NOTE

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Different depredation rates between daylight and twilight placed artificial nests

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A b s t r a c t . The effects of the time of day on depredation of artificial open ground nests were studied in the Szigetköz riparian area in NW Hungary. Seventy five percent of nests placed out during daylight, and 40 % of nests placed out in twilight conditions were depredated ($P < 0.05$). This result showed that in areas where visual predators are abundant, which can browse after the experimenter departs, nest placement during daylight may cause an artificially high depredation rate.

Key words: ground nest, experiment, chicken egg, plasticine egg, grassy dike-side, Hungary

Nest predation is a significant factor determining reproductive success and community structure of open-cup nesting bird species (R i c k l e f s 1969, M a r t i n 1988). Predation on the nests of active bird is difficult to study for several reasons. First, the nests may be disturbed by the observer, who thereby influences nest success. Second, the usually small sample size of active nests, due to the difficulty of finding them, makes analysis difficult. Experimental studies of nest predation began using artificial nests and usually quail or chicken eggs to avoid these problems. Also, experimental nests allow the experimenter to choose the arrangement and locations of nests to test specific features of nest-sites and how they influence predation. There are several factors, however, which may affect the result of an experiment, including the effect of egg colour, egg type, nest type, nest visibility (M a j o r & K e n d a l 1996), egg size (H a s k e l l 1995, D e G r a a f & M a i e r 1996), and observer's scent marks (W h e l a n et al. 1994). Therefore, understanding and controlling for biases associated with experimental nests is necessary before we can explain processes at active nests by the use of experimental nests.

In a preliminary experiment, I intended to test the effect of nest visibility on predation. I used artificial open-ground nests as follows: 20 nests with one chicken egg, 20 nests with 7 quail eggs, and 20 nests with one quail egg, placed 15m apart. The nests were exposed for two days. I expected to get higher depredation rate on nests containing one chicken, and on 7 quail eggs, than on nests with 1 quail egg, due to the better visibility of large eggs/clutches than that of single quail eggs. However, all the 60 nests were depredated after 2 days. The possible explanation for the extremely high predation rate was that hooded crows (*Corvus corone cornix*), which recognised my activity, browsed the experimental area after my departure. Thus, I predicted that the time of day that experimental nests are set in place may influence predation. Specifically, when the main predators hunt visually, nests placed in the day time will have higher predation than those placed at twilight, in the dark.

The study site was the dam along River Danube, at the Macska Island, Szigetköz region (47° 51' N, 17° 27' E), Western Hungary (more details in B á l d i et al. 1998). This section of the dam is between the river flood area, covered by gravel shores and young poplar plantations,

and a wetland of mowed wet meadows and reedbeds (ca 200 ha). The width of the dike (including both sides) was ca. 100 m. The dike sides were regularly mowed for many years, thus the vegetation was a homogeneous grassland. The height of the grass was ca. 15 cm.

Artificial nests were placed out to one side of the dike, along four transects parallel to dike, within a 500m long section. Two transects were established at ca. 18.00h, when there was still daylight. Two other transects were established one hour later, when there was twilight, and, in addition, a storm with dense clouds further reduced light intensity. Ten nests were placed 15m apart in each transect. Nests were created as a shallow depression on the ground among grass tussocks. All nests contained a fresh chicken and a plasticine egg. The size of the plasticine egg was similar to a quail egg. The nests were checked 16 hours later (at 10.00 and 11.00, the daylight and twilight nest, respectively). A nest was considered depredated if one or both eggs were destroyed or disappeared.

Seventy five percent of the daylight nests, and 40% of the twilight nests were depredated (Table 1). The difference between the rates was significant (G test of homogeneity with Williams' correction (Fowler & Cohen 1995), $G_{adj} = 4.94$, d.f.= 1, $P<0.05$). Out of the 23 depredated nests, 12 were empty and 11 contained egg shell fragments and/or teeth marks on the plasticine eggs. The red fox (*Vulpes vulpes*) was identified as the predator of 3 nests by comparing the marks with museum specimens. No other predator was identifiable from the marks.

Table 1. Number of depredation of artificial open ground nests in Hungary. Treatment refers to the time of artificial nest placing.

	Treatment		
	Daylight	Twilight	
Number of nests	20	20	
Number of depredated nests	15	8	$P < 0.05$

The study showed that the effect of light conditions was significant on the depredation of artificial open ground nests. Thus, besides numerous other factors, such as the colour and size of eggs, the concealment, location and type of nest, and the researcher's scent marks, the time of day should also be considered in the design of artificial nest studies. If the potential main predators are birds, which are using visual cues and are active during the day (Picman & Schriml 1994), evening nest placing is recommended to avoid the bias of increased predation by birds observing the experimenter.

Although it is known that avian predators may respond to, or follow, a field worker (e. g., Götmark 1992), its effect on artificial nest experiments was not yet investigated. My results suggest that in large number of cases, when corvids were the main predators (see in Paton 1994), the observed predation rate may be biased, and it also contributes to the explanation of the overall trend of higher predation rate of artificial than actual nests. The generality of the results, however, should be tested using a larger sample size and different areas.

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