

be made in a season or two; in fact, that such was actually the case is borne out by the observation that as one walks through the burned area now, three years after the fire, he sees and hears about the same grouping of birds that he used to notice. Except for changes in location, the general population is about the same. This might not be true in a broad area where the vegetation type is uniform. In such a case the destruction of the plant life would change the environment so that an entirely new line-up of populations might occur. But in a rugged mountain area such as we have in the north coast ranges of California, the checkered arrangement of ecological areas makes a readjustment comparatively easy. Birds finding their accustomed habitats destroyed will not have far to go until they find other areas where either new growth of vegetation or replacement of old types will afford them their usual conditions of life.

In conclusion, I am led to speculate as to the relation ordinarily maintained between the bird population and the territory. If my observations are valid, they would seem to indicate that a crowding of bird populations may occur, at least temporarily. That raises the question as to whether under normal conditions the bird population in any given territory is at its saturation point, or whether other factors aside from the ability of the territory to support bird life may not at least be a contributing factor to the regulation of the populations. Anyway, the problem is one that will bear investigation.

Angwin, California, October 2, 1934.

THE THICK-BILLED PARROT IN SOUTHERN ARIZONA

By ALEXANDER WETMORE

In a recent number of the Condor (36, 1934, pp. 180-181) Professor Charles T. Vorhies has given interesting information on the latest known occurrence of the Thick-billed Parrot (*Rhynchopsitta pachyrhyncha*) in Arizona, to which I may be permitted to add some additional data. During June and July, 1919, I was engaged in field work in southern Arizona for the Bureau of Biological Survey and as a part of this work secured what information I could on parrots. In work in Pinery Canyon I was a guest in the camp of Mr. and Mrs. J. Eugene Law and subsequently placed my notes at Mr. Law's disposal, as he had planned a full account of the avifauna of the Chiricahua region. Illness prevented completion of this project and the data secured on parrots were not published, except that in reading the proof sheets of the fourth edition (1931) of the A. O. U. Check-list I added certain localities that extended the previously known range for these birds within our limits. The data that follow were obtained from reliable observers and were checked where possible by inquiry from different sources.

In Pinery Canyon, Thick-billed Parrots were observed by Mr. F. Hands on August 20, 1917. On this day he heard a strange noise and, stepping to the door identified it as the calling of parrots, a sound that he had heard in other years. To verify his identification he followed the sound and found six or eight of the birds feeding in a pine over a mile away. From this date the number of parrots in Pinery Canyon increased steadily until by September 1 about 300 were present. As cold weather came during the fall some of the birds disappeared. Others remained during the entire winter, although at one time the ground was covered by six inches of snow for over two weeks and the birds were forced to seek their food on the ground

where this covering had blown partly away. The last was observed in Pinery Canyon on March 26 or 27, 1918, when a flock of ten or twelve was seen. The birds ranged in Pinery and Pine canyons and to a less extent in Bonita Canyon. According to O. C. Duffner of Paradise, none was found at this time in the canyons leading down on the eastern side at the north end of the Chiricahua Range.

In Rucker Canyon to the south Thick-billed Parrots were more abundant. According to Theodore Hampa the first arrived during the first week of July, 1917. A flock of fifty or sixty was noted first and the birds increased steadily until by early fall 1000 or possibly 1500 were present. They ranged above the junction of Rucker and Whitewater rivers, covering the high slopes of Monte Vista. Though the birds were at Hampa's Ranch at the junction of the two rivers mentioned, early in July, Fred Heine who lived a mile below did not observe them at his place until late in August, although the difference in altitude between the two points was slight. The birds remained throughout the winter though they wandered much and occasionally were not observed for a week at a time. By November they had decreased somewhat in number, but a few were present until March, 1918. The birds were said to range into Price Canyon on the eastern side of the range but were not reported from other nearby localities.

In the Dragoon Mountains W. J. Waln informed me that a considerable flock of parrots arrived in Cochise Stronghold Canyon about the end of July or the first of August, 1917, and remained for about six weeks. These birds were observed to fly directly out across the flats to the east and to return at night so that it is possible that they may have crossed to the Chiricahua Mountains to feed. Mr. Waln killed one and nailed it on the wall of a shed where it was examined by several persons who told me of it. This specimen had been burned a few months previous to my visit.

Mr. T. Swift, Forest Supervisor of the Crook National Forest, at Safford, Arizona, told me that in 1918 one of his rangers reported parrots in Rattlesnake Canyon at the northern end of the Galiuro Mountains, west of the Graham Range. About 150 appeared about the middle of May and remained through the summer until early fall. The birds ranged here in an area covered with new growth yellow pine. Stockmen had also reported to Mr. Swift that in former years parrots had appeared occasionally in the southern end of the Graham Mountains.

R. Winkler who resides near the mouth of Rucker Canyon said that parrots had been seen by his son above Deer Creek on Animas Peak in southwestern New Mexico.

According to newspaper report parrots were found by Fred Miller near Mowry in Santa Cruz County, Arizona, in September, 1917. John Deegan, Sheriff of Nogales, was also said to have seen them.

On their arrival in the Chiricahua Mountains Thick-billed Parrots began to feed on the cones of Chihuahua pine (*Pinus chihuahuana*) and continued to eat the seeds of this tree until the entire crop had been consumed. In Rucker Canyon at the time of my visit the ground under many trees was still covered with cones from which the seeds had been extracted. The parrots pulled out or twisted off the heavy scales so that the fibres remaining gave the cone the appearance of having been shredded more or less completely. The cones were attacked as soon as the seed was in the dough. Occasionally I found cones of yellow pine (*Pinus brachyptera*) that showed signs of the same work, but such instances were rare so that apparently the parrots had not cared for the long heavy cones of this tree. It is possible that ease in handling was one basis for preference for the Chihuahua pine. According to Sudworth (U. S. Dept. Agr., Bull. 460, The Pine Trees of the Rocky Mountain Region, p. 37), cones of the Chihuahua pine are matured in September, so that the

birds must have begun eating these seeds while they were still quite soft.

During previous invasions (1904) parrots were said to have eaten pinyon nuts but were not known to have done this in 1917 and 1918. Two species of this group occur here in fair numbers, the Mexican pinyon (*Pinus cembroides*) and the pinyon (*Pinus edulis*).

When the harvest of pine cones was completed the Thick-billed Parrots turned their attention to an abundant crop of acorns and these formed their food through fall and winter. The birds fed at first in the trees and then later descended to the ground in search of fallen nuts. At least four species of oaks are common here and all probably furnished food for these birds. The white-leaf oak (*Quercus hypoleuca*), abundant on the upper slopes (low Transition and high Upper Sonoran), has a very sweet acorn. The Arizona oak (*Quercus arizonica*), *Quercus reticulata* and *Quercus grisea* cover extensive areas.

According to various newspaper accounts the Thick-billed Parrot had come in flocks into fields of feterita and kaffir corn, and had fed in them extensively, and it was also said that they ate corn. Careful inquiry however among the ranchers in the Chiricahua Mountains showed these statements to be groundless and that the food of the birds as stated above was made up entirely of pine seeds and acorns. In Pinery Canyon Mr. F. Hands said that the parrots fed constantly in oaks bordering fields of corn and small grains, coming to the borders of the clearings but never attacking or injuring the crops in any way. The same statement was made by other ranchers here and farther south. F. Heine in Rucker Canyon said that when the birds reached his ranch apples were still on the trees in his orchard. He watched the feeding habits of the parrots with much interest for this reason, but though they came about the place none offered to injure the fruit.

According to all accounts Thick-billed Parrots gathered at night to roost in flocks and then spread out in small bands to feed during the day. In Pinery Canyon they roosted somewhere on the upper mountain slopes during summer and fall. Morning and evening they were seen in two large flocks. As the weather became colder the roosting place was changed to one at a lower altitude. In Rucker Canyon the birds came at night to the mountain side above the site of old Camp Rucker. As there were a thousand or more here, their morning and evening flights were quite impressive. In the Dragoon Range the parrots roosted somewhere near the head of Cochise Stronghold and made a morning flight that often carried them directly out over the plains to the east.

In feeding, the large bands usually broke up into smaller parties. In winter such flocks at times came down to perch on broken sandstone ledges where they clambered about or basked in the sun. In Rucker Canyon toward evening flocks often flew down to the river to drink before passing on to their roost. In the Chiricahua Mountains during late fall and winter the birds came down into the foothills to an altitude of between 5000 and 5500 feet though earlier they were confined to the higher basins.

The birds were noisy and their coming was heralded by their loud calls that were said to be readily audible at a distance of more than a mile. Like parrots elsewhere they were said to show much fear of hawks (though it seems strange that a bird with so powerful a bill and so muscular a body should show such fear); when a red-tail or a hawk of some other species appeared they rose in flocks and circled in the air, doubling the volume of their ordinary screeching calls.

In August when the birds first appeared in Pinery Canyon, Mr. Hands stated that he was certain from their plumage that many of them were young that had been hatched that year. At this season when they were feeding on pine cones the feathers

of breast and head were often smeared with pitch. I have examined several specimens taken at this time in which the feathers were very dirty from this cause.

In Pinery Canyon according to the best information available about seventy-five or possibly one hundred parrots were killed. Probably half of these found their way into collections of bird skins while the remainder were sent to Chandler Brothers, in El Paso, and Colburn, Los Angeles (taxidermists). In Rucker Canyon where the birds were most numerous not more than half a dozen were destroyed: these were killed by hunters through curiosity.

Though parrots apparently remained through the summer in the Galiuro Range, whether they bred there is uncertain. From available accounts the birds in Mexico nest usually in abandoned nesting holes of the Imperial Woodpecker (*Campephilus imperialis*). Suitable nesting cavities for these parrots could be found in large pines in our mountains but are not common. The date of arrival of the Thick-billed Parrot in 1917 seems remarkably early as Thayer (Auk, 23, 1906, pp. 223-224), records nests containing eggs or small young near Colonia Pachacho and Colonia Garcia, Chihuahua, from August 11 to August 28, 1905, and Bergtold (Aug, 23, 1906, pp. 428), secured partly fledged young near Parral on October 5, 1904. From these dates it would seem that there is some variation in the time of nesting, as the parrots arrived in the Chiricahuas at a time when they had been breeding during other years.

United States National Museum, Washington, D. C., October 3, 1934.

GEOGRAPHICAL DISTRIBUTION AND DISPLAY COLORS OF TROCHILIDAE

By A. L. PICKENS

Students of botany are familiar with De Candolle's law by which xanthic flowers group themselves toward the tropics and cyanic flowers toward the circum-polar regions. When, several years ago, I began a close study of our southwestern hummingbirds I found in the geographical arrangements of the gorget and other display colors an elusive orderliness nothing short of surprising. Experimenters have so emphasized the spectrum in their color tests that the color wheel of the worker in pigments has been almost neglected.

In this color wheel, with some necessary distortion of proportions, the pigmented approximation of the spectrum may be imagined as wrapped about the dial of a clock with red at twelve, and the purplish hues joining the red through a series of crimsons between eleven and twelve. The scarlets will shade away on the other side and the counter-color of red will stand at six. The six major colors, red, orange, yellow, green, blue, and purple, will stand by the even numbers on the dial in their natural order, the intermediate shades, red-orange, orange-yellow, and the others, will stand in order by the odd numbers. Thus we travel from red to its counter-color, green, on one side through a xanthic series and on the other through a cyanic. Now, with a map of North America and our color dial we start at about 61° of latitude in Alaska and southern Yukon, and at about twelve on our dial, dropping continuously to the lower numbers in each case, though of course not proportionally, to find a surprising orderliness in the first appearances of the luminous display colors of the various species of hummingbirds.

Reds.—The most northerly ranging species, the Rufous Hummingbird (*Selas-*