NEST CONSTRUCTION BY HOUSE WRENS

By Robert A. McCabe

The scientific binomial of the House Wren (*Troglodytes aedon*) implies that it is a "cave-dwelling songstress." This description may be in part misleading, since the female wren does not sing. The "cave-dwelling" aspect implies that this wren builds its nest in a cave-like shelter. This paper reports on the structure of wren nests built in three-quart-sized "No. 10 tin cans" (2839 cc.; depth, 17.2 cm.; diameter, 15.5 cm.) adapted as nest boxes (McCabe and Ellarson, 1959).

Wrens were studied on the University of Wisconsin Arboretum and Wildlife Area at Madison, Wisconsin. The objective of one phase of this study was to appraise the nest structure. Over a period of eight years, 80 nests were examined after the breeding season was over. Only nests in which at least one egg had been laid were analyzed. The number examined in any one year was too variable and often too small for year-to-year comparisons. For various reasons, data on physical measurements were not available for all nests for all years, hence the numbers vary in the tables. Numerical data were analyzed statistically. Twig material from the nests was identified with the aid of botanical keys and an herbarium twig collection; feathers and hair were checked against museum specimens.

In general, House Wrens build nests in a wide variety of natural and artificial cavities. The industry and diligence of the wren when nest building are well known, and the literature records many humorous and interesting nest situations. The nest is built in two stages: the first part, always built by the male, although females occasionally carry sticks, is a crude formation of twigs with a nest depression in the back of the twig platform. The location of the depression was the same for the many nests built in the tin-can nest boxes and for a number of nests I observed in the natural cavities. Baird, Brewer, and Ridgway (1875:151), however, described the nest thus: "In the midst of these masses of material they construct a compact, cup-shaped, inner nest." In the tin-can nest boxes the nest cavity was always in the rear quarter of the box opposite the entrance, never in the center of the box. The amount of material in this bulky part of the nest may depend upon the availability of a mate. Males that acquired a mate very early in the breeding period usually built smaller nests than did those that acquired mates later. An unsuccessful male frequently filled the nest box with twigs to a point where it appeared difficult for him to enter or leave the box.

Twigs were piled up in the center of the nest box, forcing the wren to creep over the mound before the nest cavity could be reached. There is a limit to the amount of material that a male will use. The three-quart can was adequate for the wren's capacity to fill most of the cavity. It does not always hold that a wren will fill the nest cavity selected. Roberts (1932, fig. 343, p. 90) shows a wren nest built in a large box where only a small section held the twig nest.

The "male" nest, or first stage, is not compact, but it is built solidly and is partly interlocking. Alexander Wilson's (1832:132) astute observations on this aspect of nest building are: "The twigs with which the outward parts of the nest are constructed are short and crooked, that they may the better hook in with one another, and the hole or entrance is so much shut up, to prevent the intrusion of snakes, or cats, that it appears almost impossible the body of the bird could be admitted." The twigs in the nest materials of this study were not uniformly crooked

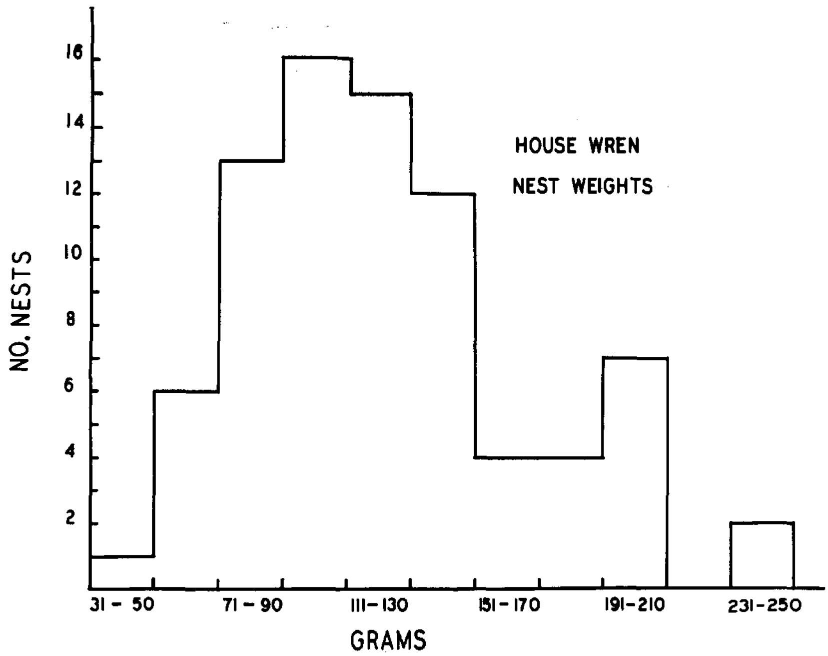

Fig. 1. Distribution of nest weights of House Wrens. The nests were built in three-quart tin-can nest boxes.

and not all entrances were blocked as indicated by Wilson. The entrance to the nest was very often constricted by twigs which narrow the entrance or create a small corridor-like passage within the box. The small nest cup and its narrow approaches may discourage some predators, but the raccoon (*Procyon lotor*) must be excepted. This predator was able to reach into the nest box through the entrance and with dexterous forepaws pulled out nest contents through the narrow passageway. One advantage of the matrix of coarse twigs was that a wren in the box confronted by a predator could use the twigs as escape cover. I found that wrens trapped in the box for banding used the twigs as cover.

A constricted entrance as a result of nest building was not always found among the nests examined. A small hole in the nest box might eliminate the need for the wren to reduce the size of the entrance. Barrows (1912:673) conducted a simple experiment using nest boxes with large and small entrances, and he states: "this bird [House Wren] almost invariably selects the box with the *larger* opening. . . ." He reasons, and I agree, that the larger opening was chosen because of the relative ease with which the nest material could be brought into the box.

All twigs forming the bulk of the nest were dead and dry. I never saw a wren break a dead twig from the parent source or bring to the nest any green material, but I often saw wrens pick up dry twigs from the ground. When Godard (1915) gave nesting House Wrens a choice of green twigs or dead twigs, the latter were preferred.

A male wren may build in several boxes at the same time, but I found that only one of these nests was completely formed and readied for lining. Whether these multiple nests are, as Kendeigh (1941:24) points out, "to give an incoming female

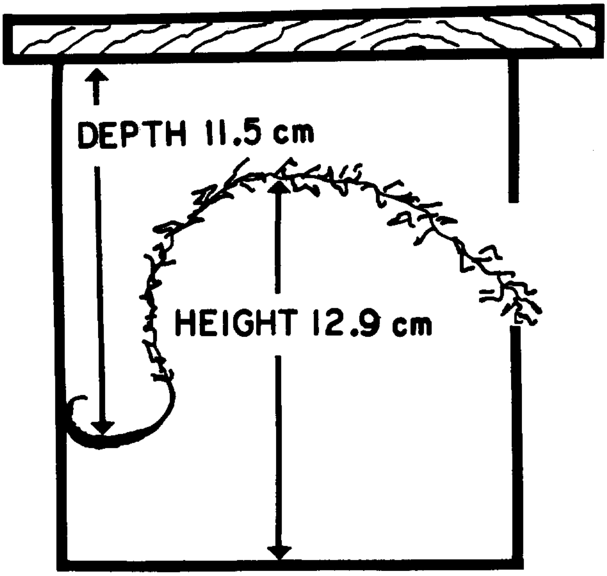

Fig. 2. Schematic side view of an average House Wren nest built in a number 10 tin-can nest box.

a choice of various sites for nesting," I do not know. The nests seem to be components of territory in the same way as multiple feeding areas and singing perches. The female always accepted the male nest that was ready to be lined.

The second stage of nest building, the lining of the nest cavity prior to egg laying, is carried on by the female. A variety of soft, delicate materials is used. Occasionally a female adds lining material during egg laying and early incubation. In this study the linings, like the twigs, varied in composition and weight.

The size of the nest box limited the amount of nest material to three quarts (2839 cc.), but no box was ever completely filled. The mean weight for 52 nests (fig. 1) was 121 gm. (standard error, 5.1). The weight of the nest is determined by the number of twigs used and the plant species involved. Oak (*Quercus* spp.) twigs, for example, are heavier and bulkier than aspen (*Populus tremuloides*) twigs.

I was unable to devise a suitable method to quantify and compare nest bulk. Baird, Brewer, and Ridgway (1875:151) describe one nest container of the House Wren as "holding perhaps a bushel [of nest material]." McAtee (1940:334) reported that "the material in one nest, loosened up in the process of analysis, filled a two-gallon bucket." Generally the bulkiness of the nests varied with the type of material used.

Most nests are made up of twigs of from three to five plant species. Some species are represented by quantities less than one gram in weight. The distribution of plant species among the twigs in 40 nests examined was:

Number of species	1	2	3	4	5	6	7	8	9	10
Frequency	1	2	10	9	7	3	5	1	1	1

One species of plant usually is predominant among the twig components. In an average nest, 67 per cent of the weight is contributed by the predominant species (table 1).

The weight of the nest lining was difficult to obtain largely because of contam-

TABLE 1
PREDOMINANCE RANKING BY WEIGHT OF COMPONENTS IN 40 HOUSE WREN NESTS

Predominance order	Aggregate weight (gms.)*	Per cent of total weight
1	2335	67
2	692	20
3	295	8
4	94	3
5	46	1
6	20	0.5
7	16	0.5

* Items of less than 1 gm. omitted.

ination that occurred during the nestling period. Twenty-six nest linings averaged 3.6 gm. (standard error, 0.4).

Nest depth was the distance from the upper rim of the can to the bottom of the nest cavity (fig. 2). This measurement, taken only on completed (lined) nests, related nest to nest box and could be taken precisely. The mean depth of 39 nests was 11.5 cm. (standard error, 1.5). In all cases the dome of twigs in the center of the box prevented direct entry from the hole in the can to the nest cavity, regardless of the depth of the nest. Only two nests contained so many sticks that the nest cavities were built above the level of the entrance hole (7.0 cm. from top of can).

Nest height was the distance from the bottom of the can to the top of the dome of twigs. Although this measurement is not precise because of the uneven nature of the twigs, 19 nests averaged 12.9 cm. (standard error, 0.5). The greatest nest height was 16.6 cm. The wren in this case entered the nest cavity via a corridor through the twigs.

In spite of the limited number of plant species represented in the twigs in any one nest, there was considerable variation among the 52 nests examined; 36 species of plants were recorded. All but four were woody plants; 13 were found in only one nest each. Tartarian honeysuckle (*Lonicera tatarica*) was most commonly used although plum (*Prunus americana*), oak, black locust (*Robinia pseudo-acacia*), black cherry (*Prunus serotina*), and white cedar (*Thuja occidentalis*) contributed greater weight per nest.

Rootlets and tendrils were primarily from grape (*Vitis* sp.), woodbine (*Parthenocissus quinquefolia*), and a variety of cultivated vines grown near the study area. Unidentified plant material in most cases consisted of stem pieces from dried herbaceous plants. Finely broken plant material, discarded food items, droppings, and so forth were recorded as debris. Six nests contained metal in some form. In one case, an average-size nest weighed 902 gm., due largely to an accumulation of 706 gm. of roofing nails in addition to the plant material. Other workers have recorded metal as part of wren nests. Battell (1925), for example, lists the following items found in a wren nest: 68 nails, 52 hairpins, 120 small nails, 13 staples, 4 tacks, 10 pins, 11 safety pins, 6 paper fasteners, and 52 pieces of wire.

In general, the frequency of plant species in the nests paralleled the abundance of the plants in the vicinity of the nest. I offered a pair of wrens an unlimited but paint-marked supply of twigs from five common woody plants. These were found in the nest in the following quantities: Tartarian honeysuckle, 38 gm.; plum, 37; oak, 16; black locust, 12; and elm (*Ulmus americana*), 9. In addition, there were 3 gm.

TABLE 2

NEST LINING MATERIAL IN 52 NESTS OF THE HOUSE WREN

Item	Number of nests	Per cent	Item	Number of nests	Per cent
Feathers	52	100	Horse hair	14	27
Grass	35	67	Rootlets + tendrils	13	25
Spider egg sacs	30	58	Plastic/cellophane	4	8
Plant parts	25	48	Hair	4	8
Snake skin	20	38	Twine	2	4
Pine needles	18	35	Snail shell	2	4

of Japanese barberry (*Berberis thunbergii*), 5 gm. of aspen, and 4 gm. of unmarked plum. Ideally an experiment on preference should have many replications on wrens building nests for the first time.

Nest linings averaged only 3.6 gm. in weight. Eleven items were recorded in 52 nest linings examined in detail. No one item predominated although no nest was lacking in feathers (table 2). Fine grass was common. Other items such as pine needles, rootlets and tendrils, twine, plant parts, and horse hair had the same general characteristics as the fine grass, being long, thin, and flexible. In four cases, short-haired fur was recorded. Pierce (1925) reports the death of a wren when it became entangled in the horsehair lining of a nest.

Pieces of shed snake skin were found in 20 nest linings. The gathering of snake skins is a practice common to another hole-nesting species, the Great Crested Flycatcher (*Myiarchus crinitus*). The man-made counterpart of snake skins, cellophane cigar wrappers, along with bits of thin transparent plastic, were also found in four nests. Spider "cotton" or egg sacs were found in 30 nests, both in the lining and in all parts of the twig base. Other workers have also recorded spider cotton in wren nests. McAtee (1927:180) stated that "it is apparent that birds' nests are favored hibernacula for at least the spiders of the immediate environment." This may be a fact, but a wren nest becomes a favored hibernaculum only because the wren brings the egg sacs into the nest box. What biological significance this accumulation of spider egg sacs has for the wren I do not know. Samuels (1870) and Judd (1895) report spiders in the diet of the House Wrens. In two instances I found fragments of snail shells in wren nests. These fragments were probably discarded during the feeding of young. McAtee (1940) also reports a fragment of a snail shell in a wren nest along with other debris associated with feeding nestlings.

The prime component of the nest lining was feathers. The frequency of feathers occurring in the linings of 43 nests approximates the commonness of birds found in the wren habitat. Ring-necked Pheasant (*Phasianus colchicus*) feathers were found in 36 of the 43 nest linings; Catbird (*Dumetella carolinensis*) in 16; House Wren in 15; Mallard (*Anas platyrhynchos*) and chicken (*Gallus gallus*) 14 each, and Brown Thrasher (*Toxostoma rufum*) and Robin (*Turdus migratorius*) 11 each. Feathers from 18 other species were found in from one to nine nests. The greatest diversity was found in a nest with feathers from seven species. Occasionally a lining had a considerable number of one kind of feather. This occurred when a predator plucked a bird in the area frequented by the wren. Dark-colored feathers were more common than those of light shades. Large birds (that is, ducks and pheasants) are important feather contributors because the feathers remain available longer, are more numerous, and carcasses are more readily located.

If cigar wrappers can replace snake skins, twine can replace horsehair, and metal can replace wood, we need not fear for the survival of the House Wren in man's synthetic environment.

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SUMMARY

Fifty-two House Wren nests built in three-quart tin cans adapted as nest boxes were examined, measured, and the components of each identified. The nest is built in two stages: the first, made by the male, is a bulky mass of twigs with a nest depression in the rear of the box opposite the entrance. The average depth of the nest cavity of 29 nests was 11.5 cm., the average height of 19 nests was 12.9 cm., and 52 nests weighed an average of 121 gm. Tartarian honeysuckle, black cherry, and oak head a list of 36 plant species found among the twigs in the nests. One plant species was usually predominant in any one nest, comprising about 67 per cent of the weight of the nest. The nest lining or second stage was built by the female. Eleven items were found in linings of 52 nests. Chief among these soft lining materials were feathers which were found in all nests. Twenty-five different species of birds were represented in the feathers found in 43 nest linings.

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