A Study to Determine the Preference for Nesting Box Design of *Sialia sialis* (Eastern Bluebird): Comparison of the Traditional Nesting Box and the Peterson Box
Year 2

C. A. Burkart[1], A. Russo[1], C. Meade[2], D. Hubbard[2], C. Phillips[2], T. Yates[2], H. Lipps[2], E. Lambert[2], C. Moles[2], K. Flanary[2], S. Head[2], D. Williams[2], C. Engle[2], A. Huneycutt[2], L. Oquinn[2], L. Owens[2], M. Steele[2], J. Reinhard[2], A. Maine[2], C. Dean[2], F. Croley[2], C. Gaiger[2], T. Younce[2], A. Bourn[2], M. Short[2], S. Mullins[2], A. Fields[2], A. Stidham[2], D. Hamilton[2], K. Green[2], A. Nash[2], Z. Cooper[2], H. Tate[3], M. DeBoard[3], A. Adams[3], S. Kern[3], T. Turner[3], C. Greer[2], W. Beaver[4].

The 2013 nesting season was the second year comparing the Peterson box to the traditional rectangular blue bird nesting box. Peterson boxes have a lower internal volume, requiring less material and parental effort for nest construction. It has been suggested that by freeing up energy for rearing young, fledging success could be improved over that of the traditional box. As during the previous season, bluebirds, tree swallows and chickadees utilized the Peterson boxes. However, unlike the 2012 season, more nests were built in Peterson boxes than in the traditional boxes. Of the 11 nests built in Peterson boxes, eggs were laid in 8 boxes of which only 4 successfully fledged chicks. Eggs or chicks were lost to predators from 3 of the Peterson boxes, while one clutch of 3 chicks was found dead in the nest. Five nests were built in traditional boxes, of which three fledged chicks. Hatching and fledging success were higher for eggs laid in traditional boxes than in the Peterson boxes. However, the paucity of clutches (2 of the 3 clutches in traditional boxes were in the same box) makes it difficult to draw a conclusion about hatching of fledging success. Student volunteers from both the general biology and human anatomy and physiology classes at Mountain Empire Community College assisted in the monitoring of nesting activity during the course of the breeding season, as well as maintenance along the trail.

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[1]Biology Department, Mountain Empire Community College, 3441 Mountain Empire Road, Big Stone Gap, VA, 24219.
[2]Mountain Empire Community College student volunteers.
[3]Dual enrollment students from John I. Burton High School, Norton VA.
[4]Mountain Empire Community College staff volunteer.

Introduction

The 2013 nesting season at the Powell River Education Center was the second year of testing with the Peterson Box design. Nesting preference was tested between the traditional rectangular box and the Peterson box developed and modified by Dick Peterson (Berner, 1994). Peterson boxes have a slant roof and a slanted front which reduces the internal volume of the boxes. It has been suggested that the smaller internal volume requires less nesting material, and therefore less time and energy spent by the parents in building the nest. Less energy invested in nest building would free up more energy to feed and care for the chicks, increasing fledgling success (Bluebird Nest Box Styles: Pros and Cons, 2010). Traditional boxes have a round opening, while the Peterson design has an oval opening. Berner (1994) proposed that the larger opening in the Peterson design would allow the adults to feed chick and remove waste sacs without completely entering the box. In addition to the possible enhancement to fecundity, the Peterson design is reported to be better at keeping out rain, experience less internal temperature fluctuations, and is better at deterring predators (Berner, 1994; Bluebird Nest Box Styles: Pros and Cons, 2010).

Student volunteers from the General Biology and Human Anatomy and Physiology classes at Mountain Empire Community College assisted in brush and weed removal, replacement of damaged boxes, and monitoring of nesting activity.

Methods

Box design preference and clutch success- The traditional rectangular boxes (figure 1a) were paired with Peterson boxes (figure 1b) during the previous (2012) nesting season. Boxes were nailed to posts at thirteen sites along fence lines in two separate fields (figure 2 a, b). When possible, both types of boxes were attached to posts facing the same direction. Monitoring began April 9, and continued on a weekly basis until nesting activity was no longer observed (July 18). Monitoring activity followed the protocols established by Virginia Bluebird Society (Virginia Bluebird Trail Monitoring Information, 2004) and the North American Bluebird Society (Fact Sheet: Monitoring Bluebird Nest Boxes, 2002). Data was recorded on forms downloaded from the Virginia Bluebird Society website. Data collected included partial and completed nests,

Figure 1. (a) Tree swallow perched by the traditional rectangular nesting box, and (b) and a tree swallow peering out the nesting hole of a Peterson box.

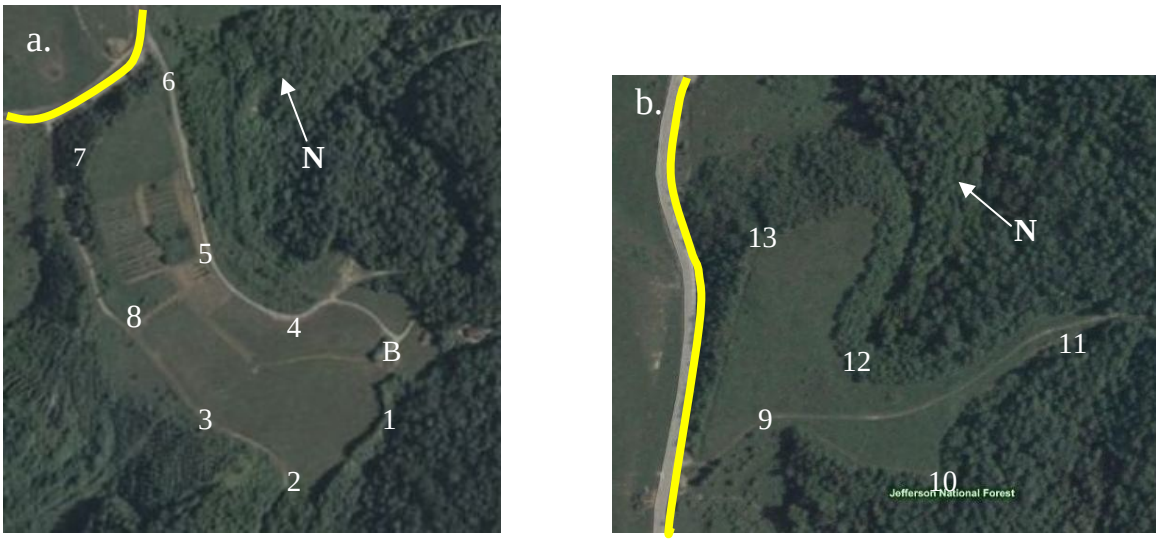

Figure 2. (a) Nesting box sites in field 1 and (b) field 2. Numbers indicate the box locations. Arrow indicates north. The B indicates the position of the barn. Yellow lines indicate the location of the main road. (Image from Microsoft Virtual Earth.)

species identity, number of eggs, number of young, condition of young (recently hatched, feather development, etc.) and number of young fledged. Condition of the boxes was also noted, including the presence of ants, wasps or spiders.

Results

Nesting activity: The three species commonly active the along the nesting trail (eastern blue bird, tree swallow and black-capped chickadee) were again active during the 2013 season; however, only bluebirds and tree swallows successfully fledged chicks. Of the three nests produced by chickadees, only two nests contained eggs and both clutches were lost to predators (table 1). As with the 2012 season, monitoring during the 2013 season began on April 9. The only active box on that date was box 1A, which contained a partial chickadee nest. By the next week, the nest was completed but was never used. Chickadees also build a nest in the Peterson Box at site 1 and 2 (box 1B and 2B). A complete nest was observed in box 2B on April 16. Six eggs were observed on April 30, but on May 17 the box was found in pieces on the ground. A partial nest was observed in box 1B on May 17. By the next week (May 22), the nest had been completed and contained 2 eggs. Three more eggs were laid in the nest by May 29. Two featherless chicks were observed by June 12, but were missing seven days later.

Box	Species	Nest building	# of Eggs	# of Hatchlings	# Fledged
1A	CH	Yes	0	---	---
1B	CH	Yes	5	2	0*
2A	TS	Yes	3	3	2*
2B	CH	Yes	6	0*	---
3A	?	Yes	0	---	---
3B	BB	Yes	2	2	2
4A	BB; BB	Yes	5; 5	4; 5	4; 5
4B	BB; TS	Yes	5; 5	4; 3	4; 3
5A	---	No	---	---	---
5B	BB	Yes	5	3	0**
6A	---	No	---	---	---
6B	?	Yes	0	---	---
7A	---	No	---	---	---
7B	?	Yes	0	---	---
8A	---	No	---	---	---
8B	TS	Yes	4	0*	---
9A	---	No	---	---	---
9B	BB	Yes	5	5	5
10A	---	No	---	---	---
10B	---	No	---	---	---
11A	---	No	---	---	---
11B	---	No	---	---	---
12A	---	No	---	---	---
12B	?	Yes	0	---	---
13A	---	No	---	---	---
13B	---	No	---	---	---

Table1. Nesting results for the 2013 nesting season. (A: traditional nesting box; B: Peterson nesting box; BB: bluebirds; CH chickadees; TS tree swallows). Sites 1-8 are in field 1. Sites 9-13 are in field 2. *Eggs or chicks lost to predators. **Chicks found dead in nest.

Both bluebirds and tree swallows were more successful than the chickadees during this nesting season. The earliest grass nest was found in box 4A on April 9, but no eggs were found in the nest until May 22 when 5 bluebird eggs were present. Only 4 of the 5 eggs hatched laid in the box hatched, but all 4 chicks fledged by June 12. The last activity for this season was also in box 4A. A bluebird egg was found in the nest on June 19, and 4 additional eggs were present by the next week. All eggs hatched successfully and the chicks fledged by July 18. The earliest active bluebird nest, and the only active nest in field 2, was box 9B. A complete grass nest was found on April 16, and 5 bluebird eggs were found the following week. All 5 eggs hatch, and the chicks had flight feathers by May 17. By the following week, all the chicks had fledged. There was no

further activity in the box or field 2 after that date. Completed grass nest were found in boxes 3B and 4B on April 23, and on April 30 bluebird eggs were found in both nests (2 and 5 eggs in boxes 3B and 4B, respectively). The 2 eggs in box 3B hatched and fledged by May 29. Four of the 5 eggs hatched in box 4B, and all 4 fledged on May 29 when the box was opened for inspection.

Tree swallows were active in 3 boxes, boxes 2A, 4B and 8B. A grass nest was found in box 8B on April 23, and 4 white eggs were found on May 17. A parent was found on the nest the following week, so it was impossible to determine the whether there were eggs or young in the nest. On May 29, only 1 egg was found in the nest, and it was lost to a predator. A partial nest was found in box 2A on April 30, and a complete nest with 3 eggs was present by May 17. All the eggs hatched, but only 2 of the chicks fledged. One chick was killed by a predator, its body was found in the box, decapitated. The birds in box 4B had slightly more success. Tree swallows moved into the box after the bluebirds fledged. Four eggs were found on June 12, and an additional egg was found on June 19. Only 3 of the 5 eggs hatched, all chicks fledged by July 11.

Discussion

The 2013 nesting season was the second year of testing for the Peterson boxes. All three species commonly nesting along the trail (bluebirds, black-capped chickadees and tree swallows) utilized both the traditional and the Peterson boxes. However, unlike the previous year when most of the nesting activity occurred in the traditional boxes [9 nests in traditional boxes, 4 in Peterson boxes (Burkart, et al., 2012)], twice as many nests were built in Peterson boxes as in the traditional boxes (11 and 5, respectively). Berner (1994) reported bluebirds and tree swallows favoring the Peterson design over the traditional box design. While the opposite was true for the 2012 breeding season, bluebirds and tree swallows built more nests in the Peterson boxes than the traditional boxes during the 2013 season (figure 3). Peterson boxes were installed during the 2012 season, after early nesting had begun, which may have biased the results for that season (Burkart et. al., 2012).

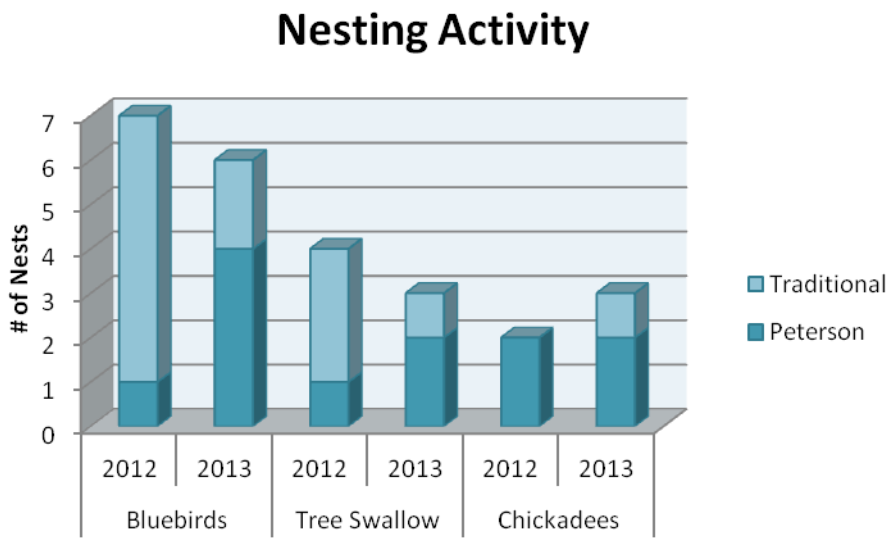

Figure 3. Number of clutches per nesting box design by year and by species.

Predation was again a problem during the 2013 season as it was in previous seasons (Burkart et. al, 2007, 2008, 2009, 2010, 2011, 2012), with the chickadee nests experiencing the biggest impact. Of the 11 chickadee eggs produced, 6 were lost to predation, while the 2 chicks that did hatch were also lost (figure 4). Box 2B, which contained the 6 lost eggs was found in pieces along the fence line. The destruction of the box and the subsequent loss of the eggs was most likely due to a bear; a large black bear was reported crossing the fence in that area (W. Beaver, per. com.).

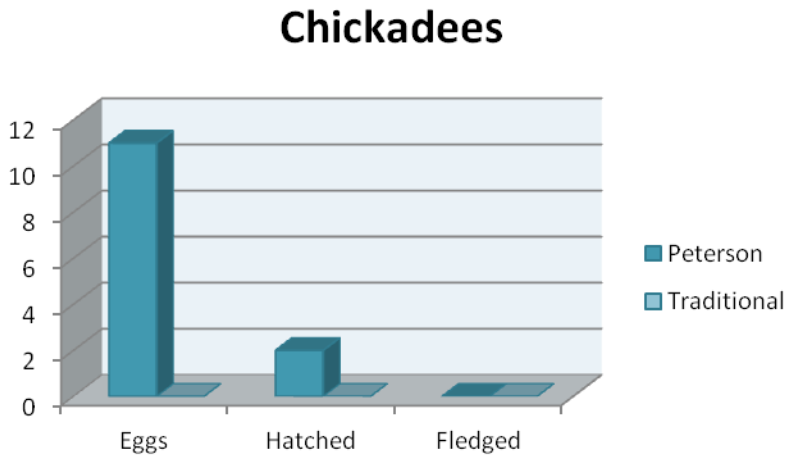

Figure 4. The number of chickadee eggs produced, eggs hatched and chick fledged.

Tree swallow nests in both traditional and Peterson boxes were affected by predation. Of the 9 eggs produced in Peterson boxes, 4 were lost to predation and 2 failed to hatch; however, the 3 chicks that hatched successfully fledged (figure 5). Only three eggs were laid in a traditional box, but all 3 eggs hatched. Two of the 3 chicks hatched fledged. One chick was killed by a predator, its decapitated body was found in the nest with its nest mates.

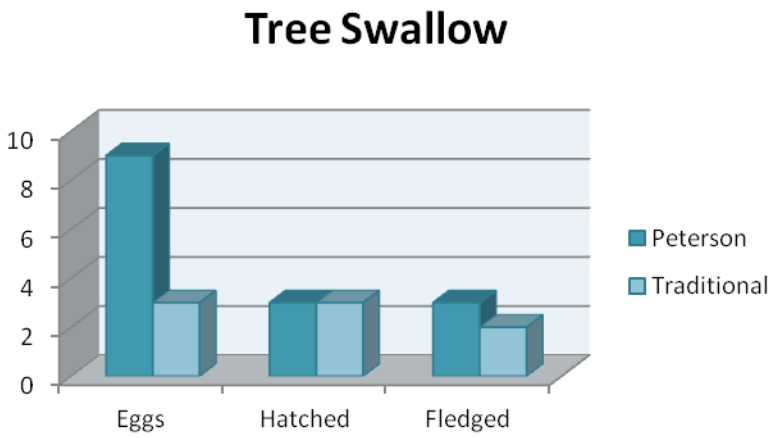

Figure 5. The number of tree swallow eggs produced, eggs hatched and chicks fledged.

Bluebirds were the most success of the three species during this season, producing the largest number of eggs and chicks while escaping predation. Bluebirds built nests in both types of nesting boxes, producing a total 17eggs and 10 eggs in the Peterson boxes and traditional boxes, respectively (figure 6). Three of the eggs laid in the Peterson boxes failed to hatch, while 1 egg in a traditional box failed to hatch. Three chicks, close to fledging, were found dead in 5B (a Peterson box). All 9 chicks hatched in traditional boxes were successfully fledged.

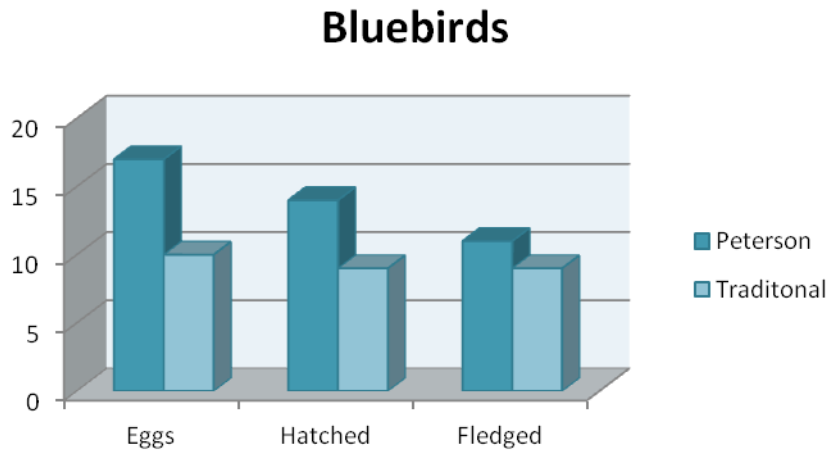

Figure 6. The number of bluebird eggs produce, eggs hatched and chicks fledged.

While the bluebirds, tree swallows and chickadees chose the Peterson boxes over the traditional boxes during this year's breeding season, conclusions cannot yet be made on the design's effect on fecundity. The Peterson design was touted to deter predators (Berner, 1994; Bluebird Nest Box Styles: Pros and Cons, 2010); however, 3 clutches laid in this type box were lost to predators (although one was destroyed by a bear). Peterson boxes will again be tested during the 2014 season to provide additional hatching and fledging success data, but predator deterrents will have to be devised that can be added to the posts to reduce the loss of eggs and chicks.

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