

Test of Nest Box Preferences of Eastern Bluebirds, *Sialia sialis*, and Tree Swallows, *Tachycineta bicolor*

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Choice by Eastern Bluebirds, *Sialia sialis*, and Tree Swallows, *Tachycineta bicolor*, of nest boxes designed specifically for each was recorded in 1985-87 at two study areas in Ontario. All the bluebirds used the boxes designed for them and Tree Swallows used the boxes designed for them over four times as often as the bluebird boxes. House Wrens, *Troglodytes aedon*, did not show any preference. Too few Black-capped Chickadees, *Parus atricapillus*, House Sparrows, *Passer domesticus*, and Great-crested Flycatchers, *Myiarchus crinitus*, used the boxes to indicate a preference. Ontario Eastern Bluebirds chose boxes with larger entrances than those in Manitoba.

Key Words: Eastern Bluebirds, *Sialia sialis*, Tree Swallows, *Tachycineta bicolor*, House Wrens, *Troglodytes aedon*, Black-capped Chickadees, *Parus atricapillus*, House Sparrows, *Passer domesticus*, Great-crested Flycatchers, *Myiarchus crinitus*, nest boxes, competition, Ontario.

Characteristics of next boxes preferred by secondary cavity-nesting birds were identified by an earlier series of experiments in which one feature was varied in sets of 2 or 3 boxes mounted together (Lumsden 1986). This note reports on the results of further tests in which the features favoured by Eastern Bluebirds (*Sialia sialis*) were combined in one box type and those favoured by Tree Swallows (*Tachycineta bicolor*) in another. The objectives of these tests were to measure acceptance and see if competition among species could be reduced.

Materials and Methods

In accordance with the earlier results (Lumsden 1986), the bluebird box had a floor that measured 10 × 10 cm, an entrance 44 mm in diameter, a depth from the bottom of the entrance to the floor of 14 cm. The Tree Swallow box had a floor of 15 × 15 cm, an entrance 35 mm in diameter, and a depth of 12 cm. Externally all boxes were stained pale grey-brown and all were painted white inside. Sheeting grade plywood 1.3 cm thick was used and no nest material was provided.

The boxes were mounted singly 1.5 m above the ground on posts spaced 45+ m apart facing south. Bluebird and tree swallow boxes alternated and each year were switched so that a post carrying a bluebird box in 1985 carried a tree swallow box in 1986 and a bluebird box in 1987. Fifty-nine boxes were placed in 1985, 55 in 1986 and 34 in 1987. A choice by a species was recorded only when a nest was built and one or more eggs laid. For a description of the study areas at Anten Mills and Aurora see Lumsden (1986).

Results

The results of these tests are summarized in Table 1. All the bluebirds chose the boxes which

combined the features they preferred in the earlier tests (Lumsden 1986). None used the Tree Swallow boxes ($P < 0.001$, Table 1). Tree Swallows used the boxes designed for them over four times as often as the bluebird boxes ($P < 0.05$, Table 1). House Wrens (*Troglodytes aedon*) did not discriminate between the boxes offered ($P > 0.005$, Table 1), and probably had little influence on the choices by Bluebirds and Tree Swallows because they used approximately equal numbers of each kind of box. Because they also nest later they did not interfere with the choices of Tree Swallows and first nests of bluebirds. House Sparrows (*Passer domesticus*) used only one box at Aurora during the three years of tests.

The Black-capped Chickadees (*Parus atricapillus*) usually dig their own nesting cavity in rotten wood, but six used nest boxes at Anten Mills (in which five laid eggs) in 1986 and 1987. The first nests were started in early May before Tree Swallows and House Wrens had started to build. Too few Black-capped Chickadees used the boxes to give any indication of preference. They are unlikely to offer much competition with other cavity nesters because of the rarity of their use of boxes.

In 1986 two Great-Crested Flycatchers (*Myiarchus crinitus*) nests were in Tree Swallow boxes. They chose those in which the entrances had been enlarged by the gnawing of Chipmunks (*Tamias striatus*). Like the Black-capped Chickadee, this species, which nests relatively late, is not likely to compete with bluebirds.

Munro and Rounds (1985) showed that temporal separation in breeding was important in reducing competition at least in the early part of the breeding season for some of the species they studied in Manitoba. In this Ontario study,

TABLE 1. Choice of bluebird and Tree Swallow nest boxes by six cavity nesting species.

Species	Number of nests in	
	Bluebird Box	Tree Swallow Box
Eastern Bluebird	10	0
Tree Swallow	3	13
House Wren (<i>Troglodytes aedon</i>)	12	11
House Sparrow (<i>Passer domesticus</i>)	0	1
Black-capped chickadee (<i>Parus atricapillus</i>)	2	3
Great-Crested Flycatcher (<i>Myiarchus crinitus</i>)	0	2
Unoccupied	46	45
Total Boxes	73	75

Eastern Bluebird = Binomial Tables $P < 0.001$.
Tree Swallow = Binomial Tables $P < 0.05$.

Eastern Bluebirds generally started their first nests in late April (earliest record: 4 eggs, 19 April) before Tree Swallows arrived at this site and four weeks before House Wrens, and were thus largely free of competition for their first nesting attempts. In contrast, while they did not discuss competition, Munro and Rounds (1985) found that both Eastern Bluebirds and Tree Swallows in Manitoba initiated their nests during the third week of May, and about three weeks later than Mountain Bluebirds (*Sialia currucoides*).

For Tree Swallows and Mountain Bluebirds, Munro and Round (1985) found that intrinsic characteristics of nest boxes or their placement were more important than the surface cover of the area in identifying choices. For Eastern Bluebirds, their stepwise discriminant function analyses showed first a choice of boxes associated with the greatest availability of grass and wooded pasture, with a large component of shrub pasture. They avoided long grass and fallow. Less important but still significant was a choice of boxes with small entrance holes (Used: $\bar{x} = 39.3 \pm 5.3$ mm; Unused: $\bar{x} = 41.6 \pm 5.7$ mm). Eastern Bluebirds in the Manitoba study differed from those in southern Ontario in that the latter preferred larger entrances (44 mm in diameter) over smaller (35 mm; Lumsden 1986).

It is likely that the preferences for cavity features of local populations are shaped by competition and may vary from place to place. Thus, Mountain Bluebirds in Manitoba used the nest boxes with the largest entrance hole diameter. Because they nested earlier than Eastern Bluebirds, they appeared to have excluded the latter from using boxes similar to those favoured in Ontario.

The Eastern Bluebird boxes in Ontario had entrances 44 mm in diameter, but none were used by European Starlings (*Sturnus vulgaris*) although large enough to admit them. Starlings prefer dark boxes with black interiors and avoid white (Lumsden 1976). Although Starlings were common on the study areas and nested in boxes designed for American Kestrels (*Falco sparverius*) and Wood Ducks (*Aix sponsa*), they appeared reluctant to use the bluebird boxes. It seems likely that the light interiors of the boxes freed the Eastern Bluebirds from competition with Starlings.

Tree Swallows showed a significant preference for the boxes designed for them, but occasionally used a bluebird box although many unoccupied Tree Swallow boxes were available. Tree Swallows were relatively indiscriminating in their choice of box features in earlier experiments (Lumsden 1986). Munro and Rounds (1985) also found great variability in nest box selection by Tree Swallows in Manitoba. However, they found that Tree Swallows avoided sites with wooded pasture which were favoured by Eastern Bluebirds and chose sites with long grass which were avoided by Eastern Bluebirds.

House Wrens can create problems when they vandalize the nests of other cavity-nesting species. Because the male wrens build more than one nest and probably use most of the suitable cavities (or boxes) within their territories, they can provide formidable competition for other species. House Wrens, however, chose more shrub and tree cover in their territories than the Bluebirds and Tree Swallows in Manitoba and no House Wrens nested more than 30 m from a tree or tall shrub (Munro and Rounds 1985). Box location may be the most effective means of reducing competition between wrens and other species.

House Sparrows (*Passer domesticus*) can be persistent and vigorous competitors with other cavity nesters. Gowaty (1984) presented circumstantial and correlational evidence of House Sparrows killing adult Eastern Bluebirds and observed the destruction of a brood. In this study only one box at Aurora was occupied by House Sparrows. This box was located within 330 m of dwellings and bird feeders. At Anten Mills all the boxes were placed more than 600 m from houses and a stable, and none was used by House Sparrows. Munro and Rounds (1985) in Manitoba found that House Sparrows favoured boxes with small entrances 30-38 mm in diameter. They stated that House Sparrows cannot be excluded from boxes by design features that allow ready occupation by more desirable species. However, House Sparrows can be excluded from Tree Swallow boxes by cutting oval entrances 27 mm

wide × 22 mm vertical (A. J. Erskine, personal communication). Munro and Rounds found that Mountain and Eastern Bluebirds tended to nest more than 400 m from buildings whereas House Sparrows nested within 400 m of buildings. The inference is obvious, to favour Eastern Bluebirds and reduce competition from House Sparrows, boxes should be placed in areas remote from human habitation.

This test demonstrated that both Eastern Bluebirds and Tree Swallows would choose boxes designed especially for them. Competition may be further reduced by placing bluebird boxes in areas with grassland, pasture with shrubs or trees; Tree Swallow boxes are best placed in extensive open areas with long grass; House Wren boxes should be located in wooded or shrubby areas and not more than 30 m from a tree or tall shrub; House Sparrow boxes may be placed within 400 m of a stable or houses.

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The Nomenclatural Status and Type Locality of the Yellow Warbler Subspecies *Dendroica petechia aestiva* (Gmelin) (Aves: Parulinae)

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The name *aestiva* Gmelin, 1799, is based on the bright population of Yellow Warbler, *Dendroica petechia*, found in southeastern North America, contra Oberholser (1974). Restricted type localities of birds based on Brisson with the original locality "Canada" should be given uniformly as Québec, Québec.

Key Words: *Dendroica petechia aestiva*, Yellow Warbler, type locality.

Five subspecies of the Yellow Warbler, *Dendroica petechia*, are recognized as breeding in Canada and the United States (Lowery and Monroe 1968). Two are in eastern North America. A dark subspecies, *D. p. amnicola* (Batchelder 1918), breeds from north-central Alaska to Labrador, southward to northeastern British Columbia and to south-central Quebec and Newfoundland. A paler and brighter subspecies *D. p. aestiva* (Gmelin 1789) has a breeding range south of *amnicola* that occupies southeastern

Canada and the eastern United States (cf. A.O.U. 1957; Lowery and Monroe 1968).

In discussing the nomenclature of the eastern subspecies of the Yellow Warbler, Oberholser (1974: 1000) concluded that the references cited by Gmelin (1789) in the original description of *aestiva* referred to the dark northern subspecies and that the paler southern subspecies therefore should be known by the name *D. p. flava*. Raveling and Warner (1978), in a study of the geographic variation in certain eastern populations that



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