# Re-Use of Old Nests Versus the Construction of New Ones in the Magpie Pica pica in the City of Sofia (Bulgaria)

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Source: Acta Ornithologica, 38(1) : 1-4

Published By: Museum and Institute of Zoology, Polish Academy of Sciences

URL: https://doi.org/10.3161/068.038.0104

ACTA ORNITHOLOGICA
Vol. 38 (2003) No. 1

# Re-use of old nests versus the construction of new ones in the Magpie *Pica pica* in the city of Sofia (Bulgaria)

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**Antonov A., Atanasova D. 2003. Re-use of old nests versus the construction of new ones in the Magpie *Pica pica* in the city of Sofia (Bulgaria). Acta Ornithol. 38: 1–4.**

**Abstract.** Nest re-use in a high density population of Magpies *Pica pica* in the city of Sofia and its vicinity was studied during 1999–2000. The rate of nest re-use was significantly higher within the urban area (17%) as compared to the immediate rural surroundings within the distance of 1 km (7%). Re-used nests were on average higher above the ground than newly-built nests. The nest reuse rate was not related to breeding density, abundance or the mean height of available trees. Magpies re-using their old nests laid eggs significantly earlier compared to those building new nests. However, nest re-use did not confer other benefits on the reproductive output since clutch-size, hatching and fledging success did not differ significantly between the two nesting strategies.

**Key words:** Magpie, *Pica pica*, nest reuse, breeding success

Received — March 2003, accepted — May 2003

## INTRODUCTION

Magpies build large nests of sticks and mud, and usually also with a dome of sticks above (Cramp & Perrins 1994). Nest structures seem to be costly in terms of effort and are durable enough to survive the following season and even further (Birkhead 1991). Nevertheless, Magpies usually build a new nest each season even when well preserved old nests are available (Goodwin 1976), which is generally thought to represent an anti-predator strategy (Tatner 1982a). Alternatively, the generally lower occurrence of reused nests could be due to the tendency to avoid ectoparasites contained in old nest material. On the other hand, urban breeding Magpies reuse their old nests significantly more often than their rural counterparts (Tatner 1982a). Increased nest reuse occurrence is pointed as one of the main changes in the ecology of this species evolved in the conditions of urban environment (Tatner 1982b). This life history trait and its significance have received little attention so far.

In this paper the nest reuse in Magpies was studied in the city of Sofia, Bulgaria where one of the highest densities for the species is recorded (Antonov & Atanasova 2002). We considered and tested the following three hypotheses concerning the occurrence and potential benefits of nest reuse in the Magpie:

1. Predation risk. Nest reuse in the Magpie is associated with reduced predation risks. The following predictions stem from this hypothesis:
— nest reuse should be more common within urban environments which are considered "safe zones" in terms of reduced numbers and/or absence of predators (Cramp 1972, Gering & Blair 1999, Kosiński 2001);
— we predicted greater nest-height of reused nests as compared to newly built ones as previous studies showed that nest height is a reliable predictor of success in the Magpie and was the only factor discriminating between successful and unsuccessful nests in our urban area (Jerzak 1995, Antonov & Atanasova 2002);
— if nest reuse is associated with safer nest sites then reused nests should suffer less predation and enjoy an increased probability of success.

2. Availability of nest sites. Magpies are suggested to reuse nests more frequently if nest-sites

are in short supply (Birkhead 1991). As nest tree height is positively related to the probability of breeding success, then the height of available trees could also have an influence on nest reuse. Furthermore, Tatner (1982b) suggested greater renovation occurrence in urban areas could result from the heightened density. We predicted the spatial variation of nest reuse rate to be negatively related to the total number of trees and positively related to mean height of available trees and breeding density.

3. Energy savings. As nest-building is an energetically costly activity in the Magpie (Tatner 1982a) then pairs reusing their old nests should gain benefits over conspecifics building new nests due to energy savings. Such benefits are predicted to be realized in earlier laying, and/or larger clutch-size, and/or greater hatching and fledging success among pairs reusing previous year nests as compared to those building new nests.

## STUDY AREA AND METHODS

The current study was carried out in 1999–2000 in Sofia city (42°40′N 23°20′E). The study area comprised 405 ha urban habitat in the periphery of the city. The density of Magpies (up to 56.8 pairs/km$^2$) recorded in this area is one of the highest known for the species (Antonov & Atanasova 2002). Details of the urban part of the study area can be found in Antonov & Atanasova (2002). We also recorded nest reuse rate within the rural areas (478 ha) surrounding the urban area and extending 1 km out of the border of built-up area. Rural habitat mostly included wet meadows interspersed with clumps of thorny bushes (*Crataegus monogyna*, *Rosa canina*, *Prunus spinosa*) and low to medium trees (mainly *Prunus cerasifera* and *Acer campestre*). There were no residential buildings in the rural area. Density of magpies in the rural area was also very high, 40.1 pairs/km$^2$, though significantly lower than that in the urban area (Antonov & Atanasova, in press). Due to the low occurrence of nest reuse, however, only nests from the urban area were considered in the analyses, and data from the rural area were used only for comparing the rates of reuse and the incidence of predation.

Nests were classified as either newly-built or reused from the previous season. Only well preserved structures (at least nest cup with the mud bowl present) were treated as renovated.

Most nests were accessible and they were visited every 2–5 days to record laying date, clutch-size, number of young hatched and fledged respectively. Part of inaccessible nests at least could be assigned as successful or unsuccessful on the basis of regular observations. Only original breeding attempts are considered here.

To sample breeding density and habitat characteristics we used maps with a 300 m grid superimposed. Within each plot, all trees and bushes were counted and measured by height. The number of breeding pairs, total number of available trees and mean tree height were chosen as possible predictors of the proportion of pairs reusing their nests and tested by use of multiple regression analysis.

Laying dates differed significantly between the two years of study and were standardized by setting the first date of a given season to 1 and counting subsequent dates accordingly.

Hatching success and fledging success for each nest were expressed as the ratio of the number of chicks hatched to clutch-size and the number of chicks fledged to the number of chicks hatched, respectively.

Since the study was conducted over a 2-year period at the same location, some birds likely contributed more than one observation considering breeding performance which implies a potential problem of pseudoreplication. Thus, we analyzed all the data available as well as data from 2000 year separately (for which more breeding data were available). As the two groups of analyses agreed well and the same results were reached at, only the results on the whole dataset were presented.

Statistical analyses were performed with SPSS 11.0. All tests are two-tailed and means reported with their standard deviations.

## RESULTS

On average, 16.8% of urban Magpies reused their old nests. The rate of nest reuse did not differ significantly between the two years (1999 — 17%, 33/193; 2000 — 16%, 38/230; $\chi^2 = 0.0008$, df = 1, p = 0.98). Nest reuse was more frequent within the urban area than within the immediate rural surroundings (urban — 16.8%, 71/423; rural — 6.9%, 12/174; $\chi^2 = 10.07$, df = 1, p = 0.0015). Breeding attempts in the urban area were more likely to be successful than those in the rural area (urban — 122 of 228 attempts successful; rural — 59 of 166; $\chi^2 = 12.486$, df = 1, p = 0.0004). Furthermore, predation accounted for a significantly higher proportion of breeding failures within the rural

area compared to the urban one (urban — 52 of 89 losses to predation; rural — 88 of 104; $\chi^2 = 16.51$, df = 1, $p < 0.00001$).

Reused nests were on average significantly higher above the ground, than newly-built nests (reused — 6.2 ± 2.51, n = 32; newly-built — 5.3 ± 1.84, n = 198; Mann-Whitney test, U = 2376, p = 0.023).

In a multiple regression analysis with density, total number of trees and the mean height of trees as predictors of the proportion of pairs reusing their old nests, none of these explanatory factors was significant ($F_{3,31} = 2.045$, p = 0.128).

Reused and newly-built nests showed few differences in breeding parameters (Table 1). Magpies reusing their old nests laid on average 7.5 days earlier than those building new nests. Controlling for laying date clutch-size did not differ significantly. Neither hatching success, nor fledging success differed significantly between the two nest types (Table 1). Finally, the probability that a breeding attempt was successful and proportions of nests lost to predation were not related to nest reuse habit either (Table 1).

## DISCUSSION

The proportion of pairs reusing their old nests in our local population, 16.8%, is low compared with other urban areas, e.g. 36% in Manchester (Tatner 1982a), 23–27% in Denmark (Henriksen 1989 in Birkhead 1991), 24% in Sheffield, UK (Birkhead 1991) and 22–28% in Zielona Góra, Poland (Jerzak 1995). The urban area, where predation pressure was much more relaxed as compared to rural area was associated with higher rate of nest reuse. This was according to the prediction for the increased occurrence of nest reuse in urban environments (Tatner 1982a, Jerzak 1995). Tatner (1982a) suggested that changing the nest site between seasons may reduce the probability of the nest contents being depredated. Given that rural Magpies suffer more predation than urban ones (Eden 1985, this study), nest-reuse seems not to be advantageous among Magpies breeding under rural settings. On the other hand, birds often do not reuse their old nests because of the tendency to avoid ectoparasite infestation (deLope & Møller 1993, Stanback & Dervan 2001). Even if differential abundance of ectoparasites between urban and rural environments exists, there should be more parasites in the urban area as ectoparasite abundance increases with density of birds (Møller 1987) and the density of magpies was higher in the urban area than in the rural one. Thus, reduced ectoparasite abundance seems not to be the primary cause for the increased occurrence of nest-reuse in the urban area.

Reused nests were higher above the ground compared to newly-built ones. Nest height is a predictor of breeding success in the Magpie (Jerzak 1995, Antonov & Atanasova 2002) which may explain the greater height of reused nests. Thus, the distribution of reused and newly-built nests in relation to height was in the predicted direction and reused nests were associated with safer sites.

We did not find support of the Tatner's (1982b) hypothesis that nest reuse is related to breeding density. Even if density potentially may affect the occurrence of nest reuse, it was generally very high in the study area, possibly exceeding some threshold above which it is no more influential.

One may expect the number of trees within a plot, respectively within territories to reflect the opportunities Magpies have to switch to new trees and building new nests there but it was not related to nest reuse. Thus our results do not support the "availability of nest sites" hypothesis (Birkhead 1991). Furthermore, as reused nests were on average higher above the ground than newly-built ones, plots containing higher trees were expected to be associated with increased nest reuse occurrence. However, variation of nest

Table 1. Breeding parameters in relation to nest type — means ± standard deviations. ( ) — sample size; t — independent samples t-test, F — ANCOVA with laying date as a covariate, U — Mann-Whitney U-test, subscripts — degrees of freedom.

| Variable | Type of nest | | Statistic | p |
|---|---|---|---|---|
| | re-used | newly built | | |
| Laying date | 22.2 ± 10.47 (32) | 29.7 ± 9.98 (200) | $t_{230} = 3.356$ | 0.001 |
| Clutch-size | 6.6 ± 1.15 (29) | 6.4 ± 1.15 (172) | $F_{1,196} = 0.574$ | 0.461 |
| Hatching success/complete clutch | 3.4 ± 2.54 (27) | 3.2 ± 2.40 (170) | U = 1172 | 0.389 |
| Fledging success/pair | 2.10 ± 2.357 (31) | 2.14 ± 2.294 (194) | U = 479 | 0.295 |
| % successful pairs | 53.1 (17/32) | 53.6 (105/196) | $\chi^2_1 = 0.002$ | 0.962 |
| % depredated nests of failed nest | 61.5 (8/13) | 57.9 (44/76) | $\chi^2_1 = 0.06$ | 0.805 |

reuse within plots was not related to availability of higher trees. Further studies including more nest-substrate and habitat variables as well as larger samples are needed to clarify the pattern of spatial variation of nest reuse in the Magpie.

Birds reusing their old nests laid earlier and this was the only breeding parameter that differed significantly between the two nesting strategies. Similarly, Tatner (1982a) and Jerzak (1995) found that this was the case in two other cities, Manchester (UK) and Zielona Góra (Poland), respectively. Earlier breeding in birds is usually associated with greater breeding success (Perrins 1970), but hatching and fledging success as well as the proportion of successful breeding attempts were very similar between the two nest-building strategies. Reused nests were not more secure in terms of probability of predation since depredation rate was very similar to those for newly-built nests, which did not support our prediction. A similar lack of any benefits to Magpies reusing their nests was also found by Tatner (1982a) and Jerzak (1995) and thus seems a general phenomenon, holding over wide geographic areas.

Early laying pairs, however, may have advantages over later breeding ones if only because if they fail, there is more time to re-nest.

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## STRESZCZENIE


**[Porównanie lęgów sroki z zeszłorocznych i z nowych gniazd w Sofii]**

Celem pracy było sprawdzenie trzech hipotez uzasadniających używanie zeszłorocznych gniazd przez sroki: 1) gniazda w których w poprzednim roku odbyły się udane lęgi mogą być bezpieczniejsze przed drapieżnikami — ich lokalizacja okazała się szczęśliwa; 2) użycie zeszłorocznych gniazd powinno być pozytywnie skorelowane z zagęszczeniem populacji i negatywnie z obfitością miejsc lęgowych; 3) użycie zeszłorocznych gniazd jest oszczędnością wkładu energii — co może pozwolić na wcześniejsze i większe zniesienia.

Obiektem badań, prowadzonych w latach 1999–2000 była populacja z obszaru zabudowanego (405 ha) w dzielnicy peryferyjnej miasta oraz populacja zasiedlająca pobliski teren niezabudowany (478 ha) poza miastem. Obie te populacje cechowały się bardzo wysokim zagęszczeniem — pierwsza z nich 56.8 par/km$^2$, a druga — 40.1 par/km$^2$ .

Udział lęgów w zeszłorocznych gniazdach był większy (17%) w porównaniu do populacji pozamiejskiej (7%). Na terenie miejskim lęgi w gniazdach zeszłorocznych miały też istotnie wyższy sukces lęgowy i niższe straty spowodowane drapieżnictwem, co potwierdza hipotezę 1. Zajęte gniazda zeszłoroczne były też wyżej umieszczone (6.2 ± 2.51 m, n = 32) niż gniazda nowe (5.2 ± 1.84, n = 198) — były więc bezpieczniejsze.

Obfitość drzew, ich wysokość i zagęszczenie nie wiązały się w stopniu istotnym z częstością użycia gniazd zeszłorocznych, co nie potwierdziło hipotezy 2.

Pary w gniazdach zeszłorocznych rozpoczynały zniesienia 7.5 dnia wcześniej od par z gniazd nowych. Natomiast wielkość i sukces lęgów u obu grup nie wykazał istotnych różnic. Ten brak korzystnych skutków ponownego użycia gniazd stwierdzono również w innych badaniach.