Le Gerfaut 79: 149-152 (1989)

HIGH BREEDING SUCCESS IN EXPERIMENTALLY PARASITIZED BROODS OF AZURE-WINGED MAGPIES (*CYANOPICA CYANA*)

Tomás REDONDO and Luis ARIAS DE REYNA

Parasitic cuckoos can be separated into two groups according to their strategies of parasitism. One group comprises those species that reduce their host's brood size by evicting (*i.e. Cuculus* and *Chrysococcyx*) or killing (*i.e. Tapera*) host nestlings or eggs. The other group includes more generalist species that parasitize comparatively larger-sized hosts, the chicks of both species being reared together (*i.e. Clamator* and *Eudynamys*) (Payne, 1977). Frequently, competitive behaviour by the parasite's chicks in the second group causes starvation of host nestlings, this being an indirect method of brood reduction analogous to that observed in asynchronous hatching broods of many altricial species (Clark and Wilson, 1981).

The Great Spotted Cuckoo (*Clamator glandarius*) parasitizes several species of corvids and sturnids (Friedmann, 1964). The main host species in Southern Europe is the Magpie (*Pica pica*) although some populations are parasitizing Carrion Crows (*Corvus corone*) succesfully (Valverde, 1953). In Magpies, the Cuckoo chick usually causes the death of all the host nestlings by monopolizing the incoming food and smothering weakened Magpie chicks. When host species are of a larger size compared to the Cuckoo, as in *C. corone*, brood reduction may not be complete or not occur at all in a large proportion of cases (Zuñiga and Arias de Reyna, unpublished data). For the main large corvid host in Africa, *Corvus albus*, differences in breeding success between parasitized versus non parasitized broods are also smaller than in the Magpie (Mundy and Crook, 1977). Differential fledging success in hosts species has been interpreted in terms of dissimilar competitive abilities between nestlings of large versus small sized hosts when confronted with the same parasite (Gramet, 1970; Gaston, 1976).

During the years 1978-1980 we obtained data about nest failure in Magpies attributed to Great Spotted Cuckoo parasitism in Córdoba, Southern Spain. In 1980 we experimentally parasitized eight Azure-Winged Magpie (*Cyanopica cyana*) nests. Azure-winged Magpie weights at hatching had a mean of about 5.5 g and had a growth asymptotic value close to 70 g. Such values were smaller

than those of magpie (8.5 g at hatching and 180 g of asymptotic weight) and Great Spotted Cuckoo (8 g and 145 g respectively). So, from the above one would expect the fledging success of Azure-Winged Magpie parasitized nests to be less than that of Magpie.

In four *C. cyana* nests, artifically parasitized, we added one cuckoo egg to each. In the first nest where the cuckoo hatched just after incubation had begun, the cuckoo was ejected. In the second nest where the cuckoo hatched after six days of incubation, the parasite was accepted and reared and incubation terminated. In the third nest, the cuckoo egg dissappeared after six days of incubation. The fourth clutch was artificially parasitized when both the cuckoo and the hosts' eggs were close to hatching. All chicks were reared.

Another four nests were parasitized with a cuckoo nestling. In three nests the cuckoo was one or two days younger than the Azure-winged Magpie chicks but approximately the same weight. In the fourth nest the cuckoo chick was five days younger than the hosts' chicks. This last nest was preyed upon but in the other three both host and cuckoo chicks fledged. In only one nest there was brood reduction. Two days after hatching, this nest contained seven nestlings (including cuckoo), nine days later three azure-winged magpie chicks had disappeared.

So, in the four cases where the cuckoo was accepted and rearing proceeded normally, host fledging success (birds fledged/birds hatched) was fairly high (mean 87.5 per cent). This fact sharply contrasts with that of magpie nests where host nestling mortality is almost total in parasitized broods. For six succesful magpie nests where cuckoos hatched two days earlier, at the most, than the magpie nestlings, only the cuckoos fledged. A similar phenomenom occurred in more asynchronous naturally parasitized clutches, as might be expected. For a total of 18 successfully parasitized nests, there were only two cases of both parasite and hosts' chicks fledging together, although brood reduction occurred in both. Considering only those nests in which age differences between parasite and hosts' nestlings were equal or less than two days, then comparing *Pica* (six cases) with *Cyanopica* (four cases), there was a significant difference between the proportion of nests of both species where hosts fledged (Fisher's exact probability test, $P = 0.0047$).

Brood reduction can be a consequence of a limited food supply to the nestlings (Clark and Wilson, 1981). In certain avian social systems where reproductive efforts are shared by more than two birds, helper individuals may contribute with additional food, thus reducing nestling mortality (Wilkinson and Brown, 1984). Azure-winged Magpies may have helpers at the nest (Hosono, 1983), so increased food demands by parasitized broods can be compensated for. In fact, brood reduction is a much less common event in azure-winged magpie nests than in magpie ones. Average fledging success (birds fledged/birds hatched) in succesfull azure-winged magpie nests is around 68.8 per cent, 47 per cent of all nests being 100 per cent succesfull (based on data from Hosono, 1966 and Pacheco *et al.*, 1975). For *P. pica*, fledging success is about 47.2 per cent, only 14.8 per cent of fledged nests not being brood reduced. Such differences

become statistically significant at the level of 0.05 (Mann-Whitney's U test, Z = 1.73). Brood reduced nests of Azure-winged Magpies may be those of first breeding pairs, since helper individuals are presumably the previous seasons' offspring (Hosono, 1983).

Data on *C. cyana* as a host of cuckoos are scarce. Friedmann (1964) reports on 11 cases of parasitized clutches by Great Spotted Cuckoo but this not a common fact (Valverde, 1953). We have no direct knowledge of natural parasitism, although both species are largely sympatric in many areas of Spain. Hosono (1983) reports on five nests parasitized by *Cuculus canorus*, only one being succesfull. In this nest, both a chick of Azure-winged Magpie and a Cuckoo were reared, presumably due to inability of the Cuckoo to eject the eggs of this species, bigger than those of its usual hosts.

Since breeding success of Great Spotted Cuckoo parasitizing Azure-winged Magpies seems to be equally high as when parasitizing magpies, and the former species' breeding success is not significantly lowered, absence of frequent parasitism is unlikely to be due to a non-suitable host-parasite relationship. Perhaps Azure-winged Magpies' colonial breeding system and presumably enhanced nest-site defence reduces cuckoo parasitism on this species. Cooperative breeding of hosts actually results in communal defence against brood parasites (Payne *et al.*, 1985). All other things being equal, this may result in a selective pressure for parasites to choose host species with no communal defence of nests.

LITERATURE CITED

CLARK, A.B. and D.S. WILSON. 1981. Avian breeding adaptations: hatching asynchrony, brood reduction and nest failure. Q. Rev. Biol. 56: 253-277.

FRIEDMANN, H. 1964. Evolutionary trends in the avian genus *Clamator*. Smith. Misc. Coll. 146: 1-127.

GASTON, A.J. 1976. Brood parasitism by the Pied Crested Cuckoo *Clamator jacobinus*. J. Anim. Ecol. 45: 331-345.

GRAMET, PH. 1970. Le parasitisme des corvidés par le Coucou-geai. Rev. Comp. Anim. 4: 17-26.

HOSONO, T. 1966. A study of the life history of Blue Magpie (1): Breeding biology. Misc. Rep. Yamashina's Inst. Ornith. Zool. 25: 59-79.

HOSONO, T. 1983. A study of the life history of Blue Magpie (11): Breeding helpers and nest-parasitism by Cuckoo. J. Yamashina's Inst. Ornithol. 15: 63-71.

MUNDY, P.J. and A.W. CROOK. 1977. Observations on the breeding of the Pied Crow and Great Spotted Cuckoo in Northern Nigeria. Ostrich 48: 72-84.

PACHECO, F., F. ALBA, E. GARCIA and V. PEREZ. 1975. Estudio sobre la biología de reproducción del Rabilargo *Cyanopica cyanus* (Pallas). Ardeola 22: 55-73.

PAYNE, R.B. 1977. The ecology of brood parasitism in birds. Ann. Rev. Ecol. Syst. 8: 1-28.

PAYNE, R.B., L.L. PAYNE and I. ROWLEY. 1985. Splendid wren *Malurus splendens* response to cuckoos: an experimental test of social organization in a communal bird. Behaviour 92: 108-127.

VALVERDE, J.A. 1953. Contribution a la biologie du Coucou-geai, *Clamator glandarius* L. I Notes sur le Coucou-geai en Castille. L'Oiseau R.F.O. 23: 288-296.

WILKINSON, R. and A.E. BROWN. 1984. Effect of helpers on the feeding rates of nestlings in the Chesnut-bellied Starling *Spreo pulcher*. J. Anim. Ecol. 53: 301-310.