

“rally call,” and was joined by its mate and 4 other crows. The 6 crows made occasional passes at the intruder.

Guarding the nest is a less obvious form of antipredatory behavior, but is a precursor to chasing or mobbing. Guarding was not done from the nest itself but from the top of adjacent spruce trees and from deciduous trees 107 m away. Guard changes usually took place in the deciduous trees. Occasionally, the incoming crow went directly to the nest, but 82% of the time it stopped at the deciduous tree first (N = 90 of 110). The nest was only left unguarded for a mean of 1.04 times per 30 min of observation (N = 23 observations). These unguarded periods were usually brief, with a mean duration of 3.4 min (N = 24 unguarded periods observed).

After fledging, the family was seen 6 times in the adjacent woodlot between 7 June and 16 June. Since the young were not seen on the ground during this time, it was assumed that the young were still being fed by the parents. The young were not seen foraging in open fields until the first week in July. Good (Ph.D. thesis, Ohio State Univ., Columbus, Ohio, 1952) also found that fledglings do not alight in open fields until at least 2 weeks after fledging. On each occasion, when the family was seen in the woodlot, the authors were mobbed by the adults. On 2 occasions, 1 banded young tried to join in the mobbing. On both occasions, the adults began to vocalize at the young and half chased, half led the young into a tree. Once the young was concealed, the adults continued to mob the authors.

In the first week of July, the family unit under study was seen foraging in an open field adjacent to the woodlot. One adult was stationed in a nearby tree or on a fence post. The sentinel occasionally gave calls that were barely audible to an observer 100 m away. Louder calls led to the other adult joining its mate at the guard post while the 3 young continued to forage. Once when the family was approached, all 5 crows flew to the adjacent woodlot.

If these crows had not been banded and observed for the 2 months that preceded these last observations, they would have appeared as a band of feeding crows with 1 or 2 posted sentinels. Instead, we interpreted this group as a feeding family unit with 1 or 2 parents sitting on guard over the young. We feel that the sentinel is an extension of parental care originating from the guarding which occurs during nesting. The mobbing by nesting parents does not switch immediately into sentinel warning upon fledging. Instead, the parents go through a transition period in which intruders are still mobbed while the recent fledglings are being taught to flee from potential danger.

We think that sentinel crows are not altruistic, self-appointed guardians of the feeding flock. Instead, they are parent crows exhibiting antipredatory behavior as they guard their offspring. The contradictory observations by Goodwin (1976) mentioned above could be explained if the young of the fleeing sentinel were already out of danger, even if other crows were still feeding. Guarding by adults of a family would not preclude use of such sentinels by other crows, or even other species.—GLORIA M. D'AGOSTINO, LORRAINE E. GIOVINAZZO AND STEPHEN W. EATON, *Dept. Biol., St. Bonaventure Univ., St. Bonaventure, New York 14778. Accepted 2 June 1980.*

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Behavior of a male Least Bittern incubating after loss of mate.—On 30 June 1978, I found a 4-egg completed clutch of a Least Bittern (*Ixobrychus exilis*) in a solid stand of cattails (*Typha* sp.) at Ramsayville Marsh, 4 km east of Ottawa, Ontario. The nest was located about 65 m from shore and approximately 70 cm above the surface of water ca. 40 cm deep. The nest, typical for the species (see Weller, *Wilson Bull.* 73:11–35, 1961), was

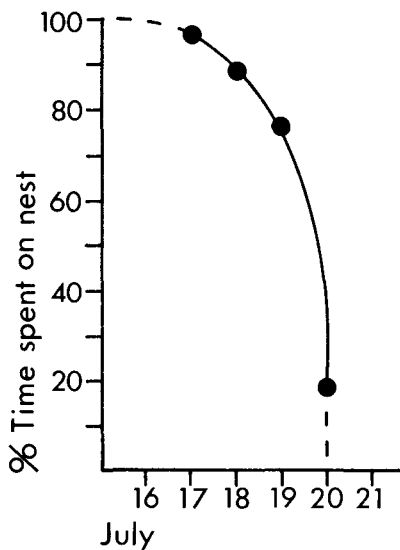


FIG. 1. Loss of interest in incubation by male Least Bittern as indicated by decrease in nest attentiveness.

supported beneath by both dead and living cattails. The latter also formed a loose canopy above the nest.

When I checked the nest on 8, 11, 13 and 14 July, either the female or the male incubated. I last saw the female on 14 July. From 17–20 July, inclusive, I observed the nest from a blind about 3 m from the nest. On 17 July, during 11 h and 35 min of continuous observation I saw the male spend 96.9% of this time on the nest, a remarkably long time since the female usually incubates more than the male (Weller 1961).

Given that 1 egg is laid per day and incubation starts with the first or second egg (Weller 1961), incubation probably began by 27 June. Since the first egg hatches 19 days after it is laid (Weller 1961), the last date for the beginning of hatching in the above nest was probably 17 July. The male attended the nest until 20 July.

While incubating, the male performed nest "jabbing" (Weller 1961) especially frequently on 18 and 19 July. He often performed the movements of picking something up and throwing it out of the nest, but nothing was seen falling except on 5 occasions when he flicked out small pieces of nesting material. Several times he suddenly got up, then vigorously pecked his feet or jabbed. After such a session, I found an unidentified arthropod in the nest. Possibly, the bittern was attempting to get rid of insects, perhaps parasites, rather than poke holes in the nest for future nest sanitation (as suggested by Weller 1961).

Each day the male's tendency to incubate was high in the early morning and waned as the day progressed, and with each day he shortened his incubation time (Fig. 1). I did not see him on 21 July (nest observed continuously from 06:45–11:20). I assumed that he abandoned the nest. On 28 July, I found the eggs cracked and carrion beetles (*Silpha* sp.) eating their contents. Since the male incubated at least 3 days beyond the latest presumed hatching date for the first egg, failure to hatch may have been due to infertility, being chilled at night or overheated in the sun.

I would like to thank all those who offered constructive criticism of this manuscript. The above observations were incidental while I was working on rails (Rallidae) in Ramsayville Marsh, a study which was supported by a Visiting Fellowship held in the ornithology section of the National Museum of Natural Sciences.—B. T. ANISKOWICZ, *National Museum of Natural Sciences, National Museums of Canada, Ottawa, Ontario K1A 0M8 Canada.* (Present address: R.R. #4, Shawville, Quebec J0X 2Y0 Canada.) Accepted 21 July 1980.

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Notes on Brown Pelicans in Puerto Rico.—The biology of 2 races of the Brown Pelican (*Pelecanus occidentalis carolinensis*, *P. o. californicus*) of coastal United States and Baja California is well known. Few data exist for the nominate race (*P. o. occidentalis*) inhabiting the Caribbean region, especially on breeding distribution, population size and aspects of breeding biology (Wetmore, N.Y. Acad. Sci. Survey of Porto Rico and the Virgin Islands 9:245–406, 1927; Palmer, Handbook of North American Birds, Vol. 1, Yale Univ. Press, New Haven, Connecticut, 1962). A nesting colony on Conejo Cay, a 2 ha rock approximately 30 m high, near Salina del Sur Bay at 65°17'W, 18°7'N, off the southeastern shore of Vieques Island (23 km east of Puerto Rico) is easily viewed from the military operations headquarters on 190 m Cerro Matias hill, about 1 km from the colony. We spent about 15 h observing this colony from this location using a 30× telescope and 8× binocular in April–September and made other observations in Puerto Rico between March and November 1978 on 25 days in the field.

History of nesting on Vieques Island and the reason for this study.—Conejo Cay is 1 km from the impact area for air-to-surface target operations on the United States Marine Base Camp Garcia. This cay is thus subject to overflights by military aircraft on an irregular, but frequent basis and the resulting bombing and shell-fire explosions from these aircraft and from ships off-shore. On a normal bombing run the jet aircraft pass over the cay at about 400 m. We were interested in the reactions of the pelicans to these military activities.

Dr. Cameron B. Kepler first discovered the pelican colony on Conejo Cay from a Navy helicopter on 20 July 1971, and estimated 50 nests present there (Sorrie, Caribbean J. Sci. 15:89–103, 1975). These were the only data for this colony until we began a series of visits in March 1978. Local fishermen reported nesting in former years on nearby Alcatraz Rock, which is usually awash even in moderate seas. However, unless Alcatraz Rock has changed materially in recent years, which seems unlikely, close inspection suggests that it is only suitable as a roosting-loafing site.

Nesting on Conejo Cay in 1978.—Pelicans built nests on top of the island in sea grape (*Coccoloba uvifera*), limber caper (*Capparus flexuosa*), *Ipomoea* sp. and *Opuntia rubescens* from 0.5–2 m above ground. Pelicans nested on the cay from the autumn of 1977 through August 1978 with several “waves” of laying (Table 1). Most nests were established during the winter. An extended nesting cycle, with most nesting in winter, is probably typical of Brown Pelicans in the tropics (Schreiber, Auk 97:491–508, 1980). The colony was abandoned in late August–early September. Although a food shortage may have occurred, human interference probably caused the desertion. A shift in nesting location occurred during the season, with early nests formed in the middle-highest portion of the cay and later nests on the northeast edge. We were unable to determine the exact number of nests existing in the colony during 1977 and 1978. Based on the known productivity of *P. o. carolinensis* (Schreiber, Contrib. Sci. Nat. Hist. Mus. Los Angeles County 317:1–43, 1979) and the number of