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Short communication

Predation on artificial nests in post-mining recultivated area and forest edge: contrasting the use of plasticine and quail eggs

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Abstract

Intensive opencast coal mining has been in effect in the northeastern outskirts of Pécs (south Hungary) since 1968. The covering layer of the northern, recultivated area extending over 15 ha is overgrown by herbaceous vegetation. Oleaster (*Elaeagnus angustifolia*) was planted in rows on the hillsides. The recultivated open areas are bordered by turkey oak forests (*Potentillo micranthae–Quercetum daleschampii* Horvát A.O. 1981) from the east, north, and west; thus it forms a wedge of a clearing in the wood. Our studies have aimed at determining whether nest predation is greater in the forest edge or in the rows of oleaster in the recultivated area. First a plasticine egg, then a quail egg was put in each of the 50–50 artificial nests mounted on trees in the two habitat types. After a week it was found that predation to nests with only one plasticine or one quail egg in each was significantly higher in forest edge trees than in the rows of oleaster. There was no significant difference between predation to plasticine and quail eggs in either of the habitats. Irrespective of where the nests were, predators (mostly jays, tits, and once a small mammal) attempted to "consume" the plasticine eggs in the nest, whereas quail eggs were usually taken away. The rate of disappearance of eggs from the nests (plasticine 24%, quail 60%) differed significantly from the rate of pecking or gnawing at them and from in situ consumption (plasticine 76%, quail 40%). Nests located in tree rows in the recultivated areas are safer than those in the forest edge.

Keywords: Post-mining recultivated area; Forest edge; Artificial nest; Plasticine egg; Quail egg; Nest predation; Hungary

1. Introduction

Forest fragmentation results in a decrease of the amount of habitats and an increase of the rate of forest edges (see Wilcove et al., 1986; Paton, 1994). Nesting possibilities are usually better in forest edges than inside forest sections, thus edges attract passerine birds but also their predators. Nest predation, in turn, strongly influences breeding success (Ricklefs, 1969; Martin, 1995; Saether, 1996; Yanes and Suárez, 1997). The width of the habitat patch is a limiting factor filtering out sensitive species and allowing only those species to stay which tolerate poorer conditions and greater disturbance of tree rows (Legány, 1991).

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The majority of bird species nesting in forest edges and tree rows feed on phytofagous insects (Jánoska, 2001), thus they indirectly influence the growth and health of the surrounding vegetation (Holling, 1988; Marquis and Whelan, 1994).

Habitat restoration should be as cheap and as effective as possible (Bradshaw, 1997). An inexpensive and successful way is to allow spontaneous succession (Prach, 1994). However, planting trees in recultivated areas not only assists faster forest formation, but also provides nesting opportunity to a number of bird species. How the presence or absence of predators in recultivated areas influence breeding success of birds nesting there?

We have set the aim of finding out how much a tree row in a recultivated area differs from the forest edge in respect of nest predation. Answers were sought to the following questions: (1) Is nest predation higher in the forest edge or in the tree rows of the recultivated area when only one plasticine egg or one quail egg is placed in each of the artificial nests? (2) Is there any difference between predation at plasticine and quail eggs in nests at the forest edge and in the recultivated area? (3) plasticine and quail eggs taken away or rather consumed in situ?

2. Study area

Intensive opencast coal mining has been in effect in the northeastern outskirts of Pécs (south Hungary) since 1968. The delft is bordered from the west by the eastern slopes of Misina (535 m height a.s.l.), the southernmost summit of Mecsek Hills. The covering layer of the northern, recultivated area extending over 15 ha is overgrown by herbaceous vegetation of the initial stage of primer succession. The plot has been planted with various tree saplings since 1996. Most of them hardly stick out from the grass, but oleaster (*Elaeagnus angustifolia*) that was planted in rows 15–25 m apart on the hillsides and the spontaneously colonizing black locust (*Robinia pseudoacacia*) have already grown taller than 2–3 m. The recultivated area is bordered from the east, north and west by turkey oak forests (*Potentillo micranthae–Quercetum daleschampii* Horvát A.O. 1981).

3. Material and methods

The study area was surveyed in March 2002 with the aim of locating nests remaining from the previous breeding season. Only three nests were found in the forest edge: two blackbird (*Turdus merula*) nests, and one turtle dove (*Streptopelia turtur*) nest. Five abandoned nests of the red-backed shrike (*Lanius collurio*) were located in the oleaster rows. Experimental nest predation studies applying artificial nests and eggs have contributed significantly to learning about breeding success and nest predation (see reviews: Paton, 1994; Major and Kendal, 1996; Söderström et al., 1998; Báldi, 1999). In the morning of 29th April 2002, 50–50 dummy nests were placed out in the forest edge at the western and eastern sides of the recultivated area (in a stripe of 5 m) and in the oleaster rows, respectively. The nests were located at least 20 m apart from each other (Bayne and Hobson, 1999), at a height of 1–2 m (Marini et al., 1995). They were open and cup-shaped, 15 cm in diameter and 6 cm in deep, their structure built of wire mesh (Melampy et al., 1999). Nest frames were mounted to the branches using fine wiring, and were then lined with leaf litter (Bayne and Hobson, 1999) and dry leaves of tall fescue (*Festuca arundinacea*) available everywhere in the surroundings.

In the afternoon of 29th April, a plain colour plasticine egg, the size of a quail egg, was placed in each of the 100 nests. The content of the nests was checked on the first (30th April), second (1st May), fourth (3rd May) and seventh (6th May) day after placement, between 16:00 and 20:00 h each time. At the time of the last checking, all the remaining dummy eggs were removed from the nest. On the afternoon of 7th May, a quail egg was put in each of the 100 nests. The content of the nests was checked on the first (8th May), second (9th May), fourth (11th May) and seventh (14th May) day after placement, at the same time as specified above.

Both types of eggs were stored outdoors for 1 week prior to the experiment. Before lining the artificial nest and positioning the eggs, we thoroughly rubbed our hands with leaf litter taken from the ground (Báldi, 1999). A nest was considered to have been predated if either type of egg was missing or was damaged in some way. In the statistical analysis we used *G*-test for goodness of fit for two categories with Yates correction

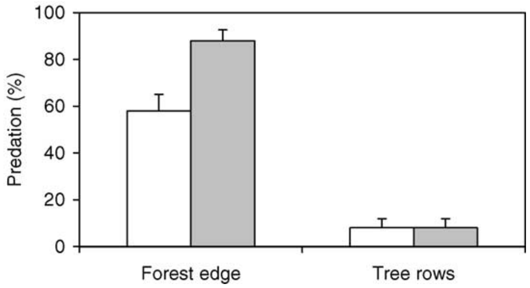

Fig. 1. Predation rate to plasticine (white bars) and quail (grey bars) eggs (mean ± 1 S.E.) in nests mounted in the forest edge and in rows of Oleaster.

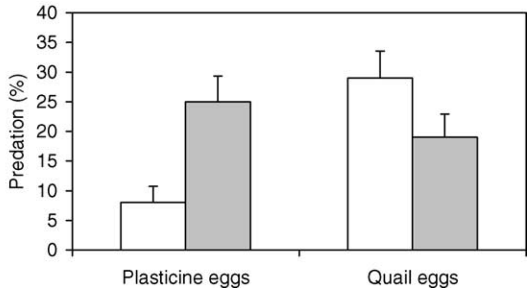

Fig. 2. Number of plasticine and quail eggs (mean ± 1 S.E.) disappearing from the nest (white bars) and left in situ, with marks of pecking or gnawing on them (grey bars).

for continuity, and for comparing proportions (numbers of missing and in situ consumed plasticine and quail eggs) we used 2 × 2 contingency tables with Yates correction for continuity (Zar, 1999). A minimum probability level of $P < 0.05$ was accepted for all the statistics.

4. Results and discussion

Predation to nests in forest edge trees was significantly higher than to those in the rows of oleaster in the recultivated area, when only one plasticine egg ($G_c = 18.26$, d.f. = 1, $P < 0.001$) or one quail egg ($G_c = 36.67$, d.f. = 1, $P < 0.001$) had been placed in each (Fig. 1).

During our investigations and later surveys the nesting of six pairs of red-backed shrike and two pairs of yellowhammer (*Emberiza citrinella*) was discovered in the oleaster rows, whereas only one yellowhammer nest was found in the forest edge. It may well be that due to the thorns of oleaster, the tree rows are a more suitable habitat for the shrikes than the thicket of the forest edge. The higher rate of predation in the forest edge and the small number of nests (either old or new) revealed there suggest that the predator community in the area is composed mostly of species linked to forests, which do not occur or never sally out to the recultivated area, due to their low mobility and limited tolerance of disturbance.

Plasticine eggs do not attract predators better than for example quail eggs (Bayne and Hobson, 1999). Our results have confirmed the former assumption: there was no significant difference in the forest edge between predation to nests with plasticine and to those with quail eggs ($G_c = 2.70$, d.f. = 1, NS). Predation to plasticine and quail eggs in the Oleaster rows of the recultivated area was found to be identical, reaching only 8% on the seventh day after placement, in both settings (Fig. 1). Consequently, a true picture could have been obtained about the predation relations of the two habitats, with the use of plasticine eggs only.

Irrespective of whether the nests were in the forest edge or in the tree rows, predators attempted to consume the plasticine eggs in situ, whereas quail eggs were usually taken away (Fig. 2). The rate of disappearance of plasticine and quail eggs, respectively, from the nests (24 and 60%) differed significantly ($\chi^2 = 8.91$, d.f. = 1, $P = 0.0028$) from the rate of pecking or gnawing at them and consumption in situ (76 and 40%) (Fig. 2).

It was possible to recover eggs that had been transported away from the nest in three cases (8% of eggs missing). Based on the marks, the predator is supposed to have been a Jay (*Garrulus glandarius*). Several researchers (e.g. Bayne and Hobson, 1999; Pierre et al., 2001) counted the occurrences of predators carrying away eggs from the nest, but one cannot find out from these studies why it is mostly the real eggs that tend to disappear. Maybe the predators usually attempt to take the egg away before the owner of the nest returns, but leaves the sticky, heavier, inedible plasticine eggs behind. Only larger bodied predators are able to peck quail eggs open and carry away quail eggs or similar-sized plasticine dummy eggs. Jays do not leave apparent signs around the nest, because they carry away the eggs or the chicks (Jakober and Stauber, 1981). Smaller beak marks are left by tits (*Parus* spp.)

mostly, but these birds are unlikely to be able to take eggs away from the nest. Tooth marks were found on one plasticine egg only, thus the damage caused by mammals can be regarded insignificant.

The spontaneous and artificial resettling of species in the recultivated area is still in an initial stage. The planted oleaster rows, however, can play an important role, not only for the bird species nesting there, but also indirectly. By feeding on phytofagous insects, birds regulate their density, thus indirectly promote better sapling development.

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