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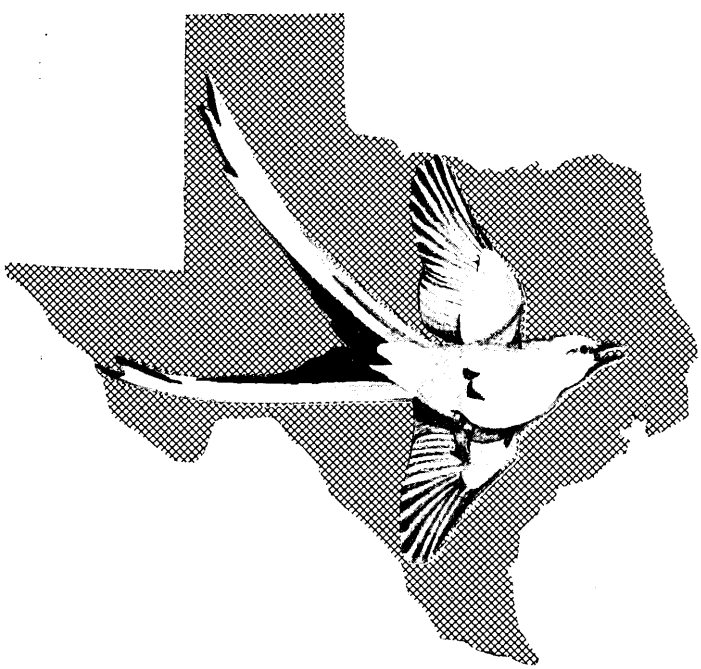

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LINDA M. ROACH

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Contents

Seasonal Distribution Notes on Birds from the Welder Refuge, San Patricio County, Texas[1]

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The Welder Refuge is located in the Coastal Bend region, an area which includes all or part of nine counties of southeast Texas (Fig. 1). This small area, roughly comparable to the state of Maryland in size (25,000 sq km), has one of the richest avifaunas in North America. More than 450 species have been reported for the region (Blacklock 1976). This large diversity is due to a number of factors, including a variety of major habitat types and the area's location along the Gulf Coast.

Despite the acknowledged richness of the area, systematic studies documenting the presence, absence and relative abundance of species during different seasons of the year are lacking. Though a number of ornithologists have worked in the Coastal Bend (e.g. Audubon 1838, Dresser 1866, Sennett 1878, Chapman 1891, Griscom and Crosby 1925), the collections made by these workers are far from complete. The gaps in documentation on birds found along the central coast are illustrated by the species distribution maps in Oberholser (1974). There are no specimen records for some birds seen regularly in the Coastal Bend counties (e.g. Lesser Yellowlegs (*Tringa flavipes*), American Redstart (*Setophaga ruticilla*), Golden-winged Warbler (*Dendroica chrysoparia*), Song Sparrow (*Melospiza melodia*), and seasonal distribution is unsubstantiated for many common species.

Many workers have contributed sight records on birds of the region, most notably Hagar, who compiled extensive field notes for the Rockport area of the Coastal Bend from 1935 to the mid-1960's (Hagar and Packard 1952, McCracken 1976).

Texas riparian forest is one of the most important habitats for birds, especially migrants, in the state; and also one of the most endangered. Dams are proposed or in progress for all of the major river systems of east Texas. These dams will drastically alter the character of the riparian habitat.

The purpose of this study was to systematically document the seasonal occurrence and relative abundance of bird species in a section of Coastal Bend riparian forest. Such data are necessary for more specific studies on the evolution of migration, migrant-resident interaction, species diversity, and, most importantly, evaluation of current land management practices with regard to their effects on the avifauna.

Study Area

I worked on an 11.4 ha riparian forest (hackberry mott) bordering the Arkansas River at the Welder Wildlife Foundation in east San Patricio County, 48 km north of Corpus Christi (Fig. 1). This site still receives the vital intermittent flooding necessary to maintain a river woods in this part of Texas. Canopy height is 10–

[1] Welder Wildlife Foundation Contribution Number 210.

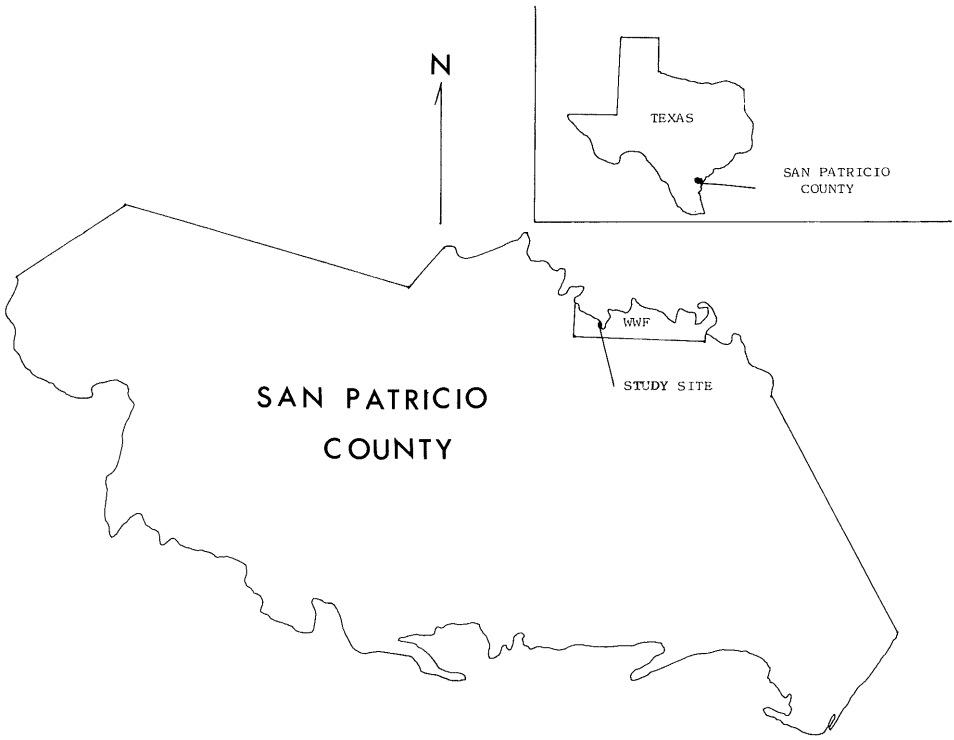

Fig. 1. Location of the study site on the Welder Wildlife Foundation (WWF) in San Patricio County, Texas.

15 m. Dominant plant species include hackberry (*Celtis* sp.), cedar elm (*Ulmus crassifolia*), anaqua (*Ehretia anaqua*), pecan (*Carya illinoensis*) and mustang grape (*Vitis mustangensis*).

Materials and Methods

I set nylon mist nets (12 × 2.6 m with 30 mm mesh) in five sectors of 10 nets each. The nets were run during four seasons: fall, 1973; spring, 1974; fall, 1974; spring 1975. The opening and closing dates for each season, days netted, net hours, and total birds captured are shown in Table 1.

I identified each bird using the available taxonomic literature and saved spec-

Table 1. Days netted, net hours,[1] and total birds captured per season.

Season	Nets opened	Nets closed	Total days netted	Total net hours	Total birds captured
Fall, 1973	15 August	23 October	70	36,600	1,960
Spring, 1974	4 March	24 May	82	14,580	1,882
Fall, 1974	20 August	13 November	86	23,400	1,390
Spring, 1975	29 March	28 May	61	20,520	3,272

[1] One net hour = one 12 × 2.6 m net up for one hour.

imens of those species previously unrecorded in the Coastal Bend. These specimens are housed in the collections of the Welder Wildlife Foundation and the University of Minnesota. All other captures were banded with U.S. Fish and Wildlife Service bands and released.

Results and Discussion

Total captures by species and season are presented in Table 2. For some species, there are marked differences between fall and spring capture totals. The Wilson's Warbler (*Wilsonia pusilla*) and Mourning Warbler (*Oporornis philadelphia*) were abundant in the fall seasons, but much less common during the spring. Several other species were common during the spring and rare or unrecorded in the fall (e.g. Hooded Warbler (*Wilsonia citrina*), Tennessee Warbler (*Vermivora peregrina*), Chestnut-sided Warbler (*Dendroica pensylvanica*), Worm-eating Warbler (*Helmitheros vermivorus*), Swainson's Thrush (*Limnothlypis swainsonii*), Magnolia Warbler (*Dendroica magnolia*). Apparently, these species use different migration routes in the fall from those used in the spring. Gulf and continental weather patterns (Gauthraux 1971), evolutionary constraints, and geographical features could all be causes of this phenomenon.

A second type of variation in the samples is in species totals from one year to the next for the same season. Species showing notable variation of this kind include the Ruby-throated Hummingbird (*Archilochus colubris*) (40 in fall, 1973 vs. 2 in 1974), Yellow-bellied Flycatcher (*Empidonax falviventris*) (425 in fall, 1973 vs. 154 in 1974), Ruby-crowned Kinglet (*Regulus calendula*) (19 in fall, 1973 vs. 80 in 1974), Red-eyed Vireo (*Vireo olivaceus*) (3 in spring 1974, 39 in 1975), and Magnolia Warbler (61 in spring, 1974 vs. 218 in 1975).

One explanation for this type of variation is that opening and closing dates of nets differed somewhat from one fall or spring season to the next, thus skewing the sample for early or late arrivals. The Ruby-crowned Kinglet samples were probably affected by this kind of bias.

Another cause of variation is local weather patterns during peak migration periods. These patterns can cause considerable fluctuation in numbers of birds on the ground in any given season (Bagg et al. 1950, Curtis 1969). This problem was clearly demonstrated during my study. In fall, 1973, 1,051 birds were captured between 10 and 20 September. In fall, 1974, during the same period torrential rains caused flooding of the entire study area, and 181 birds were captured. Samples of the Yellow-bellied Flycatcher and Ruby-throated Hummingbird were affected by this kind of variation.

A further outcome of the study was documentation for several species for which specimens had previously been lacking (Table 2). These data along with the relative abundance figures, represent a baseline for future comparative studies. Furthermore, they document the richness of the riparian forest, a habitat that is rapidly being "dammed" out of existence. When the riparian forests are gone, the rich avifauna which was associated with them will also be gone. Since migrant passerines in particular seem to be dependent on these forests, the effects of destruction may be felt far from the Coastal Bend, in the localities where these birds breed and winter. Without the necessary habitat in key stopover areas like hackberry motts, many of these migrants will be unable to complete their migration.

Table 2. List of total individuals captured by species and season.

Species	Fall	Spring	Species	Fall	Spring
Sharp-shinned Hawk	6	0	Philadelphia Vireo	0	9
Red-shouldered Hawk	0	2	Warbling Vireo	17	6[c]
Broad-winged Hawk	11	5	Black and White Warbler	131[c]	207
Yellow-billed Cuckoo	9	0	Prothonotary Warbler	14	14
Black-billed Cuckoo	0	2	Swainson's Warbler	4[a,d]	48[c]
Chuck-will's-widow	13	5	Worm-eating Warbler	2	118
Whip-poor-will	3	10	Golden-winged Warbler	0	22
Pauraque	1	0	Blue-winged Warbler	5[c]	56
Ruby-throated Hummingbird	42	33	Brewster's Warbler	0	1[e]
Black-chinned Hummingbird	0	1[a]	Tennessee Warbler	16[d]	260
Buff-bellied Hummingbird	1	0	Orange-crowned Warbler	16[c]	10
Belted Kingfisher	2	1	Nashville Warbler	105[c]	110
Green Kingfisher	1	0	Northern Parula Warbler	1	5
Common Flicker	1	0	Yellow Warbler	14	8
Golden-fronted Woodpecker	0	1	Magnolia Warbler	13	279
Yellow-bellied Sapsucker	6	9	Black-throated Blue Warbler	2[a,d]	0
Ladder-backed Woodpecker	1	0	Black-throated Gray Warbler	1[d]	0
Great Crested Flycatcher	182	35	Black-throated Green Warbler	7[c]	57
Wied's Crested Flycatcher	13	0	Cerulean Warbler	1[d]	6
Eastern Phoebe	42	0	Blackburnian Warbler	2[c]	32
Yellow-bellied Flycatcher	579	103	Chestnut-sided Warbler	2[c]	122
Acadian Flycatcher	0	188	Bay-breasted Warbler	2[c]	62
Willow Flycatcher	5	1	Blackpoll Warbler	1[a,b]	0
Alder Flycatcher	16	1	Ovenbird	38	505
Willow or Alder Flycatcher ?[b]	160	12	Northern Waterthrush	41[c]	204
Least Flycatcher	60	5	Louisiana Waterthrush	6[c]	24
Eastern Wood Pewee	59[c]	97	Kentucky Warbler	19[c]	240
Western Wood Pewee	1[c]	0	Mourning Warbler	147	54
Olive-sided Flycatcher	2	0	Common Yellowthroat	12	232
Carolina Chickadee	3	2	Yellow-breasted Chat	120	71
Black-crested Titmouse	4	3	Hooded Warbler	6	73
Brown Creeper	2	0	Wilson's Warbler	208	21
House Wren	16	11	Canada Warbler	245	476
Winter Wren	30[c]	4[c]	American Redstart	21[a]	71[c]
Bewick's Wren	1	0	Orchard Oriole	19	13
Carolina Wren	6[c]	1[c]	Northern Oriole	47	17
Long-billed Marsh Wren	0	2	Brown-headed Cowbird	1	3
Mockingbird	1	0	Western Tanager	1[a]	0
Gray Catbird	26[c]	110	Scarlet Tanager	0	3
Brown Thrasher	26	12	Summer Tanager	1[c]	27
Long-billed Thrasher	9	4	Cardinal	63	65
Wood Thrush	11[d]	79	Rose-breasted Grosbeak	3	20
Hermit Thrush	70	15	Black-headed Grosbeak	2[a]	0
Gray-cheeked Thrush	1	74	Blue Grosbeak	3	1
Veery	4[d]	31	Indigo Bunting	23	64
Blue-gray Gnatcatcher	116	45	Painted Bunting	37	116
Golden-crowned Kinglet	0	25	Purple Finch	1[a]	0
Ruby-crowned Kinglet	99	18	Olive Sparrow	3	0
Loggerhead Shrike	27	2	Dark-eyed Junco	1	0
White-eyed Vireo	49[c]	62	Field Sparrow	0	1
Bell's Vireo	5[c]	0	White-throated Sparrow	33	32
Yellow-throated Vireo	1[c]	1	Lincoln's Sparrow	41	130
Solitary Vireo	10	11[c]	Swamp Sparrow	12	4
Red-eyed Vireo	43[c]	42	Song Sparrow	2[a]	0

[a] First specimen record for the Coastal Bend.

[b] Birds of the Willow–Alder Flycatcher complex which were banded and released. Only specimens could be critically identified to species.

[c] First specimen record for that season in the Coastal Bend.

[d] First specimen record for that season for Texas.

[e] First specimen record for Texas.

Acknowledgments

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Breeding Characteristics, Eggshell Thinning, and Population Trends of White-tailed Hawks in Texas

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The White-tailed Hawk (*Buteo albicaudatus*), occurring locally from South America to Mexico, reaches its northernmost breeding distribution in south Texas (Voous 1968, Blake 1976). The species has been declining in numbers, at least in Texas, since the early 1930's (Sprunt 1955, Oberholser 1974). However, little information is available which can be used to assess the mechanisms causing the decline of white-tails. Studies on behavior (Stevenson and Meitzen 1946), morphological variation (Voous 1968), and food habits (Guthrie 1932, Cottam and Knappen 1939, Hauche 1971) provide the only sources of information.

The paucity of field data on breeding and egg characteristics necessitated my attempt to obtain information from oological collections. Bird surveys and personal interviews with south Texas observers were used to plot past and present population trends. This paper thus provides a summary of published and unpublished information and includes new facts about eggshell thinning and breeding biology of White-tailed Hawks.

Methods

Two hundred-forty egg sets from 11 museums were studied. Information transcribed from data slips included date and location of collection, clutch size, incubation stage, nest site, collector, and collector's comments. As incubation terminology is non-standardized (Storer 1930), dates of set collection were corrected on the basis of reported incubation (to give date of clutch initiation), thus providing an estimate of nesting phenology (Anderson and Hickey 1970). Using 30 days as an approximate incubation period, the date of clutch initiation was estimated by subtracting stage of incubation in days from date of set collection. Although exact length of incubation has apparently not been reported for white-tails, all species of *Buteo* incubate from 28 to 35 days (Brown and Amadon 1968:109); 30 days was chosen as an average incubation period. To determine if incomplete sets had been collected, clutch size of unincubated ("fresh") sets were compared to sets in which incubation had commenced. As no significant difference existed ($P > 0.05$, t-test), all sets were included in analysis of clutch size. Unless otherwise stated, all analyses in this paper are based on data obtained from oological collections.

Eggs housed at the Western Foundation of Vertebrate Zoology were used to analyze temporal patterns in eggshell thickness. All eggs were collected in south Texas between 1884 and 1970. Eggs were first divided into pre-1947 (pre-DDT) and post-1947 (post-DDT) groups (Anderson and Hickey 1972). The post-1947 group was then subdivided into three smaller groups. All post-1947 groups were independently compared (% change and t-test) against the pre-1947 group. The

Table 1. Nest sites (species, % frequency) of White-tailed Hawks in south Texas.

Species	n	%
Oak (*Quercus* spp.)	44	32.1
Huisache (*Acacia farnesiana*)	22	16.1
Mesquite (*Prosopis julifola*)	19	13.9
Yucca (*Yucca* spp.)	16	11.7
Granjeno (*Celtis pallida*)	6	4.4
Eastern Cottonwood (*Populus deltoides*)	3	2.2
Ebony (*Pithecellobium flexicaule*)	1	0.7
Cactus (*Opuntia* spp.)	1	0.7
Other	25	18.2

n = 137 nests.

length and breadth of blown eggs were measured (nearest 0.01 mm) with dial vernier calipers and weighed (nearest 0.001 g) on a Mettler P 120 balance. A "shell thickness index" was calculated for each group (Ratcliffe 1967). Anderson and Hickey (1972) have shown that this index gives an accurate measure of actual shell thickness.

Six Audubon Christmas Bird Count areas (n = 110 counts) within the range of White-tailed Hawks in south Texas were conducted consistently enough to allow trend analysis. To allow for varying levels of observer effort between counts, count data were normalized by converting to birds/100 party-mile (Brown 1971, 1973, Raynor 1975). Normalized data were plotted by 3-year averages to reduce yearly fluctuations and aid in trend interpretation.

Results and Discussion

Nesting

Construction of new nests may last 5 weeks, with material being added until egg laying commences. White-tails show distinct nest-site tenacity, with material being added to old nests for periods up to 3 years. Nests were also built over Common Crow (*Corvus brachyrhynchos*) and Caracara (*Caracara cheriway*) nests. If a new nest is constructed, it is often located near the old site (see also Burrows 1917, Stevenson and Meitzen 1946).

Nests were usually placed in isolated trees or bushes. These sites correspond to the prairie and savannah habitats used for foraging by this species (Stevenson and Meitzen 1946). Nests located in trees along riparian habitats commanded a view of adjacent prairie. Nest height averaged 2.97 m (range = 0.91–12.19 m, n = 124). Although plant heights were seldom given by collectors, nests were usually placed at the top of bushes or in the upper branches of trees. Burrows (1917) and Bent (1938) listed similar average heights; Stevenson and Meitzen (1946) felt that white-tails were forced to nest at low levels due to the scarcity of tall trees in south Texas. Taller trees are apparently used for nest sites when available. Plants used for nesting correspond to the most abundant sites available on south Texas prairies (Table 1).

Clutch Size

Clutch size averaged 2.26 eggs per nest (S.D. = 0.47, range = 1–4, n = 139). Burrows (1917) and Bent (1938) listed the usual clutch of a white-tail as 2 or 3 eggs.

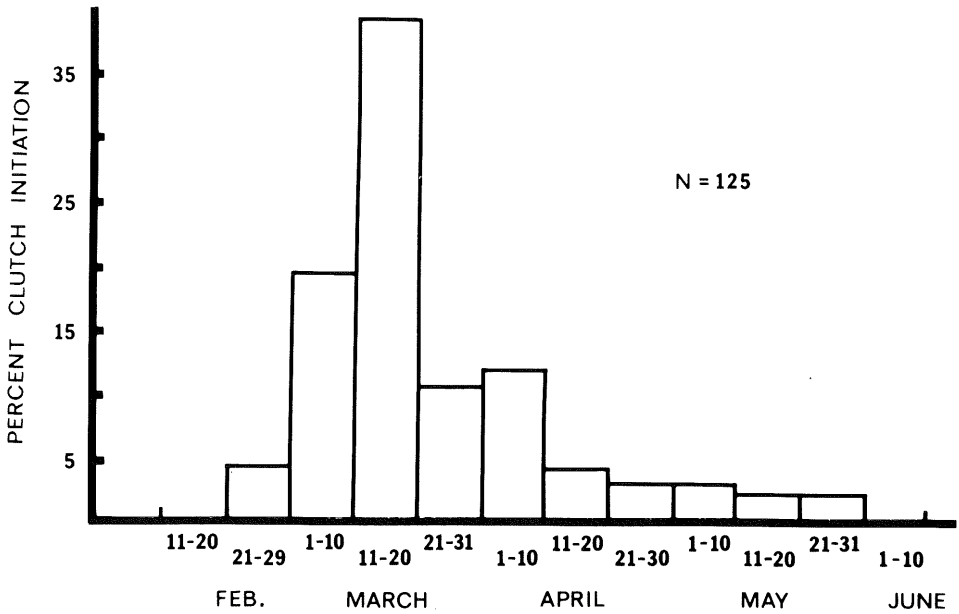

Fig. 1. Nesting phenology of White-tailed Hawks in Texas based on museum records.

A replacement clutch is often layed if the first set is removed or destroyed. Although specific data are scarce, several collectors mentioned the laying of replacement clutches. A second set was begun about 10 days after the initial clutch was collected (calculated from Nyc 1941), while another pair initiated a replacement clutch about 15 days after the first set was taken (Nyc, unpubl. data). A new nest is constructed or an old nest refurbished for the replacement clutch. *Buteos* usually lay replacement clutches 2 to 3 weeks after the original set is lost (Bent 1937, 1938).

Nesting Phenology

Egg laying in south Texas usually takes place from late February through May, with peak laying during March (Fig. 1). Egg dates of 20 January (Stevenson and Meitzen 1946) to 4 August (Oberholser 1974) have been reported. Egg sets taken during and after April could represent second attempts. Burrows (1917) felt that second sets were laid only when the first disappeared. However, Webster (1969) recounted the rearing of two successful broods by the same pair.

Eggshell Thinning

White-tailed Hawk eggshells have undergone an average thinning of 6.6% in south Texas since 1947 (Table 2). More significantly, 26.8% of the post-1947 eggs were over 10% thin, with a maximum thinning of 18.6% in 1961. Average shell thinning of 5% and 13%, respectively, has been reported for Red-tailed (*B. jamaicensis*) and Red-shouldered (*B. lineatus*) hawks in south Texas (Anderson and Hickey 1972).

Eggshell thinning of about 15% has caused reproductive failures in birds (Anderson and Hickey 1972, Faber and Hickey 1973). Although this study does not include pesticide analysis, significant eggshell thinning is often caused by DDE,

Table 2. Thickness indices of White-tailed Hawk eggs from south Texas.

Period	n	$\bar{x} \pm$ S.E.	% Change
Pre-1947	46/114	2.26 ± 0.0162	
1948–1950	7/15	2.13 ± 0.0387	−5.8*
1951–1956	34/73	2.11 ± 0.0168	−6.6***
1961–1970	4/9	2.03 ± 0.0627	−10.2**
$\bar{x}$ post-1947	45/97	2.11 ± 0.0152	−6.6***

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, t-test.
n = number of clutches/number of eggs within clutches.

a metabolite of DDT. In addition, electron microscopy studies have shown that DDE causes marked changes in shell structure even in the absence of obvious shell thinning (Fox 1976). Pesticide analysis of White-tailed Hawk eggs is needed to determine the causes of eggshell thinning in this species.

Population Trends

Prior to the 1930's, White-tailed Hawks were apparently quite common in south Texas. Strecker (1912) called them "not uncommon," Burrows (1917) described the population as "plentifully distributed," while Smith (1910) thought white-tails were more numerous than all other raptors except Harris' Hawks (*Parabuteo uncinctus*).

Since the 1930's, white-tails have declined in numbers (Sprunt 1955, Oberholser 1974). Land conversion for agricultural, industrial, residential, and recreational purposes has greatly reduced nest sites and foraging grounds preferred by white-tails; over 90% of the Rio Grande delta has been cleared (Box and Chamrad 1966, Oberholser 1974). The possible addition of pesticide induced reproductive problems may have further caused population declines.

Competition may partially limit white-tail populations in south Texas. Howell (1971) felt that competition for food between White-tailed and Red-tailed hawks may limit both species' relative abundance.

Although many problems can be associated with the interpretation of Audubon Christmas Bird Count data (Stewart 1954, Hickey 1955, Raynor 1975), no other quantitative information expressing population trends was available. Analysis of this data supports previously suggested population declines for the White-tailed Hawk in south Texas (Fig. 2). Oberholser (1974) felt that white-tails reached their lowest levels in the late 1960's; Christmas Count data supports his contention. The recent upturn (1974–1976) has also been suggested by Blacklock (pers. comm.). In 1977, he believed that the white-tail population in Texas was about 200 pairs. The population trends, habitat requirements, reproductive success, and other aspects of this species life history should be closely monitored.

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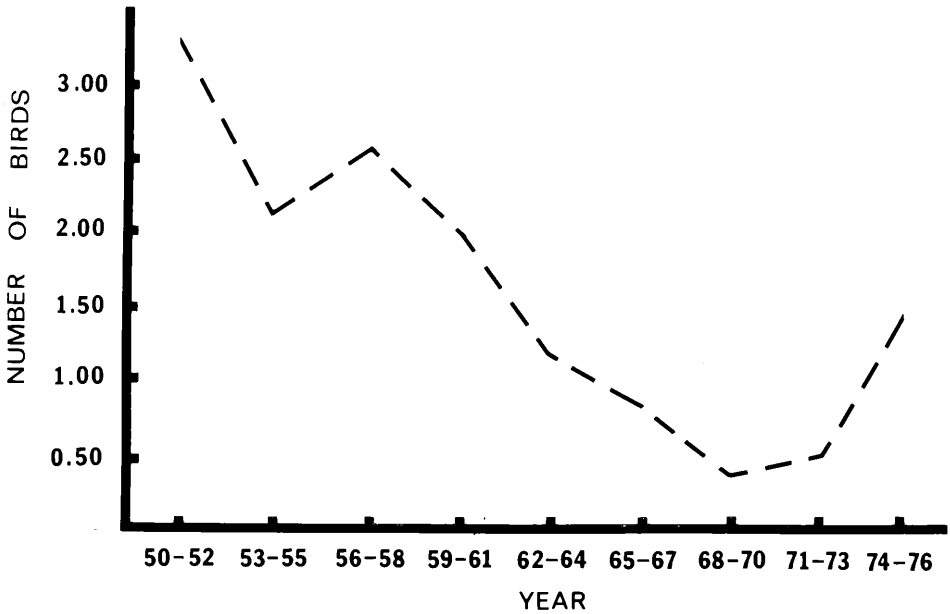

Fig. 2. Population trends of White-tailed Hawks in Texas calculated from Audubon Christmas Bird Count data. Units are in no. of birds/100 party-mile.

Museum of Vertebrate Zoology, U.C. Berkeley (through NSF grant BMS 7200102); Delaware Museum of Natural History; Santa Barbara Museum of Natural History; Rob and Bessie Welder Wildlife Foundation; San Bernardino County Museum; U.S. National Museum of Natural History; Strecker Museum, Baylor Univ.; Field Museum of Natural History; and the Dept. of Zoology, Clemson Univ.

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Broad-winged Hawk Nest in Central Texas: Geographic Record and Novel Aspects of Reproduction

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The Broad-winged Hawk (*Buteo platypterus*) is a rare breeding bird in Texas. Six nests are reported from the Houston-Galveston area northeastward to Harrison County; a seventh, questionable record exists for Grayson County (Oberholser 1974, *The Bird Life of Texas,* Vol. 1, Univ. Texas Press, Austin, p. 232). The species is not known to nest in central Texas. Our 1978 observations of a successful Broad-winged Hawk nest in Woodway, 6 km SW Waco, McLennan County, provide a western breeding record in Texas plus novel aspects of reproduction amidst suburban disturbance.

On 9 April 1978, about 1,200 Broad-winged Hawks migrated over Woodway. Several to a few hundred birds were seen daily thereafter until 15 April, when a single pair frequented Bird Hollow, a ravine studied by the junior author for the past 15 years. This site supports deciduous (riparian) woodland flanked by evergreen (cedar brakes) woodland, in turn bordered by suburban development (mean house density 3.7/ha). A first-order stream is dammed into a small pond at the ravine head. The streambed below was disturbed in 1970 by sewerline construction.

By 20 April the deciduous leaf canopy was fully developed, and a pair of broad-wings was active daily in a lineal, six ha section of the 16-ha ravine below the pond. On 1 May one of the birds carried a large stick through the canopy in the direction of the nest site, while the other called and circled above the site. On 3 May, as a wave of migratory passerines moved through the ravine, one broad-wing carried an oriole-sized bird to the other in a perch 30 m northeast of the nest site. This perch tree (*Quercus sinuata*) later became the nocturnal roost for the presumed male during incubation.

The nest, 35 cm in diameter, was located on 6 May, 9 m high in a 41-cm (dbh), 15-m tall, scaleybark oak (*Q. sinuata*) at the edge of the stream. This tree was 20 m south of an active motorcycle path in the ravine, 50 m northwest of ongoing house construction, 40 m northeast of an occasionally used trash dump, and 380 m northeast of the pond. Broad-wings seemingly were absent until 13 May, when an incubating bird was seen for the first time.

Between 14 and 24 May incubation was not observed when air temperatures exceeded 30°C (about 1300–1500 hrs CDT) but was noted between 0700 and 1030 and 1700 until dusk. By 5 June the incubating bird was wary and often left the nest quietly upon approach by the observer. Calling increased, especially during the nestling period, as the observer approach to 20 m of the nest on the motorcycle trail. Both the incubating or brooding bird and its mate called, yet they seemed little disturbed by suburban noise.

The first downy nestling was observed 13 June. The 31-day incubation period

Fig. 1. Nestling Broad-winged Hawks (*Buteo platypterus*) about 13 and 18 days old, 6 km SW. Waco, McLennan County, Texas, 30 June 1978. Photo by Floyd F. Davidson.

thus approximated is typical of broad-wings in New York (Matray, 1974, *Auk* 91:307–324) but 6–10 days longer than those in Minnesota (Burns, 1911, *Wilson Bull.* 23:139–320). A second, smaller, downy nestling was noted 18 June, as an adult shaded both with its partly extended wings, standing over them at 1340 hr (air 37°C). Sunlight was directly on the nest at this time and later, but the adults were not seen to shade or screen the nestlings in this manner again.

On 22 June at 1830 hr (air 34°C) red mulberry (*Morus rubra*) twigs with freshly wilted leaves had been added on top of the west edge of the nest, obviously shading both nestlings. On 2 July fresh red mulberry twigs and leaves were placed in a like manner by 1600 hr (air 38°C). Greenery is typical in completed Broad-winged Hawk nests (Burns, op. cit.; Matray, op. cit.), as in the nests of 16 other raptors; but earlier observers did not mention such special placement in suggesting and then dismissing the shade hypothesis (Olendorff, 1971, *Raptor Res. Repts.* 1:70–73).

That red mulberry leaves were selected repeatedly in the present circumstance is significant, because they are the largest hence furnish the most shade of any tree in the ravine. Moreover, the specially placed green vegetation was not seen in the early nesting period, when the adults brooded or physically shaded or screened their nestlings (as on 18 June). Nor was other greenery noted in the nest. The fresh twigs with leaves were placed in a direct line with the afternoon sun, not in the path of the house construction, trash dump, or motorcycle trail; so the sun-shade hypothesis is tenable.

By 28 June the two nestlings were partly feathered and often stood up in the nest (Fig. 1). On 6 July both were perched 2–5 m from it in the same tree. On 13 July the larger one perched 1.5 m from the nest while the smaller stood on it, but

both had flown to trees at least 25 m away between 7 and 12 July. The 13 June–6 July nestling period was 5–6 days shorter than reported by Matray (op. cit.), 5–17 days less than noted by Burns (op. cit.), and may have been influenced by 18 consecutive days of air temperatures over 37°C plus the drying of all stream pools except the headwaters pond by 13 July.

The family group was last observed together on 2 August, so the fledgling-dependence period approached 28 days (from 6 July). This is 22–28 days shorter than in New York (Matray, op. cit.) and also could have been influenced by the hot-dry weather. The adult not seen after 2 August, although the immatures were noted until 16 August, still within the 6-ha nesting area of their parents. The only Broad-winged Hawk migration through Bird Hollow, seen in the fall of 1978, occurred 16 September and included immature and adult birds.

Acknowledgments

We thank Jerry Bush, Floyd Davidson, Nancy Gehlbach, and David Jordan for help with the field work.

Lapland Longspur Casualties in Texas

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It is well known that traffic takes a toll of animals along major highways. This type of accident together with a recent snowstorm resulted in a phenomenal destruction of Lapland Longspurs (*Calcarius lapponicus*) in north central Texas. Since we know of no previous examples of heavy Lapland Longspur mortalities in this region, we wish to report a recent occurrence of such a catastrophe.

Lincoln (1950, *Migration of Birds,* Fish and Wildlife Service, Circular 16, p. 76) pointed out that Lapland Longspurs frequently are victims of mass destruction and writes, "Almost every winter brings reports of their death by thousands somewhere in the Middle West." He cites examples for eastern Colorado, Minnesota, Nebraska and North Dakota. T. S. Roberts (1932, *The Birds of Minnesota,* Vol. 2, p. 447) apparently was the first to report this mortality in Lapland Longspurs. He conservatively estimated an exceptionally high number of 750,000 birds killed in a two square mile area during a snowstorm on 13–14 March 1904 on two lakes in southwestern Minnesota. Roberts further speculated that millions of longspurs were killed over an area of approximately 10,000 km^2.

On 17 February 1978 a heavy snowfall of 15–25 cm covered the Dallas area in north central Texas. During the period following when snow was melting, Mrs. Elgin Wilson of Italy, Ellis County, Texas, reported to Mrs. Margaret Roddy of Dallas that large numbers of longspurs had been killed on a stretch of highway in her area. On 20 February Mrs. Roddy and Steve Runnels of the Dallas Museum of Natural History visited the area and confirmed Mrs. Wilson's report. They later indicated to Pulich that "hundreds of Lapland Longspurs" had been killed along U. S. Interstate Highway 35 near the rest stop area north of Italy.

Gollob made a trip to the scene of the kill on 21 February . The bulk of the kill occurred near the rest stop area 30.4 km south of the Dallas-Ellis county line. The first dead Lapland Longspur was found 26.0 km south of the county line and longspurs continued to be found for a stretch of 8.3 km. Many more dead birds were on the east side of the highway than on the west side.

Along the grass and shoulders of the highway, flocks of Lapland Longspurs were still foraging with Savannah Sparrows (*Passerculus sandwichensis*) and Horned Larks (*Eremophila alpestris*). Flocks of over 300 longspurs were in the kill area and were so tame they could be approached within a few meters. If a truck or auto came too close, however, they would readily take flight as a group, then, uttering their typical notes, circle and fly low into the path of oncoming vehicles. This startling maneuver caused many fatalities.

The days following the snowstorm remained cold and crisp, and the day Gollob visited the area early morning temperatures were in the low 20's and the wind blew briskly from the north at 32–40 kph. Snow remained in patches. The highway

where the major portion of the kill took place was bordered by a ditch and an unused service-type road. Many longspurs used the grassy median strip between the interstate lanes of traffic. The road in the vicinity of the kill area was cut level and somewhat protected by the adjacent higher rest stop area. We could not determine whether or not the longspurs flocked to this area for probable protection.

Samples were taken from two stretches of highway, each 0.16 km long, near the rest stop area north of Italy. The first sample, taken just north of the rest stop, tallied 296 dead birds, all Lapland Longspurs with the exception of two Savannah Sparrows; the second, taken 0.48 km south of the rest stop, showed 338 casualties, including one Savannah Sparrow, and two Smith's Longspurs (*Calcarius pictus*) among the Lapland Longspurs. This sample included birds from both sides of the highway with 208 from the east side, 80 from the median strip, and 50 from the west side, clearly showing more longspurs killed on the east side than on the west side.

On their visit to the area the previous day Roddy and Runnels picked up approximately 50 dead birds as specimens for the museum. On 23 February several birders also visited the rest stop site and noted longspurs still being hit by vehicles. They indicated that at least a hundred dead birds littered the highway. Thus the kill extended from 19 February when Mrs. Wilson first noted bird fatalities to at least 23 February.

In view of the fact that over 300 dead birds were counted in each of the two samples we can say that for at least 1.6 km on each side of the rest stop area the mortality rate was 1,875 birds per km (3,000 birds per mile)—totaling 6,000 fatalities. For the remaining distance of the 8.3 km stretch there were about 1,000 bird casualties per 0.16 km (.1 mile), thus adding another 3,200 birds to the total number killed. Mrs. Wilson indicated a similar kill occurred on U.S. Highway 77 lying parallel within 0.8 km to U.S. Interstate Highway 35, but unfortunately no counts were made nor extent determined. We conservatively estimated the overall kill in this area to be approximately 10,000 Lapland Longspurs.

Returning to Dallas, Gollob found another kill of approximately 1,000 Lapland Longspurs on a 1.6 km stretch of State Highway 342 in Red Oak, Ellis County. He saw and heard a flock of at least 50 longspurs in adjacent fields. Continuing on into Dallas County, he saw another road kill of 20 to 30 Longspurs near Cedar Valley Junior College in Lancaster. Nearby flocks of Lapland Longspurs also contained some Horned Larks.

On 22 February members of the Dallas County Audubon Society observed a flock of several hundred longspurs in north Dallas and noted several dozen birds hit by vehicles. Other reports made to Pulich of Lapland Longspur flocks in the Dallas area were made from North Lake in northwest Dallas county and near Kaufman and Terrell, Kaufman County. No kills were noted in the latter two areas.

From all reports made to us for this area we estimated at least 12,000 Lapland Longspurs were killed by vehicles following the most recent snowstorm. None of the birds showed any signs of starvation. Most of those examined by Pulich were extremely fat and had crops filled with weed seeds gathered along the road sides. Nearly all showed hemorrhages due to impact with vehicles.

Allan R. Phillips examined 17 specimens sampled from various north central

locations during the period of casualties. He indicated that most of the birds were the Alaskan race *alascensis* and that only two appeared to be nearer to *lapponicus*. Except for a specimen taken on 9 February 1936, east of Canyon, Randall County in the panhandle, the western race *alascensis* had not been previously reported from Texas (Stevenson 1937, Condor 39:44).

Acknowledgments

We gratefully acknowledge the reports and specimens given to us, and we particularly wish to thank Mrs. Elgin Wilson, Mrs. Margaret Roddy and Mr. Steve Runnels for first alerting us to this avian catastrophe. We are also grateful to Dr. Allan R. Phillips for determining the subspecific identifications of the longspurs.

REQUEST FOR ASSISTANCE

Nesting sites and concentration areas of Least Terns. During the past 5 years, trend data collected by the Texas Colonial Waterbird Census have revealed an approximate 80 percent reduction in nesting pairs of Least Terns on the Texas Coast. Research has been initiated at Texas A & M University to identify causes for the apparent decline in the breeding population. Further information is needed concerning locations of nesting sites and concentration areas (feeding, loafing, courting) to determine characteristics of "use" areas and to identify additional locations for field work related to population dynamics studies. Anyone observing Least Terns along the Texas Coast is requested to record the following: date, time, and specific location of observation; number of terns (or nests) observed; behavior of terns; whether leg-banded or wing-tagged individuals are present; name, address, and telephone number of observer. Observations during the 1979, 1980, and 1981 breeding seasons are needed. Please send information to Bruce C. Thompson, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station 77843.

GENERAL NOTES

A Reinterpretation of the "Stooped–Submissive" Posture in the Purple Martin

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Johnston and Hardy (1962, Wilson Bull. 74:254–255) describe a behavior of the Purple Martin (*Progne subis*), which they term the "Stooped–Submissive" posture. Although they quite accurately describe the posture, their interpretation may be erroneous, as indicated by my studies of Purple Martin behavior in Sherman, Grayson County, northcentral Texas, in 1968–1977. My interpretation of the posture is based on observations of Purple Martins for about 9,000 h during the study.

According to Johnston and Hardy (op. cit.), a martin in this posture "flies with the upper back humped, with head lowered, and with the tail held low; the rectrices are abnormally constricted so that the tail resembles a tapered spine. . . . The action in flight is labored and seems to lack the coordination otherwise typical of martins. The bird may remain in this posture when perched; the wings are drooped and the crown feathers are greatly appressed." Johnston and Hardy also state that the posture may be maintained for only a few seconds to a half-hour and emergence from the posture is gradual.

Johnston and Hardy (op. cit.) report that male martins which are decisively defeated by other males, presumably in territorial encounters, exhibit the Stooped–Submissive posture. But, I have not seen the posture assumed by a defeated bird as a result of intraspecific territorial fighting, although such fighting is very prevalent in early and mid-spring at martin colonies in northcentral Texas. There are many fights in which one male soundly defeats another, but the loser simply retreats without display. Johnston and Hardy (op. cit.) never recorded a female in this posture, and, if their interpretation is correct, this would be surprising since female martins also intensely fight for territories.

It seems best to attribute the Stooped–Submissive posture to sexual behavior. Males often assume the posture when attacked by a *female,* but this aggression is sexual, not territorial as implied by Johnston and Hardy. Females may attack a nearby male which is making sexual advances short of rape, i.e., courting with profuse song and gradual approach toward the female. When such a displaying male is attacked by a female, he often assumes the posture. Attack by the female consists only of a short lunge toward the male. Unpaired females do not attack males in this fashion. I have seen females attack their mates, but the females' aggression usually is directed toward a foreign male which may be paired to another female in the colony. I have also seen males assume the posture imme-

diately following a rape chase of a female; rape chases are described by Brown (1978, Auk 95:588–590). I have two records of males assuming the posture immediately after copulating with their mates, but observations of actual Purple Martin copulations are rare (see Brown, op. cit.). In addition, I have seen male martins show the posture when no explanation was available, but at no time did I suspect that it was related to territorial behavior as Johnston and Hardy suggest. In Sherman, the posture is most frequently observed in February through May while pairs are forming, and I have not seen it in July or August. Like Johnston and Hardy, I have not seen a female martin show the posture. I observed at least 290 instances of the posture in Sherman during 1968–1977.

The exact significance of this posture is unclear, but it is apparent that only males exhibit it. Since a male when in the posture lacks coordination and is less mobile than normal, perhaps the Stooped–Submissive posture serves to inhibit a male when he is attacked by a sexually-unreceptive female. If, instead of showing the posture, the attacked male carried the fight to the attacking female, the female possibly could be harmed and this would reduce reproductive output for the species. Attack by a female with the male's resulting posture also could help to prevent rapes. As evidenced by this posture and studies on sexual chase, sexual behavior in the Purple Martin is rather complex and not well understood at the present time.

First Record of a Ross' Goose in Central Texas

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An adult female Ross' Goose (*Chen rossii*) was collected by B. W. Baker at Somerville Lake, Lee County, Texas, on 1 January 1978. When first sighted, it was alone and flying low over the water. It was the only goose seen by the authors that day. The bird was collected at 0915, approximately 3 h after the onset of a severe northern front. It weighed 1.1 kg and had very little body fat. The ovary measured 7 mm × 18 mm and appeared normal. Bellrose (1976, *Ducks, Geese and Swans of North America,* Stackpole Books, Harrisburg, Pa., p. 131) listed the average weight of an adult female Ross' Goose as 1.6 kg. Kortright (1942, *The Ducks, Geese and Swans of North America,* The Stackpole Co., Harrisburg, Pa., p. 383) reported an average of 1.2 kg for adult females. Total length (572 mm) and wing length (375 mm) were well within the normal ranges reported by both authors.

Oberholser (1974, *The Bird Life of Texas,* Univ. Texas Press, Austin, Vol. 1, p. 147) reported a total of six specimens collected from four Texas counties: Jefferson, Colorado, Jeff Davis, and Wharton. He described the Ross' Goose as apparently rare in Texas and found chiefly in the northern third of the state, along the coast, and near El Paso. A review of all Christmas Bird Counts in Texas from

1946 to 1976 (1947–1977, American Birds 1–31) clearly supported Oberholser's statement. A total of 66 Ross' Geese was reported from nine different counts during the period from 1965 to 1976, with at least one bird reported yearly. Of the nine counts, five were located on or near the coast from Laguna Atascosa to Bolivar Peninsula, three in northern Texas, and one near El Paso. The paucity of Ross' Geese reported on Christmas Bird Counts in Texas between 1946 and 1964 likely indicated a lack of effort in the field identification of this species when found among other geese (notably Snow Geese, *Chen caerulescens*) rather than an absence of birds wintering in Texas during those years.

The bird collected from Lee County is apparently unique, as we found no published specimen records or sight records of Ross' Geese from Central Texas (Regions 5 and 6 of Oberholser 1974). The specimen is No. 10392 in the Texas Cooperative Wildlife Collections of the Department of Wildlife and Fisheries Sciences at Texas A&M University, College Station, Texas.

Dew-bathing by Long-billed Thrashers (*Toxostoma longirostre*), and an Olive Sparrow (*Arremonops rufivirgatus*)

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At 0815 on 5 December 1977 I observed a Long-Billed Thrasher dew-bathing in the top of a 230 cm colima shrub (*Zanthoxylum fagara*) on the Welder Wildlife Foundation, San Patricio County, Texas. On this date, fog was dense, and the dew was especially heavy. The thrasher was observed for approximately 5 minutes during which time it actively moved through the shrub crown. Frequently, it stopped, leaned downward and laterally, and rubbed its sides and ventral surface on moisture-laden leaves. This movement was interspersed with wing fluttering and feather ruffling. After a few minutes of this behavior, the bird had become visibly wet. It then perched, fluffed its feathers, and preened. Under similar foggy conditions, this behavior was twice noted on 30 May 1978 near Dinero, Live Oak County, Texas. On this date a Long-Billed Thrasher and an Olive Sparrow (*Arremonops rufivirgatus*) were observed dew-bathing in the canopy of a 340 cm colima at 0715 and 0730, respectively.

Dew-bathing has been a rarely reported phenomenon. It has been recorded from families Tyrannidae (Berger, Bird Study, 1961), Paridae, Sylviidae, Vireonidae, Parulidae (Veerbeek 1962, Auk 79:719), and Fringillidae (Baptista 1973, Wilson Bull. 85:346–347, and Veerbeek op. cit.). Generally, reports coincide with prolonged droughts. Free-water was unavailable in the chaparral communities on both dates when these observations were made. These observations support Baptista's (op. cit.) premise that dew-bathing may be an important aspect of feather maintenance where free-water is otherwise scarce.

Dow (1968, Bird-banding 39:227–228) suggested that dew-bathing in Cardinals

(*Cardinalis cardinalis*) is elicited by contact with wet leaves during foraging. Since Long-Billed Thrashers spend much of the early morning hours in shrub canopies (personal observation), contact with wet-foliage may well have stimulated this behavior. The same may be true of the Olive Sparrow which had been singing prior to the onset of dew-bathing. These observations represent the first record of dew-bathing by the Long-Billed Thrasher and Olive Sparrow, and to my knowledge, it is the first recorded occurrence of dew-bathing in the family Mimidae.

First Nesting Record of Double-crested Cormorant in Texas Since 1939

Stephen F. Holm[1], Harold D. Irby, and Jack M. Inglis

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On 24 April 1974 Stephen Holm and Randal Howard, research scientists with the Texas Agricultural Experiment Station, discovered 14 nests of the Double-crested Cormorant (*Phalacrocorax auritus*) on the extreme southern end of Toledo Bend Reservoir at the mouth of Mill Creek Bay. According to Oberholser (1974, *The Bird Life of Texas,* Univ. Texas Press, Austin), this species last bred in Texas in 1939. The 14 nests, situated 7–10 m above water, were in two dead bald cypress (*Taxodium distichum*) standing adjacent to each other in about 20 m of water in the open reservoir. At least 10 nests had an adult apparently incubating eggs. Other nests were in various stages of completion.

On 2 May and 22 May 1974 Dr. Harold D. Irby and Holm revisited the colony and took photographs. The colony had increased to 11 nests in one tree, 3 in another, 2 in a third, and 1 in a fourth. Most nests had three young, several had one or two and one had four (the latter was within 0.6 m of a second nest and the large nestlings might have transferred to the one nest). Figure 1 shows an incubating adult with obvious nuptial plumes on the sides of its head. Irby and Holm made observations again on 5 and 19 June, 3 July, 7 and 27 August, 17 September, and 11 October.

On 3 July a large nestling with a broken wing was found at the base of a nest tree. Irby and Holm collected this bird and deposited it in the Texas Cooperative Wildlife Collection (No. 9539) at Texas A&M University. On this date there were still three young birds at the nests. On 7 August only five cormorants were observed on the southern end of the reservoir, all near the nest trees. On 27 August seven were observed, but all within bay areas of the reservoir. On 17 September no cormorants were observed, but on 11 October 18 birds were counted—again on the open lake.

[1] Present address: Route 3, Box 95S, Palestine, Texas 75801.

Fig. 1. Nesting Double-crested Cormorants on Toledo Bend Reservoir. Photographed on 2 May 1974 by Stephen Holm.

A flock of 24 cormorants observed on 11 December 1973 on the southern portion of the reservoir and the flock of 18 seen on 11 October 1974 might indicate that a good portion of the individuals of the breeding colony had been present on this inland reservoir most of the year.

Subsequent monthly observations determined that this species did not breed on the extreme southern portion of Toledo Bend in 1975. However, one Double-crested Cormorant nest was found on 27 June 1977 in vegetation in the middle of the reservoir about 1.6 km above the Texas Highway 21 bridge. It was photographed on 15 July (C. D. Fisher, pers. comm.).

These observations were made as part of an environmental impact assessment for the Blue Hills Nuclear Power Station supported through Bechtel Power Corporation through Gulf States Utilities Company (TAES Project No. S-6024).

Occurrence of the Coppery-tailed Trogon in Hidalgo County, Texas

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Webster (1978, Am. Birds 32:227–230) noted our observation of a female Coppery-tailed Trogon (*Trogon elegans*) in Bentsen–Rio Grande Valley State Park, Hidalgo County, on 14 September 1977. Herein we provide further documentation of this interesting record.

Debbie Gendron first noticed a medium sized bird with a long tail as it flew across the road ahead of our vehicle. The bird landed at the edge of a camp site clearing about 20 m away. After parking the vehicle, we cautiously approached to within 5 m of the bird. We observed it from close range with 7 × 50 binoculars, while Gendron took six photographs using a Minolta 101 SLR with a 400 mm Vivitar lens. The bird was readily identified as a female Coppery-tailed Trogon by its parrot-like profile, long square tail, brown upperparts and pink belly. After approximately 5 min the trogon flew into nearby vegetation and was not heard or seen again by us during the two days we camped in the park.

Four of the six slides provided confirmation of our identification of the species. One slide was forwarded to Dr. Keith A. Arnold, Texas A&M University, for incorporation into the Texas Photo-Record File for birds (Nos. 132 a & b) and another was published in the March 1978 issue of *American Birds*.

Oberholser (1974, *The Bird Life of Texas,* Univ. Texas Press, Austin) has detailed the few observations of this species in Texas. The earliest dates from summer, 1877, when hunters shot two birds near Las Cuevas and Rio Grande City, Starr County. From their descriptions J. C. Merrill identified the birds as trogons and relayed reports to Robert Ridgeway, who confirmed the identification as *T. ambiguus* Gould. The species was not again reported in Texas until 23 and 24 September 1957 when one was seen near San Benito, Cameron County by T. Gill, L. C. Goldman and G. E. Hudson Jr. Another sighting was said to have been made at Brownsville (fide R. T. Peterson) and in the vicinity of Big Bend National Park.

The Coppery-tailed Trogon is usually listed as a casual or accidental species in Texas. In this context, a severe storm passed through the Bentsen–Rio Grande Valley State Park area the night before our arrival and discovery of the trogon.

NOTES AND NEWS

ABOUT THE ARTIST.—The illustration of a Red-cockaded Woodpecker (inside front cover) is an original pen and ink drawing by Linda M. Roach, a native east Texan. She has an art studio (Linda M. Roach—Watercolors) in Nacogdoches. Her wildlife art includes works in a variety of media, including watercolors, ink, and pencil. She has recently completed artwork for a documentary film on the Red Wolf and illustrations for the book, *Paisanos,* published by the Texas Folklore Society. Linda Roach is an avid birder, wildlife photographer, and nature observer.

Her studio address is P. O. Box 6073, SFA Station, Nacogdoches, Texas 75962.

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The *Bulletin* and *Newsletter* of the *Texas Ornithological Society* are issued to all members not in arrears for dues. Membership in the *Texas Ornithological Society* is open to all persons interested in observation, study, and conservation of birds in Texas. Membership dues are $3.00 per year (student), $5.00 per year (active), $10.00 per year (sustaining), $100.00 paid once, or in $25.00 annual payments over a period not to exceed four years (life). Inquiries regarding membership should be addressed to Ms. Elaine Robinson at *TOS,* P.O. Box 19581, Houston, Texas 77024. Original articles, reports and other items submitted for inclusion in the *Bulletin of the Texas Ornithological Society* should be sent to the editor, R. Douglas Slack, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843.

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Black-bellied Whistling Duck from Burleson County, Texas, July 1978. Photograph by Robert Stickney, taken at the Texas A&M University Aquaculture Center.