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TREE SWALLOW *(Tachycineta bicolor)* NEST COMPOSITION AT RED SLOUGH WILDLIFE MANAGEMENT AREA, MCCURTAIN COUNTY, OKLAHOMA

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Abstract—Tree Swallow *(Tachycineta bicolor)* nest composition has been studied in the northern region of the species' distribution, but not at the southern end of its nesting range. We collected 48 Tree Swallow nests at the Red Slough Wildlife Management Area in McCurtain County Oklahoma from 2011-2012. Tree Swallow nests were overwhelmingly composed of grasses, although pine needles also were used in one nest. Mean nest mass was 30.7 g, with first nests heavier than second nests in both years. Tree Swallows lined their nests with primarily wading bird, waterfowl, and cormorant feathers with a combined mean of 73 feathers per nest attempt. We also documented a variety of other objects in Tree Swallow nests at Red Slough including invertebrate shells and exoskeletons. Tree Swallow nest composition was similar to materials used in other areas of the species' range; however, the use of egret, heron, and cormorant feathers differed from previously published results.

INTRODUCTION

Tree Swallows are a secondary cavity nesting species in eastern and southeastern Oklahoma (Baumgartner and Baumgartner 1992, Neeld 1993, Long and Long 1997, Heck 1999), and one record from Cimarron County in the Panhandle (Newell 1979). The Oklahoma Breeding Bird Atlas (Reinking 2004) documented confirmed nests in Osage, McCurtain, and Choctaw Counties, and likely nested in Cimarron and Washington counties. Tree Swallows also recently nested in Kay County in 2010 (Eugene Young, pers. comm.). The atlas also documented previous nesting records from 1997-2001 in Custer, Stephens, Alfalfa, Delaware, Sequoyah, and Laflore counties.

Previous studies documented Tree Swallow nest composition, although not at the southern extent of the species' distribution. Females build the majority of the nest with materials obtained in the vicinity of the nest site (Cohen 1985, Winkler *et al.* 2011). Tree Swallows typically used grasses,

pine needles, and aquatic vegetation as primary nest materials (Austin and Low 1932, Stocek 1970, Dring 1981a). Upon completion of the vegetative component of the nest, males, and occasionally females, add feathers to the nest cup (Winkler 1993). Feathers contribute to thermoregulation of the nest microclimate (Lombardo *et al.* 1995). Although Tree Swallow nest composition was studied in the northern portion of the species' distribution in Massachusetts (Austin and Low 1932), New York (Winkler 1993), and Michigan (Lombardo *et al.* 1995), there is a gap in the scientific literature about Tree Swallow nest composition in the southern portion of the species' distribution. Our objective was to study Tree Swallow nest composition in southeastern Oklahoma.

METHODS

Tree Swallow nests were collected from nest boxes at the Red Slough Wildlife Management Area, McCurtain County, in southeastern Oklahoma during 2011 and 2012. We collected 12 nests from both first and second nesting attempts in 2011 and 2012. Nest boxes were completely cleaned out after each nest attempt and after the last nest attempt of each season. Boxes were closed until the following season to prevent other species from entering the boxes, as well as preventing any materials from entering the nest box during the winter.

Nests were dried at room temperature in a lab for one week prior to sorting by undergraduate and graduate students at Southeastern Oklahoma State University. Dry nest contents were sorted by vegetation type (i.e., grass, pine needles), non-vegetative material (i.e., feathers, invertebrate exoskeletons), and dried fecal matter. Dried fecal matter was removed from nest material and vegetative and feather components weighed separately. Nest materials were sorted by type and weighed to the nearest 0.1 g using an electronic balance. We also counted the number of feathers in each nest and classified them to species level when possible.

Parametric t-tests were used to test for statistical differences in Tree Swallow nest composition, mass, and feather variables. For data that failed normality tests, non-parametric Mann-Whitney *U* tests were performed to detect differences.

RESULTS

We collected 48 Tree Swallow nests with 12 nests from first and second nesting attempts in both years. All but one nest consisted of Bermuda grass (*Cynodon dactylon*), with one nest composed of 65% Bermuda grass and 35% loblolly pine (*Pinus taeda*) needles by mass. Other items found

in swallow nests included: Tree Swallow eggshell fragments, cockleburs (*Xanthium strumarium*), a dead spider, small snail and freshwater mussel shells, as well as pieces of crayfish, dragonfly, grasshopper, and insect exoskeletons.

Mean Tree Swallow nest mass was 30.1 g for 2011-2012 (Table 1), and were similar among years (2011 = 29.9 g; 2012 = 31.4 g) (t = 0.28, df = 47, P = 0.78). First nests were significantly heavier than second nests in both 2011 (t = 5.5, df = 22, P < 0.001) and 2012 (t = 5.47, df = 21, P <0.001) (Table 1). Mean vegetation mass was 26.7 g for 2011-2012 (Table 1) and was similar among years (2011 = 25.8 g; 2012 = 27.6 g) (t = -0.415, df = 47, P = 0.68). Vegetation mass also declined from first to second nests in 2011 (t = 5.5, df = 21, P < 0.001) and 2012 (t = 5.14, df = 22, P < 0.001) (Table 1).

Table 1. Tree Swallow nest mass, vegetation mass, feather mass, and number of feathers by clutch and year at Red Slough Wildlife Management Area, Oklahoma. All values are means ± SD.

YEAR	CLUTCH	NEST MASS (g)	VEGETATION MASS (g)	FEATHER MASS (g)	# FEATHERS
2011	1st	38.5 ± 8.7	33.1 ± 8.9	4.2 ± 1.4	78.4 ± 35.3
2011	2nd	21.4 ± 13.8	18.6 ± 13.2	2.8 ± 1.3	54.2 ± 39.8
2011	Combined	29.9 ± 14.3	25.8 ± 13.4	3.5 ± 1.5	66.3 ± 39.5
2012	1st	41.0 ± 8.9	36.4 ± 8.7	4.5 ± 1.8	109.0 ± 41.5
2012	2nd	21.7 ± 6.7	18.9 ± 5.8	2.8 ± 1.6	50.0 ± 27.3
2012	Combined	31.4 ± 12.5	27.6 ± 11.4	3.6 ± 1.9	79.4 ± 46.9

Tree Swallows used a mean of 73 feathers per nest attempt in 2011 (range = 12-149) and 2012 (range = 21-192), with more feathers per nest in 2012 (mean = 79.4) than 2011 (mean = 66.3), although not significantly so (Mann-Whitney U = 249.5, n = 48, P = 0.31) (Table 1). Feather numbers decreased from first to second nest attempts in both years with an average of 24 fewer feathers in 2011 (t = 3.38, df = 24, P = 0.009) between nest attempts and an average of 59 fewer feathers in 2012 (Mann-Whitney U = 8.0, n = 24, P < 0.001) (Table 1). Mean feather mass was 3.6 g per nest, and was similar between 2011 (4.2) and 2012 (4.5) (t = -0.232, df = 47, P = 0.82). Feather mass decreased significantly from first to second nests in 2011 (t = 2.36, df = 22, P = 0.28) and 2012 (t = 2.79, df = 22, P = 0.011).

Based on feather color and size, we determined that feathers from Great Egrets (*Ardea alba*), Great Blue Herons (*Ardea herodias*), Cattle Egrets (*Bubulcus ibis*), Double-crested Cormorants (*Phalacrocorax*

auritus), and Gadwall (*Anas strepera*) were used to line the cup of Tree Swallow nests. Other feathers found in nests may have been from Snowy Egrets (*Egretta thula*), immature Little Blue Herons (*E. caerulea*), or White Ibis (*Eudocimus albus*), but we are unable to conclusively confirm the species identification of some feathers.

DISCUSSION

Tree Swallows used Bermuda grass as the primary nest composition material at Red Slough. Nest boxes were often adjacent to levees at Red Slough that were heavily vegetated with Bermuda grass. This grass is often planted to prevent soil erosion and protect levees, although it is non-native to Oklahoma. The use of grasses and other vegetation adjacent to Tree Swallow nest boxes is well documented in the literature. Dring (1981b) documented Tree Swallow use of a variety of terrestrial vegetation as nest material including: straw, black willow (*Salix nigra*) leaves, river grape (*Vitis riparia*) tendrils, and emergent vegetation such as cattail (*Typha latifolia*). Dring (1981a) also documented the occasional use of submerged vegetation like pond weed (*Elodea canadensis*) as nest material in Illinois.

Stocek (1970) documented the use of grasses as nest material in Pennsylvania, but did not classify which grass species were used. Similarly, Long and Long (1997) stated that Tree Swallows in Oklahoma used grasses as nest material, but did not identify the grasses to the species level. One nest at Red Slough did contain 35% pine needles by mass. Loblolly pine trees were present a short distance away from this nest box and were likely the source of the pine needles used in this nest. Austin and Low (1932) also documented the use of pine needles as nest material in Massachusetts. Newell (1979), Neeld (1993), and Heck (1999) did not mention which nest materials were used by Tree Swallows nesting in Oklahoma. We did not observe the use of mosses or rootlets documented by Austin and Low (1932) and Tate and Weaver (1966).

We also observed a wide variety of other materials in Tree Swallow nests at Red Slough. We expected to find egg shell fragments, but were surprised to observe cockleburs which were placed in the nest prior to hatching. Cockleburs may have been attached to grass nest material and were collected incidentally by Tree Swallows. Post-hatching, we found possible food items including dead spiders or remnants of food items such as snail shells, mussel shells, and a variety of invertebrate exoskeletons. Although we did not observe adult Tree Swallows feeding these items to nestlings, we suggest that they were part of the nestlings' diet.

Nest mass averaged 30.1 g and was similar among years. Nest mass declined between first and second nest attempts by almost half; however, we cleaned out all nest boxes at the completion of each nest attempt. Previous studies suggested Tree Swallows rebuild on top of existing nests (Winkler *et al.* 2011), but in order to study nest composition for each attempt, we removed nests, thereby, forcing Tree Swallows to build a new nest for each attempt. Both vegetation and feather mass declined from first to second nest attempts. The amount of vegetation and feather mass may affect incubation efficiency and nest outcome, although we did not attempt to test this hypothesis. We did not find nest mass estimates in the literature.

Tree Swallows at Red Slough used a large number of feathers per nest attempt to line nest cups. Although the number of feathers used per nest attempt declined from first to second nests, an average of 73 feathers per nest is similar to the 72 feather per nest average reported by Austin and Low (1932) in Massachusetts. However, our feather count was high compared to other studies of Tree Swallow feather use. Dring (1981a, b) reported only 6-30 feathers per nest attempt in Illinois. Winkler (1993) reported 45 feathers per nest with a range of 0-114. Tree Swallows often used higher numbers of feathers in individual nests (>115) than other published estimates. Average feather mass at Red Slough was 3.6 g per nest. Our feather mass per nest was higher than the only other estimate (0.87 g) in the literature we were able to find (Winkler *et al.* 2011).

Tree Swallows used a wide variety of feathers from bird species that occurred at Red Slough during the winter or concurrently with Tree Swallow nesting season. Specifically, feathers from egrets, Double-crested Cormorants, and Gadwall were frequently found in Tree Swallow nests at Red Slough. Winkler (1993) documented the use of Canada Goose (*Branta canadensis*) and Wood Duck (*Aix sponsa*) feathers in Tree Swallow nests in New York. Dring (1981b) also reported the use of waterfowl feathers, but did not specify which species feathers were used. Austin and Low (1932) reported feathers from Herring Gull (*Larus argentatus*), American Black Duck (*Anas rubripes*), Wood Duck, Canada Goose, Great Horned Owl (*Bubo virginianus*), Red-tailed Hawk (*Buteo jamaicensis*), and domestic chickens (*Gallus gallus domesticus*) in Tree Swallow nests in Massachusetts. In Sumner County, Kansas, Eugene Young (pers. comm.) documented feathers of Great Egret, Snowy Egret, Mallard (*Anas platyrhynchos*), Gadwall, Blue-winged Teal (*A. discors*), and Green-winged Teal (*A. crecca*).

Feathers are likely used to prevent hypothermia among nestlings in the northern portion of the species' range (Winkler 1993, Lombardo *et al.* 1995); however, Red Slough has higher summer temperatures based

on latitude, but Tree Swallows used more feathers per nest attempt than in northern latitudes. Others have suggested that feathers help deter ectoparasites in the nests, but this relationship has not been demonstrated experimentally (Stephenson *et al.* 2009). The greater number of feathers in Tree Swallow nests at Red Slough compared to nests in northern portions of the species' range may be due to the greater availability of feathers due to high nesting densities of other birds at this site.

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