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## THE STORAGE OF ACORNS BY THE CALIFORNIA WOODPECKER

By HENRY W. HENSHAW

WITH ONE PHOTO

**Y**EARS AGO when I first visited California my attention was attracted by the antics and behavior of the "carpintero", or California Woodpecker as it is more widely known, and I looked hopefully forward to the time when I should have the opportunity to carefully study the habits of this the most remarkable of our woodpeckers. The looked for opportunity, however, never came, and all I can hope to do at the present time is to add a few desultory notes and gleanings to the very suggestive and interesting account of the storage habits of the bird by Dr. Ritter in *THE CONDOR* for January, 1921.

Before advertng to the subject proper a few words may be devoted to the general subject of food storing in the animal world by way of comparison with the well known habits of our woodpecker. The storing of food in times of plenty against the hour of need would seem to be a procedure so natural that one can but wonder that it is not more common among animals, especially when we find the habit so well developed in an order as low as the insects. Whole groups of these, as the ants, bees, and wasps, have acquired the practice, and have devised many curious ways, not only of storing food for themselves, but of providing sustenance for their offspring yet unborn.

Passing at a jump from the lower orders to the higher we find that not a few members of the rodent family, the largest of the order, rely upon stored food for their existence a part of the year, and by their thrift and foresight are thus enabled to inhabit regions where otherwise they could not exist. Many of them, however, substitute the practice of aestivation and hibernation to carry them past the seasons of drought and cold, certain of the western ground squirrels and the well known woodchuck of weather-wise fame furnishing examples.

The perishable nature of their food forbids the carnivorous mammals from storing supplies, though we catch a glimpse of the practice in certain of them, as the lion and other cats, which often hide their partly devoured kills with intent to return to them later for further meals.

Turning now to the highly organized group of birds, but one remove from the mammals, we find that very few have developed the storage habit, even to a slight degree, and that most birds are dependent for food upon their daily

toil. The majority of them, indeed, lead a "hand to mouth" existence and spend most of their waking hours in the never ending quest for sustenance for themselves and their offspring. In the cold and temperate zones, when the food supply begins to fail, most of them depart for regions where food is plenty and never failing. In their constant struggle for life their wings confer upon birds a great advantage over their less mobile cousins, and it is of interest to note that the bats, the only family of mammals that has developed the power of flight to the point that vies with birds, has also adopted the habit of migration, and, with rare exceptions, the several species leave the colder regions for more tropical ones.

The most conspicuous example among birds of a food storer is the California Woodpecker, under which name for the purposes of this paper are included the "Ant-eating Woodpecker" of our southern border and Mexico, and the "Narrow-fronted Woodpecker" of Lower California. All these are but subspecies of *Melanerpes formicivorus*.

In early November of 1884, while conducting linguistic researches among the California Indians, I visited the town of Los Alamos, having found there an old Indian who formerly lived on Santa Rosa Island, and who was one of the last survivors of his tribe, if not the last. My daily walks morning and afternoon to where he lived on the outskirts of the town carried me through a grove of scattered oaks, and here I had an excellent, though brief, opportunity to observe a colony of woodpeckers storing away acorns in holes already drilled in the dead branches of the oaks.

Here for the first and only time I saw the birds pick up pebbles from the ground, and insert them in the holes as a substitute for acorns. This apparently nonsensical departure from the acorn storing habit is by no means entirely devoid of significance, and forms an interesting example of a useful habit gone wrong. The explanation of the substitution of pebbles for acorns seemed to me at the time to be simple enough; nor do I see any present reason to change my view. California is remarkably well supplied with oaks, and the valleys, foothills, and mountains each have their own species. Nevertheless not every year is an acorn year, and some seasons the supply of mast is very small indeed, or altogether wanting. It chanced that there was a very poor crop that year about Los Alamos, and, acorns being for the most part wanting, the birds took the readiest substitute. The storage habit developed through thousands of years has now become imperative, and, as the birds have to store something in the holes already suggestively prepared, they take the most convenient substitute, quite oblivious of the fact that the stones have no food value nor, indeed, any value whatever to the storer, except that arising from the pleasure of storing them, which will be adverted to later. Probably not many stones are thus laid away as compared to the number of acorns, but, as the birds have no further interest in them, they remain where placed till in the lapse of years they weather out and fall to the ground.

The practice of storing stones in the holes dug for the reception of acorns is by no means a local one. Other observers, as quoted by Dr. Ritter, have noted the habit in widely separated localities, both in our own territory and Mexico. Thus C. R. Orcutt contributed to *Science* of March 14, 1884, a note stating that 75 miles south of the boundary, in Mexico, at an altitude of 6000 feet, he observed "the bark of pines perforated with holes" in about one-third

of which were acorns; in the rest were bits of granite gravel of size corresponding with the acorns in the other holes. This was unmistakably the work of our woodpecker, and the unusual percentage of stones would seem to indicate either the work of years or to point to several recent bad acorn seasons.

It is interesting to note that the habit of this woodpecker of storing food is not confined to the temperate zone but accompanies the species to its tropical habitat where food abounds and there would seem to be no adequate reason for it. Thus it is stated in the Proceedings of the Zoological Society (p. 14, 1876), that Mr. O. Salvin exhibited and made remarks on the section of the trunk of a pine from Guatemala perforated by a woodpecker (*Melanerpes formicivorus*) "for the purpose of storing acorns".

De Saussure\* also states that in the desert near Cafre de Perote, Vera Cruz, Mexico, *Colaptes cafer* [Red-shafted Woodpecker] bores holes into dead agave stalks through which it inserts acorns into the hollow interior of the stalk. The birds begin the holes near the bottom and fill up the entire stalk. The storing of this food for consumption later in the winter must be important in woodpecker eyes, since the acorns were brought from a considerable distance from the mountains where alone the oaks grow. This account tallies so well with the habits of the California Woodpecker and is so unlike the known habits of *Colaptes* that I am led to raise the question whether or not the bird was that species and not the red-shafted one. At all events the birds were woodpeckers, and they appear to have hit upon a safe place of deposit which argues well for their intelligence.

While I do not doubt that the acorn-storing habit is based on the more or less definite intent to provide food for future use, the faulty methods employed and the imperfect results obtained show that as yet the birds have only imperfectly learned their lesson. Thus when the acorn season arrives the birds do not systematically proceed to fill all the available holes and then make others as needed, but dig holes at any and all seasons as they have leisure or feel inclined. The result is that the supply of holes in a locality usually far exceeds the number of acorns stored, with a corresponding waste of energy and lack of foresight.

In searching for the motives underlying the storing habit of the California Woodpecker we should not lose sight of the fact that the several acts in the process, the boring of the holes, the search for the acorns, the carrying them to the holes and the fitting them in, bear no semblance to work in the ordinary sense of the term, but is play. I have seen the birds storing acorns many times, and always when thus engaged they fill the air with their joyous cries and constantly play tag with each other as they fly back and forth. When thus engaged they might not inaptly be likened to a group of children at play.

In further illustration of the play habit of this woodpecker it is to be noted that its bill, as in the case of others of its tribe, is wonderfully well adapted to digging into wood, and it is as natural for the bird in its idle moments to dig just for the fun of it as it is for the boy to whistle or the proverbial Yankee to whittle a stick. I have many times observed the Downy and the Hairy Woodpecker drilling holes in sound trees with no apparent purpose unless to occupy an idle moment. I have also noticed in Maine live fir trees in the trunks of which several inches of bark and wood had been dug out by the

\*Observations sur les Moeurs de Divers Oiseaux des Mexique, 1858.

Pileated Woodpecker for no apparent reason, and I am constrained to the opinion that in such cases amusement has much, if not everything, to do with the act. So, too, it appears to be when the Hairy Woodpecker beats a tattoo on a dry resonant limb, a very pleasant musical sound even to human ears, with no apparent object in view save the fun of making a noise or perhaps occasionally signalling to some distant mate. We may note in passing that one result of this play habit, though probably not anticipated by the bird, is to keep the bill and the muscles connected with it in serviceable condition for the more serious labor of digging out larvae from the wood.

The California Woodpecker is not the only one of our birds that has glimpsed the advantage of storing food against the time of need, as witness the impaling of mice, small birds, and insects on thorns or in the forks of branches by the shrike. In the case of this bird, however, the habit, not a frequent one I think, is more often than not unavailing, since the bird more often than not fails to profit by its foresight in any way, either forgetting all about its stores, or, perhaps, wandering too far away to make it worth while to return to them. In any event the usefulness of the habit to the bird must be very small, and is, perhaps, to be viewed as a habit in the very early stages of its birth. In this connection one is tempted to ask why other woodpeckers, particularly the Red-head, which is a mast eater and in many of its habits strongly resembles the "Carpintero", have not hit upon the device of storing food, as, in fact, some of them have while others have not. Thus Merriam\* tells us that in the Adirondack region the Red-head winters or not according to whether it is or is not a beech-nut year. It would thus appear then that the Red-head of the Adirondack region has not acquired the habit of storing away beech nuts, and so far as my own observations about Washington go, as also those of other observers, the Red-head never stores away food of any kind but depends upon what it can obtain from day to day. When this fails it accepts the alternative of migration and departs for regions where supplies are more readily obtainable. Nevertheless the Red-head in certain localities does store away food, apparently habitually.

Much to the point are the observations in central Indiana made and recorded by O. P. Hay in the *Auk*, 1887, p. 193, which show the Red-head as an active hoarder of food. They are so interesting that I quote them almost verbatim.

From the time the nuts [beech nuts] began to ripen, these birds appeared to be almost constantly on the wing passing from the beeches to some place of deposit. They have hidden away the nuts in almost every conceivable situation. Many have been placed in cavities in partially decayed trees; and the felling of an old beech is certain to prove a little feast for a bevy of children. Large handfuls have been taken from a single knot-hole. They are often found under a patch of the raised bark of trees, and single nuts have been driven into the cracks in bark. They have been thrust into the cracks in front gate-posts; and a favorite place of deposit is behind long slivers on fence posts. I have taken a good handful from a single such crevice. . . . In a few cases grains of corn have been mixed with beech-nuts, and I have found also a few drupes apparently of the wild-cherry and a partially-eaten bitter-nut. The nuts may often be seen driven into the cracks at the ends of railroad ties; and, on the other hand, the birds have often been seen on the roofs of houses, pounding nuts into the crevices between the shingles. In several instances I have observed that the space formed by a board springing away from a fence-post, has been nearly filled with nuts,

\*Remarks on Some of the Birds of Lewis County, Northern New York, Bull. Nuttall Orn. Club, July 1878, p. 123.

and afterwards pieces of bark and wood have been brought and driven down over the nuts as if to hide them from poachers. . . . An examination recently of some of these caches showed that the nuts were being attacked by animals of some kind. The Red-heads are frequently seen in the vicinity of these stores and they sometimes manifest great impatience at the presence of other birds.

It may be added that observation clearly showed that the stored nuts were subsequently used for food.

Another instance of the storage of food by the Red-head was published in Bull. Nuttall Orn. Club, April, 1878, p. 97, by Mr. H. B. Bailey, being an extract from a letter received from Mr. G. S. Agersborg of Vermilion, Dakota, as follows:

Last spring in opening a good many birds of this species (*Melanerpes erythrocephalus*) with the object of ascertaining their principal food, I found in their stomachs nothing but young grasshoppers. One of them, which had its headquarters near my house, was observed making frequent visits to an old oak post, and on examining it I found a large crack where the woodpecker had inserted about one hundred grasshoppers of all sizes (for future use, as later observations proved), which were put in without killing them, but they were so firmly wedged in the crack that they in vain tried to get free. I told this to a couple of farmers, and found that they had also seen the same thing, and showed me the posts which were used for the same purpose.

In respect of this habit of storing away live prey for future use the Red-heads of Dakota are unique, and I know of no exact parallel to it.

I have received the following interesting note from Miss Marion J. Pellew on the habits of the Red-head in South Carolina, which not only shows that the local woodpeckers there are storers of food but that their method results in considerable damage to property.

About Aiken, South Carolina, the Red-headed Woodpeckers are very abundant, and are very common in the town. As soon as the poles carrying electric wires begin to show cracks, the birds begin stuffing the cracks with acorns which are hammered in. An official of the electric light and power company of Aiken states that the company sustains an annual loss of several thousand dollars due to the operations of these woodpeckers, both from the drilling of holes, and from the rotting of the wood caused by the storing of the acorns.

Miss Pellew further states that she noticed that the board along the ridge pole of her house was curling up, and on investigation it was found that under this board for a distance of from 8 to 10 feet from the eaves were decayed and half decayed acorns to a depth of at least 1 inch, and a friend of hers had the same experience.

It is well known that the Red-heads dispossess other birds of their nesting sites in the holes of trees, and even destroy their eggs and kill their young; but the following observation by Bendire given in his "Life Histories" is in some respects unique. He saw a Red-head eat part of a young bird, probably a bluebird, and store away the remainder "behind the loose bark of an oak post". This was in Holland Patent, New York. Visiting the place the following morning, he found that the remains were gone and, though definite proof was wanting, he inferred, probably correctly, that the bird had returned to its store and eaten the remains of its victim.

In view of the above interesting observations it seems highly probable that the Red-head is more of a food storer than our scanty records indicate, and that elsewhere than in the locations mentioned it depends to a greater or less extent upon food laid by for future needs.

The crow is certainly one of our most sagacious birds, but, so far as I know, no one has ever found it storing away supplies of any kind though it inhabits regions where in winter it is often put to it to make a living. Perhaps European crows are a bit ahead of their American cousins. At any rate I find a paragraph in Yarrell's *British Birds* (vol. II, p. 288) which seems to prove that the habit is not entirely unknown to at least one member of the crow family, namely, the Black Crow (*Corvus corone*). Yarrell says of it: "Its method of hiding portions of food that cannot be conveniently eaten suggests an amount of forethought that can be pardonably exaggerated." This statement regarding the Black Crow calls to mind Dickens' raven, or rather the compound of his two ravens, which he immortalized under the name of Gripp, and which he says had the habit of burying in the garden "cheese and halfpence". Gripp, however, was a remarkable bird in so many different ways that we need not wonder at this departure from the usual habits of his kind.

Our jays are mast eaters par excellence, and I believe that closer field observations will show that the habit of storing supplies is more common among them than we have been led to believe, particularly the species that winter in the colder regions. I am not aware that the Blue Jay, or, indeed, any of the species within our own boundaries have acquired the habit, but the Whiskey Jack of the far north, according to Richardson\*, is fully alive to the importance of laying up food against the time of snow and extreme cold. He says of it: "It hoards berries, pieces of meat, etc., in hollow trees or between layers of the bark of decaying branches, by which it is enabled to pass the season in comfort, and to rear its young before the snow is off the ground, and indeed earlier than any other bird in the fur countries."

Turning now to the nuthatches we might confidently predict that such lovers of mast would have hit upon the storage plan, but data on the subject are not over plenty. In the *History of North American Birds*, by Baird, Brewer and Ridgway, we find a note stating that "the European species collect and store away the fruit of the hazel and other nut-bearing trees", and I am sure that our own species, the white-belly, has been credited with the same habit, though I can find no direct reference to the subject. This would seem to indicate at least that the habit is not common. Dr. Chas. W. Richmond, however, informs me that not once but many times he has seen nuthatches, familiar guests at his lunch counter, bear off and store away peanuts and even suet in the crevices of the bark of trees and in the cracks left by the weathering out of the mortar in the walls of his house. This habit of storing suet in cracks in the bark of trees has been observed about Washington also by Dr. A. K. Fisher and Mr. McAtee. Ordinarily, however, it is probably true that the White-bellied Nuthatch, energetic worker as he is, finds no surplus to store, but has to devote all his energies to digging out today's supplies without taking thought of tomorrow. Given the surplus, however, to draw upon, the bird's instincts, as we see, are equal to the occasion.

To return to our California Woodpecker: I see no valid reason for accepting the theory of the older ornithologists that the holes in the bark and dead limbs of trees were originally bored by the birds in the pursuit of insects. Apart from the fact, as has been dwelt upon, that this particular woodpecker

\**Fauna Boreali-Americana*, 1831, p. 295.

is only to a small extent an insect eater, the holes, at least those I have examined, are usually bored in sound wood or bark, and the wood around the holes shows no signs of ever having been inhabited by larvae of any kind.

The choice of trees to act as granaries has always seemed to me largely a matter of chance, being chiefly determined by proximity to the acorn-bearing trees. Their bark being soft and easily drilled, pines are, perhaps, on the whole the favorite trees. But I have seen scores of dead oaks, the bark of which had long disappeared, which had been used apparently for years for storage purposes, and in many of these every available bit of space had been utilized.

I do not seem to be able to recall any instances of the use of live oaks for storage purposes, but Dr. Merriam and Dr. Fisher both assure me that live oaks (*Quercus agrifolia*) are occasionally selected, and a photograph made by Dr. Fisher on the premises of Dr. Jordan at Palo Alto (see frontispiece, Condor, VIII, September, 1906, p. 106), is visible proof of the fact. Probably in this and other similar cases it is Hobson's choice, and live oaks are taken because they are the best available.

An example of a still wider departure from this bird's custom appears in the accompanying photo (fig. 22) made by the author near Ukiah, Mendocino County. The colony of woodpeckers located here had taken advantage of the long summer vacation, when the building was untenanted, to improve the school house up to woodpecker standards; and, while the results would hardly commend themselves to the school supervisors, they at least increased the utility of the building from the woodpecker standpoint. Nor is this example of woodpecker industry highly exceptional, and Mr. Carpenter, then a photographer of Ukiah, told me that in an adjoining county a school house had been so disfigured by woodpeckers that it was found advisable to build a new one rather than to repair the old. Such instances of serious injury to buildings must be rare, if for no other reason than that it is only in structures temporarily abandoned that the birds find their opportunity.

It is of interest to note that, while holes drilled in trees for this and for no other apparent purpose by the California Woodpecker is its common method of storing acorns, it is not the only one. Thus near Ukiah I found the woodpeckers harvesting the acorns and dropping them into the cavities formed by hanging pieces of bark, some of these containing from a gill to a half pint or more of the mast. This departure from the birds' usual custom is the more difficult to explain since there were plenty of pines near by of which they might have availed themselves. Sumichrast found them doing the same thing in Mexico as quoted by Baird, Brewer and Ridgway, North American Birds, vol. II, p. 571. After describing the usual method he adds: "At other times they make their collection of acorns in the openings between the raised bark of dry trees and the trunks". Such cavities, indeed, may have been the original store houses. If so, the present method is a decided improvement, since, when stored in such cavities, there seems to be no way by which the birds can reach them, though they are quite accessible to mice and squirrels. This particular storage method furnishes a remarkable example of undiscriminating instinct. The bird follows the blind impulse to store, but in such an ineffective way as to gain little or nothing by the act.

That acorns are often "wormy" everyone knows who has gathered them

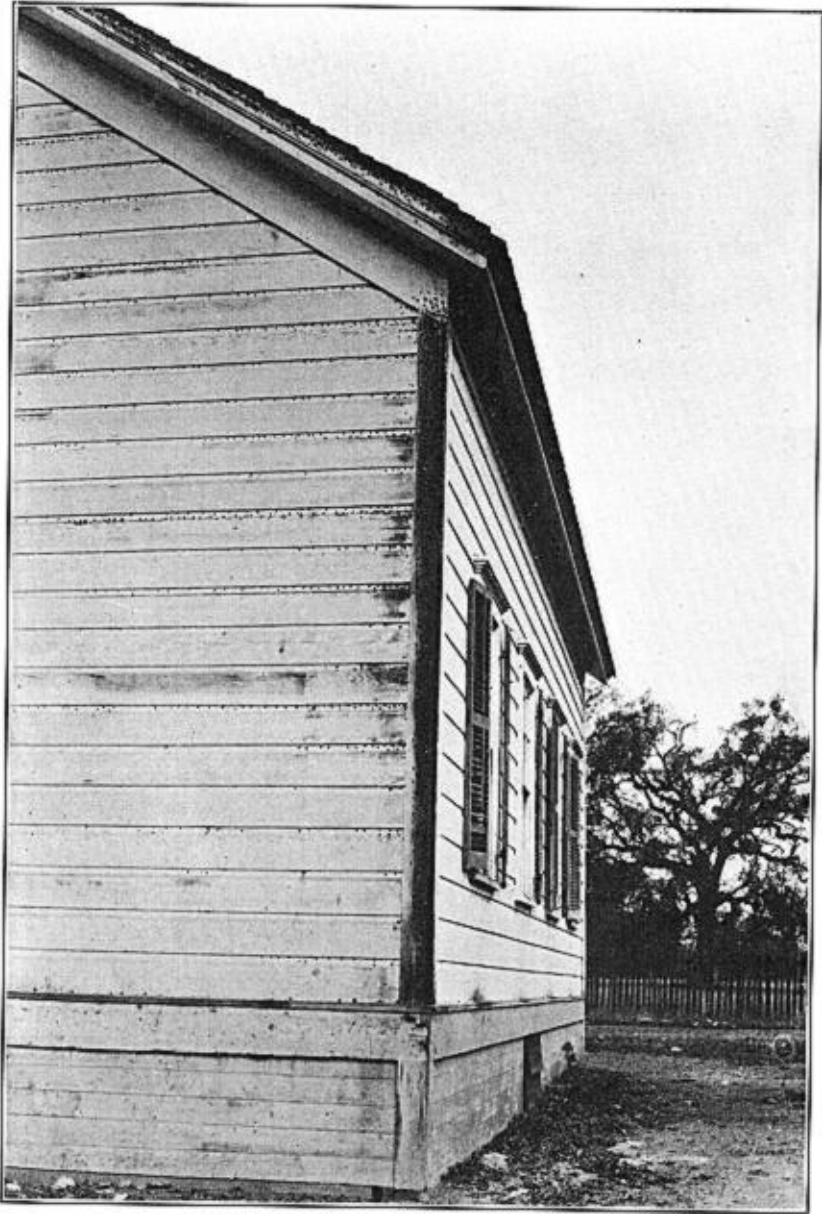


Fig. 22. SCHOOLHOUSE NEAR UKIAH, MENDOCINO COUNTY, CALIFORNIA, USED AS ACORN GRANARY BY CALIFORNIA WOODPECKERS.



for study or for other purposes, but I find no convincing reason for the belief that the California Woodpecker is sufficiently versed in entomological lore as to store away acorns for the sake of the weevils that later are developed in them. If proof to the contrary is desired it is to be found in the results of Beal's investigations of the food habits of the species in Biological Survey Bulletin No. 34. He there states that 77.57 percent of this woodpecker's food consists of vegetable matter, compared to a little less than 23 percent of animal matter, which of itself compels us to class the species as chiefly vegetarian. Moreover he found in the stomach contents the remains of no boring larvae whatever. Notwithstanding the absence of larvae in the stomachs of the 75 specimens examined by Beal I do not doubt that larvae of any sort would be welcomed by the woodpecker, but evidently they are not specially sought for. The bird is essentially vegetarian, and, indeed, as Beal points out, more than half of its food consists of the meat of acorns.

In passing, we may note that only 21 percent of its food throughout the year consists of ants, which, while a respectable allowance, is small when we recall the fact that Swainson, in selecting a specific name for the bird, called it "formicivorus" or ant-eating, thus laying undue stress upon its ant-eating habits.

The discovery of the edibility of the acorn, however, was not made alone by the woodpecker. Even today the acorn crop is an important one to the Indians, and in bygone days it furnished the California aborigine his most important staple. There is, too, quite a list of birds and mammals that are more or less dependent for food upon the acorn, and, one and all, these are looked upon by the woodpecker as enemies and treated as such. His store houses are well known to jays, mice, rats, and squirrels, and are regularly raided by these less industrious and unscrupulous foes whose rule of conduct is well expressed in the lines, "He should take who has the power; He should keep who can." When at home the woodpecker has little trouble in defending his own, but we may safely assume that no small part of his hoard always goes to his unscrupulous neighbors.

An incident witnessed by me illustrative of the warfare waged by the woodpecker against the squirrel may be worth relating. While out one day in Mendocino County with my camera I heard loud outcries from 8 or 10 "Carpinteros" coming from a dead oak. Inspection revealed a ground squirrel flattened out on a limb some forty feet or more from the ground, this being the first and only time I ever saw a ground squirrel as far from mother earth, although in this county, which is heavily wooded, the ground squirrels are more addicted to climbing trees than I have observed elsewhere. Apparently the squirrel had been detected in the act of robbing the woodpecker's larder, but I arrived on the scene much too late to witness the beginning of the fracas. The birds were thoroughly enraged and were taking turns in making spirited dashes at the squirrel, at the same time filling the air with their vociferous threats. It was quite evident that the squirrel might have escaped from his foes easily enough by running down the tree or by jumping to the ground, apparently no great feat even for a ground squirrel; but he seemed to be completely paralyzed by fright and afraid to move in any direction or do anything by way of self protection. After watching the strife for some time and noting that it was likely to be a prolonged one the squirrel was brought down

for close examination by a small bore rifle. It was then found that the attack by the birds was even more serious than it appeared, for they had punctured the skin in places along the back and drawn blood with their sharp bills, and in time, perhaps, might have killed the rodent.

The California Woodpecker is not exceptional in its hatred of its traditional enemy, the squirrel, and Merriam, as above cited, was witness to attacks by the Red-head on both the grey and the black squirrel. Evidently the woodpeckers of the Adirondack region look upon the crop of beech nuts as peculiarly their own, and promptly resent on the part of outsiders any attempt to share in it. Not woodpeckers alone are a bit hazy in respect to property rights, and the enforcement of conflicting views on the subject often leads humans into acts that bear a curious analogy to the ones above noted.

Take him all in all, the California Woodpecker presents a rarely inviting subject for study, especially with reference to the genesis and significance of its food storing habits. Since California at the present time is exceptionally fortunate in the number and activity of its bird students it is to be hoped that among them are those who will take up the subject systematically, and endeavor to unravel the many puzzling questions that touch upon the life history of this beautiful and interesting species.

Washington, D. C., May 15, 1921.

## THE STORAGE OF ALMONDS BY THE CALIFORNIA WOODPECKER

By CLAUDE GIGNOUX

WITH ONE PHOTO

ON Saturday, March 26, 1921, I spent about two hours inspecting the larger trees and the buildings on the ranch of Mrs. Nora Thresher, in Butte County, California, to obtain information in regard to the storing of almonds by the California Woodpecker (*Melanerpes formicivorus bairdi*). The three places at which we found almonds stored are close together near the ranch house. The locality is one quarter of a mile west of the Feather River, five miles northeast of Liveoak, four miles southeast of Gridley and one and a quarter miles east of the Manzanita School, and is in Township 17 N., Range 3 E., M. D. B. and M. The country for several miles in every direction is practically level and very fertile and the mature native trees left standing are magnificent individual specimens. There are many fruit orchards in the section from Marysville to Gridley, and almonds are extensively grown farther north, around Durham. On the Thresher ranch there is a very heavy growth of trees and brush along the Feather River and this heavy growth extends a considerable distance in both directions along the river beyond the boundaries of the ranch.

Mr. Gerald J. Chalmers, whose ranch adjoins the Thresher ranch, had told me that he had found almonds stored in the bark of an oak tree, on the Thresher ranch, which had been cut down about the middle of February, 1921,