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Brief report

Opportunity makes a predator: Great Spotted Woodpecker predation on Tit broods depends on nest box design

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Secondary cavity nesters are species that breed in cavities made by other species. A variable but marked proportion of their nests undergo predation, especially in areas where specialized and/or opportunistic predatory animals are abundant. Indeed, predation is the most common cause of nest loss in primeval forests (Walankiewicz 2002a, 2002b, Wesołowski 2002, Thompson & Burhans 2004, Weatherhead & Blouin-Demers 2004, Yamaguchi *et al.* 2005). Because of their special construction, nest boxes may be less accessible to predators than are natural cavities, especially if they are equipped with protective devices, such as metal plates surrounding the entrance hole (Walankiewicz 1991). On the other hand, nest boxes can be more easily spotted by predators and humans. In addition, ornithologists often distribute them at regular distances apart, which may make them still easier to find (Mänd *et al.* 2005). Under these circumstances, wooden nest boxes without protective devices may greatly suffer from predation. Interestingly, while building their nests, secondary cavity breeders seem to maintain the distance between the cavity entrance and the nest cup by modifying the nest size (Alabrudzińska *et al.* 2003, Kosiński & Ksit 2007, Mazgajski & Rykowska 2008). The reason may be that the greater this distance is, the more difficult it will be for larger predators to reach eggs or nestlings in the nest.

Supplying forested habitats with large numbers of nest boxes usually increases the abundance of cavity-nesting birds in those habitats (von Haartman 1957, Enemar & Sjöstrand 1979, Slagsvold 1975, Alerstam 1985, Stański *et al.* 2008). This increase in potential prey density may attract more predatory animals, thus increasing nest losses and potentially leading to the establishment of an ecological trap for secondary cavity nesters (Mänd *et al.* 2005). Indeed, the rate of nest loss in study sites of some projects had become so high that counter-predator measures had to be undertaken. For example, in the long-term study on Great Tits (*Parus major*) in Wytham Wood, UK, it was necessary to change the design of nest boxes when the originally-used wooden boxes started to be depredated by weasels (*Mustela nivalis*) (Dunn 1977).

Studies in primeval forest conditions have shown that the Great Spotted Woodpecker (*Dendrocopos major*) is an efficient avian predator of nests located in tree cavities (Walankiewicz 2002b, Czeszczewik & Walankiewicz 2003). This species is also a common destroyer of wooden nest

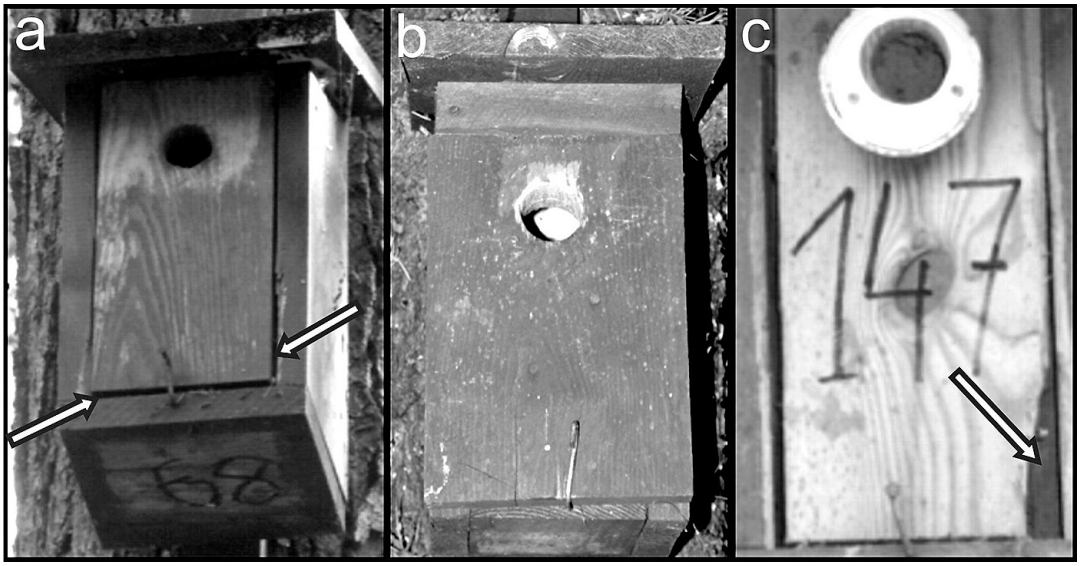

Fig. 1. a – Type 1 nest box with a gap between the front and side walls. b – Type 2 nest box, without gaps. c – A Type 1 nest box with a gap enlarged by Great Spotted Woodpecker.

boxes (Mainwaring & Hartley 2008). However, the scale of nest-box brood losses caused by Woodpeckers in relation to nest-box construction has not been experimentally studied so far. In our study on Blue (*Parus caeruleus*) and Great Tits, predation on nestlings by Great Spotted Woodpeckers occasionally took place. The aim of this note is to show that woodpecker predation on tit nestlings is not random with respect to the nest-box construction.

The present study was carried out between 2005 and 2008 as part of a long-term project on secondary cavity breeders using wooden nest boxes set up in a mixed deciduous forest near Łódź, central Poland (see Marciniak *et al.* 2007 for details of the study area). We used two types of nest boxes differing in the construction of the front wall. In the first type (Type 1), the front wall was placed between the side walls, with a 1–2-mm gap between the walls on both sides (Fig. 1a). In the other type (Type 2), the front wall extensively covered the edges of the side walls so that no gap was left on the front side (Fig. 1b). Under the protocol of the study, nest boxes were visited at least once a week to establish the occupancy by tit species and their stage of reproduction. We recorded signs of predators having been present, with particular attention to evidence for woodpecker predation (Fig. 1c). Because the destroyed nest boxes were replaced by new Type 2 boxes and events of successful Great Spotted Woodpecker predation on tit nestlings were infrequent, we pooled the data for four successive years. We recorded a total of 297 nest-box broods of Blue and Great Tits; of these, 194 were in Type 1 (with front gaps; 65.3%) and 103 were in Type 2 (without front gaps; 34.7%) nest boxes.

We tested the frequency with which nest boxes were attacked by Great Spotted Woodpeckers in relation to the distribution predicted from nest-box-type availability using the Chi-square test of the goodness of fit (Zar 1996).

We detected 12 cases of Great Spotted Woodpecker predation on Blue and Great Tit nestlings. These all concerned broods in Type 1 nest boxes, i.e., those with front gaps (Fig. 1a). In all of these cases, the woodpecker had drilled an opening by enlarging the original side gap (Fig. 1c) in order to get at the tit nestlings. Twelve Type 1 nest boxes as compared with zero Type 2 boxes is evidently biased toward the former, when compared to an expected random proportion that should be 7.84 versus 4.16, respectively ($X^2 = 6.37$; df = 1; $p = 0.016$).

Even if the rate of Great Spotted Woodpecker predation on Blue and Great Tit broods in nest boxes in the studied woodland was not high, it was

significantly related to the nest-box type. Only the nest boxes with side gaps between the front wall and the side walls were destroyed by woodpeckers. We did not record a single case of an unoccupied nest box being destroyed by woodpeckers. Moreover, no single nest box was robbed at the stage of egg laying or incubation either. The type of nest-box damage described in this note always concerned occupied nest boxes at the nestling stage of breeding.

We suggest that the clear effect of nest-box type on predation rate resulted from movements of tit nestlings being easily detectable and begging calls being more audible to woodpeckers in the boxes with gaps. The generally low number of cases of woodpecker predation suggests that Great Spotted Woodpeckers may not be selective in attacking nest boxes in comparison with their exploitation of natural food sources, but they may efficiently take the advantage of an opportunity of easily getting nestlings. A practical recommendation for conservation purposes or scientific studies would be to only use nest boxes without front gaps in order to limit woodpecker predation on nestlings.

Mainwaring and Hartley (2008) reported a similar case of the destruction of wooden nest boxes and predation on tit nestlings. In their case, the opening, enabling access to tit nestlings, was drilled from the crack between the side wall and the rear wall. Mainwaring and Hartley (2008) proposed covering the nest box with wire mesh to prevent woodpecker predation, and experimentally confirmed the efficiency of this method in decreasing woodpecker predation rate.

Although the diet of Great Spotted Woodpeckers during the breading season basically consists of insects and other invertebrates collected on trees, the presence of nestling items in it seems also a consistent feature of the species (Cramp 1985). Nilsson (1984) found that the Great Spotted Woodpecker may be responsible for as much as 48% of predation on tit nest boxes. Woodpeckers have been shown to be important predators of birds nesting in natural tree cavities as well (Walankiewicz 1991, 2002a, Wesołowski 2002). The case described in this paper shows that the nestling predation by at least one species of woodpeckers is rather opportunistic, and probably a consequence of normal searching for prey on tree-trunks.

Käpytikan tiaisiin kohdistama pesäsaalistus riippuu pöntön rakenteesta

Käpytikan tiedetään toisinaan suurentavan pönttöjen liitoskohtia päästäkseen käsiksi poikasiin. Tässä tutkimuksessa vertailtiin kahteen eri tavoin rakennettuun tiaispönttötyyppiin kohdistuvia, tikkojen aiheuttamia pesäpoikastuhoja: tyypin 1 pöntössä oli etu- ja sivulautojen väliin jätetty 1–2 mm rako, tyypin 2 pöntöissä rakoa ei ollut. Sini- ja talitiaisen pesäpoikasiin kohdistunutta saalistusta tutkittiin 297 tiaispesyeellä, joista 12 joutui käpytikan saalistamiksi. Kaikki 12 tapausta – joissa tikka oli aina suurentanut pöntön rakosia – kohdistuivat tyypin 1 pönttöihin; ero tyyppiin 2 (nolla tapausta) on tilastollisesti merkitsevä. Tutkijat esittävät, että tikat kykenevät pöntön rakosista helpommin havaitsemaan poikaset ja tarttumaan tilaisuuteen helpohkon saaliin toivossa. Tällaisten tapausten välttämiseksi pöntön rakennuksessa etu- ja sivulautojen väliin ei tulisi jättää rakosia.

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