Comparison of House Wren (*Troglodytes aedon*) Nesting Density in the Beaverhill Natural Area

By: Christine Duke

4 October, 2018

Introduction

The Beaverhill Bird Observatory (BBO) is located in a natural area on the south shores of Beaverhill Lake, to monitor the migratory and local owl, shorebird, songbird and waterfowl populations (Beaverhill Bird Observatory, 2018). BBO, established in 1984, has a range of environments, including grasslands, wetlands, mudflats, and aspen forests. Beaverhill Lake dried up in 2005 (BBO, 2017), however Lister Lake remains present, as well as some seasonal mudflats on the Beaverhill Lakebed continue to draw species of gulls and shorebirds (BBO, 2017). The Beaverhill Natural Area was established so as to protect the valuable habitat of the area, as well as to provide a refuge for local and migratory bird species. (BBO, 2017). One of the commonly noted species that nest and live in the natural area is the House Wren (*Troglodytes aedon*).

The House Wren is a small insectivorous species, identifiable by their brown plumage, small compact bodies and specialized bill, whom rely on their ability to nest in a variety of environments (Gardner, 2006). House Wrens are cavities nesters, and a male will build nests at multiple cavity sites. The males will guide a female to all the sites and she will then select a suitable one to line it with feathers (Gardner, 2006) and lay pink eggs with darker speckling on them (Johnson, 2014). At the beginning of the nesting season, the male House Wren travels north earlier than the female of the species to build several dummy nests for the female to choose from (Kaufman, n.d.). House Wrens lays eggs that undergo a nine to sixteen day brooding period, during which both parents are aggressive and vocal in defending their breeding territory (House Wren Life History, 2017.), and occasionally cracking the eggs of competing pairs (Kaufman, n.d.) to ensure the survival of their own.

This paper will cover the survival and fledging success rate of nestlings found within the four nest box grids put in place for the House Wren population present at BBO.

Methods

Four House Wren grids containing a total of 99 nest boxes were located in the natural area. These grids are named A, B, C and D. Grids A, C and D were laid out as 5 by 5 while Grid B was 3 by 8, all of which had a 30m spacing. (Antoniw, 2017).

From May to August, the nest box grids were checked weekly and the building state of each nest, how many eggs or nestlings were present, what their ages were, and if the adults were present was recorded. Once nestlings were present, a photo aging guide created by the W.P. Brown et all (2013) was used to accurately determine age (Brown, n.d.). When it was determined that the hatchlings were over 7 days old, the nest box was no longer checked so as to prevent premature fledging.

A two-way ANOVA without replication was performed to compare the four grids to one another to determine if there was a statistically significant difference between the nesting success and failures of those grids in terms of productivity. Nest failure was based upon several factors; including nests that became inactive after parental presence was confirmed, the presence of eggs that did not hatch, and or nests that were destroyed or lost from external factors.

Results

The results of these ANOVA's are laid out in Appendix 1 (Tables 4.0 – 9.0). As seen in Table 1.0, while some grids may have had a higher number of productive nests, they may have also had a higher number of abandoned or destroyed nests. Table 2.0 shows that none of the grid's success and productivity rates were statistically different enough to be considered significant, as the p-values of each trial did not fall below the required 0.05 level. Grids B and D were the least productive in terms of successful nests, and grids A and C stood out as having the largest amount of House Wren nest boxes being occupied. Table 3.0 outlines which nests were destroyed, and which were abandoned during the building process.

Table 1.0. Raw numbers of productive and unsuccessful nests in each House Wren grid.

Grid	**Productive Nests**	**Unsuccessful Nests**
A	5	1
B	2	1
C	7	4
D	1	5

Table 2.0. Grid comparison trials of productive nests that produced fledged young as derived from a two-way ANOVA without replication at an 0.05 significance level.

Grid Comparison	P-Value
A and B	0.34
A and C	0.09
A and D	1.00
B and C	0.29
B and D	0.65
C and D	0.90

Table 3.0. Number of destroyed nests versus abandoned nests in all House Wren grids

Grid	Destroyed Nests	Abandoned Nests
A	0	1
B	0	1
C	0	4
D	2	3

Discussion

The data collected over the four month period showed that grids C and D suffered the greatest nestling mortality, while A and B appeared to retain the most amount of productive nests. Yet when observing the amount of productive versus unsuccessful nests, we can see that grids A and C were largely more productive than the others. However, the information returned from the ANOVA analysis determined there was no statistical significance to these numbers. Some reasons for the raw difference in numbers could stem from the small sample size. An ANOVA test may not have been able to pick out significant differences from the gathered distribution of data, and thus the null hypothesis was accepted due to lack of sample size. As well, the presence and interference of biologists and interns, may have had an impact as House Wrens prefer secluded nesting sites in enclosed cavities (Kaufman, n.d.). While the grids are relatively secluded and off set from common walking paths, interns perform weekly checks, which often flushes the parents from the box.

As seen in Table 1.0, the number of successful nests largely outranks those that were not productive.

The relative nest count of each grid were in a similar range, running an average of 6.5 nests per grid. This may account for why the ANOVA did not find any particular discrepancy, as total number of successful nests wasn't different between each counted grid. This could be due to a similarity in habitat, and so there was no driving force for the wren's to select one grid over another. However, when comparing the raw data from Table 1.0, we can see that grid A was the most productive with a nest success rate of 83.33%, and grid D was the least productive with a nest success rate of 20.00%. This could be due in part to the presence of herbivores, such as neighbouring deer or moose, brushing against the boxes and exposing the eggs and young to external dangers. Weather such as rain and/or predators could cause nest failure when lids are not set properly. Cattle are occasionally found in grids C and D that originate from nearby pastures, and would not cross the weir and thus have no access to grids A and B. Another possible explanation for the nest success of House Wrens in Grid A is that this grid is located in an open stands of trees that are well spaced apart, filled with low undergrowth and a large number of anthills. House Wrens are insectivorous species, and as such would benefit from the high insect density (Kaufman, n.d.). House Wrens also prefer more open forests (Zarowny, 2014.), and the poplar dominated grid A appears to be the most conducive to the nesting pairs.

It is recommended in the future to potentially utilize trail cams in grids C and D so as to pinpoint exact reasons for the increased nest loss and to determine frequented areas for nest box reinforcement suggestions.

Conclusion

In conclusion, there was no statistical significance productivity found between the four House Wren grids at the BBO in 2018. This is most likely due to the sample size as ANOVA requires a high sample size and a 'normal distribution' in order to detect statistical significance. In the future, it is recommended to compile the historic nesting data from past years to analyze more accurately the trends in House Wren nesting capabilities. Additional factors to be considered could include preferred vegetation type and relative location of nest selection.

Literature Cited

Antoniw, Z., Golly, S. (2017). Comparison of House Wren (Troglodytes aedon) Grids over Four Years at the Beaverhill Natural Area: Number of Nests with Nestlings. Retrieved September 07, 2018, from http://beaverhillbirds.com/media/1719/2017-antoniw-golly-howr-internship-final.pdf

Beaverhill Lake. (n.d.). Retrieved September 07, 2018, from http://beaverhillbirds.com/welcome/beaverhill-lake/

Brown, W., Zuefle, M. Underwood, T., Alexander, A., &Alexander, D. (2013). House Wren Nestling Age Can be Determined Accurately From a Guide of Digital Images. North American Bird Bander, *38(4)*, 150-155. Retrieved September 02, 2018

Gardner, D., Overcott, N. (2006). Fifty Common Birds of the Upper Midwest. University of Iowa Press.

History of Beaverhill Bird Observatory. (n.d.). Retrieved September 07, 2018, from http://beaverhillbirds.com/welcome/history

House Wren Life History. (2017). Retrieved August 15, 2018, from https://www.allaboutbirds.org/guide/House_Wren/lifehistory

Johnson, L. S. (2014). House Wren (Troglodytes aedon), version 2.0. In the Birds of North America (A.F. Poole, Editor). Cornell Lab or Ornithology, Ithanca, NY, USA. https://doi/org/10.2173/bna.380

Kaufman, K. (n.d.). House Wren Troglodytes aedon. Retrieved August 15, 2018, from https://www.audubon.org/field-guide/bird/house-wren

Zarowny, M. (2014). Effects of vegetation density on nest box selection by house wrens. Retrieved August 16, 2018, from http://beaverhill birds.com/media/1701/house-wren-michelle-zerowny.pdf

Appendix 1 - Tables and Figures

Table 1.0. Raw numbers of productive and unsuccessful nests in each House Wren grid.

Grid	Productive Nests	Unsuccessful Nests
A	5	1
B	2	1
C	7	4
D	1	5

Table 2.0. Grid comparison trials of productive nests that produced fledged young as derived from a two-way ANOVA without replication at an 0.05 significance level.

Grid Comparison	P-Value
A and B	0.34
A and C	0.09
A and D	1.00
B and C	0.29
B and D	0.65
C and D	0.90

Table 3.0. Number of destroyed nests versus abandoned nests in all House Wren grids

Grid	Destroyed Nests	Abandoned Nests
A	0	1
B	0	1
C	0	4
D	2	3

Table 4.0. ANOVA comparison of the productivity in HOWR Grids A versus B

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	2.25	1	2.25	1	0.5	161.4476
Columns	6.25	1	6.25	2.777778	0.344042	161.4476
Error	2.25	1	2.25			
Total	10.75	3				

Table 5.0. ANOVA comparison of the productivity in HOWR Grids A versus C

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	6.25	1	6.25	25	0.125666	161.4476

Columns	12.25	1	12.25	49	0.090334	161.4476
Error	0.25	1	0.25			
Total	18.75	3				

Table 6.0. ANOVA comparison of the productivity in HOWR Grids A versus D

Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Rows	0	1	0	0	1	161.4476
Columns	0	1	0	0	1	161.4476
Error	16	1	16			
Total	16	3				

Table 7.0. ANOVA comparison of the productivity in HOWR Grids B versus C

Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Rows	16	1	16	16	0.155958	161.4476
Columns	4	1	4	4	0.295167	161.4476
Error	1	1	1			
Total	21	3				

Table 8.0. ANOVA comparison of the productivity in HOWR Grids B versus D

Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Rows	2.25	1	2.25	0.36	0.655958	161.4476
Columns	2.25	1	2.25	0.36	0.655958	161.4476
Error	6.25	1	6.25			
Total	10.75	3				

Table 9.0. ANOVA comparison of the productivity in HOWR Grids C versus D

Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Rows	6.25	1	6.25	0.510204	0.605137	161.4476
Columns	0.25	1	0.25	0.020408	0.909666	161.4476
Error	12.25	1	12.25			
Total	18.75	3				