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HOUSE WREN MIGRATION COMPARED WITH OTHER WRENS: AN EMPHASIS ON FLORIDA

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Six wren species breed in the eastern United States: House (*Troglodytes aedon*), Winter (*T. troglodytes*), Bewick's (*Thryomanes bewickii*), Carolina (*Thryothorus ludovicianus*), Marsh (*Cistothorus palustris*), and Sedge (*C. platensis*). Of these, the House Wren is probably the most abundant and has the largest and most continuous breeding range. Florida is the southern limit of the wintering range of most of the eastern populations. From our studies of avian migration in central and peninsular Florida, we present data on wren migration: demographics, chronology, weights, geographic origin, and routes. Particular emphasis is on House Wrens and the species' occurrence in Florida.

MATERIALS AND METHODS

Data are from birds killed during night migration flights at the 472 m WDBO-WFTV and WSWB transmitting TV towers in Orange County (central peninsular Florida) (Taylor and Anderson 1973, Taylor 1976) and at the 308 m WCTV tower in Leon County (northwest Florida) (Stoddard and Norris 1967). The central Florida studies cover 6 yr, but the last 2 (1974, 1975) at only the WSWB tower, were meagerly productive; most data are from the WDBO-WFTV tower during 1969–1973. Work at WCTV began in 1955 (Crawford 1981), but age, sex, and weight data are from 1973–1976 (Crawford 1978). At both sites, fresh specimens were frozen soon after collection. Shortly thereafter, they were thawed, weighed, and dissected to determine sex and age (by skull ossification). We also reviewed accounts of similar studies of accidental wren mortality, banding studies, and all recoveries of banded wrens processed through August 1978 by the Bird Banding Laboratory. The disasters at the Florida facilities are among the largest documented for both the House and Marsh wrens.

To compare regions, we used the percentage of House Wrens among the total number of identified wrens killed or banded (Tables 1 and 2). The assumptions to which this index of relative abundance is subject were discussed by Nisbet (1970).

RESULTS AND DISCUSSION

House, Winter, Marsh, and Sedge wrens occur frequently in accounts of nocturnal, autumnal bird kills (Table 1); except for the Sedge Wren, they are trapped commonly at banding sites (Table 2). Both means of sampling record the House Wren as the most abundant species: 42% of 1829 wrens killed were House; 62.8% of 6922 wrens banded were House. Even though House Wrens migrate during autumn in large numbers across a broad area of the eastern and midwestern U.S., ap-

TABLE 1. Occurrences of House Wrens among wrens killed in nocturnal autumnal migration.[1]

State/Province	Total wrens	Wren species[2]					
		H	W	M	S	C	B
Plains							
Ontario	35	2	14	15	4	0	0
Saskatchewan	7	4	0	2	1	0	0
North Dakota	20	8	0	7	5	0	0
Nebraska	5	2	0	2	1	0	0
Iowa	60	24	0	20	16	0	0
Kansas	18	11	0	3	4	0	0
Missouri	39	17	2	14	6	0	0
Oklahoma	52	28	7	7	8	2	0
Subtotals	(236)	(96)	(23)	(70)	(45)	(2)	(0)
Great Lakes							
Minnesota	49	18	2	10	19	0	0
Wisconsin	14	4	0	5	5	0	0
Illinois	40	7	2	17	14	0	0
Indiana	1	0	0	1	0	0	0
Michigan	10	1	5	2	2	0	0
New York (upstate)	51	19	28	3	1	0	0
Subtotals	(165)	(49)	(37)	(38)	(41)	(0)	(0)
Eastern Inland							
Tennessee	(130)	(30)	(10)	(76)	(14)	(0)	(0)
Atlantic Coastal							
Massachusetts	1	0	0	1	0	0	0
Maryland	21	19	0	2	0	0	0
Washington, DC	19	1	0	10	8	0	0
Virginia	1	1	0	0	0	0	0
North Carolina	143	70	23	42	8	0	0
Georgia	4	1	1	3	1	0	0
Tallahassee, FL	740	384	26	113	213	1	3
Orlando, FL	367	118	0	198	51	0	0
Subtotals	(1298)	(594)	(50)	(369)	(281)	(1)	(3)
Totals	1829	769	120	553	381	3	3

[1] Data compiled from published and unpublished studies that cover primarily the past 20 yr. See appendix for published sources, acknowledgments for unpublished sources.

[2] Species designations: H = House, W = Winter, M = Marsh, S = Sedge, C = Carolina, and B = Bewick's wrens.

parently more individuals migrate through or east of the Appalachian Mountains than to the west (Tables 1, 2; Ralph 1981). These observations are consistent with the long-distance, autumn recoveries of House Wren (Fig. 1) and with the data obtained from racial determinations of autumn migrants killed in Florida. All 4 long-distance, autumn-migrating House Wrens recovered in Florida were banded in the northeastern states. Marsh Wrens, on the other hand, may be more frequent west of

TABLE 2. Occurrence of House Wrens among wrens banded while migrating in autumn.[1]

Banding location	Total wrens	Wren species[2]					
		H	W	M	S	C	B
Manomet, MA (1966–1978)	685	513	129	4	0	39	0
Wadsworth Sanctuary, CT (1971–1975)	271	191	77	1	0	2	0
Brookhaven, NY (1965–1975)	551	173	76	288	0	14	0
Sandy Hook Park, NJ (1971–1975)	49	13	36	0	0	0	0
Island Beach, NJ (1956–1979)	1380	591	642	80	1	65	1
Bellevue, MD (1969–1971)	89	50	8	0	0	31	0
Kiptopeke Beach, VA (1969–1975)	1621	1150	270	8	1	191	1
Vischer Ferry, NY (1967–1974)	215	73	125	16	0	1	0
Ellenville, NY (1970–1980)	45	44	1	0	0	0	0
Farmersville, NY (1966–1980)	142	138	4	0	0	0	0
Powdermill, PA (1959–1981)	1728	1398	230	46	4	48	2
Allegheny Front Mountain, W. VA (1970–1980)	146	15	122	0	0	2	7
Totals	6922	4349	1720	443	6	393	11

[1] Data compiled from published and unpublished studies. Individuals who sent results from their banding stations are mentioned in the Acknowledgments.

[2] Species designations: H = House, W = Winter, M = Marsh, S = Sedge, C = Carolina, and B = Bewick's wrens.

the mountains than on the east side (Tables 1 and 2). At the WSM TV tower in Nashville where annual studies of migrants have been conducted in excess of 15 yr, Marsh Wrens outnumber House Wrens in individuals killed (Table 1). The frequent appearance of these 4 species in nocturnal accidents supports a nocturnal migration for them, but the absence of Carolina Wrens from the kills combined with the high numbers banded (Table 2) suggest that this species moves largely by day. The overall scarcity of Bewick's Wren may be because of its reduced population.

In Florida, House, Marsh, and Sedge wrens occur frequently in the central peninsula at WDBO-WFTV and in the northwest portion of Florida at WCTV (Tables 1 and 3). Carolina and Bewick's wrens were unrecorded at WDBO-WFTV; only 1 Carolina and 3 Bewick's were

FIGURE 1. Long-distance, autumn–winter recoveries of the House Wren.

recorded at WCTV during 25 yr of study. Winter Wrens were absent from WDBO-WFTV, but they occur regularly at WCTV, supporting Sprunt's (1954) statement that the species was rare in the peninsula. Marsh Wrens were more numerous at WDBO-WFTV than at WCTV; we suspect that this relates to the greater amount of marsh habitat available in southern Florida than in the panhandle. The House and Sedge wrens were relatively more numerous at WDBO-WFTV, considering the number of years for each study.

At both sites, most individual wrens migrate late (Tables 3 and 4). The peak of autumn migration is in mid-October. At WDBO-WFTV, the largest, single-night kill for the House, Marsh, and Sedge wrens was on 17–18 October 1969. All 3 species were migrating together at least during this kill. This is well after the migration of most individual warblers, vireos, and other intercontinental migrants is well underway. Extreme migration dates suggest that Marsh Wren migration through the peninsula is more prolonged than in the panhandle area.

Age ratios.—For many migratory species banded in autumn in the eastern U.S., higher percentages of adults are captured at inland sites than at coastal ones (Murray 1966, Barry 1971, Heintzelman 1972). The central Florida facility is inland and for many species adults clearly outnumber immatures. Of 344 House, Marsh, and Sedge wrens aged from the central Florida towers, 208 (60.4%) were adults. Adults outnum-

TABLE 3. Comparison of individuals of 4 wren species killed at the WCTV TV tower and the WDBO-WFTV, WSWB TV towers. Dates in parentheses are extreme migration dates.

Species/date	Sept	Oct	Nov	Dec	Totals
House Wren					
WCTV (19 Sept–12 Dec)	15	329	36	4	384
WDBO-WFTV, WSWB (29 Sept–29 Oct)	9	109	1	0	119
Winter Wren					
WCTV (10 Oct–15 Nov)	0	20	6	0	26
WDBO-WFTV, WSWB (0)	0	0	0	0	0
Marsh Wren					
WCTV (19 Sept–18 Nov)	7	99	7	0	113
WDBO-WFTV, WSWB (12 Sept–2 Dec)	33	159	3	1	196
Sedge Wren					
WCTV (19 Sept–24 Nov)	8	193	12	0	213
WDBO-WFTV, WSWB (8 Oct–30 Oct)	0	51	0	0	51

bered immatures in all wrens, but only the Marsh Wren samples clearly show a preponderance of adults (125) over immatures (59). Of 81 individuals of the same species aged at WCTV, only 25 (31%) were adults; immatures outnumbered adults in all species. The greatest difference occurred in the Sedge Wren (immatures, 20; adults, 2). From 182 House Wrens banded while migrating in autumn at Kiptopeke Beach, Virginia, a coastal banding station, immatures (178 of 182, 98%) dominated the samples (F. R. Scott, pers. comm.). Similar results were found for House Wrens banded during the autumn at Island Beach, New Jersey, another coastal station (Murray 1966). However, results from 2 banding stations (Binghamton, New York; New Land Research Reserve, New Jersey) show a preponderance of immature House Wrens banded in the autumn despite both being inland sites (Heintzelman 1972, Yunick 1973). Heintzelman (1972) believed that the relative high percentage of immatures on the Reserve can be attributed to a large number of immature birds fledged in or near the area. Sufficient age data for the other wren species are not available for comparison.

Sex ratios.—For all 3 species of wrens collected in autumn at WDBO-WFTV, females (190) outnumbered males (124); the greatest differences in the sexes occurred in the Marsh Wren (64% females) and the Sedge Wren (63% females). Adult female Marsh Wrens dominated age-sex classes. Crawford (1978) found nearly equal sex ratios in smaller samples of House and Sedge wrens; sex data for Marsh Wrens killed at WCTV are too few to compare. The high percentage of female wrens at the central Florida tower may be due to a geographic displacement of the sexes on the wintering grounds, with males occupying the northernmost part of the wintering range.

TABLE 4. Adult/immature seasonal casualty totals for 103 House, 167 Marsh, and 43 Sedge wrens collected at the WDBO-WFTV and WSWB TV towers, autumns 1969–1972 and 1974–1975.

	Sept				Oct					Nov Dec	
Species	8–14	15–21	22–28	29–30	1–7	8–14	15–21	22–28	29–31	1–7	2
House Wrens (103)											
Males	—	—	—	1/0	2/1	13/12	10/7	2/0	—	—	—
Females	—	—	—	3/5	3/2	15/6	4/11	2/3	0/1	—	—
Marsh Wrens (167)											
Males	1/1	1/0	3/1	11/2	7/1	19/6	2/1	0/1	—	1/1	0/1
Females	1/0	1/1	0/1	4/0	7/1	30/27	22/6	5/1	—	—	—
Sedge Wrens (43)											
Males	—	—	—	—		6/5	5/0	—	—	—	—
Females	—	—	—	—		5/11	4/4	1/1	1/0	—	—

Weights.—Weights of 74 House Wrens killed at WDBO-WFTV, 39 House Wrens at WCTV, 126 Marsh Wrens at WDBO-WFTV, and 30 Sedge Wrens at WDBO-WFTV are in Table 5. The mean weights for all age-sex classes of each species are similar. Female Marsh and Sedge wrens weighed slightly less than did the males. House Wrens killed in central Florida weighed nearly the same as those killed at the northwest Florida tower. The mean weights for all age-sex groups for all 3 wren species are less than those given by Clench and Leberman (1978) for HY-U (hatching year-unknown sex) and AHY-U (after-hatching year-unknown sex) birds banded in September and October. Our adult House Wren mean weights are similar to their AHY-U wrens banded in April and May, and our immatures' mean weights are similar to their HY-U wrens that were weighed in June, July, and August. Also, our birds weighed less than the migrants at Island Beach, New Jersey (Murray and Jehl 1964). This weight difference of our birds is consistent with the fact that they had undergone long-distance migration and that the birds were at or near their wintering areas.

Recovery analysis.—All House Wren recoveries processed through August 1978 by the Bird Banding Laboratory were examined (n = 2218 records). To standardize the data, a month was considered to be composed of 30 days. We determined the following: minimum ages, the frequency of the same bird repeating at or near the place of banding after 1 yr or more of being banded, the number of individuals that were recaptured at or near the place of banding 6 months or less after being banded, the number of individuals that were recaptured at or near the place of banding in excess of 6 months after being banded, the number of short-distance records (i.e., ≤62 km from place of banding to place of recovery) of individual wrens, and the number of long-distant records (i.e., >62 km from place of banding to place of recovery).

TABLE 5. Weights (g) of 113 House, 126 Marsh, and 30 Sedge wrens killed at WDBO-WFTV and WCTV TV towers, September–November.[1]

Species	Age and sex			
	Ad M	Im M	Ad F	Im F
House Wrens (74) (WDBO-WFTV)				
Number	19	15	18	22
Mean ± SD	10.3 ± 0.49	10.8 ± 0.88	10.3 ± 0.45	10.5 ± 0.79
Range	9.1–11.1	9.4–12.4	9.6–11.3	9.1–11.9
House Wrens(39) (WCTV)				
Number	9	11	7	12
Mean ± SD	10.6 ± 0.99	10.7 ± 0.81	10.4 ± 0.66	10.6 ± 0.49
Range	9.4–12.4	9.1 –11.9	9.6–11.3	10.1–11.8
Marsh Wrens (126) (WDBO-WFTV)				
Number	39	10	47	30
Mean ± SD	10.3 ± 0.95	10.4 ± 0.79	9.1 ± 0.63	9.4 ± 0.60
Range	7.9–12.4	8.7–11.3	7.9–10.9	8.1–10.5
Sedge Wrens (30) (WDBO-WFTV)				
Number	8	3	8	11
Mean ± SD	8.3 ± 0.53	8.3 ± 0.51	7.5 ± 0.27	7.8 ± 0.61
Range	7.5–8.8	7.9–8.9	7.2–7.9	6.7–9.0

[1] Over 75% are October birds; all Sedge Wrens are October birds.

From the 2218 recovery records of banded House Wrens, 2164 (97%) individuals repeated at or near the place of banding; 1775 (82%) were recaptured in excess of 6 months after being banded, and 389 (17.9%) were recaptured 6 months or less after being banded. There were 207 (9.3%) instances of the same bird repeating at the same site at least 1 yr after being banded: 166 (80.1%) repeated once after the first recovery, 27 (13.0%) repeated twice, 13 (6.3%) repeated 3 times, and 1 individual repeated 4 times. Of the 207 records analyzed, 132 (63.7%) were adults, and 41 (19.8%) of unknown age at the time of banding. The data suggest that House Wrens show considerable site fidelity and at least some individuals probably follow the same migration route year after year. One House Wren banded by Taylor on 2 November 1975 at Winter Park, Florida, was recovered precisely at the same banding site on 15 January 1977.

There were 23 short-distance recoveries and 31 (21 autumn, 10 spring) long-distance (Figs. 1 and 2) recoveries.

Age records.—Minimum age records for 1955 banded-recovered House Wrens were analyzed. Most of the records (1151, 59%) fell into the 0–12-month category, followed by 589 (30%) in the 13–24-month, 149 (8%) in the 25–36-month, 43 (2%) in the 37–48-month, and 19 (0.9%)

FIGURE 2. Long-distant, spring recoveries of the House Wren.

in the 49–60-month category. There were 2 wrens each in the 61–72- and 73–78-month categories.

Racial determinations.—Twenty-six wrens killed in autumn migration at WDBO-WFTV tower were determined as to subspecies by Roxie Laybourne of the U.S. National Museum. Subspecific determinations for 36 autumn-killed wrens at WCTV were made by T. D. Burleigh. At WCTV these included: 3 *Troglodytes aedon aedon,* 1 *T. a. parkmani,* 11 *T. a. baldwini,* 8 *Cistothorus palustris palustris,* 7 *C. p. dissaeptus,* and 6 *C. p. iliacus.* At WDBO-WFTV these included: 4 *T. a. aedon,* 6 *C. p. palustris,* 3 *C. p. dissaeptus,* and 13 *C. p. waynei.* The occurrence of *Cistothorus palustris waynei* was unexpected. The tower specimens represent the southernmost record of this race and extend its winter range farther than previously known (A.O.U. 1957). *C. p. waynei* has been recorded at the WCTV tower in northwest Florida (Kale 1975). The specimens of *C. p. iliacus* represent a range extension of this wren in Florida (Stevenson and Baker 1970). Sprunt's (1954) statement that *C. palustris palustris* is apparently a rare winter resident in Florida is probably incorrect judging from the common occurrence of the subspecies from the kills at both towers.

SUMMARY

Data gathered from nocturnal kills of migrants and from autumnal banding studies indicate that a large migration of House Wrens prob-

ably occurs through or east of the Appalachian Mountains. The species is commonly killed in autumn migration at tall-lighted structures and trapped at banding sites during the fall. In Florida, greater numbers of House, Marsh, and Sedge wrens probably migrate through the peninsula than in the northwest area where Winter Wrens are more common. At the central Florida TV towers, adult and female House, Marsh, and Sedge wrens outnumbered immatures and males; immatures of the same species dominated the samples at the northwest TV tower. Weight loss of the central Florida wrens is consistent with the fact that they had undergone long-distance migration. The recovery analysis of banded House Wrens in the U.S. suggests considerable site fidelity for the species. Most minimum age records from 1955 banded-recovered House Wrens fell into the 0–12-month category. Three races of House Wrens and 4 races of Marsh Wrens were found at the Florida facilities. A southern, wintering range extension for *Cisthothorus palustris waynei* was found.

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LITERATURE CITED

American Ornithologist' Union. 1957. Check-list of North American birds. 5th edition, Baltimore, Port City Press, Inc.

Barry, J. S. 1971. Differential fall migration. EBBA News 34:55–66.

Clench, M. H., and R. C. Leberman. 1978. Weights of 151 species of Pennsylvania birds analyzed by month, age, and sex. Bull. Carnegie Mus. Nat. Hist. 5.

Crawford, R. L. 1978. Autumn bird casualties at a northwest Florida TV tower: 1973–1975. Wilson Bull. 90:335–345.

———. 1981. Bird casualties at a Leon County, Florida TV tower: a 25-year migration study. Bull. Tall Timbers Res. Sta. 22:1–30.

Heintzelman, D. S. 1972. Age classes of birds migrating southward through central New Jersey—autumn 1970. EBBA News 35:239–244.

KALE, H. W., II. 1975. Extension of winter range of *Telmatodytes palustris waynei* to Georgia and Florida. Auk 92:806–807.

MURRAY, B. G., JR. 1966. Migration of age and sex classes of passerines on the Atlantic Coast in autumn. Auk 83:352–360.

———, AND J. R. JEHL, JR. 1964. Weights of autumn migrants from coastal New Jersey. Bird-Banding 35:253–263.

NISBET, I. C. T. 1970. Autumn migration of the Blackpoll Warbler: evidence for long flight provided by regional survey. Bird-Banding 41:207–240.

RALPH, C. J. 1981. Age ratios and their possible use in determining autumn routes of passerine migrants. Wilson Bull. 93:164–188.

SPRUNT, A., JR. 1954. Florida bird life (with addendum 1963). Coward-McCann, New York.

STEVENSON, H. M., AND W. W. BAKER. 1970. Records of new avian subspecies in Florida. Florida Nat. 43:69–70.

STODDARD, H. L., SR., AND R. A. NORRIS. 1967. Bird casualties at a Leon County, Florida TV tower: an eleven-year study. Bull. Tall Timbers Res. Sta. 8:1–104.

TAYLOR, W. K. 1976. Migration of the Common Yellowthroat with an emphasis on Florida. Bird-Banding 47:319–332.

———, AND B. H. ANDERSON. 1973. Nocturnal migrants killed at a central Florida TV tower; autumns 1969–1971. Wilson Bull. 85:42–51.

YUNICK, R. P. (ed.). 1973. Atlantic flyway review. EBBA News 36:125–132.

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APPENDIX

The following references were used in preparing Table 1 but not mentioned in the text or Literature Cited.

ADAMS, D. H. 1962. Nocturnal migrant mortality in the Carolinas, September, 1962. Chat 26:83–88.

AVERY, M., AND T. CLEMENT. 1972. Bird mortality at four towers in eastern North Dakota—fall 1972. Prairie Nat. 4:87–95.

BAGG, A. 1971. The changing seasons. Am. Birds 25:16–23.

BAIRD, J. 1971. Mortality of birds at the Boylston television tower in September of 1971. Chickadee 41:20–23.

BALDWIN, D. H. 1963. Enquiry into the mass mortality of nocturnal migrants in Ontario. Progress Report II. Ontario Nat. 1:7–15.

BIERLY, M. L. 1973. 1971 fall television tower casualties in Nashville. Migrant 44:5–6.

BREWER, R., AND J. A. ELLIS. 1958. An analysis of migrating birds killed at a television tower in east-central Illinois, September 1955–May 1957. Auk 75:400–414.

BROUGHTON, D. 1977. The bird kill problem at Ontario hydro's thermal generating station. Unpubl. rep. CTS-07017-1 Environmental Protection Depart., Central Thermal Services, 700 Univ. Ave., Toronto, Ontario.

CALDWELL, L. D., AND G. L. WALLACE. 1966. Collections of migrating birds at Michigan television towers. Jack-Pine Warbler 44:117–123.

CARTER, J. H. III, AND J. F. PARNELL. 1976. TV tower kills in eastern North Carolina. Chat 40:1–9.

———. 1978. TV tower kills in eastern North Carolina; 1973 through 1977. Chat 42: 67–70.

CLARK, A. R. 1975. Television tower bird kill. Prothonotary, 41:131–136.

———. 1976. Erie County television tower casualties: 1976. Prothonotary 42:144–146.

———. 1977. Erie County television tower casualties: 1977. Prothonotary 43:198–200.
———. 1978. Erie County television tower casualties: 1978. Prothonotary 44:186–189.
———, S. E. WADE, AND A. SCHAFFNER. 1974. Tower kill record. Prothonotary 40:113–114.
CRAWFORD, R. L. 1976. Some old records of TV tower kills from southwest Georgia. Oriole 41:45–51.
EASTERLA, D. A., J. K. MARTINSON, AND D. SNYDER. 1961. Large bird kills at TV towers. Bluebird 28:9.
ENGLISH, A. O. 1961. Destruction of birds in migration. Raven 32:66–67.
GANIER, A. F. 1966. Some facts learned from nocturnal migration. Migrant 37:27–34.
GOLLOP, M. A. 1965. Bird migration collision casualties at Saskatoon. Blue Jay 23: 15–17.
GOODPASTURE, K. A. 1974. Fall 1972 television tower casualties in Nashville. Migrant 45:29–31.
———. 1976. Nashville television tower casualties, 1975. Migrant 47:8–10.
GRABER, R. R. 1968. Nocturnal migration in Illinois—different points of view. Wilson Bull. 80:36–71.
GREEN, J. C. 1962. Destruction of migrating birds at the Duluth ceilometer. Flicker 34:3–6.
GREGORY, H. 1975. Unusual fall tower kill. Bluebird 42:9–10.
HERNDON, L. R. 1973. Bird kill on Holston Mountain. Migrant 44:1–4.
HEYE, P. L. 1963. Tower fatalities. Bluebird 30:7.
JOHNSTON, D. W., and T. P. Haines. 1957. Analysis of mass mortality in October, 1954. Auk 74:447–458.
KEMPER, C. A. 1958. More TV tower destruction. Passenger Pigeon 21:135–142.
———. 1964. A tower for TV 30,000 dead birds. Audubon Mag. 66:86–90.
LASKEY, A. R. 1966. TV tower casualties at Nashville; spring and fall, 1966. Migrant 37:61–62.
———. 1969. TV tower casualties at Nashville in autumn 1968. Migrant 40:25–26.
———. 1969. Autumn 1969 TV tower casualties at Nashville. Migrant 40:79–80.
———. 1971. TV tower casualties at Nashville; spring and autumn, 1970. Migrant 42: 15–16.
MANUWAL, D. D. 1963. TV transmitter kills in South Bend, Indiana, fall 1962. Indiana Aud. Quart. 41:49–53.
MOSMAN, D. 1975. Bird casualties at Alleman, Ia. TV tower. Iowa Bird Life 45:88–90.
NERO, R. W. 1961. Regina TV tower bird mortalities—1961. Blue Jay 19:160–164.
NORMAN, J. L. 1975. Birds killed at a TV tower near Coweta, Oklahoma. Bull. Okla. Ornithol. Soc. 8:25–27.
———. 1976. Birds killed at a TV tower near Coweta, Oklahoma. Bull. Okla. Ornithol. Soc. 9:20.
———. 1977. Birds killed at a TV tower near Coweta, Oklahoma in the fall of 1976. Bull. Okla. Ornithol. Soc. 10:6–8.
NORWOODS, J. R. 1960. TV tower casualties at a Charlotte station. Chat 24:103–104.
OVERING, R. 1936. The 1935 fall migration at the Washington monument. Wilson Bull. 48:222–223.
———. 1937. The 1936 fall migration at the Washington monument. Wilson Bull. 49:118–119.
———. 1938. The 1937 fall migration at the Washington monument. Wilson Bull. 50:146.
PARMALEE, P. W., AND B. G. PARMALEE. 1959. Mortality of birds at a television tower in central Illinois. Bull. Ill. Aud. Soc. 111:1–4.
PETERSEN, P. C., JR. 1959. TV tower mortality in western Illinois. Bull. Ill. Aud. Soc. 112:14–15.
SEETS, J. W., AND H. D. BOHLEN. 1977. Comparative mortality of birds at television towers in central Illinois. Wilson Bull. 89:422–433.
SMITH, L. B. 1966. Bird mortality at radio and TV towers near Winnipeg, September 1965. Blue Jay 24:172–176.

STRAND, F. W. 1975. More bird kills at KROC-TV tower, Ostrander, Minnesota. Loon 47:16–21.

TROTT, J. 1957. TV tower fatalities at Chapel Hill. Chat 21:28.

TURNER, L., AND M. DAVIS. 1980. Birds killed at television towers in Knox County. Migrant 51:27–29.

WEIR, R. D. 1973. Bird kills at the Lennox generating plant autumn 1973. Blue Bill 20:55–57.

———. 1974. Bird kills at the Lennox generating plant spring and autumn 1974. Blue Bill 21:61–62.

———. 1975. Bird kills at the Lennox generating station spring and autumn 1975. Blue Bill 22:47–48.

———. 1976. Bird kills at the Lennox generating station spring and autumn 1976. Blue Bill 23:41–43.

———. 1977. Bird kills at the Lennox generating station spring and autumn 1977. Blue Bill 24:40–42.

WESTMAN, F. 1967. Casualties at station CKVR-TV Barrie. Pp. 18–19, 180, *in* Devitt, O. E. 1967. The Birds of Simcoe County, Ontario. Bereton Field Nat. Club, Barrie, Ontario.