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GREAT REED WARBLERS BURY ARTIFICIAL OBJECTS, NOT ONLY CUCKOO EGGS

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The Great Reed Warbler (*Acrocephalus arundinaceus*) is a frequently used host of the Common Cuckoo (*Cuculus canorus*) in Hungary, locally parasitism rate may exceed 50%. Earlier studies revealed that Great Reed Warblers buried approx. 2–3% of the Cuckoo eggs, when clutches were parasitised naturally. In the pre-incubation stage we placed non-egg shaped foreign objects, pieces of reed stems as light elongated objects, and two types of small coins, like heavy rounded objects into Great Reed Warbler nests in central Hungary. Birds easily ejected reed stems from nest (88%), but the coins were more frequently buried. Approx. 53% of the small coins and 19% of the big coins were buried. Our results showed that Great Reed Warblers were able to bury foreign objects, so burial might have a general cleaning role.

Key words: *Acrocephalus arundinaceus*, nest cleaning, brood parasitism, antiparasite defence, egg burial, *Cuculus canorus*

INTRODUCTION

The regularly used hosts of the Common Cuckoo (*Cuculus canorus*), a brood parasite in the Northern Palearctic, developed at least some ability to recognise the parasitic egg (DAVIES & BROOKE 1989, MOKSNES & RØSKAFT 1992). Hosts' successful rejection of the foreign eggs may eliminate the threat to accept and incubate the parasitic egg, and as a consequence, to fledge only the Cuckoo chick instead of their offspring (WYLLIE 1981). Egg burial when the host builds over the Cuckoo egg with nest material and builds it into the nest cup is generally a rare (0–3%) reaction to parasitism. Egg burial was found in many host species of the Cuckoo, e.g. in the Reed Warbler (*Acrocephalus scirpaceus*) (WYLLIE 1981, DAVIES & BROOKE 1988), Great Reed Warbler (*Acrocephalus arundinaceus*) (MOLNÁR 1944, LOTEM *et al*. 1995, MOSKÁT & HONZA 2002) and the Bull-headed Shrike (*Lanius bucephalus*) (NAKAMURA *et al*. 1998). This behaviour was more fre-

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quently observed in some of the hosts of the Brown-headed Cowbird (*Molothrus ater*), a well-known brood parasite in North America (FRIEDMANN 1963, SEALY 1995). Burial of the parasitic egg ensures a perfect protection against brood parasitism, causing the failure of the buried eggs. For this reason this behaviour looks like a response to brood parasitism (PETRIE & MØLLER 1991). In some cases ROTHSTEIN (1975) was not certain if egg burial is really adaptive against brood parasitism, or it is simple the continuation of nest building.

In central Hungary the Great Reed Warbler occurs in sympatry with the Cuckoo (MOSKÁT *et al*. 2002), where Cuckoos parasitise this host species in a high (ca. 64%) frequency (MOSKÁT & HONZA 2002). In the present study we experimentally parasitised Great Reed Warbler nests with natural and artificial objects to reveal if burial behaviour is a specific response to brood parasitism, or it could be regarded as a more general response.

STUDY AREA AND METHODS

The study was conducted in central Hungary, around the village Apaj (47°09'N, 19°05'E), in chanalside strips of reed (*Phragmites australis*) between May 15 and July 8 in 2000 and from May 12 to June 29 in 2001 (see more details of habitat description in MOSKÁT & HONZA 2000). We put different foreign objects into still empty Great Reed Warbler nests, just after they had been finished (pre-egg-laying stage): pieces of reed stem, as natural objects, and two types of coins, as artificial objects. We used one nest for only one experiment, and controlled the nests for checking the possible reactions of the host until six consecutive days after the experiment. Small pieces of reed stem (ca. 3 cm long, diameter: 4–5 mm), and small coins were used as foreign objects. We used the older, mat pieces of small copper-coloured coins, the Hungarian 1 Forint (HUF; diameter: 16 mm, weight: 2.05 g) (called: "small coin"), and the Hungarian 5 Forint (diameter: 21 mm, weight: 4.2 g) (called: "big coin").

RESULTS AND DISCUSSION

We revealed that Great Reed Warblers generally ejected small pieces of reed: out of the total 16 experiments the birds ejected 14 (88%) and accepted only 2 (12%) cases (Table 1.). They buried frequently the small coins, out of the 17 experiments 9 (53%) coins were buried, 7 (41%) were ejected, and only 1 (6%) was accepted. Big coins were less frequently buried ($\chi^2 = 4.164$, df=1, P=0.041), out of the 16 experiments only 3 (19%) were buried, 8 (50%) coins were ejected, 2 (12%) were accepted, and 3 (19%) experimental nests were deserted.

Great Reed Warblers buried any of the light pieces of reed stem, but frequently buried the coins, even in a higher rate than burial of Cuckoo eggs were observed in natural populations. LOTEM *et al*. (1995) found 78 Great Read Warbler

Table 1. Reaction of Great Reed Warblers towards foreign objects placed into their empty nests (pre-egg-laying stage)

Experimental object	Burial	Ejection	Desertion	Acceptance	N
Reed stem	–	14	–	2	16
Coin (small)	9	7	–	1	17
Coin (big)	3	8	3	2	16

nests parasitized by the Cuckoo in Japan, but egg burial was observed in only 2 cases (ca. 3%). In three consecutive years MOLNÁR (1944) found 189 Great Reed Warbler nests parasitized by the Cuckoo in SE Hungary, and he reported that 19 nests in which the Cuckoo egg was buried (10%). One of these 19 nests contained two Cuckoo eggs, built in just above each other, and separated by nest material. In central Hungary we found 123 Great Reed Warbler nests parasitized by at least one Cuckoo egg, and found only 4 cases (ca. 2%) when burial of real Cuckoo eggs were observed under natural conditions (MOSKÁT & HONZA 2002).

The function of egg burial is different from temporary egg covering in the laying stage. The latter is common in several bird species (CAMPBELL & LACK 1985), e.g. to conceal eggs from predators (KELLER 1989, HOHN 1993), or to protect the clutch from destruction by House Wrens (*Troglodytes aedon*) (WHITE & KENNEDY 1997). In the Penduline Tit (*Remiz pendulinus*) it could also be a strategy for mate desertion and female polyandry (VALERA *et al.* 1997).

Egg burial possibly has no relationship with egg recognition ability of the host. DAVIES and BROOKE (1989) proved that an acceptor species, the Linnet (*Carduelis cannabina*) buried almost all parasitic eggs which were put in complete nests before laying, but in the egg-laying stage, Linnets accepted the foreign eggs. This Linnet is a seed-eating species, for this reason it is regarded as an unsuitable host for the Cuckoo, so Linnets have not been adapted to parasitism. This example supports our finding that egg burial looks like a nest cleaning behaviour, following nest construction, not exclusively an adaptation against brood parasitism.

We conclude that burial behaviour in the Great Reed Warbler is not restricted to parasitic eggs, hosts are also able to build over foreign objects in their nests. However, the shape of the objects seems to have an importance in the frequency of burial behaviour, only rounded objects were buried.

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