AMOUNT OF SEASONAL PRECIPITATION AND ITS EFFECT ON TREE SWALLOW (*Tachycineta bicolor*) REPRODUCTIVE SUCCESS

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Introduction

The efforts of the scientific community to improve the health and vibrancy of avian communities, with research and improved public awareness, needs to look at the effects of climate change. The Beaverhill Bird Observatory (BBO) is located east of Tofield, Alberta, near Beaverhill Lake. The lake has been designated as an Alberta natural area and a wetland of natural importance by the Ramsar Convention.[1] The main intention of the BBO is to raise public awareness of the issues birds in Alberta are facing, and to research the various bird species that migrate through and breed in the area as well as elsewhere.

One of the species that are studied at the BBO is the tree swallow (*Tachycineta bicolor).* There have been studies on the tree swallow using nest boxes at the BBO since 1984. Thru these nest box studies researchers have monitored the tree swallow reproduction. These nest box studies also allow for the capture and banding of tree swallows. This paper will attempt to determine the effects of precipitation differences on the breeding success of the tree swallow . The average clutch size is 4-7 eggs.[3] The mean fledgling rate of 93.2%[4] will also be used for comparison.

Figure 1.0 Tree swallow fledgling being transferred for banding. Photo by Drew Priddle taken at the Beaverhill Bird Observatory.

Methods

Data on nest contents were collected weekly from May 23 to July 25 2014 and May 23 to July 25 2015. The study area was the weir grid at the BBO. The weir grid is located in a fenced off area north of the BBO. The study area is north of the

aspen forest and is starting to get overgrown by willow bushes. The grid is set up in 5 rows of 10 nest boxes. The boxes all face east, are spaced approximately 10 meters apart and are about 1.5 meters off the ground. The boxes dimensions are 6”x11”x5.5” and have an entry hole that has a diameter of 1.5”. The top of the box lifts completely off for inspections and is held down by wire that attaches to screws on the sides of the box.

The nest boxes were checked on a weekly basis from May 23 2015 to July 25 2015. The lid was opened and the nest was inspected. The number of feathers was counted in the first weeks. As the nests progressed and the tree swallows began to lay eggs these were then counted. After an incubation period of 11-20 days the eggs hatched. These hatchlings were counted by looking into the box and counting the yellow beaks of the hatchlings. If there was an adult bird on the nest at the time of a nest check the bird was not disturbed and this was recorded. The hatchlings were then banded when they were approximately 10 days old. This was done by removing the hatchlings from the nest and placing them into cotton bags. They were then removed one at a time and carefully banded by a qualified bird bander. The hatchlings were then returned to the nest.

Then as the tree swallow (*Tachycineta bicolor)* young fledged and the boxes emptied out the boxes were cleaned of old nests and debris. Weather data was collected from the AgriClimatic Information Service (ACIS) at the Alberta Agriculture and Forestry website.[2] .

Figure 1.1 Tree Swallow nest box number 40 road grid. Photo by Drew Priddle taken at the Beaverhill Bird Observatory.

Figure 1.2 Tree swallow (*Tachycineta bicolor)* nest with eggs. Photo by Drew Priddle at the Beverhill Bird Observatory.

Figure 1.3 Tree swallow (*Tachycineta bicolor)* nest with an egg and hatchlings under 1 week old. Photo by Drew Priddle at the Beaverhill Bird Observatory.

Figure 1.4 Tree Swallow (*Tachycineta bicolor)* nest with hatchlings over 1 week old. Photo by Drew Priddle at Beaverhill Bird Observatory.

Results

A two-tailed t-test was used to compare the clutch size and hatchling success of tree swallows (*Tachycineta bicolor)* in the weir grid between the 2 years. Nests with no eggs were not included in the calculations of clutch and brood size. The clutch size between the two years of precipitation data were not significantly different (p= .24).

A two-tailed t-test was also used to compare fledgling success in the two years. For a nest box to be included on the fledgling category it needed to contain at least one

egg during the breeding season. There was not a significant difference between the means (p= .40)

Discussion

Tree swallow (*Tachycineta bicolor)* clutch size and fledgling success was not significantly affected by the amount of precipitation in 2014 and 2015. This may be a result of the limited amount of data from only two years. The mean fledgling rate was normally 93.2%.[4]

fledgling success of tree swallows (*Tachycineta bicolor)* is dependent on temperature.[5] This may be part of the reason that lower precipitation did not affect fledgling success significantly. The increase in precipitation might lower the temperature and in turn lower the fledgling success. In hot and dry years the amount of insect prey for tree swallows may not be affected enough to lower the clutch sizes and fledgling success of tree swallows (*Tachycineta bicolor)*.

Conclusion

In the event that precipitation levels at the Beaverhill Bird Observatory fall to levels that let the entire wetland dry up the tree swallow (*Tachycineta bicolor)* nest box program will likely be affected. The lack if insect prey will drive the tree swallows to some other nesting area[6]. With the proper action by society there can be a reversal in the climactic trends. This should help to lower the stresses on the tree swallow (*Tachycineta bicolor)* populations at Beaverhill Bird Observatory.

References

1. http://beaverhillbirds.com/index.php
2. **http://agriculture.alberta.ca/acis/about.jsp**

3. R.M. DeGraaf, and M. Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution. University Press of New England, Hanover, NH.

4. De Steven, D. 1980. Clutch Size, Breeding Success, and Parental Survival in the Tree Swallow (*Iridoprocne bicolor*). Evolution 34: 278-291.

5. Dawson, R.D., Lawrie, C.C., and O'Brien, E.L. 2005. **The Importance of Microclimate Variation in Determining Size, Growth and Survival of Avian Offspring: Experimental Evidence from a Cavity Nesting Passerine.** Oecologia 144: 499-507.

6. Mengelkoch, J.M, Niemi, G.J., and Regal, R.R. 2004. Diet of the Nestling Tree Swallow. Condor 106: 423-429

Appendix 1. Weather data

Weather data for Tofield AB.,
2015 May 23 July 25: 183.2 mm of precipitation
2014 May 23- July 25: 231.5 mm of precipitation

Appendix 2. Statistical analysis

2014 clutch size	2014 # of fledglings
7	7
5	5
6	5
4	7
6	7
7	6
7	6
5	7
6	7
7	2
7	7
7	6
6	6
5	5
3	0
6	5
6	5
2	7
7	7
6	6
7	5

7	5
7	7
7	7
7	6
7	7
7	7
7	7
4	4
6	6
7	0
7	7
7	7
Mean= 6.12	Mean- 5.70

2015 clutch size	**2015 # of fledglings**
6	6
7	7
6	5
6	5
6	4
6	6
6	7
6	6
7	8
7	7
8	7
7	7
6	5
7	5
6	5
7	6
6	5
6	6
6	6
6	6
7	6
6	1
7	4
4	0
6	1
6	6

7	3
8	7
6	2
8	8
7	7
6	5
7	6
7	6
5	4
6	6
5	5
6	6
7	6
6	0
7	6
5	4
7	7
7	7
6	6
6	6
7	5
7	7
Mean= 6.39	Mean= 5.33

t-Test: Two-Sample Assuming Equal Variances
clutch size

	2015 clutch size	*2014 clutch size*
Mean	6.395833333	6.121212121
Variance	0.627216312	1.672348485
Observations	48	33
Pooled Variance	1.05056099	
Hypothesized Mean Difference	0	
df	79	
t Stat	1.184836771	
P(T<=t) one-tail	0.119817083	
t Critical one-tail	1.664371409	
P(T<=t) two-tail	0.239634167	
t Critical two-tail	1.99045021	

t-Test: Two-Sample Assuming Equal Variances

fledglings

	2015 # of fledglings	*2014 # of fledglings*
Mean	5.333333333	5.696969697
Variance	3.588652482	3.46780303
Observations	48	33
Pooled Variance	3.539700806	
Hypothesized Mean Difference	0	
df	79	
t Stat	-0.854710635	
P(T<=t) one-tail	0.197647976	
t Critical one-tail	1.664371409	
P(T<=t) two-tail	0.395295953	
t Critical two-tail	1.99045021	