

## DISCUSSION

Many grebes sunbathe and in those species the bases to feathers of the lower back and rump, as well as the pigmentation of the underlying skin, are dark (Storer et al. 1976). The persistence of dark feathers on the lower back of leucistic birds suggests a strong genetic resistance to pigment loss in that area and gives indirect support to the suggestion (Storer et al. 1976) that thermoregulation may be a problem for small species of grebes at high altitude lakes.

Despite the roughness of my census data, it is evident that leucism was much more common in the summering population, which was composed mainly of one- and two-year-old birds, than among the spring and fall migrants, which were mainly birds of breeding age and (in fall) juveniles (Jehl, unpubl.). It is unlikely that the leucistic summering birds had been unable to find mates and returned early to the staging areas because: (1) the summering population is stable and the number of whitish birds does not increase as the season progresses; (2) some leucinos do pair (and, presumably, breed) successfully (Jehl, pers. observ.); and (3) the leucistic birds that I collected had at least a trace of a cloacal bursa, which is usually, but not always, evidence of immaturity (Storer and Jehl, in press). Therefore, I doubt that these birds had attempted to reach the breeding grounds. Another possibility is that leucism may be restricted to particular feather generations (P. A. Buckley, in litt.), and that some whitish feathers are replaced by normal plumage in the pre-basic molt. Indeed, the head and neck pattern of one bird that I watched intermittently from July to October, 1981, seemed to be slightly darker after the molt. A third explanation is that white adults on the breeding grounds are more susceptible to predation than are juveniles and non-breeders summering at Mono Lake, where predation is essentially nil (Jehl, unpubl.). Selection against conspicuous birds would result in a decreased frequency of leucism in the post-breeding flock.

In order to interpret the biological significance of ab-

normal plumage patterns, one requires data on the variation and incidence of such patterns at different seasons. This paper illustrates some of the difficulties encountered in trying to obtain such data for wild birds. If data from a large, mostly sedentary, and easily-studied population are so tentative, one cannot be hopeful of obtaining more precise information for most birds. The incidence of leucism at hatching, however, could be measured through studies of colonial-nesting birds (e.g., gulls, penguins).

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## CAVE SWALLOW PAIRED WITH CLIFF SWALLOWS

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The only confirmed sightings of Cave Swallows (*Hirundo fulva*) in Arizona have been made in Tucson on the University of Arizona campus. One Cave Swallow was seen each year from 1979 through 1982 at the Main Library among the nesting Cliff Swallows (*H. pyrrhonota*), and two were present during the 1983 breeding season. The Cave Swallows fledged three young from an old Cliff Swallow nest on the library building, and all five of the family were marked with U.S. Fish and Wildlife Service bands in 1983 (Huels 1984). Of these five, in 1984 I saw only the adult male as I recorded the periods of occupation of approximately 300 old and new Cliff Swallow nests on the university campus. This note summarizes five moves of the lone male Cave Swallow between four Cliff Swallow nests, his successive association with two or three Cliff Swallows, and his one nesting with a Cliff Swallow in 1984.

My first 1984 sighting of a Cave Swallow on the University of Arizona campus occurred at the Main Library on the evening of 19 March, shortly after the season's first sighting of Cliff Swallows on 8 March by Arnold Moor-

house. I found the Cave Swallow perched on a cup-shaped remnant of an old Cliff Swallow nest, approximately 24 m west of the nest from which he fledged young in 1983 and 0.4 m from a complete old nest occupied by a pair of Cliff Swallows. From 19 March to 9 or 10 April, I saw only the Cave Swallow on the broken nest. He appeared to center his activity at this nest. He frequently chased and displayed in flight to flying Cliff Swallows, and he added about 2 cm of mud to the rim of the nest before temporarily shifting his activity to another nest.

I found the Cave Swallow at his second nest of the 1984 season on the evening of 11 April. He and a Cliff Swallow repeatedly entered a complete old Cliff Swallow nest on the Main Library and then spent the night together inside the nest, approximately 84 m east of the nest he first occupied in 1984 and 60 m east of the nest he used in 1983. He and a Cliff Swallow were active at his second nest of the 1984 season from 11 to 17 April. Both abandoned this nest immediately after I captured them inside the nest before dawn on 17 April. The Cave Swallow proved to be the adult male banded the previous season, and I marked his chin with blue ink. His female nest-mate was banded, inked, and released. No eggs were present in their nest. The Cave Swallow resumed using the nest he used at the start of the 1984 season. From 17 through 24 April, he repeatedly displayed in flight to Cliff Swallows, but only he was seen on the nest. He abandoned this nest after being frightened from it as I captured the pair of Cliff Swallows in the nearest nest before dawn on 25 April.

The Cave Swallow was found again on 29 April 1984 at the old Cliff Swallow nest from which he fledged young

in July, 1983. This nest lacked the entrance tube and was lined with material deposited by House Sparrows (*Passer domesticus*) earlier in April, 1984. The Cave Swallow probably began using this nest the same day that I disturbed him at the cup-shaped nest, but his new roosting site was not determined until 1 May. On 1, 2, and 3 May 1984, I found the Cave Swallow at his nest of the 1983 season. He and a Cliff Swallow were sleeping side by side at the nest entrance after dark on 1 and 2 May. Only the Cave Swallow was seen roosting in this nest on the night of 3 May; however, a Cliff Swallow might have been in the nest out of sight. The day of 3 May was my last 1984 record of a Cliff Swallow at this nest. No band was detected on the Cliff Swallow interacting with the Cave Swallow at this nest, and I made no attempt to capture and mark the Cliff Swallow. The night of 3 May was my last 1984 record of a Cave Swallow at the Main Library.

The Cave Swallow was rediscovered at the Physical Education Building on 7 May 1984 at a new Cliff Swallow nest, approximately 331 m northeast of the Main Library nest he used in 1983 and May, 1984. He and a Cliff Swallow repeatedly entered the nearly completed nest. Construction of this nest began on 1 or 2 May 1984, while the Cave Swallow still was active at the library building. On 5 May, I heard but did not see a Cave Swallow near this new nest. From 7 May through 2 June 1984, an unbanded Cliff Swallow and the Cave Swallow were active at their nest on the Physical Education Building each time it was examined. The Cliff Swallow was seen adding mud to the nest on and after 7 May, but the Cave Swallow was not. Both shared in other nesting duties, and their interactions at the nest seemed as harmonious as those of the neighboring conspecific pairs. Shells of hatched eggs were found beneath the nest on 25 and 26 May. Nestlings were seen at the entrance, and both the Cave Swallow and a Cliff Swallow fed the young during a nest check at 10:30 on 2 June. Two nestlings were dead beneath the intact nest and neither adult was seen at the nest at 12:00 on 3 June. The Cave Swallow was not seen again during the 1984 breeding season.

I have found no published records of hybrids or pairs between Cave and Cliff swallows. Martin (1980), however, reported seven instances of hybridization between Cave Swallows and Barn Swallows (*H. rustica*), and five instances between either Cave or Cliff and Barn swallows (also see Martin and Selander 1975 and Martin 1982). Hubbard (1983) reported ten Cave Swallows that showed some Barn Swallow characteristics. Trotter (1878) and Mearns (1902) each reported a Barn Swallow  $\times$  Cliff Swallow hybrid. Martin (1980) reported an instance of a Cave Swallow  $\times$  Barn Swallow pair attending a nest containing two hybrid and three Barn Swallow young. The two 9- or 10-day-old nestlings that I found dead below the nest attended by the Cave Swallow  $\times$  Cliff Swallow pair provided no evidence to support or refute a hybridization event. From all indications, the Cave Swallow and one Cliff Swallow were functioning as a pair in attending the eggs and young. With the exception of one incident that might have influenced paternity or maternity of the young had it oc-

curred before or during the egg-laying period, two Cliff Swallows were not seen inside the nest. On 19 May, one Cliff Swallow was inside the nest on the eggs when a second Cliff Swallow entered the nest. A scuffle resulted, one Cliff Swallow left the nest and the other remained looking out the entrance until relieved by the Cave Swallow. Both cuckoldry and brood parasitism could have decreased the probability of the male Cave Swallow having made a genetic contribution to the young he attended. Extra-pair copulations and intraspecific brood parasitism have been reported for Cliff Swallows (Emlen 1954, Brown 1984). I rejected the possibility that the Cave Swallow was serving as an interspecific helper (*sensu* Skutch 1961), since the hatching dates suggested that the eggs were laid after he claimed the nest and my observations gave no indication that two Cliff Swallows were attending the nest. Helping at the nest has been reported for Cliff Swallows and other hirundinids, but not for Cave Swallows (Skutch 1961, Myers and Waller 1977, Shy 1982).

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