

## NESTING BEHAVIOR OF AMAZONA PARROTS AND ROSE-RINGED PARAKEETS IN THE SAN GABRIEL VALLEY, CALIFORNIA

KAREN T. MABB, Department of Biological Sciences, California State University, Long Beach, California 90840 (current address: 6213 N. Cloverly Ave., Temple City, California 91780)

Many species of parrot have established populations well away from their native ranges (Enkerlin-Hoeflich and Hogan 1997, Fisk and Crabtree 1974, Froke 1981, Garrett 1997, Hall 1988, Hardy 1964, 1973, Johnston and Garrett 1994, Morgan 1993, Neidermeyer and Hickey 1977, Shelgren et al. 1975). In southern California, at least, several species now occur in what appear to be self-sustaining populations (Garrett 1997). Some of these, particularly amazon parrots (*Amazona* spp.), occur in large flocks and roosts numbering in the hundreds of individuals (Mabb 1997).

The numbers and variety of parrots in southern California have been increasing (Garrett 1997, Johnston and Garrett 1994), and some species are present in such numbers as to suggest strongly that there is reproductive recruitment, rather than repeated escapes or releases of hundreds of parrots (Mabb 1997). There is little direct evidence of breeding because naturalized parrots in California have been largely ignored by ornithologists and bird-watchers. Froke (1981) reported one pair of Lilac-crowned Parrots (*Amazona finschi*) nesting in an old woodpecker cavity in a Blue Gum tree (*Eucalyptus globulus*), two pairs of Red-crowned Parrots (*A. viridigenalis*) also nesting in a Blue Gum tree, and a pair of Yellow-headed Parrots (*Amazona oratrix*) nesting in a Mexican Fan Palm (*Washingtonia robusta*). All of these nestings were in Arcadia and produced young. Residents in Anaheim, Orange County, reported to me that a Red-crowned Parrot nestling fell out of a nest on 26 June 1994. A nestling Canary-winged Parakeet (*Brotogeris versicolurus versicolurus*) was collected in San Pedro, Los Angeles County, California in June 1973 (Garrett 1997). Hardy (1964) reported the first instance of Rose-ringed Parakeets (*Psittacula krameri*) breeding in southern California, and Charles T. Collins collected three Rose-ringed Parakeet chicks from a nest in a tree hollow in Pomona in 1974 (Shelgren et al. 1975, Collins pers. comm.).

In their native range, the Red-crowned and Lilac-crowned parrots are allopatric, with the Red-crowned limited to northeastern Mexico and the Lilac-crowned occurring in western Mexico (Forshaw 1989, Howell and Webb 1995). Two previous studies provide information about *Amazona* spp. nesting in northeastern Mexico (Aragon-Tapia 1986, Castro 1976). Recent study of the Red-crowned Parrot's breeding behavior has shown that the species may nest colonially, with 76 nest cavities used in a 96-ha study area in northeastern Mexico from 1992 to 1994 (Enkerlin-Hoeflich 1995, Enkerlin-Hoeflich et al. in press, Enkerlin-Hoeflich and Hogan 1997). There is little documentation of the nesting behavior of native populations of the Lilac-crowned Parrot.

The Rose-ringed Parakeet ranges through the Sudan belt of Africa from Senegal to Somalia and across the Indian subcontinent from Pakistan to

central Burma and Sri Lanka. Introduced populations are present in Mauritius, Zanzibar, Egypt, Aden, Oman, Kuwait, Iraq, Iran, Great Britain, Hong Kong, Macao, and Singapore (Forshaw 1989, Morgan 1993). Which of the four subspecies that occurs in California has not been documented.

I report here observations on breeding *Amazona* parrots and Rose-ringed Parakeets in the San Gabriel Valley of Los Angeles County, California. My observations were concentrated in the communities of Temple City and adjacent Arcadia. I observed nesting areas from 9 April 1996 to 7 August 1996 and from 27 January 1997 to 15 July 1997 and observed roosting flocks, noting the number of dependent juvenile *Amazona* parrots present, from 15 May 1995 to 16 August 1997 (Mabb 1997).

## STUDY AREAS

### Location 1

On eight occasions between 9 April 1996 and 7 August 1996, I located at least 10 to 30 *Amazona* nests and four Rose-ringed Parakeet nests in what appeared to be a semi-colonial situation. Because of the difficulty of distinguishing female Red-crowned Parrots from Lilac-crowned Parrots, I merely established that both were present, and refer to them as "*Amazona* spp." On seven occasions between 27 January 1997 and 8 July 1997, I observed two Rose-ringed Parakeet nests and up to 50 *Amazona* spp. in the area, but I noted only the presence of nesting activity and did not attempt to locate any specific nest cavities. All of these parrots were using Silver (= Soft) Maples (*Acer saccharinum*) lining streets in a neighborhood developed in the 1940s near the border of Arcadia and Temple City. Some trees contained more than three nests. In one tree, there were two Rose-ringed Parakeet nests and at least one *Amazona* nest. Frequent tree trimming in this area caused large nodes to form at the end of thicker branches and exposed the heartwood to decay by weathering, insects, and excavation by parrots or other birds or mammals. All of the nests I observed were in these excavated cut-off limbs (Figure 1). Nest heights varied mostly from 8 to 14 m; the lowest was in a tree trunk at a height of approximately 5 m.

I was unable to mark and examine each nest and was thus restricted to casual observations concentrated on those nests that I could readily find on subsequent trips.

### Location 2

I observed a pair of Lilac-crowned Parrots nesting in a cavity in a utility pole 9 m high in Temple City. I made observations of this nest on eight different days from 2 April to 2 June 1996. I was unable to distinguish the sexes of the two individuals attending the nest. I also visited this area eleven different days between 31 January 1997 and 15 July 1997; although over 500 parrots were foraging and roosting in the area, I did not observe any parrots using the utility-pole cavity, nor was I able to find any other nests. Sycamores (*Platanus racemosa*) and Silver Maples line the streets in this suburban neighborhood.



Figure 1. Tree containing several nest cavities occupied by *Amazona* parrots in Temple City, Los Angeles County, February 1997.

*Photo by John Young*

## ROSE-RINGED PARAKEET

Two pairs of Rose-ringed Parakeets nested at an approximate height of 10 m in the same Silver Maple at Location 1. An *Amazona* nest was also located in the same tree and at the same height. There were two additional Rose-ringed Parakeet nests in two nearby Silver Maples. In April 1996, I observed male Rose-ringed Parakeets leaving these nests to forage and returning to feed young or a mate. The males rarely entered the nest completely; in most cases they merely ducked their heads into the nest. Upon my approach, the male often performed distraction displays before leaving to forage. These distraction displays included short flights to many perches around the nest and circular flights beneath the tree canopy in the nest area. Both displays were accompanied by loud vocalizations. On 27 April 1996, nine individuals were present in the Silver Maple with the two nests. One, presumably an immature, had a yellow bill; the others had red bills. On 28 April 1996, I observed a fledgling Rose-ringed Parakeet being fed by a male on the outside rim of a nest cavity. After feeding the fledgling, the male ducked his head into the nest and fed other chicks or the female. In May 1996 and June 1996, up to 10 Rose-ringed Parakeets were using the area. Five individuals were present on 23 June 1996, but none after that.

On six occasions between 27 January 1997 and 8 July 1997, I observed two male Rose-ringed Parakeets, each using the same Silver Maple as the one that contained the two nests in 1996. I also observed a female Rose-ringed Parakeet entering a cavity on 9 February 1997.

## LILAC-CROWNED PARROT

At Location 2, a pair of Lilac-crowned Parrots aggressively defended their nest, the utility pole, and nearby power lines against Red-crowned Parrots, Red-lored Parrots (*A. autumnalis*), and other Lilac-crowned Parrots. They also chased away American Crows (*Corvus brachyrhynchos*) and European Starlings (*Sturnus vulgaris*). The nest cavity was located on the north side of the utility pole, approximately 1 m from the top of the pole. Directly under the cavity was a wood cross-beam and a transformer drum on which the nesting pair performed many courtship displays, such as tail-fanning, wing-spreading, nape-raising, and pupil dilation (Copsey 1995, Levinson 1980). They frequently engaged in allopreening and in mate feeding by regurgitation. They also shared solid food held in the foot of one individual.

In early April, these two parrots were frequently entering and exiting the nest cavity. They excavated the nest presumably by enlarging a pre-existing cavity. In the evening, both parrots usually disappeared into the cavity approximately one minute before a nearby flock (numbering approximately 350 *Amazona* spp.) settled on their nighttime roost. On 3 May 1996, I heard chicks begging in the nest and saw an adult Lilac-crowned Parrot peeking out of the nest periodically. Another Lilac-crowned Parrot made many short trips, about 5 minutes in duration, to and from a foraging location, returning to put its head in the nest and deposit food to the nest occupants. On 17 May and 2 June 1996, I saw 10–30 Lilac-crowned

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Parrots foraging on fruits directly under and around the utility pole, but I could not determine if any were interacting with the nest cavity.

In 1997, I did not observe any parrots using this nest on 12 visits from 31 January to 16 August 1997, but juveniles were present among the roosting flock. On 15 July 1997, I observed a Red-lored Parrot feeding a chick.

### RED-CROWNED PARROT AND LILAC-CROWNED PARROT

Between 9 April and 23 June 1996, there were over 50 *Amazona* spp. at Location 1. There were 20 to 30 trees in use, with as many as five individuals per tree readily apparent outside cavities. An average of two to three cavities per tree were either occupied or being investigated. On 9 April 1996, I observed a Red-crowned Parrot emerge from a nest cavity; a Lilac-crowned Parrot peeked out of the same cavity immediately after. The Red-crowned Parrot stayed outside of the nest for 2 minutes and engaged in allopreening and other courtship posturing and behaviors with the watching Lilac-crowned Parrot before leaving to forage. On 5 May 1996, I observed one other such mixed pair. On this occasion, when a Lilac-crowned Parrot arrived at a nest, a Red-crowned Parrot poked its head out. The Lilac-crowned Parrot then entered the nest. It reemerged shortly afterward and flew from tree to tree, vocalizing, in an apparent distraction display. On 11 April 1997, I observed a Red-crowned Parrot × Lilac-crowned Parrot pair exploring a cavity. They also engaged in allopreening and displays outside of the cavity. All other pairs appeared to be conspecific.

On 5 May 1996, I observed a recently fledged chick accompanied by an adult Red-crowned Parrot. The chick fluttered on the ground, and I first assumed it to be an injured adult. Upon my approach, the adult, also on the ground, repeatedly pecked the chick until both took flight. The chick landed several times and was pecked by the adult each time until they both flew to the roof of a house where the chick began begging and was immediately fed by the adult. After that, again prompted by the adult, both parrots flew to an area out of sight on private property.

Nesting activity was noted on 19 May and 6 June 1996. On 23 June 1996, there was little activity at the nests, but eight dependent juveniles and approximately 35 adults were present in the area. After 23 June 1996 parrots were at this location only to forage.

On five visits to Location 1 from 27 January 1997 to 13 May 1997, I noted up to 50 *Amazona* spp. using cavities in the same trees as the previous year. On 11 March 1997, I observed a pair of Blue-fronted Parrots (*Amazona aestiva*) exploring a cavity in a Silver Maple and performing courtship displays near the opening of the cavity. Juvenile Red-crowned Parrots were present on 13 May 1997. There were no *Amazona* spp. present after 8 July 1997.

## DISCUSSION

I have observed adult *Amazona* spp. regurgitating into the bills of begging juveniles. From research on captive Yellow-headed Parrots, Hardy (1973)

felt that one could not assume that parrots were dependent juveniles on the basis of observed regurgitation only, as there is the possibility that this might be courtship feeding behavior between adults. Even in the field, however, one can distinguish between feeding-of-a-mate regurgitation and feeding-of-young regurgitation. Juveniles vigorously bob their heads up and down while giving a distinctive "uk" call repetitiously before, during, and after feeding, whereas adults being fed do not vocalize or flutter their wings, feeding episodes are brief, and feeding is not persistently solicited. Froke (1981) was also able to distinguish juveniles from adults by using similar behaviors. Juveniles also differ in plumage; their color is more vibrant than the adults' and their wing coverts are edged in pale yellow (Mabb pers. obs., K. L. Garrett pers. comm.), unlike the adults' solid green wing coverts (Forshaw 1989, Howell and Webb 1995). Up to 25 dependent juveniles were present among roosting flocks (numbering 42–50 *Amazona* spp.) from 22 July to 13 November 1995 (Table 1). The following year, up to 50 dependent juveniles were present among roosting flocks (numbering 50–500 *Amazona* spp.) from 26 April to 17 December 1996 (Table 1). In 1997, juveniles were present among roosting flocks beginning 13 May 1997, and I observed over 50 juveniles among a roosting flock (numbering approximately 500 *Amazona* spp.) on 13 August 1997 (Table 1). Estimates of numbers of juveniles are based on observing juveniles present among a large roosting flock and being fed shortly before roosting. The estimates are only approximate because depending on vocalizations can only give a general idea of their abundance. When they are in shady trees and in large numbers it is difficult to see them and distinguish plumage characteristics in pre-sunset light. Also, some juveniles may already be satiated and, therefore, not beg for food. Early in the fledging period, numbers are difficult to estimate because bouts of begging behavior and calling result in rapid response by adults. Later in the season, when the juveniles are approaching independence, the bouts are longer. Dependent young noted early in the season may have achieved independence well before the end of the season and thus may not be counted among the young observed at the end of the season.

Although most of the pairs observed in this study consisted of conspecifics, in at least three cases what appeared to be mixed-species pairs were noted. It can only be assumed that these pairs were of "pure" parental types, but they could have been of hybrid origin resulting from previous hybridization either in the wild or in captivity prior to their escape to the wild. Most individuals observed in this study appeared to be typical of their respective species. There was, however, notable variation in the extent of the red and lilac present on the head of many individuals of both species. Some adult Red-crowned Parrots also had yellow posterior to the red on the crown. Similar phenotypic variation among Red-crowned Parrots has been previously reported in a native population (Enkerlin-Hoeflich 1995).

I chose to make casual observations of nesting activity because I did not want to attract public attention and risk having nests "poached" or vandalized. To more clearly document nesting, nests must be marked, height of cavity and dimensions determined, and contents monitored. Such documentation exists for populations in Mexico (Enkerlin-Hoeflich 1995), and the techniques employed were recently detailed (Enkerlin-Hoeflich et al. in press).

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**Table 1** Numbers of Total and Fledgling Red-crowned and Lilac-crowned Parrots at Roosts in Temple City and Arcadia

| Date        | Total parrots | Dependent young |
|-------------|---------------|-----------------|
| 22 Jul 1995 | 42            | 2               |
| 24 Jul 1995 | 57            | 5               |
| 1 Aug 1995  | 135           | 10              |
| 6 Aug 1995  | 275           | 20              |
| 13 Aug 1995 | 325           | 20              |
| 17 Aug 1995 | 525           | 20              |
| 24 Aug 1995 | 150           | 10              |
| 7 Sep 1995  | 300           | 25              |
| 10 Sep 1995 | 450           | 10              |
| 8 Oct 1995  | 250           | 10              |
| 15 Oct 1995 | 500           | 2               |
| 13 Nov 1995 | 500           | 1               |
| 26 Apr 1996 | 350           | 2               |
| 28 Apr 1996 | 200           | 2               |
| 5 May 1996  | 75            | 5               |
| 19 May 1996 | 200           | 2               |
| 2 Jun 1996  | 30            | 2               |
| 23 Jun 1996 | 200           | 13              |
| 7 Aug 1996  | 200           | 20              |
| 27 Aug 1996 | 450           | 30              |
| 18 Sep 1996 | 350           | 50              |
| 24 Nov 1996 | 500           | 5               |
| 17 Dec 1996 | 250           | 2               |
| 13 May 1997 | 50            | 4               |
| 13 Jun 1997 | 250           | 7               |
| 8 Jul 1997  | 350           | 7               |
| 11 Jul 1997 | 350           | 20              |
| 14 Jul 1997 | 250           | 10              |
| 25 Jul 1997 | 350           | 10              |
| 13 Aug 1997 | 500           | 50              |
| 16 Aug 1997 | 750           | 35              |

The rapid increase in parrot populations strongly suggests reproductive recruitment. Evidence of chicks produced outside of captivity has been previously documented in the Rose-ringed Parakeet (Hardy 1964, Shelgren et al. 1975), Lilac-crowned Parrot (Froke 1981), Red-crowned Parrot (Froke 1981, K. L. Garrett pers. comm.), and Yellow-headed Parrot (Froke 1981). Numbers of dependent juvenile *Amazona* in evening roosts clearly increased from 1995 to 1996. The presence of dependent juveniles and nests suggests that the large numbers of parrots observed in the San Gabriel Valley are, at least in part, due to reproduction in the wild. There appears to be an abundance of cavities suitable for nesting. The wide variety of exotic ornamental and fruit trees planted in the suburban habitat supplies adequate food (Froke 1981, Hall 1988). Thus, nest sites may not limit further increases in the parrot population of southern California.

## SUMMARY

An aggregation of naturalized Red-crowned (*Amazona viridigenalis*) and Lilac-crowned (*A. finschi*) parrots nested in Silver Maples (*Acer saccharinum*) in a Los Angeles County suburban neighborhood from April to August 1996 and January to July 1997. Four Rose-ringed Parakeet (*Psittacula krameri*) nests were observed among an aggregation of *Amazona* spp. nests. A solitary pair of Lilac-crowned Parrots nested in a utility pole from April to June 1996. Three mixed Red-crowned × Lilac-crowned Parrot pairs were observed; all other pairs appeared to be conspecific.

The numbers of dependent juveniles of *Amazona* spp. in evening roosting flocks observed from May 1995 to August 1997 increased from 1995 to 1996. The number of dependent juveniles in August 1997 was equal to or greater than the number seen in 1996.

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