

SHORT REPORT

Dummy birds in artificial nest studies: an experiment with Red-backed Shrike *Lanius collurio*

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Capsule Dummy birds placed on artificial nests increase nest survival, and their use should be considered in future studies of nest predation.

Nest predation is a major cause of avian nesting mortality (Ricklefs 1969, Martin 1993). As studies on nest predation are difficult to undertake because of the large numbers of nests required, artificial nests are frequently used to measure relative rates of nest success (Reitsma *et al.* 1990, Báldi 2000). Nearly 400 papers on artificial nests have appeared in recent decades (Moore & Robinson 2004). In recent years, however, this method has received heavy criticism and its popularity is in decline (Faaborg 2004). The main concern is the markedly different depredation rates between natural and artificial nests (Rangen *et al.* 2000, Part & Wretenberg 2002, Moore & Robinson 2004, Robinson *et al.* 2005). In general, predation on artificial nests is significantly higher than on natural nests (Wilson *et al.* 1998, King *et al.* 1999, Berry & Lill 2003, Mezquida & Marone 2003, Lindell *et al.* 2004, Batáry & Báldi 2005, but see Davison & Bollinger 2000, Thompson & Burhans 2004). Many factors may cause these discrepancies including the size, colour and type of egg, nest type and nest appearance (Major & Kendal 1996, Rangen *et al.* 2000, Batáry & Báldi 2004). The absence of parental behaviour is an additional factor responsible for higher predation rates on artificial nests (Cresswell 1997, King *et al.* 1999).

Both positive (nest defence, Montgomerie & Weatherhead 1988) and negative (nest disclosure, Martin *et al.* 2000a, 2000b) effects of parental activity on nest survival have been documented, with the positive effects prevailing over the negative ones (Weidinger 2002). Parent birds actively defend their

nests by attacking and distracting predators, or by passively sitting on the nest and camouflaging their brood (Montgomerie & Weatherhead 1988, Weidinger 2002). Schmidt & Whelan (2005) showed that just the presence of an adult bird near the nest may serve to discourage predators. Opermanis (2004) investigated nest predation using artificial duck nests and found that dummy birds may also function as passive nest defenders and prevent clutch predation. Therefore, the use of dummies or taxidermic mounts of target adult birds in artificial nest experiments has the potential to increase the realism of nest predation studies based on artificial nests.

The aim of this study was to test this hypothesis for a passerine bird species, the Red-backed Shrike *Lanius collurio*. We performed a simple experiment in which we manipulated the presence of a dummy parent bird on artificial nests. Both male and female Shrike aggressively attack predators near the nest, with increased aggression associated with higher nest success. Although the level of aggression between sexes was found to be similar in this species (Tryjanowski & Gołowski 2004), we chose a male dummy model for experiment, taking into consideration the prediction that the bigger sex would attack natural predators more intensively than the smaller sex (Montgomerie & Weatherhead 1988). We predicted that artificial nests with Shrike dummy males should have higher survival than nests without dummy parents and control nests. As far as we are aware, this is the first study that demonstrates an effect of the presence of dummy parent birds on the survival rates of artificial passerine nests.

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The study was conducted in the wider environs of Trnava city, western Slovakia (48°32'N, 17°51'E, 141 m asl) in April 2007. To avoid influencing the survival of artificial nests by the behaviour of parents from potential active nests, the experiment was started one week before the arrival of the first Shrike breeding pairs known in the study area (A. Trnka unpubl. data), i.e. on 23 April.

For the nest predation experiment, we used open cup artificial nests with an external diameter of 14–15 cm and an external height of 9–10 cm. They were made of hempen silk and fixed to branches using insulated wire. The nests were baited with one fresh Quail *Coturnix coturnix* egg and one plasticine egg. We made dummy Shrike adult males from polystyrene, taking care to achieve a natural size, posture and colour (dummies were painted). Dummies were fixed on the margin of the nests imitating a perching adult. As a control we used shrike-sized polystyrene blocks painted in an abstract way. The nests were distributed at the same height (1.5 m above ground level) on Dog Rose *Rosa canina* or Hawthorn *Crataegus monogyna* at the edge of 20 separate bush and grove patches, a typical breeding habitat of Red-backed Shrikes in this region. The patches were 0.5–2 ha in size and distances between them varied between 2 and 10 km. Each patch contained one artificial nest without a dummy, one artificial nest with a Shrike dummy and one artificial nest with a polystyrene block. The distance between neighbouring nests in a triplet was approximately 50 m.

We attempted to standardize the visibility of nests by placing them in similar locations and by arranging or trimming the foliage in some cases. The degree of concealment of each nest was estimated according to Rangen *et al.* (2000) and Weidinger (2002) and was categorized into a four-point scale (0 = exposed, 3 = concealed). Nest visibility did not differ between the three treatments (Kruskall–Wallis test, $H = 0.12$, $df = 2$, $n = 60$, ns).

Nests were checked each day over a seven-day period and removed after the exposure interval. A nest was considered predated if any of the eggs were missed or damaged. Based on the cues left on the plasticine eggs, bird (triangular bill marks) or mammal (incisor marks) predators were identified. Because the artificial nests were put out at the same time and all had the same potential exposure days, logistic regression and one-way ANOVA (number of survival days per nest as dependent variable) were used to compare the likelihood of nest predation and daily nest survival rates between the three types of artificial nests, respectively.

Overall, 45% of the 60 artificial nests were depredated during the seven-day exposure period. There were significant differences in nest predation between the three nest types (Wald's $\chi^2 = 6.97$, $df = 2$, $P = 0.031$). Nests with dummy Shrikes survived better than nests without dummies and control nests (80% versus 40% versus 45%, respectively, Table 1). Similar patterns were also found for daily survival rates (one-way ANOVA, $F_{2,57} = 8.31$, $P < 0.001$). Whereas daily survival rates differed significantly between nests with Shrikes and the other two treatments (Scheffé's post-hoc test, both $P < 0.01$), no differences between nests without dummies and nests with polystyrene blocks were found (Scheffé's post-hoc test, $P = 0.99$).

Of the 27 predated nests, the Quail egg was missing from or broken in 25 nests. Large (63.6%) and small (18.2%) bill marks were found on 11 predated plasticine eggs while two mammal predators were identified from marks only. Potential large-bill avian predators include Black-billed Magpie *Pica pica* and Hooded Crow *Corvus cornix*, while small-bill predators include Common Blackbird *Turdus merula*. All these species occur commonly in the study area. In four cases, the dummy Shrike was attacked and damaged by a large bird predator.

Our results showed a clear positive effect of the presence of the Shrike dummy on the survival of artificial nests that was close to the survival of real nests found in the study area in previous years (85–90%, A. Trnka unpubl. data). This supports the hypothesis that the absence of parent birds at artificial nests is an important cause of increased nest predation rates (Cresswell 1997, King *et al.* 1999, Weidinger 2002). In a similar study with commercial game dummies of Mallard *Anas platyrhynchos* and Eurasian Teal *Anas crecca* females placed on artificial duck nests, Opermanis (2004) found that nests with dummies provided a measure of nest predation rate that was closer to the rate for natural nests.

The Shrike used in our experiment exhibits aggressive nest defence behaviour towards potential predators

Table 1. Descriptive statistics of nest success in three experimental treatments ($n = 20$ for each treatment) and their daily survival rates (DSR).

Nest type	Lost nests	Nest-days	DSR \pm se
Nests without dummy	12	114	5.70 \pm 0.49
Nests with Red-backed Shrike dummy	4	155	7.75 \pm 0.12
Nests with polystyrene block	11	115	5.75 \pm 0.48

(Tryjanowski & Głowacki 2004) and the males are conspicuous in colour compared with many other passerine birds. Therefore, the presence of the Shrike dummy at or near the nest may discourage potential predators from nest plunder more than dummies of less attractive species. Furthermore, experiments with dummy birds are time limited because habituation of predators to inactive models is possible.

Regardless of these limitations, our findings support the hypothesis that dummy birds can fulfil a passive nest defence function and so minimize the bias in nest survival studies using artificial nests.

ACKNOWLEDGEMENTS

We are indebted to Will J. Peach for valuable comments and for linguistic revision, and to Will Cresswell for constructive criticism and suggestions on a previous version of the manuscript. The study was supported by the Scientific Grant Agency VEGA (1/3257/06).

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(MS received 2 November 2007; revised MS accepted 22 February 2008)