Arch. Biol. Sci., Belgrade, 62 (2), 489-493, 2010 DOI:10.2298/ABS1002489K

SURVIVAL PROBABILITIES OF FIRST AND SECOND CLUTCHES OF BLACKBIRD (*TURDUS MERULA*) IN AN URBAN ENVIRONMENT

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Abstract – The breeding success of blackbirds was investigated in April and June 2008 and 2009 in the Botanical Garden of the University of Pécs, with a total of 50 artificial nests at each of the four sessions (with 1 quail egg and 1 plasticine egg placed in every nest). In all four study periods of the two years, 2 nests (4%) were destroyed by predators. Six nests (12%, of the nests) were not discovered in either of the cases. The survival probability of artificial nests was greater in April than in June (both years), but the difference was significant only in 2008. Nests placed into a curtain of ivy (*Hedera helix*) on a wall were located higher up than those in bushes, yet their predation rates were quite similar. The predation values of quail vs. plasticine eggs did not differ in 2008. In the year 2009, however, significantly more quail eggs were discovered (mostly removed), than plasticine eggs. Marks that were left on plasticine eggs originated mostly from small mammals and small-bodied birds, but the disappearance of a large number of quail and plasticine eggs was probably caused by larger birds, primarily jays.

Keywords: Artificial nest, predation, quail, plasticine, Botanical garden, Pécs, Hungary

UDC 598.288.5:591.5

INTRODUCTION

Being one of the most common city birds, blackbirds (*Turdus merula*) raise two or even three clutches a year (Ludvig et al., 1995, Cramp, 1998). As revealed by our investigations performed in 2006-2007, altogether 43 bird species occurred in the cca. 4.5 ha of the Botanical Garden of the University of Pécs (Pécs, Hungary). Of these, 18 species were nesting in the area, and the most frequent one was the blackbird. It appeared from our surveys that the number of blackbirds was highest in May, decreased gradually through June and July, and the lowest numbers were observed in August. It may be that the increase observed in May was partly caused by young birds from the first clutch, but why did such an increase not occur after the second clutch as well? As the breeding season proceeds, predation pressure on blackbirds generally increases (Ludvig et al., 1995), which may be associated with the degree of nest concealment and predator activity (Wysocki, 2005). Nest predation is one of the most important influencing factors of breeding success (Skutch, 1949, Ricklefs, 1969, Martin 1995, Yanes-Suárez, 1997). Artificial nest experiments (Bayne and Hobson, 1999, Major and Kendal, 1996) carried out to investigate predation rates and to identify potential predators are useful because such experiments are unobtrusive to the real nests and the incubating birds.

Our aim has been to analyze, with the help of artificial nests placed throughout the Botanical Garden, the survival probabilities of nests in the first and second blackbird clutches. We have also been looking for an answer to the question whether or not the location of the nests influences the predation rate, and what animals the actual nest predators are.

METHODS

As we had established earlier, the eggs of the first clutches were laid in the second half of April. Accordingly, experimentations with artificial nests were launched on 21st April 2008 and, in line with

Fig. 1. Boundary garden wall overgrown by ivy, with chopped plant material (Photo: J. J. Purger).

Fig. 2. Blackbird nest built on a wire mesh (Photo: J. J. Purger).

the onset of the second nesting, on 9th June. The experiment was repeated one year later in the same periods. In spring 2009, mulched plant material was deposited in a heap against the wall bordering the garden (Fig. 1), making the nests positioned here more exposed to predators, and possibly calling attention to the location of the nests. The nests were made of small-gauge wire mesh cut into 15×15 cm squares (Yahner et al., 1989). The mesh nest frames were affixed to vegetation using wires and were lined with leaf litter and dry grass collected *in situ* (Wilson et al., 1998, Bayne and Hobson, 1999). Altogether 28 artificial nests were placed in the ivy (*Hedera helix*) growth covering the garden wall at heights of 183.4 ± 50.01 cm (average ± SD). Another set of 28 artificial nests were put on deciduous and evergreen shrubs at heights of 123.4 ± 51.79 cm. Nests positioned along the garden wall were located significantly higher up than those installed in bushes ($t = 4.17$, $df = 48$, $p < 0.001$). For the evaluation of data, 25 nests were considered from each of the two pools. The reason for this was that in both years the blackbirds sometimes chose to build their nests quite near an artificial nest, moreover it also happened that they used the installed wire mesh as a nest base (Fig. 2). These artificial nests were excluded from the experiment, even retrospectively, so that our regular surveys would not disturb the breeding birds. One quail egg and one plasticine egg was placed in each of the experimental nests, which were then monitored for 2 weeks, a period similar in duration to blackbird incubation (Cramp, 1998, Haraszthy, 1998). Checking was performed always on the same route, between 16.00-17.00, on days 1, 2, 4, 7 and 14 after the setting up of the experiment and no further interventions were made. A nest was considered to be predated when eggs were either damaged or missing (Bayne et al., 1997). Plasticine eggs were used for the identification of nest predators, as plasticine preserves tooth and beak imprints left behind by them (Major, 1991, Cresswell, 1997, Bayne et al., 1997, Báldi, 1999, Niehaus et al., 2003, Trnka et al., 2008). For statistical analysis contingency tables were used (Zar, 1999). In cases when the degree of freedom equaled 1 ($df = 1$), the Yates correction for continuity was applied. Results are presented as mean ± standard deviation. The t-test for comparing the means was two-tailed. A minimum probability level of $p < 0.05$ was accepted for all the statistics.

RESULTS

In April and June 2008, 22 nests (44%) were not found at by predators, 18 nests (36%) were robbed only in one of the months, and 10 nests (20%) were depredated in both of the months i.e. in April and June. The following year (2009) yielded similar

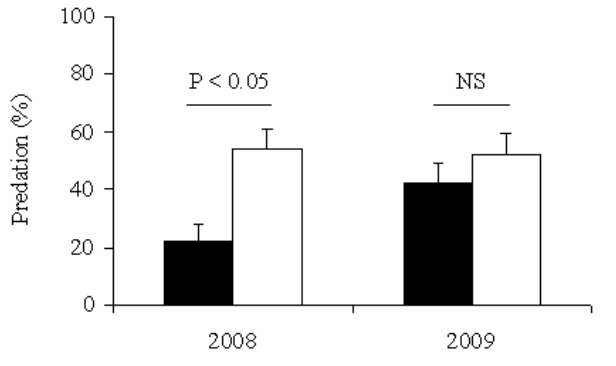

Fig. 3. Predation rates in April and June 2008 and 2009 (black bars – April, white bars – June).

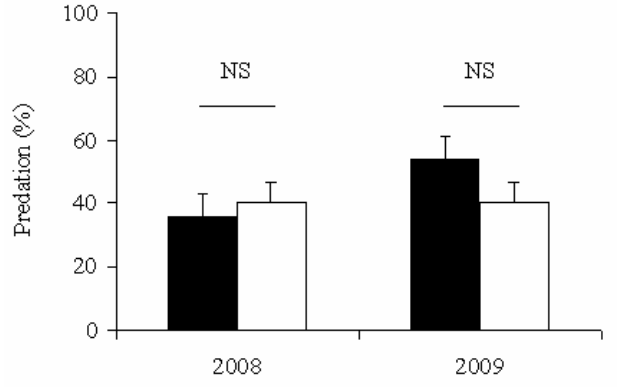

Fig. 4. Predation rates revealed for nests in wall-creeping ivy (black bars) and in bushes (white bars).

values (χ^2 = 2.12 df = 2, NS). In April and June 15 nests (30%) could not be found, 23 nests (46%) were found only in one of the months, and 12 nests (24%) were robbed in both of the months. Throughout the four breeding seasons of the two years only 2 nests (i.e. 4%) were robbed by predators in all four cases. Six nests (12%), remained undiscovered in all four periods.

For both of the study years, the number of artificial nests discovered and depredated was higher in June than in April (Fig. 3), but this difference was significant only in 2008 (χ^2 = 5.92 df = 1, $p < 0.05$), whereas it was not significant in 2009 (χ^2 = 0.34 df = 1, NS).

Nests that were positioned along the garden boundary wall were located significantly higher up than those placed in bushes, yet there was no significant difference between the predation rates of the two pools of artificial nests either in 2008 (χ^2 = 0.03 df = 1, NS), or in 2009 (χ^2 = 0.76 df = 1 NS) (Fig. 4). While in 2008 the number of bush nests that were damaged was somewhat higher than that of damaged nests on the wall, in 2009 this turned around and a higher predation rate was recorded for nests located in the ivy. Predation of the nests in the ivy was significantly higher in 2009 than in 2008 (χ^2 = 4.5 df = 1, $p < 0.05$).

No significant differences were revealed between predation of the nests in the ivy creeping on the wall and those placed in bushes either in April 2008 (χ^2 = 0.36 df = 1, NS) and June 2008 (χ^2 = 0.00 df = 1, NS) or in April 2009 (χ^2 = 1.71 df = 1, NS) and June 2009 (χ^2 = 0.04 df = 1, NS).

There was no significant difference between the predation of quail and plasticine eggs in 2008 (χ^2 = 0.19 df = 1, NS). In 2009, however, the number of quail eggs damaged (mostly removed) was much higher than that of plasticine eggs (χ^2 = 24.45 df = 1, $p < 0.001$).

Both in April 2008 and April 2009, 7.14% of the total number of predated quail eggs (28%) were left in the nest, and 92.86% disappeared. This was similar (χ^2 = 0.13 df = 1, NS) to what was recorded for June, when 2.4% of the predated (42%) quail eggs were broken up by predators, whereas the remaining 97.6% were removed (Fig. 5.).

In the month of April of both years, nearly 20% of the total predated (10%) plasticine eggs were discovered by small mammals, another 20% by some sort of smaller bird, whereas 60% disappeared. In June (χ^2 = 10.97 df = 2, $p < 0.05$) only 5% of the predated (19%) plasticine eggs were removed, and predation by small mammals (32%) and smaller birds (63%) increased (Fig. 5).

DISCUSSION

The locations of nests in April and June were identical, 44% of them in 2008 and 30% in 2009

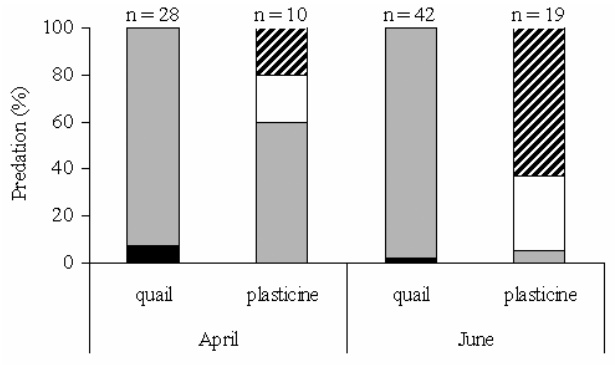

Fig. 5. Proportions of broken and removed eggs, and the distribution of predators of plasticine eggs (2008-2009), April and June. Black bars – broken; grey bars – removed (disappeared) from the nest; white bars – marks left by small mammal predators; hatched bars – marks left by small bird predators.

remained intact. Re-used nests that are less exposed to predators and provide better protection ensure greater breeding success than new nests (Wysocki, 2004). Blackbirds living in cities and parks start breeding earlier than their conspecifics living in original habitats (Partecke et al., 2005). Early blackbird nests have increased survival probability which is due to the fact that predators at this stage have not shifted to nest predation as a resource (Ludvig et al., 1995). Also, in the Botanical garden of the University of Pécs, the first nests are built as early as April. Our results show that the survival probabilities of artificial nests built in April are greater than those of nests built in June. It is difficult to assess the degree of disturbance in an urban environment, because it also affects the predators living in the same environment as the nests (Jokimäki and Huhta, 2000, Liebezeit et al., 2009). In our case, the increased predation pressure could be caused by changes in the habitat.

As revealed by earlier studies, the predation of real blackbird nests depends on how high up the nests are located (Møller, 1988, Ludvig et al., 1995), although Wysocki (2004) presented results that contradict this view. According to Van Heezik et al., (2008), the predation of artificial nests does not depend on the position of nests, a finding now supported by our results as well.

The numbers of damaged plasticine eggs and quail eggs were found to be similar, which is in line with the results revealed in other studies (e.g. Cresswell, 1997, Purger et al., 2004). The markings left behind on the plasticine eggs that remained in the nests originated from small mammals and small-bodied birds that were unable to take the quail eggs away or to damage them (Nour et al., 1993, Rangen et al., 2000). Nests in bushes are usually predated by birds (Nour et al., 1993, Söderström et al., 1998, Fazekas and Báldi, 2000). During our investigations, it was probably jays (*Garrulus glandarius*) that were responsible for losses and for the damage to a considerable amount of quail and plasticine eggs. The density of jays in the botanical garden was found to be around 0.4 pairs/ha in the studied years. Although they apparently do not exhibit particular search strategies for finding nests (Vigallon and Marzluff, 2005), they are important predators whose relative abundance correlates with the predation of the artificial nests (Luginbuhl et al., 2001). Our studies have shown that for blackbirds living in urban environments the first breeding in the season is more successful, irrespective of the location of the nests, although this can be influenced considerably by disturbance factors.

Acknowledgments - We would like to thank András Báldi for the useful comments on the manuscript and Balázs Trócsányi for translation.

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