Consequences of nest habitat selection for tree swallows

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1. Project goals and objectives

Our goals were to evaluate the extent to which, and mechanisms by which, tree swallows adaptively make nest site choices, modify nest-site habitat choices based on previous nest success, and to evaluate how predation and abandonment are affected by nest habitat.

To get at the goals, we evaluated macro- and micro-scale habitat factors influencing tree swallow nest site choice, nest success, and set out to quantify predator communities at separate tree swallow study sites.

Work completed

Tree swallow nest-boxes were erected in 2000 in and around Wolfville on privately owned lands. Beginning in early May, all nest-boxes were visited to record nest initiation date (day of first egg), clutch size (number of eggs laid), hatching date (day first egg hatches), and number of young fledging (number of nestlings banded at day 12, where hatching date is designated as day 1, less any dead found in boxes on day 22). Adults were captured opportunistically inside nest-boxes during incubation, or trapped when they fed nestlings. Adults were aged and sexed, and if not already banded, given uniquely numbered, Canadian Wildlife Service leg bands. Nestlings were banded when 12 d old.

At the micro-scale, nest-box size, nest entrance hole size, and nest entrance hole orientation were manipulated to test for adaptive nest-site choice. At the macro-scale, habitat has undergone natural succession, and landowners have also cut down trees and converted operations from orchards to row crops, etc. Every 3 or 4 yr, we quantified habitat around nests using a point-quarter method, and this was repeated in 2016. In addition, canopy cover was rigorously quantified in 2016 with a spherical crown densitometer (an instrument that has a grid and mirror and enables the number of squares with foliage to be counted to calculate canopy cover). Using these data, we assessed the extent to which micro- and macro-habitat influences tree swallow nest site choice and nest success.

Results

In 2016-2017, Hons student Anik Obomsawin used data from as early as 2012, depending on the analysis. Nest-boxes with small entrance holes had significantly greater occupancy rates (28.3%) than those with large entrance holes (4.1%; $\chi^2_1 = 21.7$, $P < 0.0001$). Lateral vegetation density (i.e., at eye height) of occupied and unoccupied boxes did not differ significantly ($\chi^2_3 = 0.1$, $P = 0.13$). Vertical vegetation density (i.e., canopy cover) was lower at occupied ($N = 43$, $\bar{x} = 9.2$, 95% C.I. = 6.9%, SD = 22.4) than unoccupied nest-boxes ($N = 130$, $\bar{x} = 24.9$, 95% C.I. = 5.3%, SD = 30.8, $\chi^2_4 = 10.5$, $P = 0.001$). Orientations of occupied nest-boxes ($N = 43$, mean 218° ± 25.4° (SD = 82.6, median = 200) and unoccupied nest-boxes ($N = 136$, mean 175° ± 14.6° (SD = 86, median = 180) did not differ ($\chi^2_3 = 2.1$, $P = 0.54$).

Anik also deployed 12 cameras at nest boxes, periodically moving them to new boxes to broaden the data purview. A total of 4,773 images was captured, of which only 1 (Fig. 1)

captured a predation event by a raccoon. Other images were caused by wind moving objects in cameras' field of view.

Fig. 1. Likely predation event by raccoon captured by a trail camera at 22:21 on 20 June 2016. The nest box adjacent to this image was depredated by having an experimental entrance hole reducer cover ripped off, which is difficult to ascribe to any other causes.

Achievements and lessons learned

We have made significant advances on understanding some nuances of tree swallow habitat selection. If the intention is to increase sample sizes of birds to work with, we now have a better understanding of where to deploy nest boxes. If the intention is to evaluate the importance of hole opening sizes or canopy cover, box deployments could be allocated to clarify the influence of these variables in a more continuous format.

We have also been educated on the frustration of operating trail cameras to collect data; far more useless than useful data are generated.

Follow-up recommendations

The next step will be to undertake a comprehensive analysis of habitat selection since 2000 in the tree swallow data set. This analysis, incorporating banding records, could be used to evaluate lifetime reproductive success of individuals pursuing particular habitat selection strategies. For example, to what extent do habitat preferences actually influence nest success?

With respect to cameras, we have learned that they need to be deployed very (uncomfortably) close to nests to minimize triggering unrelated to bird or predator activity.