Evidence for Bird Mafia!*

Threat Pays

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Birds are remarkable for their extraordinary efforts at nest building and brood care. Given that so many species of birds spend so much time and effort at these activities, there is plenty of room for some species to take it easy, lay their eggs in the nests of other species and hitch-hike on their hosts. The cuckoo that lays its eggs in the nests of a variety of host species is well known. Indeed, over 80 species, i.e., over 1% of bird species are known to be such obligate inter-specific *brood parasites.* These include two sub-families of cuckoos, two types of finches, the honey guides, the cowbirds and the black-headed duck. Because parasite species often use more than one host species, more than 1% of bird species act as hosts to brood parasites. Inter-specific brood parasitism has evolved independently at least seven times in birds and can have a significant effect on the populations of the host species and even lead to their extinction. Although hosts sometimes detect and eject alien eggs, their success in ridding their nests of parasite eggs is often very limited and that is why brood parasitism has survived as a way of life. One reason for such limited success of the hosts is the exquisite mimicry often exhibited by the parasites whose eggs are virtually indistinguishable from those of the host. What

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is perplexing however is that many parasite species lay eggs that look nothing like their host's eggs and yet get away with it. Obviously hosts have not perfected the art of removing all or most of the alien eggs. But why should this be so?

Amotz Zahavi has suggested the hypothesis that parasites such as cuckoos may repeatedly visit the parasitized nests and destroy the eggs of the host if it has ejected the parasite's eggs and not do so if the host has accepted them and is taking good care of the parasite's eggs/chicks. In the presence of such a parasite 'Mafia', hosts who are incapable of defending themselves against the attacks of the parasites may find it better to accept some parasite eggs and additionally rear at least some of their own rather than lose all their eggs in the parasite attack. There has recently been an attempt to test this Mafia hypothesis using the great spotted cuckoo *Clamator glandarius* and its host the black-billed magpie *Pica pica* in Spain. There is evidence that cuckoos visit nests where they have laid eggs and peck at magpie eggs if their own are missing. A magpie

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that finds cuckoo eggs in its nest appears to have three options - accept the parasite's eggs and rear both magpie and cuckoo chicks, eject the cuckoo eggs and rear only its own offspring or abandon the nest altogether and start all over again.

When magpies ejected cuckoo eggs, 86% of their nests were attacked by the cuckoos but when they accepted cuckoo eggs, only 12% of their nests were attacked, a difference that is statistically significant. Predation rates were of the order of 22% in non-parasitized nests. All magpies re-nesting after loss of eggs to cuckoo predation accepted cuckoo eggs without ejecting them or abandoning their nests in the second breeding attempt. But did the cuckoos destroy magpie eggs just to get the magpies to re-nest and provide another opportunity for them to lay their own eggs? If inducing the magpies to re-lay was the main objective, magpie nests, early in the season (which have a higher probability of re-nesting) rather than those late in the season (which have a substantially lower probability of re-nesting), should suffer higher rates of attack by the cuckoos. However, late nests suffered a slightly higher rate of predation compared to early nests.

Magpies that accepted the cuckoo eggs produced 0.43 ± 0.10 (mean s.d.) fledglings per nest, while those that ejected the cuckoo eggs produced 0.29 ± 0.29 fledglings per nest and finally, those that abandoned their nest and started all over again produced 0.40 ± 0.31 fledglings per nest. The measured reproductive success of the abandoners should be halved at least, because the probability of recruitment of offspring into the breeding population decreases dramatically as the season progresses, thus giving us a figure of about 0.20 fledglings per nest for the abandoners. In other words acceptors, ejectors and abandoners have about the same reproductive success values that are not significantly different statistically.

A more powerful approach is to experimentally remove cuckoo eggs from some parasitized magpie nests and do no such thing in a group of control, parasitized nests. When this was done, nests from which cuckoo eggs were experimentally removed (equivalent to ejectors) produced 0.85 ± 0.28 fledglings, while the control nests (equivalent to acceptors) produced 0.54 ± 0.24 fledglings per nest. These numbers are also not significantly different statistically. Does not the lack of significant differences between the acceptors, abandoners and ejectors in the natural population and the experimental and control nests in manipulated samples weaken the Mafia hypothesis? Not really; it would be naive to expect the Mafia to be so powerful as to destroy every magpie nest from which cuckoo eggs were ejected. Not only would this be biologically unreasonable, but it would also lead to acceptance behaviour on the part of all magpies and that has not happened (see *Figure* 1). Instead, it is far more reasonable to expect the Mafia to work with less than perfect efficiency, with the result that ejectors, acceptors and abandoners would coexist.

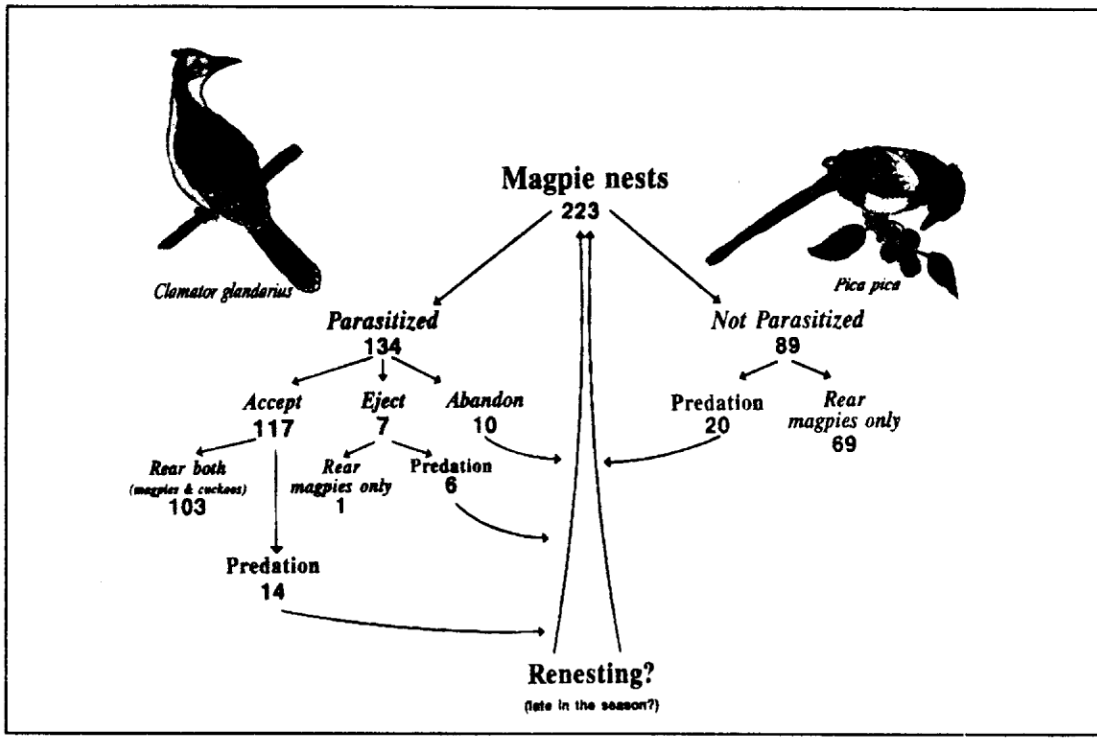

***Figure 1** Rates of parasitization, acceptance, ejection and abandonment in the study population in Hoya de Guadix in Spain during 1991-1992. The host, the black-billed magpie* Pica pica *and the parasite, the great-spotted cuckoo* Clamator glandarius *are also shown. Data from Soler et al (1995).*

Indeed one can imagine that acceptance begins to pay better if everybody else is ejecting and ejection begins to pay off if everybody else is accepting.

Thus, the prediction of the Mafia hypothesis would not be that acceptors fare better than ejectors but that acceptors should not fare any worse than the ejectors. This latter prediction is supported by both the natural population study as well as the experimental study. That is good evidence for Bird Mafia!

Suggested Reading

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