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CACTUS WRENS' NESTS IN SOUTHERN ARIZONA

By FLORENCE MERRIAM BAILEY

AT the north base of the Santa Rita Mountains between 4000 feet at Mc-Cleary's, now Nicholson's (where we camped during the winter of 1920-21), and Continental at 2900 feet on the Tucson-Mexico spur of the Southern Pacific, throughout both the mesquite and catsclaw slopes leading down from the mountains and the cholla cactus flats of the lower terraces, nests of the Cactus Wrens (*Heleodytes brunneicapillus couesi*) were the most conspicuous ornithological features of the landscape.

Near 4000 feet a well-populated patch of mesquite, catsclaw, and zizyphus, which was conveniently located on the Continental road and bordered above by the fence of the cattle ranch and below by the telephone line from Madera (White House) Canyon, included approximately fifty-three acres and was utilized for an intensive study of Cactus Wren nests.

Thirty-seven nests of sufficiently recent use to show in which direction they faced were found here. Seven of these were certainly disused, and three apparently so, the remaining twenty-seven, in January or February, showing fresh entrance material or other signs of readiness for occupation.

WINTER ROOSTS

About the middle of December, when a flurry of snow whitened the Santa Rita peaks and a number of cold nights made warm nests especially desirable, I surprised two Cactus Wrens busily carrying warm lining materials to a nest in a ball of mistletoe. Remembering Mr. Anthony's notes in *Zoe* (II, 2, pp. 133-134) on the remodelling of New Mexico Cactus Wrens' nests for winter roosts, I looked forward to seeing more of the interesting process. But his dates, which I had forgotten, showed that the work of rebuilding was going on during pleasant weather from October 24, and about the first of December "all of the nests of the vicinity were so thoroughly repaired that they had every appearance of new nests." In the *Nidologist* he recorded finding the wrens "hidden in their nests during a snowstorm in November."

Unfortunately I did not begin taking the census of the fifty-three acres until January 12, and no other Cactus Wrens were seen carrying material until spring. By January 18, when I had listed and tagged thirty-one of the thirty-seven nests, the structural part of the remodelling was all too evidently finished, although a few straws and many feathers were added to some of the nests still later. From January 13 to February 15, twenty-three of the twenty-seven good nests on the fifty-three acres were found occupied at sunset, which by repeated experiment was proved to be the retiring hour. Among the miscellaneous nests outside the fifty-three acres (also examined at sunset) on February 2 and 11 seven more were found occupied, making a total of thirty nests found used as winter roosts. Much to our surprise, on our twilight rounds a Bewick Wren was twice flushed from one of the Cactus Wren nests. A cholla cactus nest of the Cactus Wren in the giant cactus belt below, had also been used as a roost by a bird of another species, the mouth of the nest being carpeted with the ordure of a large bird.

BREEDING SEASON

When taking the nest census on January 15, a warm day that might have suggested nesting time, I heard an outburst of song and found four Cactus Wrens excitedly gathered about one tree which contained two old, broken-down nests. Two of the birds were singing with great animation, one on top of a bush spreading his tail. On January 29, another spring-like day, Mr. Bailey found some of the wrens in the fifty-three acres "singing, chasing, and fighting." Then, on February 15, what appeared a bit of courtship rivalry was witnessed. But on repeated visits the fifty-three acres was oppressively silent. On April 10 songs were heard suggesting that it was time to be watching for real nest work, but the songs came from only two or three places. In one of these the day before, April 9, I had found a nest in the first stages of construction. Outside the fifty-three acres, in the bottom of a neighboring hot wash, on April 13, Mr. Bailey found a nest being built in a cholla, both wrens gathering bills-full of grass and slender stems from the ground, and singing as they worked. Another cholla nest on the fifty-three acres had been begun before May 1, the week of our departure. But on April 30 about half of the accessible roosting nests were examined for sitting birds in the daytime, and nothing was discovered.

In the adjoining Catalina region, Mr. W. E. D. Scott has said the first eggs are laid as early as March 20; and on March 13, 1885, Mr. Herbert Brown of Tucson reported nesting well under way, the general nesting season, correlated with February rains, being unusually advanced. But as the winter of 1920-21 was marked by severe drought, said to be the worst in thirty years, the breeding season as well as the vegetation may well have been retarded. Whether this was the case, or the fault was mine in failing to discover the breeding nests, the unfortunate fact remains that I was unable to correlate the summer and winter uses of the nests and had to leave unanswered many of the questions I had hoped to answer; among them—How many of the roosting nests were cock nests and how many of them would be used by the females for their eggs and young?

NESTING SITES

While many of the nests were grouped within a small radius, in some cases two or three being in the same tree, on the other hand, isolated nests were far from being the exception. Suitable bunches of mistletoe for building sites seemed one of the controlling factors.

While the name Cactus Wren was justified in this locality as in others by the innumerable nests found in cholla cactus, here thorny trees and bushes especially catsclaw and zizyphus (*Z. lycioides*) or lote bush, were also used extensively, while mesquite and the dense shrubby hackberry or grenjeño were used occasionally for nesting sites. It was interesting to note that zizyphus bushes containing nests generally stood under mesquite trees, so getting double protection. The protection afforded by the armament of thorns was often so complete that it was impossible to reach a nest without cutting away the obstructing branches. Even that, however, did not always satisfy the nest makers, for such bulky, conspicuous nests need to be safeguarded in every way from hawks, owls, and other enemies. Thirty-five out of sixty-four nests examined were not only protected by the entangling thorns of the surrounding branches but were built within clusters of the red-flowered mistletoe (*Phora-*

dendron californicum) which in many cases partially or wholly concealed them. One nest lay on a level branch covered by an unusual horizontal growth of mistletoe and showed only as a darkened mass inside, but most of them were in round ball-like masses of mistletoe, commonly at the ends of branches in terminal mistletoe rosettes, frequently so dense that it was impossible to obtain nest statistics or photographs. One of the nests without mistletoe protection was built under an umbrella-like mass of foliage.

NEST CONSTRUCTION

In form, the Cactus Wren's nest suggests a retort, having a large globular chamber about six inches in diameter approached through a long passageway or entrance, the whole normally about twelve inches in length, the mouth of the entrance being about three inches above the base of the globular chamber. This nest chamber in course of years becomes a thick felted mass of gray, weathered plant fibers so hard that saucer-like sections sometimes crack off from the back, showing the solid, sodden bottom of the nest. The entrance, on the contrary, is made of long straw-like plant stems which may easily get blown about and so often need replenishing.

When the old nests are repaired and ready for winter use these new straw-colored entrances often afford a striking contrast to the old gray globes, although occasionally the new material is lavishly distributed over the whole top of the nest. One nest, found on March 21, looked new, only straw-colored material showing from the few possible points of observation; but it might easily have had merely a coating of fresh material. A mass of fuzzy plant material was outside the mouth. An old gray nest fragment which might have supplied foundation material was behind the nest. Besides replenishing the straw entrance, the wrens re-line for cold weather. In one instance fur, and in many instances the small gray body-feathers of the Gambel Quail, and sometimes well-marked feathers of other species of birds, were seen in the entrances and about the mouths. One nest used for roosting purposes during the winter, when examined for eggs on April 30, had its globular chamber so thickly lined with soft feathers that it suggested a feather bed.

Considerable variation and adaptability were shown in the construction of the nests examined. Sometimes in the process of repair the angle of the entrance was changed. In one case, while the old nest faced east, the new entrance faced south by east, almost at right angles, presumably for better support for the mouth and larger twigs for perches at the mouth. The contrast in angle was emphasized by the color difference, the old nest chamber (about seven inches long and sagged at base) being gray and weathered, while the new entrance (about six inches long) was straw colored.

As it has been said, more than half the nests in other than cactus were built inside a round ball-like mass of mistletoe and were supported by its innumerable twiglets. The value of this support is realized when considering the tendency of the hard outer shell of the globular chamber to crack off if unsupported.

In one instance the mistletoe protection made the builders extra work, for the diameter of the mistletoe ball was so great that the hallway of the nest had to be abnormally extended to provide an exit for the family at the outer edge of the ball. When not built inside a mass of mistletoe the nest was variously supported—by a crotch, by a horizontal branch and the trunk of

the tree, or by an angle of branches. In one case the whole nest lay along a drooping branch so that the entrance was at the same height as the bottom of the globe instead of three inches above, as commonly. Here, as if to preserve the integrity of the nest chamber, it was high arched, the deepest part measuring seven inches. In some cases for structural or other reasons the entrance was much lower or higher than typical, varying from almost level to four, five, and seven inches above the base of the retort. In one unusually large nest, evidently generations old, fresh material piled on lavishly kept the entrance high above the old sagged base.

An extreme instance of the tendency to utilize the mass of material already gathered in an old nest rather than to gather new material to build from the foundations up was shown in a nest that was being completed when we left. The old weathered remnant which was flattened down and drawn out horizontally was taken as roofing for the new nest although the nearest support for a base was about ten inches below the roof. To partly fill the gap the lighter material of the entrance of the old nest was pulled down. Whether the resulting structure satisfied the builders or not, we left too early to tell. While the entrance of the old nest had faced northwest, that of the new one faced southeast. In another peculiar remodelled nest the old one was a cup with the entrance on top. A few fresh straws were found here on January 30 but on February 22 there were no further signs of work or of use.

An inferior nest supported poorly except at the back and exposed on top was beginning to break down and stood all winter unrepaired and unused. Another inferior nest had the entrance so poorly supported that it was blown apart and had caved into the twigs several inches below. In still another the bulky globe protruded conspicuously and a slab was cracking off the back. A high nest, at the tip of a long branch about nine feet above the ground, stood with big gaping mouth and dangling straws, suggesting the visit of an owl; while an unusually low nest, within easy reach of ranging horses and cattle, had one of its supporting twigs broken off, the nest material being strewn over the branches for nine inches.

NEST MATERIAL

The material of this low, ruined nest, when examined by Mr. Gorm Loftfield, one of the Carnegie botanists conducting experiments on the neighboring U. S. Range Reserve, was found to contain eighteen species of plants, as follows:

<i>Pectocarya</i>	<i>Hosackia trisperma</i>
<i>Allocarya</i>	<i>Acacia constricta</i>
<i>Franseria tenuifolia</i>	<i>Acacia greggii</i>
<i>Plantago ignota</i>	<i>Prosopis j. velutina</i>
<i>Gilia aurea</i>	<i>Portulaca</i>
<i>Phacelia distans</i>	<i>Muhlenbergia porteri</i>
<i>Eriogonum polycladon</i>	<i>Heteropogon contortus</i> (young plant)
<i>Eriogonum abertianum</i>	<i>Scleropogon brevifolius</i>
<i>Lupinus parviflorus</i>	<i>Aristida bromoides</i>

Another nest examined by Mr. Bailey had a long *Plantago* stem sticking out in front and others attached to the body of the nest, and included several species of long-stemmed grass, *krinitzkias*, and wild mustard. Feathers of Road-runner and Sparrow Hawk were found on the outside, and downy feath-

ers in the hallway. A new cholla nest that was being built on our departure was notable for its beautiful pearly seed-scales taken from the Ephedra, scales which suggested white rosettes. Plant materials from a cholla nest were identified by Mr. Gorm Loftfield as follows:

Eriogonum polycladon, fair amount.	Aristida divaricata, much.
Eriogonum abertianum, fair amount.	Aristida bromoides, much.
Evolvulus (argenteus?), some.	Bouteloua rothrockii, fair amount.
Haplopappus gracilis, little.	Bouteloua aristidoides, some.
Chaetochloa composita, fair amount.	Andropogon saccharoides, fruits mostly.
Lupinus parviflorus and Hosackia trisperma, fair amount in one part of nest, practically none elsewhere.	

DIRECTIONS FACED BY NESTS

A study of the direction faced by the nests was taken up to determine if the birds were influenced in building by the prevailing direction of the winds and storms which come from the Gulf of California to the southwest, from which would also come the hottest, most prolonged summer sunshine.

In the summaries given beyond, the directions between the cardinal points of the compass are lumped and seem to indicate a preference for the sunny and windy exposure. Taking the nests facing only directly southwest, however, we have only fourteen out of ninety-five; but in a matter of wind and sun narrow limitations seem unsafe for generalizations.

It can be fairly said, nevertheless, that southwest nests, not in cholla, so far as could be determined through obstructing mistletoe, were so well supported and protected as to be practically storm proof. Perhaps the most striking of these was in a catsclaw surrounded by dense mistletoe, for it lay on the main leaning trunk and was arched so low as to present a strong wall to the wind.

The damage done to badly situated and poorly constructed and protected nests was easily seen, in one case the whole entrance being blown to one side. The cholla nests especially showed evidence of being beaten by the wind, many of them lying on top of low cactus, inadequately anchored and open to the storms.

SUMMARY

I. THIRTY-SEVEN NESTS INSIDE THE 53 ACRES

Location. Of the 37 nests, 21 were in catsclaw (15 in red mistletoe), 15 in zizyphus, and 1 in mesquite (in red mistletoe).

The approximate height from the ground varied from 4 to 9 feet; 5 were 4 to 5 feet; 9, 5 to 6 feet; 11, 6 to 7 feet; 5, 7 to 8 feet; and 7, 8 to 9 feet.

Approximate length of nests. Those whose outline could be seen varied from 7 to 12 inches, 12 inches apparently being the normal length.

Feathers seen at entrance. In 15 of the nests low enough to be examined, feathers were seen either in the mouth or outside the entrance. Sometimes they were scattered among the leaves below as if dropped from the entrance.

Disused nests. Only 7 surely, and 2 probably, were disused.

Wrens found roosting in nests. Of the 23 wrens found, the earliest was discovered at 4:28 P. M. (January 13), no others being found for nearly an hour later. Practically all went in at sunset, the afterglow being noted at 6:10. The records ran: 5:40 P. M. January 30; 5:53 P. M. February 3; 5:54 P. M. January 30; and 5:55, 5:55+, 6:01, 6:03, 6:05, 6:05+, 6:07, 6:10 (also February 3), 6:10+, 6:12, and 6:13 P. M. February 2; most of the others being recorded after sunset.

II. TWENTY-SEVEN MISCELLANEOUS NESTS OUTSIDE THE 53 ACRES

Location. Of 27 nests, 17 were in catslaw (14 in red mistletoe), 2 in zizyphus, 4 in mesquite (in red mistletoe), and 4 in shrubby hackberry.

The approximate height from the ground varied from 4 to 9 feet, 2 being 4 feet; 7, 5 to 6 feet; 6, 6 to 7 feet; 4, 7 feet; 6, 8 to 9 feet; and 2, 9 feet.

Approximate length. One over 10, and one, 13 inches, were recorded.

Feathers seen at entrance. In 6 nests.

Wrens found roosting in nests. Of the 7 found, one was recorded at 5:45 P. M. February 2; the rest "at sunset," February 11.

III. LOCATION OF 64 NESTS INCLUDING 37 ON THE 53 ACRES AND 27 MISCELLANEOUS ONES OUTSIDE THE 53 ACRES

Of 64 nests, 38 were in catslaw (29 in red mistletoe), 17 in zizyphus, 5 in mesquite (in red mistletoe), 4 in shrubby hackberry; and altogether 34 in red mistletoe.

The approximate height from the ground varied from 4 to 9 feet, 7 being 4 to 5 feet; 16, 5 to 6 feet; 17, 6 to 7 feet; 9, 7 to 8 feet; and 15, 8 to 9 feet.

IV. THIRTY-ONE NESTS IN CHOLLA CACTUS

Location. In the 31 nests examined, the approximate height from the ground varied from 2½ to 6 feet, there being only one under 3 feet. There were 12 from 3 to 4 feet (3 being 3½ feet, 4 being 3 feet 9 inches); 13 from 4 to 6 feet (5 being under 5 feet); the height of 5 being unrecorded.

Feathers seen at entrance. In 10 nests.

Disused nests. Six surely, and one probably.

While some of the cholla nests examined were substantial and well protected, most of them were decidedly inferior to the nests found in other bushes and trees. Being lower and more exposed to wind and storm, especially in the case of those on top of the lowest chollas, they had apparently been blown to pieces, presenting a most dilapidated appearance. Of 6 nests in a radius of about 25 feet, there were good, old, and partly demolished ones.

Feathers of Gilded Flicker, Scaled Quail (scaled ones), and of Verdin (yellow ones) were found. In one nest hard to get at, overhanging straws suggested an entrance from below. One unfinished nest was curved around, while another had the mouth turned to one side, as if to avoid obstructing cactus arms.

DIRECTIONS FACED BY NESTS

I. 37 nests on 53 acres: North, 4; northeast, 5; east, 1; southeast, 3; south, 3; southwest, 12; west, 2; northwest, 7.

II. 27 miscellaneous nests outside of 53 acres: North, 4; northeast, 3; east, 2; southeast, 6; south, 4; southwest, 5; west, 2; northwest, 1.

III. 64 nests, including 37 on 53 acres and 27 miscellaneous ones outside of 53 acres: North, 8; northeast, 8; east, 3; southeast, 9; south, 7; southwest, 17; west, 4; northwest, 8.

IV. 31 nests in cholla cactus: North, 2; east, 4; southeast, 4; south, 8; southwest, 8; west, 1; northwest, 4.

V. 95 nests, 37 in 53 acres; 27 miscellaneous, and 31 cholla nests outside 53 acres: North, 10; northeast, 8; east, 7; southeast, 13; south, 15; southwest, 25; west, 5; northwest, 12.

Washington, D. C., May 31, 1922.