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Reproduction and molt in the Burrowing Parrot.—The Burrowing Parrot (*Cyanoliseus patagonus*) has one of the southernmost ranges of neotropical parrots. In Argentina, it occurs from the arid Andean slopes in the northwest (24°S) to the Patagonian steppe in the south (46°S) (Forshaw 1978). The parrot, which nests colonially in burrows dug into cliff faces, is shot as an agricultural pest and has recently been exported in large numbers for the pet trade, causing local declines in its population (Ridgely 1980). Here, we report on the cycle of wild Burrowing Parrots in terms of changes in body weight, fat deposits, gonadal condition, and molt.

Study area and methods.—The study area was between 33° and 33°30'S and 66° and 67°W in the plains near the Sierras de San Luis, San Luis province, central Argentina. The predominant vegetation is an open dry woodland savanna mixed with grasslands. Dominant tree species include *Geoffroea decorticans, Prosopis caldenia, P. chilensis,* and *P. flexuosa,* all of whose fruits are eaten by Burrowing Parrots.

Annual rainfall, which is concentrated in the summer (November–April), averages 69.5 cm. Mean annual temperature is 17°C (Instituto Nacional de Tecnología Agropecuaria, Villa Mercedes Experimental Station, 30 km east of the study area).

We obtained parrots from farmers involved in control campaigns, as the Burrowing Parrot is considered a pest by local authorities. We obtained 7–35 parrots monthly from September 1978 to August 1979, with the exception of December 1978, when only two birds were obtained. Birds came from Paso de las Carretas, near Eleodoro Lobos, except in May, June, and July 1979, when all but a few parrots had left the area, and the sample was completed with birds obtained in Alto Pencoso, about 100 km west. In November 1983 we collected an additional 14 birds at Paso de las Carretas.

Birds were frozen within 10 h of being shot. The delay between collection and processing may have altered some variables, especially body weight (Clark 1979), but the source of error was constant during the study period.

All specimens collected belonged to the *patagonus* race (Forshaw 1978). We recognized two age classes: juvenile (=first year birds) and adult (second year and older birds). Juveniles had a horn colored patch on the mandible (Forshaw 1978) and the presence of the Bursa of Fabricius. Their ability to breed is unknown.

Each specimen was weighed (with and without crop contents) and examined for molt. The amount of visceral and subcutaneous fat was assessed visually on a scale of 0 (no fat) to 2 (very fatty). Primaries and secondaries were counted from the carpal joint outwards. Tail feathers were counted from innermost out. Molt in remiges was scored as follows: old feathers, 0; empty sockets of pin feather, 1; feather up to one-third grown, 2; feather up to two-thirds grown, 3; feather nearly full-grown, 4; new full-growth feather, 5. Molt scores were used to plot the progression of primary molt.

Testes were weighed and measured. Ovaries were weighed and the follicles over 1 mm measured. We assumed that (combined) testes weight indicated spermatogenic condition, considering the marked seasonal contrasts registered (cf. Smith and Brereton 1976 and Pohl-Apel et al. 1982). But such conclusions are tentative until histological information is obtained.

Results.—The breeding season begins in September, when the parrots return to nesting colonies. Egg laying starts in November and continues until December. The chicks fledge from the burrow from late December to early February. Fledglings begin to leave the nest area in late January, and remain in the neighborhood dependent upon adults until the end of April. In May, most parrots disperse, but if local resources, such as unplowed crop stubble, are abundant, at least some birds may remain in the area. In all samples, the sex ratio did not differ significantly from 1:1.

The mean body weight of adult parrots was 270 g. We recorded statistically significant variations in body weight during the year, with one peak in winter (March–June) and another in late spring (November–December), and minima in summer (January) and at the end of the dry season (September–October). Males were usually heavier than females, except in November–December, when females were slightly heavier than males. Juveniles of both sexes were lighter than females. The yearly pattern of fat deposits was irregular, with a higher proportion of very fatty individuals in late winter (July–August) and late spring (November–December). We did not find differences in fat deposits between sexes except in November–December, when fatty females were more common than fatty males (9 of 15 females vs 3 of 14 males, G-test, $P < 0.05$). We found no correspondence between individual fat deposit categories and body weight (Kruskal and Wallis test, $P > 0.05$), possibly due to the subjective nature of the fat deposit index.

Testes enlarged 15 fold from $\bar{x} = 19 \pm 9.5$ mg [SD] (N= 6) in August to 292 ± 100.1 mg (N = 13) in November and then declined rapidly. Changes in ovary weight and size followed a temporal pattern similar to that of the testes. We found eggs in oviducts in November through January. In November 1983 the mean ovary weight in a sample of 13 females was 604 ± 149 mg [SE] (compared with 430 ± 60 mg in 1978), and 4 of the females had eggs in the oviduct.

Replacement of primaries by Burrowing Parrots tends to begin with P6 and works towards P1 and P10, a replacement pattern common in parrots (Stresemann and Stresemann 1966). Primary molt started in November in both 1978 and 1983, and it was complete in most individuals by July. The individual primary molt period has been estimated as 8 months. There is no clear sequence in the replacement of secondaries, also typical in parrots (Stresemann and Stresemann 1966). Secondary molt starts in January and continues throughout August.

The molt of rectrices tends to start symmetrically in T1, followed by T5, T6, and, finally, T2 to T4. This pattern differs from the irregular molt found in most parrots (Forshaw 1978), and the strict centrifugal replacement found in the Budgerigar (*Melopsittacus undulatus*) (Wyndham 1981). Individuals molting rectrices were found in all months, although the period of greatest activity was February through May. We recorded asymmetric molt in 3 of 42 first year specimens, which appeared to represent replacement of lost feathers.

All females collected with eggs in the oviduct (4 in November 1983, 1 in December 1978, 2 in January 1979) were molting; however, as the intensity of molt increased, the proportion of birds in full reproductive condition decreased.

Crop contents indicated predominance of seeds from cultivated crops and wild plants in winter, but fruits from dominant trees became important in summer. Fruit comprised (in percentage of total volume) 2% of crop contents in November–December, 74% in January, 25% in February, 35% in March, and 8% in April (unpubl. data).

Discussion.—The annual cycle of the Burrowing Parrot is typical of seasonally breeding birds in temperate regions (Murton and Westwood 1977, Clark 1979). Molt follows breeding, but there is a partial overlap, which may be related to a reduction in the reproductive costs associated with the use of cavities for nesting (Foster 1975).

The Burrowing Parrot's gonadal and molt cycle are very similar to that of the Eastern Rosella (*Platycercus eximius*), which inhabits more mesic woodland savannas in Australia at about the same latitude (Smith and Brereton 1976, Wyndham et al. 1983), and contrasts with the irregular and opportunistic variations exhibited by the Budgerigar in arid regions of Australia (Pohl-Apel et al. 1982).

We think that the availability of tree fruits as food for the young may be an important factor influencing the regularity in breeding and molt in the Burrowing Parrot. Fruits are significant items in the parrot's diet during the breeding season (Forshaw 1978, this paper). Furthermore, tree fruit production is more regular than grass seed production in arid environments, as woody plants are less dependent on the irregular rains due to their capability of obtaining water from deeper soil levels (Walker and Noy-Meir 1982).

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Extrapair feeding in Pied-billed Grebes.—Two forms of cooperative rearing through feeding of chicks have been reported for grebes. These are (1) young from first broods feeding siblings from a second brood (Cramp and Simmons 1977) and (2) adults, other than pair members, feeding chicks from a single brood (Lane 1978, Forbes 1985). This latter form has been termed extrapair feeding (Forbes 1985).

On 19 June 1982, I observed 3 adult Pied-billed Grebes (*Podilymbus podiceps*) feeding 5