(a) The female common cuckoo ejecting a Daurian redstart nestling from the nest (picture extracted from a video); (b) two of the ejected redstart nestlings found on the ground under the nest; (c) a common cuckoo egg in the replacement nest of the same pair (central egg, surrounded by five redstart eggs; one host egg had been removed by the cuckoo during parasitism) (Note: Image and caption are directly reproduced from Zhang et al., 2024)

FARMING IN CUCKOOS - All you need to know

- PARVAIZ YOUSUF

In a remarkable discovery, cuckoos have been observed to "farm" their hosts for brood parasitism. They achieve this by ejecting the nestlings of their host if the host has already developed a nest. This action prompts the host to re-nest, which can later be parasitised. This behaviour was analysed by a team of researchers from China, Germany, and the United Kingdom, led by Beijing Normal University's Jinggang Zhang, and their findings were published in a paper titled "Video evidence that cuckoos farm their hosts by ejecting nestlings" in the journal Ecology and Evolution in April 2024.

Birds employ various reproductive strategies to maximise fitness. One such strategy is interspecific brood parasitism, where a bird species, known as a brood parasite, lays its eggs in the nests of another bird species, known as hosts. This behaviour shifts the responsibility of parental care to the host species, reducing the host's own biotic potential. This is an excellent example of co-evolution, where hosts and parasites compete to overcome defensive adaptations and counteradaptations, respectively. One of the extreme behaviours adopted to promote brood parasitism is that proposed by the farming hypothesis and observed in some birds like cuckoos.

The researchers were actually studying the reproductive behaviour and parasitism status in Daurian Redstarts when they came across this rare behaviour by cuckoos. They fitted a video camera to record the Daurian Redstart nest and collected data on cuckoo behaviour. The authors observed that a common cuckoo female destroyed one of the focal nests of a Daurian redstart by ejecting all its nestlings. The host then re-nested, and the cuckoo successfully parasitised the new nest. This indicates that farming behaviour might be more common than we think.

Cuckoos Farm Their Hosts for Brood Parasitism

The authors observed that a common cuckoo Cuculus canorus female destroyed one of the focal nests of a Daurian redstart *Phoenicurus auroreus* by ejecting out all its nestlings. They observed that the host then re-nested, and the cuckoo was successfully able to parasitise the new nest of the redstart. The study suggests that cuckoos benefit from destroying a nest that has advanced features and is too difficult for cuckoos to parasitise. This behaviour is a form of "farming" where cuckoos intentionally destroy the nest of its host to induce the formation of a new nest that can later be parasitised.

However, there is scarce data available for birds to show farming behaviour. Previous studies have shown clear evidence of farming behaviour in the brown-headed cowbird Molothrus ater and that too only at the egg stage. For example, in a study, researchers stimulated farming behaviour in captive cowbirds by presenting these birds with artificial nests with either highly developed host eggs or freshly laid eggs. It was observed that cowbirds removed or punctured the developed eggs more often than the fresh eggs. Similarly, another study found that hosts trying to re-nest were more frequently parasitised by the cowbirds than fresh nesting attempts.

It is necessary to mention that farming behaviour is different from "mafia strategy". The latter may also result in re-nesting, but the destruction of the nest is regarded as a kind of retaliation that only occurs when the host rejects the cuckoo egg. Only parasitic species like the brown-headed cowbird and the great-spotted cuckoo *Clamater glandarius*, where the parasitic chick does not kill the host's offspring can exhibit the parasite's "mafia" behaviour, as these systems allow the host parents to successful-

ly raise some of their nestlings after accepting the parasitism. Therefore, the common cuckoo's nest destruction behaviour, in which the cuckoo chick usually evicts all host progeny, cannot be explained by the mafia concept.

Limitations of Farming Hypothesis

Although several species have been observed to display farming behaviour, experts argue that there are potential limitations when applying this concept to other parasitic bird species. The hypothesis assumes that the parasitic bird species have the potential to recognise and target the nests that are too advanced for parasitism. However, not all birds possess the cognitive abilities to recognise and distinguish between nests of different types. Similarly, the hypothesis assumes that the host bird species will respond to the nest destruction by building a new one, which is not always true. It is quite possible that the host species does not build a new nest but rather may abandon the nest once it's destroyed.

They may not even have enough resources and time to build a new nest, which is not something that a brood parasite prefers. Furthermore, the concept assumes that the new nest built by the host bird species will be equally or more suitable for parasitism by the brood parasite. However, this may not be true in the external environmental conditions. While building the nest a second time, it is quite possible that the nest has different characteristics that do not suit the brood parasite. At the same time, the farming hypothesis is based on the assumption that the brood parasite will locate the new nest built by a host bird. However, it is possible that some brood parasitic bird species may not be able to locate the new nest. This is especially true if the host builds a new nest in an entirely different location and at a different time.

Conclusion

In conclusion, the study provides unambiguous evidence of the farming hypothesis in the common cuckoo, which suggests that the species "farm" at least some of their host nests, given the right circumstances, for brood parasitism. However, such clear evidence is usually scarce. It is likely that the behaviour is more common but often goes undetected as it requires intense nest monitoring. Thus, more studies are needed to establish whether the farming strategy is utilised by other brood parasitic species or not.

About the Author

Parvaiz Yousuf is currently a researcher at the Wildlife Institute of India, apart from being a prolific writer. He holds an MSc in Zoology with his chief interest being Ornithology. He recently authored the well-received book, "Birds of Jammu & Kashmir Including Ladakh" and has numerous publications in prestigious journals. He contributes to international science magazines like Asian Scientist and Truly Curious, and served as the Director of the Wetland Research Centre, Wildlife Conservation Fund YPJK from 2018-2023.

Email :parvaizyousuf444@gmail.com