pests in the very places where their mischief is done. This can not be asserted of the marsh wren, but it must be remembered that many harmful species of insects breed and live in marshes and waste places as well as in grainfields and orchards, so that the birds which destroy them on wild lands are removing the source of supply from which are recruited the hosts that infest the farm.

CACTUS WREN.

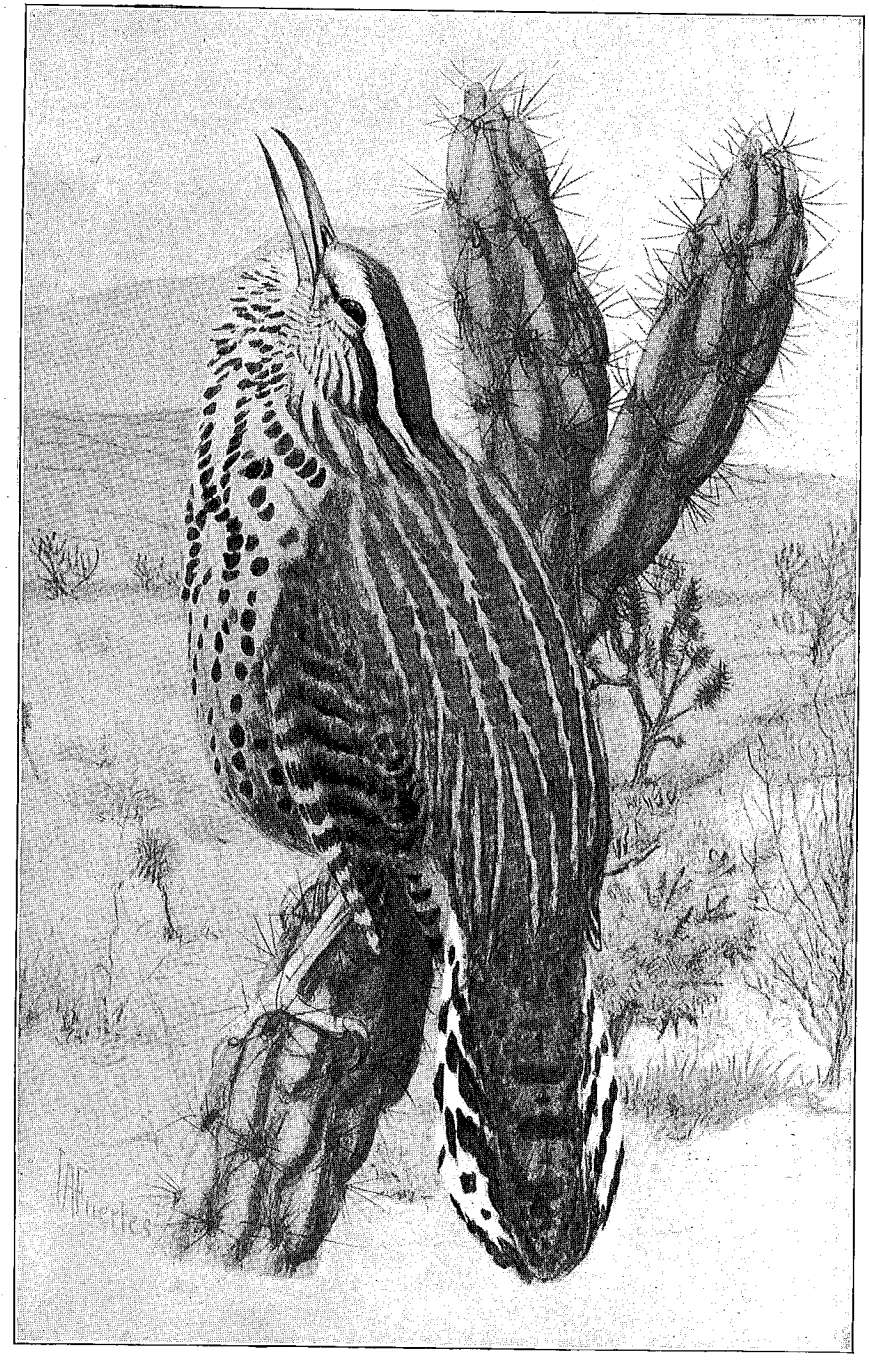
(*Heleodytes brunneicapillus.*)

(Pl. IV.)

The cactus wren is so exclusively a bird of the desert and waste places that its food may be thought to have little, if any, economic interest. It is not safe to assume, however, that the bird will never affect the interests of agriculture because it does not do so at present. Moreover, its food habits have a scientific interest which justifies a brief review. A number of the birds whose stomachs have been examined for this work were taken near orchards and grainfields, and there can be little doubt that, with the spread of cultivation, the species will adapt itself to a somewhat different environment and become of economic importance. We find, in fact, that its food is made up of practically the same orders and families of insects that compose the diet of birds living on agricultural lands, but the relative proportions differ widely, and in most cases the species are probably different.

Only 41 stomachs of the cactus wren were available for examination. They were taken in the region from Los Angeles to San Bernardino, and from July to January, inclusive. They contained about 83 percent of animal matter to 17 of vegetable.

Animal food.—Beetles and Hymenoptera, the latter ants and wasps, were the two most important items of the animal food. Each made up about 27 percent of the total. The beetles belong to several families, but weevils, or snout-beetles, were the most noticeable, and amount to somewhat more than 10 percent. One stomach contained 11 of these insects and another 10, while others held fewer. Only one species, *Rhigopsis effracta*, was identified. Five of these were in 1 stomach. The other beetles belong to more common families. Coccinellids were found in 1 stomach and carrion beetles in 2. They were the only insects noted that can be considered as useful. Hymenoptera are represented by many ants and a few wasps. These are just the insects which the cactus wren might be expected to find, for dry land and sunshine are the conditions which favor these creatures. Grasshoppers amount to a little more than 15 percent. This



CACTUS WREN (HELEODYTES BRUNNEICAPILLUS COUESI).

is the only wren that eats these insects to any considerable extent except as nestlings.

Bugs (Hemiptera) amount to only a little more than 5 percent of the food, which is the smallest quantity eaten by any of the wren family. This item, however, contains one unexpected element—that is, black scales (Saissetia). These appeared in 6 stomachs, and must have been obtained from trees or shrubs, possibly from fruit trees. In any case their destruction is a welcome service. Caterpillars and their allies (Lepidoptera) were eaten to the extent of a little more than 5 percent. Among them were many cocoons of tineid moths, indicating again that the cactus wren obtains some of its food from trees and shrubs. A few unidentifiable insects and spiders amount to somewhat more than 3 percent. This is the smallest record for spiders of any of the wren family, which is much given to eating these creatures, finding them in crannies in rocks, stumps, and other places. A few of the long bones of a tree frog were found in 1 stomach.

Vegetable food.—Seventeen percent of vegetable matter was found in the stomachs of this bird. This is the largest percentage found in the stomachs of any species of wren yet examined. The vegetable food of the cactus wren consists of fruit pulp and weed seeds. The former amounts to nearly 13 percent, but in all cases where identification was possible consisted of wild species. Of these, only 3 were fully identified—cactus (Opuntia), elderberry (Sambucus), and Cascara (Rhamnus), the last only in 1 stomach. Nothing was found to indicate that cultivated varieties had been eaten. Seeds, which amount to 4 percent, are those of the poison oak (Rhus), and a nonpoisonous species, with filaree (Erodium) and Amisinckia, most of them useless plants or worse.

SUMMARY.

From this brief inspection of the cactus wren's food it is seen that it contains but little that is useful to man, while the great bulk is made up of elements that are, or would be, harmful if present on cultivated lands. The bird thus sustains the good reputation of the rest of its family.

OTHER WRENS.

Some half a dozen stomachs each of the western winter wren (*Olbiorchilus hiemalis pacificus*) and dotted canyon wren (*Catherpes mexicanus punctulatus*) and the rock wren (*Salpinctes obsoletus*) have been examined. This number is entirely too small to serve for specific statements in regard to their food except that it may be said

that it corresponds closely to that of the other species of the family discussed in foregoing pages.

From this somewhat limited investigation of the food of the California wrens several points may be regarded as established: (1) That these wrens are essentially insectivorous; (2) that an overwhelming majority of the insects composing their food are harmful species; (3) that the quantity of vegetable food eaten is so small as to have no economic importance.

CALIFORNIA CREEPER.

(*Certhia familiaris occidentalis.*)

Only 7 stomachs of the California creeper were available for examination, but they confirm the good opinion observers have formed of the habits of this bird. Like the titmice and nuthatches, the creeper is an indefatigable forager on the trunks and branches of trees, and the food it obtains there is of the same nature—that is, small beetles (many of them weevils), wasps, ants, bugs, caterpillars, and a few spiders. Of the 7 stomachs examined, only 1 contained vegetable food, and this had only 19 percent of seed, too much digested for identification.

While the creeper is not systematically classed with the nuthatches and titmice, its food habits closely ally it to these birds and to the wrens, and whatever good is true of them applies with equal force to the creeper.

NUTHATCHES AND TITMICE.

(Paridæ.)

Few families of birds contain so many absolutely harmless and thoroughly useful species as that of the nuthatches and titmice. All of the American species are small, and several are so minute that the larger species of humming birds exceed them in size. In colors they are neither brilliant nor showy, black, white, brown, and gray being the predominant tints of their plumage. In manners and voice they are equally unobtrusive, and so little do their movements attract attention that one may be surrounded by them in the forest before he is conscious of their presence. More than forty species and subspecies of the titmouse family reside within the limits of the United States, of which some fifteen live in California.

From an economic standpoint the titmice are the reverse of insignificant. They are essentially inhabitants of trees and shrubs, and obtain almost their entire living from them. Their food consists largely of small insects and their eggs and larvæ, and, as the individuals of most of the species are numerous and spend all the daylight hours searching for food, it follows that the number of harmful

creatures they destroy is beyond calculation. As conservators of forest and orchards there are few birds that compare with them. The insects they destroy are largely those that feed upon the leaves, blossoms, and fruit of trees, with some that bore into the wood or burrow under the bark, thereby injuring or killing the tree itself. On the other hand, they do not prey upon fruit, grain, or other product of husbandry. The small amount of vegetable matter they eat consists principally of small galls, whose destruction is a benefit, with a few seeds and a little wild fruit.

PYGMY NUTHATCH.

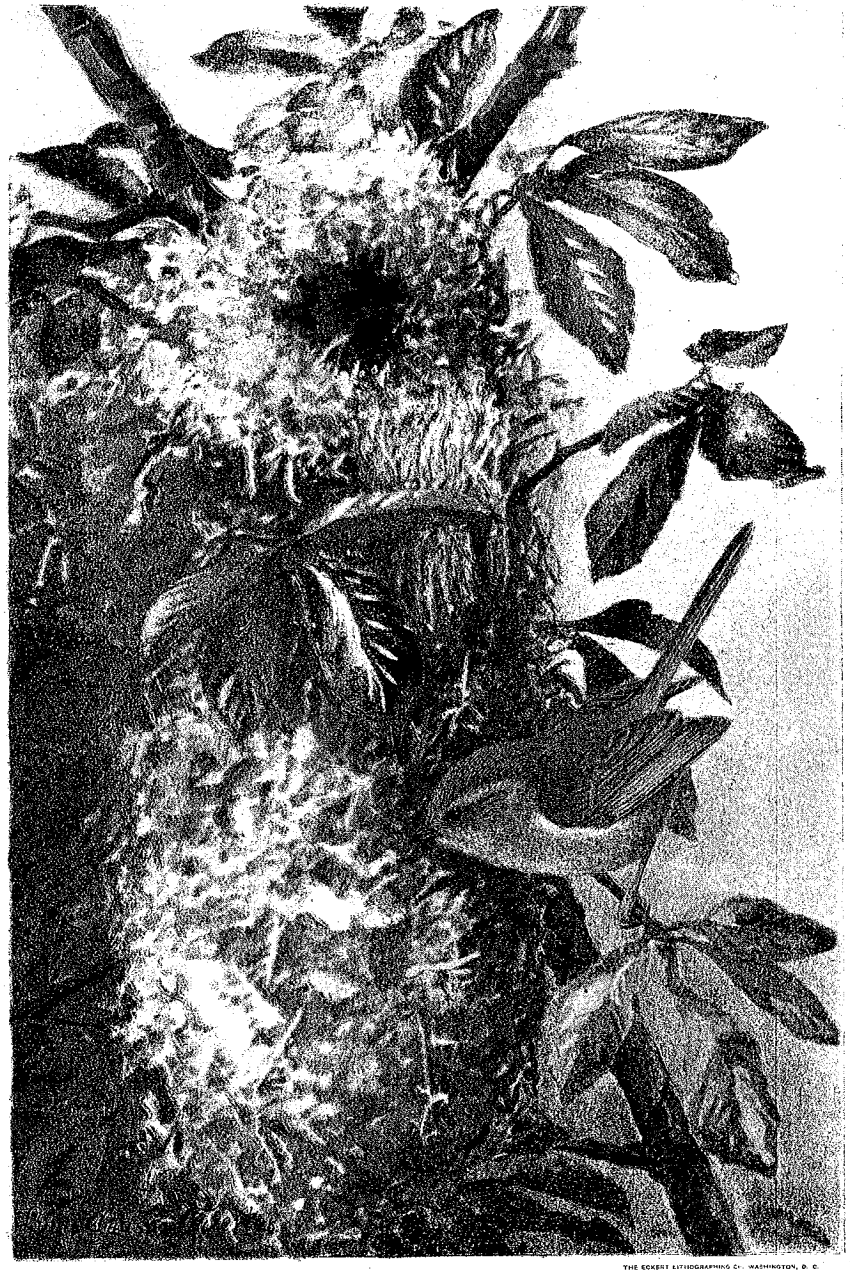
(*Sitta pygmæa.*)

The nuthatches are small, inconspicuous birds that live upon trees and for the most part remain in forests or groves, though not rarely visiting the orchard. While allied to titmice they form a fairly well-defined group and can be easily distinguished from titmice proper. As gymnasts they probably lead the avian world. After watching their movements one might suppose that nature had quite exempted them from the operation of the laws of gravity, as they move up or down a tree with equal facility, or along the underside of a horizontal branch where they inspect a promising knot hole or cranny, apparently without the least idea that they are upside down. The food they obtain from trees is of the same general character as that of the rest of the titmouse family.

Unfortunately only a few stomachs of these birds are at hand for examination—enough, however, to give a general idea of the diet.

The pygmy nuthatch is the smallest of the group, but as a destroyer of noxious insects it is far from insignificant. Only 31 stomachs of this feathered midget are available for examination, but the number is sufficient to bring out some strong points of the bird's diet. The relative proportions of animal and vegetable food, as indicated by the contents of these stomachs, are approximately 83 percent of the former to 17 percent of the latter.

Animal food.—The largest item of animal food is Hymenoptera, composed mostly of wasps, with a few ants. They amount to about 38 percent of the whole. Next in order are Hemiptera, aggregating 23 percent. A large proportion of these belong to the family Cercopidæ, commonly known as spittle-insects, from the fact that they develop inside of a froth-like substance resembling saliva produced in summer upon grass and various plants and trees. While none of these insects have yet become pests, there can be no doubt that collectively they do considerable harm to plants, as sometimes they are very abundant and subsist entirely upon their sap.



CALIFORNIA BUSH-TIT (PSALTRIPARUS MINIMUS CALIFORNICUS).

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BIRDS OF CALIFORNIA

IN RELATION TO THE FRUIT INDUSTRY

PART I

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