Heavy Brood Parasitism by the Common Cuckoo
*Cuculus canorus* on the Azure-winged
Magpie *Cyanopica cyana*

Satoshi YAMAGISHI and Masahiro FUJIOKA

*Laboratory of Animal Sociology, Faculty of Science, Osaka City University,
Sugimoto, Sumiyoshi-ku, Osaka 558*

The Common Cuckoo *Cuculus canorus* has a wide breeding distribution in the
Palearctic and parasitizes a wide range of host species (WYLIE, 1981). In Japan, the
Great Reed Warbler *Acrocephalus arundinaceus*, Bull-headed Shrike *Lanius bucephalus*
and Siberian Meadow Bunting *Emberiza cioides* have been known as common hosts
of the cuckoo (KOBAYASHI, 1956; HIGUCHI, 1978). In the course of the socio-ecological
study of group-living Azure-winged Magpies *Cyanopica cyana*, we found that they were
heavily brood parasitized by cuckoos. In this paper, we describe the frequency of
parasitized magpie nests. We also discuss the historical relationships between the
cuckoo and the magpie as the cause of the heavy brood parasitism.

**STUDY AREA AND METHODS**

This study was carried out in a cultivated area at Azumino (36°18′N, 137°52′E),
Nagano Prefecture in Japan in the breeding seasons of 1984 and 1985. Azure-winged
Magpies forage and nest in premises consisting of some houses and their surrounding
woods scattered among rice fields. Planted *Cryptomeria japonica, Chamaecyparis obtusa, Taxus cuspidata*,
and *Diospyros kaki* predominate in the woods. Similar habitats
continue to the north, south and east, while to the west lies a range of mountains.
Eleven groups of Azure-winged Magpie occurred in the study area of ca. 6 km². A
northern group was the only one utilizing dense pine (*Pinus densiflora*) woods on the
riversides of the Karasu River.

Almost all group members were captured and banded in three of the 11 groups,
and their nesting activities were regularly observed (core groups). About 38% of the
members of other groups (secondary groups) were captured before the breeding season
of 1984, but only some of the nests were found during irregular surveys.

Because this study was carried out as part of a general study on the social relations-
ships among magpies, we minimized nest visits to avoid disturbance of their breeding
activities. Generally, we checked nest contents quickly only twice during each of the
egg-laying, incubation and nestling periods. Eggs and nestlings were left alone except
when nestlings were banded. Thus, some selective abandonment of cuckoo eggs by a magpie parent might be overlooked and be treated as a “non-parasitized nest.” Dates of laying were estimated for nests found with incomplete clutches, or nests in which nestlings were seen and aged on the basis of the developmental stages of feather and down (Hosono, 1966). Azure-winged Magpie eggs in abandoned nests and some cuckoo eggs were collected. Nests abandoned before an egg was laid were ignored in this study.

The number of cuckoos was counted in part of the study area on May 23 and 31, 1985. The censused area covered ca. 5 km², or the home ranges of 10 magpie groups (about 150 magpies). The unbroken vista in the area enabled us to record cuckoos within about 500 m of both sides of a line. Individuals were mapped and recorded only once. Males’ singing and chasing, and females’ giving the unique “bubbling” calls (Wyllie, 1981) were also recorded.

RESULTS

Both in 1984 and 1985, nests of all the core magpie groups were heavily and constantly parasitized, while nests of the secondary groups tended to be parasitized less heavily (Table 1; \(\chi^2 = 4.981, P<0.05\)). This difference, however, may be partly due to the lower intensity of our surveys of the latter groups. It should be noted that the rates of parasitism given in Table 1 are minimum rates because we inspected nests only once or twice during the laying period.

Of 46 parasitized nests, eight held two, and one held three cuckoo eggs were found (Table 1). The color pattern and size varied between eggs in multiparasitized nests and thus the eggs were presumably laid by different female cuckoos. Some multiple laying by cuckoos might be overlooked, because the second female cuckoo might remove previously laid cuckoo’s egg (Wyllie, 1981).

Eggs of parasites are generally larger than those of hosts (Payne, 1977), but cuckoo eggs were found to be smaller than Azure-winged Magpie eggs. In the study area, Azure-winged Magpie eggs averaged \(27.67 \times 20.16 \text{ mm} (n=16)\) (see also Kobayashi, 1956; Hosono, 1983), whereas Common Cuckoo eggs averaged \(23.4 \times 17.4 \text{ mm} (n=13)\).

Table 1. Brood parasitism by the Common Cuckoo on the Azure-winged Magpie in 1984 and 1985 at Azumino, Nagano Prefecture.

<table>
<thead>
<tr>
<th>Sample</th>
<th>No. of groups</th>
<th>No. of nests</th>
<th>No. of cuckoo(^a) eggs</th>
<th>Parasitized/ available nests(^b) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0(^c) 1 2 3 Unknown</td>
<td></td>
</tr>
<tr>
<td>Core (1984)</td>
<td>3</td>
<td>32</td>
<td>5 14 2 2</td>
<td>16/21 (76.2)</td>
</tr>
<tr>
<td>Core (1985)</td>
<td>3</td>
<td>29</td>
<td>5 10 4 1 4</td>
<td>15/20 (75.0)</td>
</tr>
<tr>
<td>Pooled</td>
<td>61</td>
<td></td>
<td>10 24 6 1 6</td>
<td>31/41 (75.6)</td>
</tr>
<tr>
<td>Secondary (1984)</td>
<td>7</td>
<td>31</td>
<td>10 9 2 6</td>
<td>11/21 (52.4)</td>
</tr>
<tr>
<td>Secondary (1985)</td>
<td>5</td>
<td>13</td>
<td>5 4 3</td>
<td>4/9 (44.4)</td>
</tr>
<tr>
<td>Pooled</td>
<td>44</td>
<td></td>
<td>15 13 2 3</td>
<td>15/30 (50.0)</td>
</tr>
</tbody>
</table>

\(^a\) These include nests of which contents were not checked during the egg period but in which nestlings of the Azure-winged Magpie were present. \(^b\) Available nests exclude unknown nests and abandoned nests before the incubation stage, including nests probably abandoned due to cuckoo’s parasitism.
Fig. 1. Seasonal distribution of Azure-winged Magpie nests at Azumino, central Japan, in 1984 and 1985. Shaded parts indicate nests parasitized by Common Cuckoos.

*Fig. 1. Seasonal distribution of Azure-winged Magpie nests at Azumino, central Japan, in 1984 and 1985. Shaded parts indicate nests parasitized by Common Cuckoos.*

Nests parasitized less frequently (11.1%) than nests during the latter part of May (68.8%; $\chi^2 = 7.67$, $P < 0.01$) and than all nests other than the earliest group (72.9%; $\chi^2 = 13.05$, $P < 0.005$) (see Fig. 1). This is presumably ascribed to the migratory timing of the Common Cuckoo. In the study area, male Common Cuckoos were first heard calling on May 8 in 1985 and became very active within a few days. Most female cuckoos may be unable to lay during the middle of May because in general they arrive at a breeding area about a week later than the males do (Wyllie, 1981), i.e., about May 15 in the study area.

In the core groups, only one female magpie out of 15 females whose nest was parasitized rejected the cuckoo egg. This occurred during the latter half of the egg-laying period both in 1984 and 1985. There is a small possibility that other rejectors were overlooked because we did not check nests every day and because some cuckoo eggs were removed during the egg-laying period by the observers (before potential rejection by magpie parents themselves). Nest abandonment probably due to parasitism occurred only once. In this case, the parents left one cuckoo egg in a nest without their own eggs, but it was unknown whether the female magpie had laid her first egg before parasitism occurred. There were no cases where nestlings of both the magpie and cuckoo were reared nor in which two cuckoo nestlings were reared.

The fate of the cuckoo eggs and the effects of brood parasitism on the breeding success of the host magpies were unknown, because cuckoo eggs found in the core groups were removed by the observers. Of seven cases where cuckoo eggs were not removed and the eggs hatched, magpie parents were observed to feed the cuckoo fledgling in four cases.

In all, 69 cuckoos were recorded in the study area on the two census days: 30 singing, 12 chasing, 9 calling and 18 flying or perching (Fig. 2). Male cuckoos are far more visible than female cuckoos (Nakamura, pers. comm.). Since singing cuckoos were male, if the ratio was nearly equal in the area, there were about 60 cuckoos (12.0/km²). The 12 chasing and 18 flying or perching birds must have included males and so the density is an underestimation. Cuckoos were distributed almost uniformly throughout the area irrespective of the patchy distribution of magpies' nests (Fig. 2).
Fig. 2. Spatial distribution of cuckoos and active nests of Azure-winged Magpies on May 23 and 31, 1985. Larger black circles are singing cuckoos, asterisks refer to chases, white circles to "bubbling" calls, black triangles to flying or perching birds and small black circles represent magpie nests. Nests of the three core groups are surrounded by thin lines with the group names. If a chasing or chased cuckoo was singing, it is classified as singing.

DISCUSSION

The first reports of parasitism by the Japanese population of the Common Cuckoo on Azure-winged Magpies in Aomori Prefecture and later in Nagano Prefecture have been summarized by Hosono (1983). The range of the Azure-winged Magpie has recently expanded in Nagano Prefecture (Hosono, 1969, 1981). It probably began to breed in the study area, in the 1960's. In the last two decades, the breeding area of the Common Cuckoo has also expanded from plateaus to plains (Nakamura, pers. comm.). Cuckoo parasitism of an Azure-winged Magpie nest in Azumino (ca. 13 km NNE of the study area) was first reported in 1977 (Tanaka, 1979).

It seems likely that the magpies in the study area suffered heavy parasitism by the Common Cuckoo because the host-parasite relationship between them might have developed recently. In other studies, new hosts are sometimes heavily parasitized by a "generalist", for example, by the Common Cuckoo (Jarvinen, 1984) and by the Shiny Cowbird Molothrus bonariensis (Wiley, 1985). Rarity of rejection may also support this assumption. In Europe, 25% of Azure-winged Magpies rejected Magpie Pica pica eggs which are very similar to the eggs of the Great Spotted Cuckoo Clamator glandarius (Aris-de-reyne & Hidalgo, 1982). Successful parasitism derived from a new host-parasite relationship is indicated by the extremely high density of the Common Cuckoo in the study area compared with two other areas in Nagano prefecture (5.15 cuckoos/km² at Kayanodaira Heights and 1.89 cuckoos/km² at riverside of the Chikuma River in Nagano City; Nakamura, pers. comm.).

The absence of nest guarding behavior during the egg-laying period may also permit heavy parasitism by the cuckoo. Breeding pairs of the Azure-winged Magpie foraged with their group up to about 500 m from their nests, leaving the nest unguarded (see also...
Hosono, 1971). They were often absent from their nest for several hours, especially during the early half of the laying period when parasitism by cuckoos occurred. In addition, Azure-winged Magpies showed no special response to cuckoos.

Cuckoo parasitism of Azure-winged Magpies seems not to be rare, although there are large local variations in the frequency of parasitism. In 1983, Shigemoto Komeda and the authors observed five parasitized nests, out of 15, at the Iizuna-Heights (50 km north-east of the study area, 1100 m above the sea level) and one parasitized nest out of seven at Shinonoi (38 km north-east, 350 m above the sea level), but no parasitized nests out of 10 at Koshoku (36 km north-east, 380 m above the sea level). Of nests found in Nobeyama (66 km south-east of our study area), 29.5% (21/71) contained cuckoo eggs from 1981 to 1983 (Imanishi, pers. comm.), but parasitism was rare (two cases out of 78 nests) at Tokorozawa, Saitama Prefecture between 1977 and 1978 (Harada, pers. comm.). The cause of these variations is not yet clear, but it is likely that cuckoo parasitism influences the life history and social relationships (e.g., helping behavior) of the Azure-winged Magpie and may lead to local variations. It may effect the group size and age composition as it is known to do in Babblers Turdoides spp. (Gaston, 1976).

ACKNOWLEDGEMENTS

We thanks Dr. H. Nakamura and Messrs. S. Komeda, T. Hosono, S. Harada, S. Imanishi, N. Yabe, and N. Ibaraki for assistance in the field and for stimulating discussion about this research. Dr. H. Nakamura also measured the cuckoo eggs and presented unpublished data. We are also grateful to Dr. K. Ueda, Mr. E. Urano and Mr. M. Hotta for helpful comments on the manuscript. Our center in the field was supported by the Saito family. This work was supported in part by a Grant-in-Aid for Special Project Research on Biological Aspects of Optimal Strategy and Social Structure from the Japan Ministry of Education, Science and Culture.

SUMMARY

(1) In the course of a study of the social behavior of Azure-winged Magpies Cyanopica cyana in 1984 and 1985 at Azumino, Nagano Prefecture, we found heavy brood parasitism by Common Cuckoos.

(2) A total of 31 nests out of 41 (75.6%), among core groups and 15 nests of 30 (50.0%) in secondary groups were parasitized. Eight nests contained two, and one contained three cuckoo eggs.

(3) The earliest magpie nests, in which the first egg was laid during the middle of May, were parasitized less frequently (11.1%) than later nests (68.8%).

(4) Cuckoo eggs (23.4 × 17.4 mm, n=13) were smaller than Azure-winged Magpie eggs (27.67 × 20.16 mm, n=16).

(5) Azure-winged Magpies suffered heavy brood parasitism by Common Cuckoos probably because of the short history of the host-parasite relationship between them, which is as a result of a recent expansion of their breeding areas in Nagano Prefecture.
のカッコウ卵が産み込まれていた。

（3）5月中旬に卵が産まれた果での托卵率（11.1％）はそれ以後に卵が産まれた果での托卵率（68.8％）よりも低かった。

（4）産み込まれていたカッコウの卵の大きさ（23.4×17.4 mm, n=13）は、オナガの卵（27.67×20.16 mm, n=16）より小さかった。

（5）カッコウとオナガの托児一卵托児の関係は両種の長野県内での分布の拡大にともなって最近生じ、そのことが高頻度の托児をもたらしているものと思われる。オナガが産卵期に長時間果を留守に放置することもカッコウに托児されやすい要因の一つだろう。

LITERATURE CITED


(Received December 25, 1985)