FIGURE 3. A male House Finch completing a multiple drink on a single hover.

A total period of at least 458 hr was spent recording observations. During 205 of these hours, a count of drinks taken totaled 8971, or an overall average of 44 drinks per hr. The peak of the drinking activity occurred at the onset of nesting (mid-March) when the number of drinks per finch per day was 140. The finches at this time were ingesting an average of 12% of their body weight in sugar. The total average number of birds drinking per day increased during the nesting season, making competition higher and decreasing the number of drinks per bird per day.

How the finches first began hovering for the nectar remains an unsolved question. One assumes the finches would ordinarily drink by perching rather than hovering. Unlike hummingbirds, they are not well equipped for hovering, as they can get support only on the downstroke. While finches were completely intolerant of other species of birds in the feeder tree, they never showed any aggression toward hummingbirds. These were common in the area and drank regularly at the feeder, alternating drinks with the finches. The initial gradual increase in nectar consumption before the study began indicates that the finches learned to drink the nectar from the feeder and had ample opportunity to observe the hummingbirds daily. It is interesting to speculate that the finches may have learned to hover by imitating the hummingbirds.

Whether this hovering behavior is a local adaptation is not known. To the author's knowledge, hovering behavior on the part of finches has not been reported in other parts of California.

SUMMARY

This is a report of a behavioral study on House Finches (*Carpodacus mexicanus*) in the Palos Verdes Peninsula area of California. The finches were quite normal in courting and nesting pattern, but regularly fed by hovering at a hummingbird nectar bottle as a chief source of their nourishment. The unusual feature of the study is that each finch actually had to learn how to hover in order to obtain the liquid. The learning process was observed for several finches and it followed an extremely consistent pattern. The hovering performance is very proficient and can be sustained virtually motionless for a maximum of 5 sec. This behavior can be learned by adults of both sexes and by the immature offspring. The learning process occurs over a 2–6-week period. The study was conducted during the daylight hours from February to July 1969, and observations were recorded during a total of at least 458 hr. During 205 of these hours, 8971 drinks, by House Finches, were noted.

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ZONE-TAILED HAWK AND TURKEY VULTURE: MIMICRY OR AERODYNAMICS?

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Willis (Condor 65:313, 1963) has shown that the Zone-tailed Hawk (*Buteo albonotatus*) differs from related hawks and closely resembles the Turkey Vulture (*Cathartes aura*) in color, shape, and manner of soaring. Willis suggests that *B. albonotatus* is an aggressive mimic of *Cathartes* and that this mimicry may permit the hawk to approach closely potential prey which have become habituated to the vulture. Willis mentions that the resemblance in wing shape and dihedral might be due to similarities in the manner of soaring; I believe this is the major reason for the resemblance. The best aerodynamic "design" for a bird that habitually soars near the substrate includes rather long and narrow wings that are held at a pronounced dihedral. To my knowledge, all raptorial birds that habitually soar near the substrate share this design, including *C. aura*, *B. albonotatus*, and the harriers (*Circus* sp.).

A bird that holds its wings horizontal is quite unstable in soaring flight; if the lift on one wing exceeds that on the other, the bird will begin to roll. Since the lift generated by a wing is perpendicular to the wing axis, the vertical lift component will decrease and a lateral component will develop. This lateral component will pull the bird to the side and the loss of vertical lift will cause the bird to lose altitude; the combination results in a side-slip. Thus a bird that soars with the wings held horizontal is very unstable and will roll, lose altitude, change direction, and even completely lose control unless immediate changes are made in the wings to adjust for the differences in lift. Such a bird soaring near the substrate will encounter frequent fluctuations in wind velocity and will have to adjust its wings almost constantly. A bird soaring with its wings held at a dihedral is considerably more stable. When a roll occurs, the vertical

component of the lift of the upward wing decreases and that of the downward wing increases, automatically correcting for the roll.

Birds that habitually soar at higher altitudes presumably do not have a high dihedral because fluctuations in wind velocity are less frequent and because there is a cost for maintaining a high dihedral. In a bird soaring with horizontally held wings, all of the lift can be resolved into two components: one vertical and overcoming gravity and the other directed forward and overcoming drag. If the bird adopts a high dihedral, there is a third component to the lift of each wing, a component which does not contribute to either overcoming gravity or drag, and hence is "wasted" insofar as to its contribution to maintaining flight. This third component is directed laterally toward the bird and tends to roll the bird. The roll components of the two wings oppose each other, providing stability. The effective lift lost by utilizing a high dihedral is presumably offset by the increase in stability and the elimination of the necessity for almost constant adjustment of the wings.

Thus the Zone-tailed Hawk may resemble the Turkey Vulture (and the harriers) in shape and manner of soaring because of aerodynamics and not because of aggressive mimicry. The color pattern of the hawk may be the result of mimicry, which developed after the bird had developed a resemblance to the vulture in the manner of flight.

I thank Vance Tucker and Edwin Willis for fruitful discussions of the ideas contained in this note.

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RECOVERY OF A PENNSYLVANIA-BANDED BLUE-GRAY GNATCATCHER IN WESTERN MÉXICO

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The characters and distribution of the subspecies of the Blue-gray Gnatcatcher (*Polioptila caerulea*) in México are badly in need of revision (Allan R. Phillips, in litt.). The problem is complicated by the abundance of migrant and wintering birds from populations breeding in the United States. That no easy assumptions can be made about geographic origins of such migrants is additionally emphasized by the recent recovery of a banded gnatcatcher.

At Powdermill Nature Reserve, Carnegie Museum's field station in the Ligonier Valley (3 miles S of Rector), Westmoreland County, Pennsylvania, 145 Blue-gray Gnatcatchers were banded from 1961 through 1969. Although we have had a few returns of our local breeding birds, no recoveries from elsewhere had been reported until 1970.

On 1 November 1970, a bird bearing band no. 117–25569 was killed by a boy with a slingshot in Llano Grande, Jalisco, México. Noticing the band, the boy brought it to a neighbor, Sr. David Sahagún V., who had sent reports of other recovered bands to the U. S. Fish and Wildlife Service. The band had been placed on an adult (AHY) female Blue-gray Gnatcatcher at Powdermill Nature Reserve by Robert C. Leberman on 9 May 1969. The senior author wrote to Sr. Sahagún for verification of the species identity of the banded bird and received from him an excellent description of a gnatcatcher, together with the information that this kind of bird, locally called "pisito," was well known to the inhabitants of Llano Grande. Sr. Sahagún also supplied details on the exact location of his village, which is in the Municipio de Tomatlán, Jalisco. It is shown on the Guadalajara sheet (NF-13) of the American Geographic Society "Millionth Map," and lies approximately 72 km SE of Puerto Vallarta.

This is not only the first recovery of a banded Blue-gray Gnatcatcher south of the United States but one of very few recoveries of the species from anywhere. According to Larry L. Hood (in litt.) of the Bird Banding Laboratory, USFWS, there had been only two recoveries of banded birds of this species through early 1968, and the data on one of these were suspect. The other was a bird both banded and recovered in California.

Miller et al. (Pac. Coast Avifauna 33:202, 1957) give no records of the eastern race of the Blue-gray Gnatcatcher, *P. c. caerulea*, from the Pacific slope of México north of Huehuetán, in southern Chiapas. Their westernmost records were from Pátzcuaro, Michoacán, and Iguala, Guerrero (well north of the Sierra Madre del Sur). The Pátzcuaro record was based on a specimen taken by Lea and Edwards on 18 March 1946 (Condor 52:267, 1950). According to these authors, "the specimen closely matches the nominate race in lightness and blueness of the crown and back, and is too large for *deppei*. We hesitate to place this specimen with *caerulea*, however, since transients from the eastern United States are so unexpected, and since intermediates between *deppei* and *amoenissima* might be expected to resemble *caerulea* in some instances."

The capture of an undoubted example of eastern *P. c. caerulea* in the Pacific coastal lowlands of Jalisco strongly suggests that a re-examination of gnatcatcher specimens from western and southern México, *at least* as far north as Jalisco, is in order; it appears quite likely to us that identification of some museum specimens may well have been made on the basis of geographic probability. We have found one unreported specimen of *caerulea* in the Carnegie Museum, collected by P. Shufeldt at La Barca, easternmost Jalisco, 16 November 1899; although on the Central Plateau rather than on the Pacific slope, this locality is well west of those listed for *caerulea* by Miller et al. (*loc. cit.*).

We are indebted to Earl B. Baysinger, (then) Chief of the Bird Banding Laboratory, USFWS, for sending us a copy of the letter reporting this recovery; to Larry L. Hood of the same Laboratory for checking records of gnatcatcher recoveries; to Allan R. Phillips for information on the distribution of *Polioptila caerulea* in México and for meticulous translation of Spanish-language correspondence; and especially to Sr. David Sahagún V. for reporting the finding of the band and for the additional information he so kindly sent us.

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