

Purple Martin population status and colonization patterns in the Sacramento region in 2004

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The Purple Martin (*Progne subis*) is recognized as a species of special concern by the California Department of Fish and Game (1992) as a result of substantial population and range declines in the state. The population that currently nests in overpasses and elevated freeways (“bridges”) in Sacramento, California, is recognized as the only remnant of the formerly widespread Central Valley population (Airola and Grantham 2003). Based on estimates made by Williams (1998), the Sacramento population comprises 10-15% of the martin nesting population in the state.

Surveys conducted intermittently from 1992 until 2003 revealed that the Sacramento martin population was relatively small (154 nesting pairs), occupied only 10 individual sites, and was slowly increasing (Leeman et al. 2003). The small number of pairs and occupied sites, and their locations in transportation structures in an urban area, makes the species susceptible to disturbance and loss (Airola and Grantham 2003).

We continued population monitoring in 2004 to estimate numbers of breeding pairs and number of occupied sites. We report these results and compare them to previous surveys to assess the population trend. We also report on 2004 observations at a site in the City of Davis, Yolo County, first occupied in 2003. We also describe observed mechanisms for colonizing new sites. Other 2004 work on nest site competition with the European Starling (*Sturnus vulgaris*), effectiveness of management methods, and overwinter and migratory survival of banded martins will be reported elsewhere.

STUDY AREA

The study area consisted of colony sites in bridges in Sacramento that previously were either occupied or identified as suitable based on similarity to occupied sites (Airola and Grantham 2003, Leeman et al. 2003). Colony names used below, and their mapped locations, may be found in Leeman et al. (2003). We also include information on a nearby site, the north side of the Pole Line Road overpass of US 80 in the City of Davis 15 miles west of Sacramento, which was occupied by two pairs in 2003 but was not previously included in the Sacramento study.

METHODS

Airola, Kopp, and trained volunteers checked suitable sites and monitored occupied sites to estimate nesting population sizes. We conducted monitoring and population estimation by mapping hole use and recording breeding behaviors during 8-20 visits over the nesting season, as described by Airola and Grantham (2003). We also surveyed other suitable bridge sites that had not been previously occupied (see Leeman et al. 2003) during the height of the breeding season in 2004 to determine occupancy and to estimate numbers of any nesting pairs. Airola checked the Davis colony site on April 27, in the height of the nesting season, and three other observers (H. Ohlendorf, E. Whisler, R. Hall) also reported results from at least six other visits during the nesting and the early post-nesting period.

We recorded age classes of males at newly colonized sites during 2003 and 2004 to evaluate colonization patterns. In some cases, particularly at new colonies, we identified ages as adult (after second year, ASY) or second year (SY) males at nest sites based on direct observation of a combination of plumage (Hill 1999) and courtship behavior. We could not evaluate ages of females in nesting pairs using this method, because of the inability to distinguish age classes under most field conditions.

We also indirectly determined ages of males at nest holes where we observed >10 visits by calculating the proportion of ASY males and "non-ASY-males" that visited holes. (The term "non-ASY-males" encompasses ASY and SY females and SY males, which were often difficult to distinguish reliably under field conditions.) We considered a pair to have an SY male present if 0-10% of entries were recorded as ASY males. The resulting proportions of ASY and SY males at nest sites within colonies were compared between newly colonized sites and larger established colonies.

We also used results of banding captures of 43 adults in 2003 and 2004 to assess ASY and SY composition within sampled colonies. Birds were captured for banding at nest sites as described by Airola et al. (2003). Age classes of both males and females were determined in-hand by Kostka based on his extensive experience monitoring banded western Purple Martins at nest sites, as well as diagnostics from Pyle (1997) and Hill (2002). All banding effort was focused at larger established colonies, including 70% of captures from the I Street colony, so these data could be used only to represent composition at these areas. Recaptures in 2004 of birds banded in 2003 were included in calculations of proportions of ages of birds present in established colonies.

RESULTS

In 2004, 11 sites were occupied that supported 173 breeding pairs. The nesting population increased in 2004 by 13.8% from numbers in 2003. The 2004 nesting populations increased at 7 of 10 colonies where martins were

present in 2003, while numbers at two colonies declined, one remained the same, and one new colony was established (Table 1).

Table 1. Breeding Purple Martin pairs at Sacramento colony sites in 2004 and in previous years with comprehensive surveys.^a

Colony	1992 ^b	2002 ^b	2003 ^c	2004
I Street	23	37	29	35
20 th Street	38	14	21	23
Sutterville	0	4	6	8
Broadway	14	8	7	7
S Street	0	14	14	16
35 th Street	30	29	19	15
Redding Rd.	ns ^d	0	3	12
El Camino	ns	ns	15	23
Marconi	ns	ns	1	4
Roseville Rd.	ns	29	39	27
Arden	ns	ns	0	3
Total	105	135	154	173

a Numbers reported represent pairs reaching nestling stage.

b Source for 1992, 2002: Airola and Grantham 2003.

c Source for 2003: Leeman et al. 2003.

d ns = no survey conducted that year.

The largest increases occurred at three colonies that were established relatively recently: Marconi and Redding Road, which both increased by 300%, and El Camino, which increased by 53%. Breeding populations declined noticeably in 2004 at Roseville Road (-31%) and 35th Street (-21%). The new colony, at the Arden Way overpass of Roseville Road, is between two existing colonies (El Camino and S Street; see locations in Leeman et al. 2003). Arden Way had martins present during part of the 2003 season, but no successful nesting

occurred then. We previously rated this site as highly suitable (Leeman et al. 2003). The males of all three nesting pairs in 2004 at Arden Way were SY males.

Two other previously unoccupied sites (Airbase Drive and San Juan Road overpass of Natomas Main Drain), also rated as highly suitable (Leeman et al. 2003), were occupied in 2004. Airbase supported a single pair with an SY male, while San Juan supported two pairs, one with an ASY male and another with an SY male. We observed early nest building at both sites, but nesting did not proceed at either site.

No martins were observed nesting during 2004 at the Davis site, which Airola and other observers had determined was occupied by two pairs with SY males in 2003. A single SY male martin was observed once at the site on 29 June 2004 (Hall pers. comm.), which is late in the nesting period. In 2003, the new Marconi colony also supported a single pair with an SY male, while the Redding Road colony supported three pairs with one SY male and two ASY males.

In total, seven (78%) of nine pairs at sites colonized in 2003 and 2004 contained SY males during the first year of colonization. This SY:ASY male ratio differs substantially from that observed at larger established colonies where only 14 (14%) of 98 sites with adequate data to estimate male age class contained SY males. Banding at the larger, established colonies showed that only one (4%) of 23 males in nesting pairs was an SY male. In contrast, SY females comprised 10 (38%) of 26 females within pairs captured at established colonies.

DISCUSSION

The 2004 survey documents a continued population increase and expansion of the numbers of nesting sites by Sacramento's Purple Martins. The increase in known pairs in 2004 (13.8%) is similar to that recorded between 2002 and 2003 (12.6%), but the calculated 2003 increase incorporated the discovery of a colony (El Camino) that apparently had been previously established and overlooked (Leeman et al. 2003). The 2004 survey result represents a more precise estimate of the population increase, as we surveyed all or nearly all suitable habitat during both 2003 and 2004, but did not survey as extensively in 2002. The rates of population increase in 2003 and 2004 were substantially greater than the 2.5% average annual increase over 1992-2002.

We do not know why the recent rate of population increase is higher than previously because we do not know what factors may be limiting populations. The fact that the increases occurred simultaneously at many Sacramento colonies, as well as elsewhere in many populations throughout the species western range (Western Purple Martin Working Group, unpub. data), suggests a general cause (e.g., weather, food availability). To date, we have documented that suitable nesting habitat appears abundant (Airola and Grantham 2003), and there is no evidence of substantial predation (although we do not have access to nest sites to assess nest losses). Human disturbance also does not appear to have affected any colonies in the past three years. Initial monitoring of color-banded birds indicates no unusually

high overwinter and migratory mortality (Airola, unpublished data). Other potential limiting factors for populations could include nestling infestation by ectoparasites (due to repeated use of the same nest sites), starling disruption, pesticides, variation in food availability, vehicle collision mortality (although few mortalities have been documented), or a combination of these or other factors.

Declines at one long-term colony, 35th Street, coincided with the marked increase in numbers of martins at Redding Road, 2 miles away. The 35th Street colony has the highest traffic volume beneath it of any colony (an average daily volume of 10,104 vehicles per day when last measured in 1993; City of Sacramento 2004), and traffic appears to have increased substantially since then due to construction of several nearby hospitals. Therefore, this site may be suffering a long-term decline in suitability and populations. The decline at Roseville Road has no obvious cause and may be temporary. Lack of nesting at the Davis site may be a response to disruption by a large starling population at this small site; at least eight starling pairs nested at this site in 2004 (Airola unpublished data), possibly in response to abundant food available at an adjacent storm water detention pond.

The growth of populations at most sites directly reflects the availability of suitable additional nesting habitat and availability of colonizing individuals. All sites colonized or located since 2003 have conformed to the habitat specifications identified by Airola and Grantham (2003) based on pre-2003 surveys. The increase at 20th Street ultimately represents the continued recovery following exclusion of nesting martins from a portion of this site to construct a light-rail line in 2000-2002 and resulting population decline (see Airola and Grantham 2003).

The 2003 and 2004 observations that new sites in Sacramento are colonized primarily by pairs with SY males is consistent with observations of populations nesting in nest boxes and pilings in Washington and British Columbia (Kostka and Cousens, unpublished data), as well the many martin "landlords" who attempt to attract martins to nest boxes and gourds in the eastern United States (Stokes et al. 1997). The low proportion of SY males nesting within larger established colonies suggests interference or other factors inhibiting nesting success there may induce SY males to colonize new sites. The relatively high success of SY females in finding ASY mates within larger established colonies raises the interesting question regarding the age classes of females that are mating with SY males at newly colonized sites.

The increasing martin population in Sacramento contrasts with the larger pattern of recent decline within the state. The bridge nesting population in Sacramento, as well as other unmonitored coastal bridge sites (Williams 1998), have the potential to continue to grow in numbers and expand in range, and thereby become a more important component of the state's martin population. While Breeding Bird Survey data indicate that

starling populations are not increasing in most lowland areas of the state, they continue to increase in the less disturbed Sierra Nevada region (Sauer et al. 2004). This pattern suggests that continued human development in more remote areas (including developing areas within lowland woodlands and forests) may be making more martin nesting areas suitable for starlings, with predicted detrimental consequences (Williams 2002). While the Sacramento martins recently have become more secure by expanding their population size and the number of nesting colony sites, they continue to deserve management attention as a critical component of potential martin recovery in the state.

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