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Natal Dispersal and First Breeding Age in Monk Parakeets

LILIANA F. MARTÍN AND ENRIQUE H. BUCHER

*Centro de Zoología Aplicada, Universidad Nacional de Córdoba,
Casilla de correo 122, 5000 Córdoba, Argentina*

Between 1983 and 1988 an intensive study on population dynamics and behavior of the Monk Parakeet (*Myiopsitta monachus*) was carried out by the Centro de Zoología Aplicada, University of Córdoba. The Monk Parakeet is unique among parrots in building its own nest of sticks. Often the nest is integrated into a compound nest (Forshaw 1978) or lodge; these deserve attention because collaboration in nest building represents an important form of helping (Brown 1987).

Reduced natal dispersal and delayed breeding also are considered important determinants of helping by favoring the accumulation of a surplus of nonbreeding individuals (Brown 1978). Natal dispersal and age at first breeding is of particular interest in Monk Parakeets because the species shows at least some characteristics that suggest it is a communal breeder. Indications of an incipient degree of allofeeding also

have been found in the Monk Parakeet by Martella (1985) and Emlen (in press). Our paper concerns adult movement, natal dispersal and age at first breeding and their implications in the evolution of communal breeding.

Methods.—Fieldwork was carried out between 1983 and 1988. The study area was about 600 ha of natural and cultivated pasture with patches of forest located near the town of Jesús María, Province of Córdoba, Argentina (31°05'S, 64°11'W).

Adults and young were censused three times a year: before the breeding season (September), after this season (March), and in winter (June). Total population counts were obtained by trapping birds from the nests at night using a specially designed funnel net (Martella et al. 1987) placed below each nest entrance, supplemented by direct observations during the day.

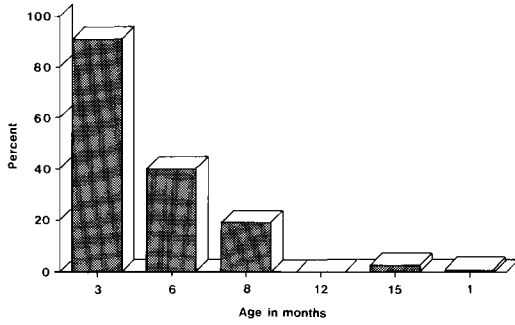


Fig. 1. Percentage of young Monk Parakeets remaining in natal nest at three-month intervals following hatching in Córdoba Province, Argentina, 1983-1988.

All captured parakeets were banded with numbered aluminum bands and released near their nests the following morning. We could not determine the sex of individuals. Also, we could not determine which individuals used different chambers that were served by a single entrance. We captured and banded 669 adults and 75 young during the study.

Age of captured individuals could be determined during the postbreeding season (March) only, because only adult birds molt their remiges during this period (Navarro et al. 1992). Nonmolting individuals were recorded as young; molting individuals were considered adults.

Nest location of each bird was determined by successive recaptures. Breeding stage for each nest was checked by inspecting nest chambers for eggs or nestlings. Nestlings were banded when 20 days old and then observed until they fledged. After fledging they were monitored in the same way as adults.

We define adult movement as the distance (in a straight line) between occupied nests in successive censuses, and natal dispersal the distance between the natal nest and the first breeding place.

Results.—We recaptured 44% of the 186 fledglings banded in the study area. Most young (91%) remained with their parents until nearly three months old (March census). From then on the birds left the nests gradually and intermittently until early the following breeding season, when almost none remained (Fig. 1). Two young remained in their natal nest during the next breeding season, but these nests had been abandoned by their parents, and the young were joined by other unidentified birds.

The median dispersal distance from natal nest to first breeding site recorded was 1,230 m (individual values were 300, 1,250, 1,400 and 2,000 m). Usually, young dispersed singly and in random directions (Fig. 2). On three occasions, whole family groups (four to six members) were displaced because their nests were destroyed by storms. None of these displaced family groups (parents with young and siblings, without

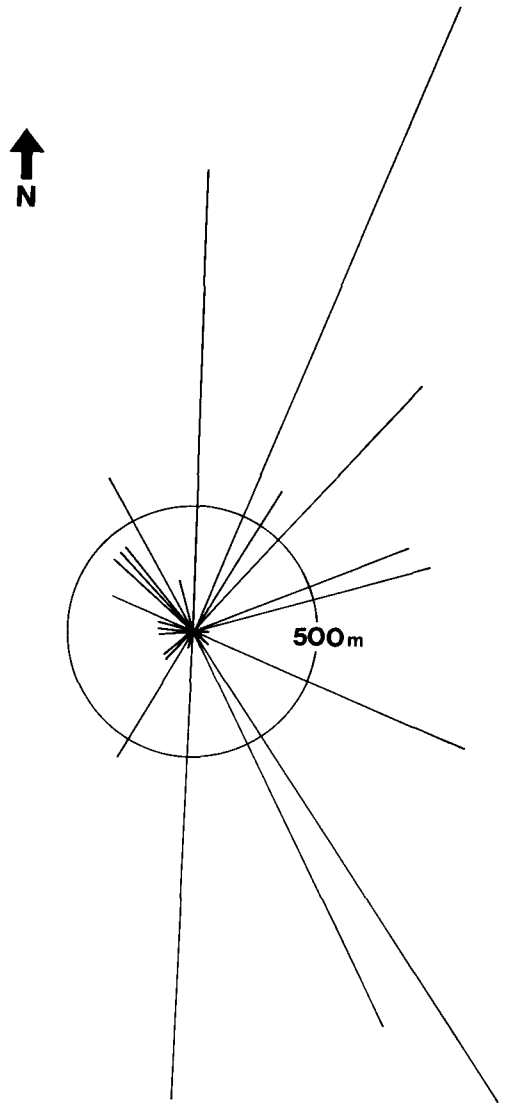


Fig. 2. Directions moved by young Monk Parakeets from natal nest to first occupied nest in Córdoba Province.

parents) moved more than 300 m. After the first year of life, none of the observed movements (either by isolated individuals or groups) included siblings or parents moving together.

About 50% of adults and birds of the year changed nests between successive censuses. Adults moved a median distance between censuses of $503.6 \pm \text{SD}$ of 118.2 m ($n = 364$). Young in their first year moved 498 ± 536.7 m ($n = 28$). Nearly one-half of the distances moved (adults and yearlings; 41%) between successive censuses were less than 250 m (Fig. 3).

Only 16 of the banded nestlings were recaptured when one year old. Two of these remained in their

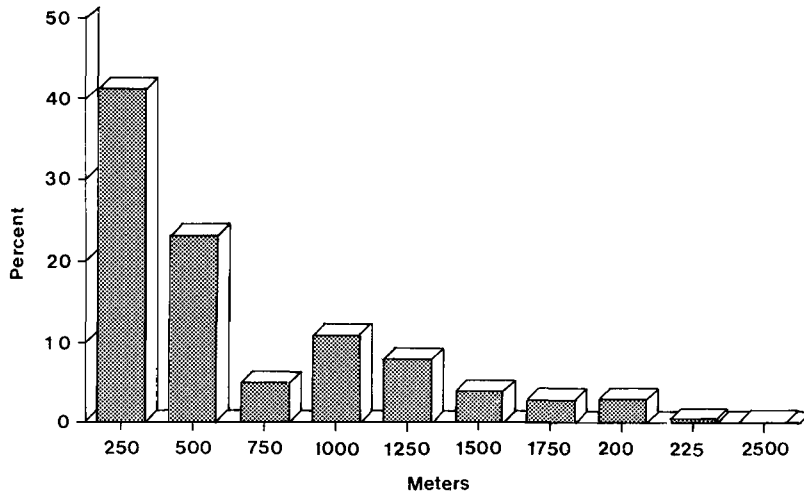


Fig. 3. Frequency of distances moved by young and adults Monk Parakeets between successive captures at three-month intervals.

natal nests but not with their parents, whereas the others had paired with individuals previously banded as adults.

Breeding was not observed in nests occupied by one-year-old Monk Parakeets. These nests were isolated and in these and other single nests, breeding did not occur during the study (six breeding seasons). We observed 51 occupied nests in which breeding did not occur. This suggests that nests may be built for nonbreeding purposes.

We recaptured eight two-year-olds. Three of these occupied nonbreeder nests and five were captured, each with adults in a breeder nest. However, we could not determine with certainty whether these five were breeders because the nests had three chambers and we could not determine the location of each individual and, consequently, the mate.

The remaining four, bred successfully with the same mate they had the previous year, but occupied a different nest. Three of these four bred in large nesting groups (communal nests or many single nests in a small area). The fourth pair occupied an isolated nest during second and third breeding season and bred successfully. The remaining four individuals changed mates or left the area.

Discussion.—In our study area, some young remain in the natal nest until the next breeding season when they leave and form pairs. These pairs remain together and may begin breeding in the second year. Two-year-old Monk Parakeets are able to breed, although only 50% of them bred in the studied population. Similar delayed breeding also has been observed in many communal breeders and in other members of the Psittacidae, like the Australian Cockatoo (*Calyptorhynchus funereus*, Saunders 1982) and

Galah (*Cacatua roseicapilla*, Rowley 1983), which breed only when three years old or older.

Reduced natal dispersal is not presently known in other species of parrots. Dispersal distance is over 20 km in the White-tailed Black-Cockatoo (*Calyptorhynchus funereus*; Saunders 1982) and the Galah (Rowley 1983). These values are considerably larger than the median of 503 m we found in the Monk Parakeet.

Reduced dispersal may be related to the high energetic cost of building and maintaining bulky compound nests. Because adding a nesting chamber to a compound nest requires less building effort and material than building a new nest, birds nesting in a compound nest may benefit by decreasing energy and time expenditure. Building a compound nest also may provide an opportunity for inexperienced birds to learn nest-building skills. It is likely that they also could gain from communal guarding against predators.

Young disperse from the natal unit before the following breeding season, and do not remain with their parents as helpers. Instead, they form a new pair when they are one year old, but do not breed until they are at least two years old. Delayed breeding may allow them to gain experience in acquiring a new nest in the highest-quality breeding areas.

Martella (1985) observed that young help to feed their own siblings, as well as adults breeding in neighboring nests. Such behavior may represent an early stage in the development of helping behavior. This coupled with the high annual survival rate, reduced natal dispersal, and delayed breeding should favor the further evolution of social cooperation in the Monk Parakeet.

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Cooperative Breeding by Rufous Hornbills on Mindanao Island, Philippines

MARK C. WITMER

Section of Ecology and Systematics, Cornell University, Ithaca, New York 14853, USA

Hornbills (Bucerotidae) are unique in their nesting habits; females seal themselves within the nest cavity, where they lay the clutch and remain with the growing young for most or all of the nesting period. In some species the male helps with the sealing process from outside the nest cavity. The nestlings and female are fed by the male through a narrow vertical slit in the sealed nest opening (Kemp 1979 and references therein). Thus far, four species of hornbills have been found to have cooperative breeding systems with helpers at the nest; nonbreeding birds assist the male in feeding the nest mates (Stacey and Koenig 1990). These are the Bushy-crested Hornbill (*Anorrhinus galeritus*; Madge 1969), Southern Ground Hornbill (*Bucorvus cafer* [=leadbeateri; see Browning 1992]; Kemp and Kemp 1980), White-crowned Hornbill (*Aceros comatus*; Leighton 1982), and Brown Hornbill (*Ptilolaemus tickelli*; Poonswad et al. 1983). I report helpers at the nest in another hornbill species, the Rufous Hornbill (*Buceros hydrocorax mindanensis*) on Mindanao Island in the Philippines.

Each of the three subspecies of Rufous Hornbill (*B. h. hydrocorax*, Luzon and Marinduque; *B. h. semigaleatus*, Bohol, Leyte, Panaon, and Samar; and *B. h. mindanensis*, Mindanao and Basilan [McGregor 1909]) has

a distinct casque morphology and bill coloration (illustrated in Hachisuka 1934). In all subspecies the sexes are similar and all show the same pattern of plumage maturation (McGregor 1909). The juvenal plumage is distinct with white feathers on the head, neck, chest, and belly. Subsequently, the pale juvenal plumage is replaced by the dark black and chestnut body plumage of adults. The casque and bill develop more slowly; many birds have adult plumage coloration but incomplete development of the casque and bill coloration. Maturation is probably complete in about four years (Kemp 1979). Mindanao Rufous Hornbills develop from a black bill with a low, humped casque in juvenals to an ivory bill with a prominent, red, anvil-shaped casque in mature adults (see Hachisuka 1934). I use "immature" to designate birds that have adult plumage coloration, but which have not yet developed the definitive adult morphology and coloration of the bill and casque ("adult" refers exclusively to these birds).

I observed breeding activity at two Rufous Hornbill nests on the island of Mindanao, Philippines: one at Mt. Apo National Park near Davao City, Davao del Sur Province (7°1'N, 125°22'E) from 31 July to 25 August 1984; and the other at Lake Sebu, South Cotabato