Sacramento Purple Martins in 2021: Results of Breeding Surveys and Application of Construction Protection Measures

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The Western Purple Martin (*Progne subis aboricola*) breeding population in Sacramento, California, is recognized as important and unusual because it is the only inland population that nests in elevated freeways and longer overpasses ("bridges"; Airola and Williams 2008). The population also is the last remaining Central Valley population and has long been recognized as at-risk of extirpation (Airola and Grantham 2003, Airola 2020). The steady population decline from a peak of 11-12 colony sites and 156-173 nesting pairs during 2003-2005 has been attributed to reduction in the aerial insect food supply which has lowered reproduction and disturbance and habitat degradation from construction projects (Airola 2020). We monitored the population for the 19th consecutive year in 2021, to determine the number of nesting pairs and resulting population trend. We also monitored the number of pairs with second-year (SY) males, compared to the more abundant after-second-year (ASY) males, as this measure can indicate past nesting success, juvenile survival, and suitability of conditions for nesting during the survey year.

In November 2020, we observed construction crews installing bird exclusion devices onto weep holes within U.S. Highway 50 overpasses that contain known martin colony sites. The excluders were installed as part of the California Department of Transportation's (Caltrans') multi-year Highway 50 Multimodal Corridor Enhancement and Rehabilitation Project to add additional lanes to the freeway (https://dot.ca.gov/caltrans-near-me/district-3/d3-projects/d3-us-50-hov-lane-0h08u). Bird exclusion is a standard practice used by Caltrans during freeway construction to avoid potential impacts to nesting birds that could slow or halt construction. In the past, construction personnel have excluded Purple Martins from nesting in weep holes in situations where we considered it unlikely that the birds would be affected (Airola and Grantham 2003, Airola et al. 2009). Furthermore, we have shown that nest exclusion can cause declines and permanent abandonment of colony sites (Airola and Grantham 2003). As a result of our concerns, we contacted Caltrans, their construction contractors (Flatiron Construction), and

their consulting biologists to coordinate efforts to limit the use of excluders and to protect martin colonies for the Highway 50 Multimodal Project. We report on these efforts and their results here.

STUDY AREA

The study area consists of 12 nesting colony sites in bridges within the City of Sacramento that have been occupied by Purple Martins since the 1990s and other sites that support similar characteristics (Airola and Grantham 2003). Martins nest within some of these freeway structures which they enter through openings (weep holes) on the undersides. The colony sites in the study area have been described in detail by Airola (2020). Martins used five colony sites in 2021 (see RESULTS).

METHODS

Our survey methods followed those that we have used consistently since 2003 (Airola 2020). During mid-March to mid-May, we conducted surveys to identify occupied colony sites at bridge structures previously used by martins and at other sites with suitable characteristics (> 80 m long with 6 m of air space below, and with adequate flight access; Airola and Grantham 2003, Airola 2020). Occupied sites were surveyed on 9-19 days generally between 0900 and 1100 from mid-April to mid-July to map and quantify martin use of individual weep holes and to observe breeding behaviors. Nesting pairs were quantified by observing their repeated use of nest holes and by noting diagnostic nesting behaviors (food delivery, removal of fecal sacs, nestling begging calls, and young in holes; Airola and Grantham 2003, Airola 2020). We also made 12 visits to one colony site (*S St*) that was active in 2020, but not in 2021.

We noted the number of nesting pairs that contained second-year (SY) males. The number of pairs with SY males indicates recruitment from the previous year's fledglings into the breeding population. SY males were distinguished from superficially similar females under field conditions based on their larger size, more peaked head profile, coloration (generally blue-black feathers on the side of the head and irregular dark feather on the breast or belly), and behavior (singing the male song, aggressive courting of females; Airola 2020). We did not track the proportion of SY females in nesting pairs because of the difficulty of distinguishing them from older females under field conditions.

We monitored martin responses to the adopted changes in bird exclusion practices for the Multimodal project.

RESULTS

Numbers of Colonies and Breeding Pairs

Five Sacramento colony sites supported nesting Purple Martins in 2021. This is the lowest number since systematic monitoring began in 2003 (Table 1). The number of colonies declined by one from 2020, due to abandonment of the S St. site.

The S St. colony site that was abandoned in 2021 had supported five successful nesting pairs in 2020. We did not observe any martins prospecting for mates or nest sites during the 10 visits we made there over the 2021 nesting season. This was the first instance over the past 19 years that a colony site supporting more than three pairs in a previous year had been abandoned. There were no obvious changes in site conditions or human activity at S St. in either in 2020 or 2021 that might explain why this colony was abandoned.

Twenty-three Purple Martin pairs nested at the five active colony sites in 2021. This total represents an 8% decline from the 25 pairs at Sacramento colonies in 2020 (Airola 2020). The number, however, is still slightly above the all-time low of 21 pairs recorded in 2019. Overall, the population has declined by 87% from the high of 173 pairs in 2004 (Airola 2020). Five (22%) of the 23 nesting pairs in 2021 contained SY males.

Table 1. Number of Purple Martin nesting pairs at Sacramento colony sites in 2021.

Colony Site	Pairs
I St.	4
Sutterville Rd.	7
35th St.	3
Redding Ave.	5
Roseville Rd.	4
Total	23

Construction Mitigation and its Effectiveness

Two colonies were within the boundaries of the four-year U.S. Highway 50 Multimodal Project. Bird excluders were installed in early December at the elevated highway section that included the 35th St. colony site (above T St. between 34th and 35th Streets). The project environmental document was not available online for review at that time. Therefore, D. Airola contacted Caltrans biologist Shawn Duffy and learned that no provisions had been incorporated into the project's environmental document to protect the martin colonies, other than to exclude them from nesting altogether. Airola then worked with Duffy and the construction contractor's biological monitor,

Scott Cashen, to address the impacts on this martin population that could occur if pairs were excluded from nesting sites.

Most of the 2021 construction activity was expected to occur in the center portion of the freeway between westbound and eastbound lanes, whereas the martins had previously nested within holes on the north side of the westbound freeway. We agreed on a plan to remove the bird excluders from 20 weep holes in the area where martins had nested in the previous few years at the 35th St. colony. The contractor removed the excluders sometime during 29 March—2 April. As of 27 March, we had not observed martins at the site. No other surveys were made from 28 March to 10 April, but we observed the first martin here on 11 April. Three martin pairs proceeded to nest in the opened weep holes at this colony site, the same number that used the site in 2020 (Airola 2020). No construction activity other than bird exclusion occurred in this section of the freeway during the 2021 breeding season.

Redding Avenue was the second martin colony site within the Highway 50 project area. This site was not scheduled for construction during the 2021 breeding season and weep hole excluders were not installed there. Five martin pairs nested successfully in this area in 2021. Discussions with the Caltrans and construction contractor's biologist led to a tentative plan for 2022 to keep the weep holes open during construction in the northernmost side of the freeway, where martins had nested in 2021 and in several previous years.

Figure 1. Purple Martin colony site in elevated section of U.S. Highway 50 near 35th St. in Sacramento. Bird excluders installed in December 2020 were removed from 10 holes in this row of weep holes prior to the 2021 nesting season. Three pairs successfully used holes here to access nesting chambers.

DISCUSSION

Numbers of Colonies and Breeding Pairs

The 2021 decline in the number of active colonies and the Sacramento Purple Martin nesting population highlights the continued fragile condition of this last Central Valley population. Maintenance of the Sacramento martin population, as a source for recovery of the population that has been eliminated from the rest of the Central Valley, requires the continued protection of Sacramento colonies from construction impacts. As described by Airola (2020), protection of colonies from construction disturbance is a critical component to a longer-term conservation program for the species. That strategy also requires the reduction in use of neonicotinoid insecticides in residential areas and on nearby agricultural crops, which appear to be reducing the supply of aerial insect prey for martins and thereby reducing the reproductive success of remaining pairs (Airola 2020).

The unprecedented abandonment of the S St. colony is particularly concerning. Martins show strong fidelity to nesting colonies unless predation or some other event causes widespread nesting failure (Airola 2020). Yet none of the five successful breeding pairs from 2020 or their progeny returned to breed at the site in 2021. Nor did it appear that the S St. martins relocated to another colony, because the number of breeding pairs did not increase at the nearest colony sites, as has been observed in the past when predation caused colony abandonment (Airola and Kopp 2013, 2015).

Abandonment of a site that supported five pairs suggests that the 2020 breeders at the site suffered an unusually high rate of mortality. This conclusion is supported by past monitoring results which showed that various colonies persisted to the next year all nine times when they consisted of five pairs, and all eight years when colonies consisted of four pairs, Although colony site abandonment due to high mortality could be an infrequent chance event, it is concerning nonetheless because the decline in the Sacramento population has been mostly attributed to low reproductive success rather than high adult mortality (Airola 2020). Considering the longer-term implications, only one of seven colony sites that was abandoned since 2004 has been permanently reoccupied (Airola 2020). This reduction in colony sites further concentrates the remaining nesting population, making it more susceptible to future construction disturbance or habitat change.

The presence of five SY males (22% of 2021 nesting pairs in Sacramento) is substantially above the 7.6% average annual contribution of SY males to pairs at Sacramento colonies (Airola 2020). This high level of juvenile recruitment and survivorship in 2020 is encouraging for the population.

Construction Mitigation and its Effectiveness

The lack of proper consideration of martin nesting population protection measures in the Highway 50 Multimodal Project environmental documents and construction plans illustrates the continued difficulties of conserving Purple Martins in urban Sacramento. The publication of detailed conservation planning guidance in 2020 (Airola 2020), however, appears to have improved receptivity by the lead agency and contractors in seeking solutions to potential conflicts and acceptance of recommended construction mitigation measures. The potential impacts of excluding martins from nest sites, including potential reduction in reproductive success of displaced pairs (Airola and Kopp 2013) and potential abandonment of colony sites (Airola and Grantham 2003) were successfully avoided in 2021 thanks to the flexibility and urgency with which Caltrans and the Flatiron Construction team acted.

The Highway 50 Multimodal Project will continue through 2024. Although impacts of pre-project bird exclusion were avoided in 2021, no major construction activity occurred near breeding colonies. The decision as to whether to leave holes open during future construction requires careful balancing of the potential risks of disturbing martins during construction against the negative impacts of disrupting breeding over the long-term by exclusion and potential site abandonment (Airola 2020). Continued flexibility and cooperation are needed in applying appropriate protection measures based on the timing and scope of construction activities, results of this and past studies (Airola and Grantham 2003, Airola et al. 2009), and continuing efforts to evaluate martin responses going forward. Thus, continued careful monitoring is required to evaluate responses to the adopted mitigation measures and to refine protection measures when necessary.

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Photos by Lisa Alvarez