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ECOLOGICAL NOTES ON THE GREEN PARAKEET OF ISLA SOCORRO, MEXICO[1]

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The Green Parakeet of Isla Socorro (*Aratinga holochlora brevipes* Lawrence) is an endemic subspecies (Grayson 1870–1871, Anthony 1898, McLellan 1926, Villa 1960, Jehl and Parkes 1982). However, no quantitative information exists on the abundance of the species on the island, and very little is known of its feeding habits, nesting and flocking behavior. Previous studies of the endemic birds of Socorro Island have noted the need for additional information on the status of the species due to the serious environmental problems the island has faced since the last century (Jehl and Parkes 1982, 1983). Thus, information regarding their status could permit evaluation of population changes. This note presents information on the abundance and some aspects of the ecology of the Socorro Green Parakeet.

Study area and methods. Socorro Island is located approximately 450 km to the south southwest of the southern tip of Baja California, Mexico (Fig. 1). Descriptions of the island may be found in Levin and Moran (1989) and Brattstrom (1990). Six plant associations have been recognized on the island (Miranda 1960, Levin and Moran 1989, León de la Luz et al. 1990). The mixed scrub, dominated by *Dodonaea viscosa* and *Pteridium caudatum* (0–700 m) and the forest, dominated by *Bumelia socorrensis, Ilex socorrensis, Guettarda insularis, Psidium socorrense* (350–850 m) and *Ficus cotinifolia* (100–300 m) cover most of the area on the island.

Field work was conducted during three short trips, from 16–28 February, 19–24 November 1990, and 22–28 August 1991. We estimated the population of Green Parakeets by intensively searching for each individual or group of individuals. We explored the island's canyons, mixed scrub, forests, the top of Cerro Evermann, and all other potential habitats where parakeets might be present. In August, the north side of the island was explored on the lowlands. Each observer noted the site and time of the day for each observation and all the records were compared later and mapped on quadrangle maps. Each observation of parakeets included the flock size or individuals observed, the plants where they were feeding, and the time they spent in this activity. Additional information on behavior was also recorded.

Results and discussion. The Green Parakeet population was estimated at 400–500 birds. Parrots were found most commonly in the forest of *Bumelia, Ilex* and *Guettarda.* The forest association includes an area of ca. 35 km^2, and represents 22% of the total area of the island (159 km^2; Fig. 1). Density of parakeets in suitable habitat was calculated as 8.9 birds/km^2. Green Parakeets inhabited mostly forest with trees 8 m tall, above 500 m around Cerro Evermann. During observations in February and November, at no time did we register parakeets below the 500 m, although we did not explore the north side; in August the species was found to be common on the north side, especially on tall plants of *Croton masonii, Conocarpus erecta,* and *Ficus.* In this area, parakeets were recorded down to 4 m elevation (J. Llinas, pers. comm.). When the *Ficus* and *Psidium* forest was well represented on the south side of the island (see Miranda 1960) and vegetation was less disturbed, parakeets probably were distributed below 450 m, as the descriptions of Villa (1960) and our north-side records suggest.

This species was observed feeding on *Bumelia* (51.0%), *Guettarda* (19.5%), *Ilex* (16.7%) and *Psidium* (12.7%) seeds and fruit pulp (n = 251 observations). The birds typically were observed feeding on ripe fruits, but also fed on unripe ones. Three parakeets, focally observed for 29 min before they flew, consumed 8, 12 and 17 *Bumelia* fruits, respectively. *Bumelia* fruit weigh approximately 20–30 g. However, birds consumed only the pulp of several fruits, preventing us from estimating their total consumption. *Bumelia* and *Ilex* fruit production probably occurs throughout the year; *Guettarda* fruit was found in February and November, but its phenology is unknown; and *Psidium* produces fruits from January to April (León de la Luz, pers. comm.; see McLellan 1926, Villa 1960). Thus, the principal food sources for parakeets are present throughout the year on the island. *Opuntia* sp. and *Ficus* fruits may be another alternate food in the dry season.

The reproductive season for this parakeet apparently begins in November, when they fly in groups of 2–6 individuals. On 19 and 20 November we found two nests in cavities of live *Bumelia* trees. Both nests were empty at the time, but an adult was continuously observed inside of the cavities, suggesting that incubation could begin soon. In both nests, six individuals occupied the surrounding nest area. During 485 min of observation of one of the nests, an adult was inside the cavity and at least two parakeets were always present near the nest tree ($\bar{x}$ = 13.9 ± 13.8 m; n = 47 observations). Parakeets apparently forage close to the nest

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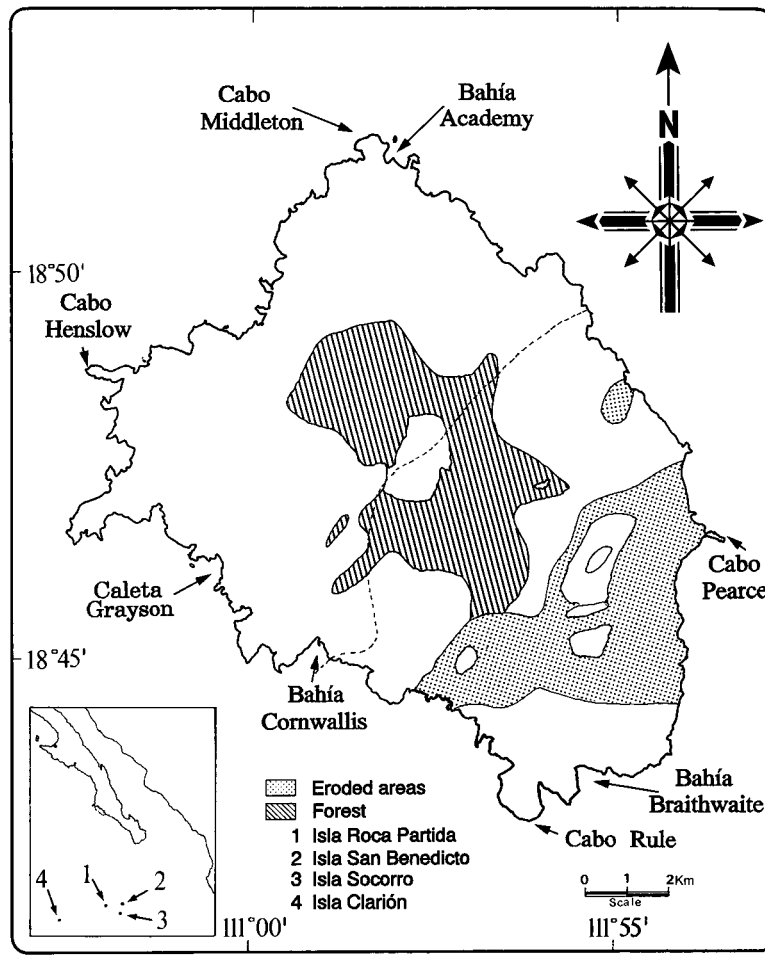

FIGURE 1. The Isla Socorro forest study area. The dotted line shows the boundaries of the sheep-impacted southern half of the island.

area during the day, and they come back to sleep there at sunset. In February, Green Parakeets were observed frequently in groups of 7–40 individuals ($\bar{x} = 25.6 \pm 13.93$; $n = 21$ flock observations), but at the northeast, northwest and northcentral sides of the island in the forest above 500 m, groups reached 50 and 100 individuals. These flocks were observed at 09:20 hr and 14:25 hr which shows no correspondance to roosting flocks. Group sizes of 3–30 were recorded on April (Jehl and Parkes 1982). In August, group size ranged from 4–35 individuals ($\bar{x} = 8.9 \pm 6.5$ $n = 31$ observations), but on the north side groups reached 47 to 65 individuals near the coast. A similar month-to-month variation in the mean flock size has been documented in other parrot/parakeet species (Lanning and Shiflett 1983, Chapman et al. 1989, Strahl et al. 1991). This variation seems to be related to competitive process and familiar relationships.

Potential predators of the Green Parakeet are the Socorro Red-tailed Hawk (*Buteo jamaicensis socorroensis*) and domestic cats. We observed a mobing activity on 24 February, when a group of 50–60 parakeets bothered a pair of hawks for 10 min, by crying and preventing them from flying. Also, on 19 November, four parakeets pursued a pair of hawks soaring close to the nest area. Although cats may prey on parakeets, we did not find remains of this bird in their scats (Rodríguez-Estrella et al. 1991); the parakeets were as tame as reported by Villa (1960) and were also observed feeding on the ground.

In conclusion, the Socorro Green Parakeet is a common species on the island, with a relatively high population density. No evidence of population decline was found when we qualitatively compared our findings with those in the literature, but the species' distribution on the island may have been reduced in the last three decades. Grayson (1870–1871) found this parakeet "quite abundant on Socorro Island." McLellan (1926) did not describe its status, but suggested it when she wrote that "large flocks of paroquets were seen in the

hinterland of Socorro." Brattstrom and Howell (1956) found the species "common in all forest areas." Villa (1960) found in the foothills of Mount Evermann "posiblemente más de 200 animales" together. Jehl and Parkes (1982) considered the species "not particularly common," perhaps because they only spent a few days in the field and surveyed a restricted area of the island. Although the Socorro Green Parakeet is not threatened at present, the spread of erosion on the island caused by sheep overgrazing could put the status of this and other endemic bird species at risk.

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