of the other species, making them more difficult to crack open.

Screaming and shiny cowbirds have evolved eggshells that are far more resistant to pernicious pecks than the eggs they usurp, providing their developing chicks with the best protection for a safe start in life. But López, Mark Hauber (University of Illinois at Urbana-Champagne, USA) and Juan Reboreda (Universidad de Buenos Aires) also point out that the eggshells can't be so tough that the tiny inhabitants within are unable to liberate themselves. Fortunately, it seems that toward the end of incubation the shells are less resistant to the chick's frail pecks from within. 'As the chick tries to break the shell it does so by imposing expansion forces through internal shell pressures, which tend to open the small cracks produced by the beak's pressure points', says López, explaining that this is how the imposter can break free of a shell that likely withstood the pounding of an adult cowbird's beak intent upon its destruction.

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