THE EGG OF THE CROWNED
SOLITARY EAGLE,
HARPYHALIAETUS CORONATUS
HELMUT SICK
AND
DANTE MARTINS TEIXEIRA

The Crowned Solitary Eagle (Harpyhaliaetus coronatus) formerly was seldom seen in captivity. Since the construction of Brasilia and the exploration of the surrounding region, however, the bird is now seen regularly in Brazilian zoos, where it is brought from the State of Goias. One such eagle in the zoo at Belo Horizonte, Minas Gerais, laid an egg in early October, 1974. This egg, acquired by the junior author for the Museu Nacional in Rio de Janeiro, seems to be the first well-documented one for the species.

The egg is a rounded oval with the ends similar in shape; it is unmarked, white, rough in texture, and without gloss; one end bears a wart-like bump. Held against the light, the inside of the shell is blue-green, which is the normal inside color of accipitrid eggs (Schönwetter, Handb. der Oologie I:138, 1967). The egg measures 65.0 x 52.6 mm; its full weight was 100 g; the empty shell weighs 10.3 g.

An egg in the Nehrkorn collection from São Paulo, Brazil, possibly of this eagle (see Schönwetter, p. 145), differs from the present one in being larger (69.3 x 60.0 mm) and having some gloss. A larger bird of prey which may occur in São Paulo is the Harpy Eagle (Harpia harpyja). Its eggs are unmarked, but sometimes are so heavily nest-stained that they appear spotted (Bond, Auk 44:562, 1927).

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TEMPORAL PATTERNS IN LAYING,
HATCHING AND INCUBATION
OF SOOTY TERNs AND
BROWN NODDIES
WILLIAM Y. BROWN

Temporal patterns in laying, hatching and incubation of wild birds are rarely studied in detail, probably because they are difficult to observe. However, these attributes are reasonably accessible for study in colonial sea birds, because such birds often lay near each other in the open and are tolerant of people.

In 1971 and 1972, I studied temporal patterns in laying, hatching and incubation of two species of colonial sea birds, the Sooty Tern (Sterna fuscata) and the Brown Noddy (Anous stolidus), on Manana Island, a 25-ha volcanic islet about 1 km north of the eastern tip of Oahu, Hawaii.
During laying, I checked for new eggs at 4-hr intervals for 168 hr. The terns, like the noddies, returned quickly to their nests after I passed; in fact, many did not leave the nest.

I recorded the time of "starring" (appearance on the egg of a small crack made by the chick) and "pipping" (a definite hole) for a sample of the eggs of each species.

I determined the diurnal variation in temperature of one incubated egg of each species. All temperature readings were made with a YSI Tele-Thermometer, probes, and extension leads. The sensor was held near the center of the egg (Howell and Bartholomew 1962), and about 0.61 m of the probe lead nearest the egg was buried. Readings were taken periodically over 48 hr for the Sooty Tern egg and over 30 hr for the Brown Noddy egg. The tern parent was not observed continuously but was incubating quietly at each temperature check. The noddy parent was observed continuously during daylight hours.

RESULTS

Sooty Terns on Manana laid primarily in the afternoon and rarely at night (fig. 1). The time of hatching (emergence) was less discrete than the time of laying, the mode falling between 08:00 and noon. The eggs first starred on the blunt end of the egg an average of 109 hr before hatching (N = 25, SD = 8.7 hr, R = 92–128 hr), and the chicks extended this fissure around the egg leaving gaps of uncracked shell. A "pip" appeared an average of 31 hr before hatching (N = 25, SD = 12.4 hr, R = 4–52 hr), and the chicks extended this hole around the egg. The incubation period for the Sooty Tern is the time from egg-laying to hatching, and on Manana averaged 686 hr (N = 175, SD = 14.2 hr, R = 660–736 hr) with distinct 24-hr modes (fig. 2).

Brown Noddies on Manana laid both day and night with a single mode from 08:00 to noon (fig. 3). The eggs also hatched day and night, but the day was favored even for eggs laid at night. The eggs first starred an average of 136 hr before hatching (N = 19, SD = 24.3 hr, R = 76–184 hr). The chicks extended the crack around the blunt end of

FIGURE 1. Distribution of Sooty Tern egg-laying and hatching by time of day.

FIGURE 2. Frequency distribution of lengths of Sooty Tern incubation periods.
the egg, and the pip appeared an average of 31.7 hr before hatching (N = 19, SD = 16.4 hr, R = 4–68 hr). The incubation period of the Brown Noddy averaged 864 hr (N = 121, SD = 13.3 hr, R = 832–900 hr), and was distinctly modal when plotted according to the time of day when the eggs were laid (fig. 4).

DISCUSSION

Sooty Tern. The Sooty Tern lays primarily in the afternoon not only on Manana, but also on the Seychelles (Ridley and Percy 1958), the Dry Tortugas (Dinsmore 1972), and Ascension Island. Ashmole (1963) found that 21 of 33 eggs on Ascension hatched between 06:00 and noon although all but one of the eggs had been laid after noon. The incubation periods of the 33 eggs had a bimodal frequency distribution with a 24-hr separation. Ashmole suggested that the bimodality arose from the failure of eggs to hatch at night which, in turn, was related to diurnal variation in temperature of the incubated eggs. This hypothesis is corroborated by my finding that an incubated Sooty Tern egg on Manana was cooler at night than during the day (fig. 5). Egg temperature appeared to follow air temperature, which peaked at about 32°C from 12:00 to 14:00 each day of observation. Ashmole’s hypothesis could be tested experimentally in incubators with controlled temperatures and light intensities.

The mean incubation period of 33 Sooty Tern eggs on Ascension was 29.5 days, significantly longer than the 28.6 days on Manana (t = 4.63, P < 0.001). This may be because the eggs are larger, although other factors such as climate may be involved. Parsons (1972) found egg volume and incubation period to be directly related in the Herring Gull (Larus argentatus). Stonehouse (1963) gave dimensions of Sooty Tern eggs on Ascension Island during Ashmole’s study; the eggs averaged 1 mm longer than those on Manana (t = 5.14, P < 0.001). Thus, the Ascension eggs probably averaged about 0.5 cm³ greater in volume than the Manana eggs (Brown 1976).

The incubation period of the Sooty Tern has been reported as 26 to 29 days on the Seychelles (Ridley and Percy 1958), “just under 28 days” on Christmas Island in the Pacific (Gallagher 1960), 26 days (Watson 1908), 31 days (Watson and Lashley 1915), and 29 days 12 hr (Dinsmore 1972) on the Dry Tortugas, and 28.1 days on Kure Atoll (Woodward 1972). Extraordinarily long incubation periods may occur in the Sooty Tern. Ashmole (1963) reported at least one egg on Ascension incubated 31 to 32 days before hatching. He suggested that this occurs when eggs are left unattended for long periods. One Sooty Tern egg on Manana hatched 38.7 days after laying; the egg was alternately warm and cold during at least the last week of incubation, indicating irregular attendance.

Brown Noddy. Regardless of when a Brown Noddy egg was laid on Manana, it was most likely to hatch between 08:00 and noon. This restriction on hatching time coupled with variation in the rate of chick development apparently causes the multi-modal frequency distributions observed in the incubation period (fig. 4). I found that the temperature of an incubated noddy egg varied at night which, in turn, was related to diurnal variation in temperature of the incubated eggs. This hypothesis is corroborated by my finding that an incubated Sooty Tern egg on Manana was cooler at night than during the day (fig. 5). Egg temperature appeared to follow air temperature, which peaked at about 32°C from 12:00 to 14:00 each day of observation. Ashmole’s hypothesis could be tested experimentally in incubators with controlled temperatures and light intensities.

The mean incubation period of three Brown Noddy eggs on Manana was 29.5 days, significantly longer than the 28.6 days on Manana (t = 4.63, P < 0.001). This may be because the eggs are larger, although other factors such as climate may be involved. Parsons (1972) found egg volume and incubation period to be directly related in the Herring Gull (Larus argentatus). Stonehouse (1963) gave dimensions of Sooty Tern eggs on Ascension Island during Ashmole’s study; the eggs averaged 1 mm longer than those on Manana (t = 5.14, P < 0.001). Thus, the Ascension eggs probably averaged about 0.5 cm³ greater in volume than the Manana eggs (Brown 1976).

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The study of egg incubation in the Sooty Tern and Brown Noddy was conducted on Manana Island. Noddy eggs on Manana were 39.6 days, more than 3.5 days longer than the incubation period of 92 single-egg clutches laid the same year ($t = 9.1, P < 0.001$). These eggs were part of "two-egg" clutches for at least the last week of incubation, the second eggs apparently rolling into the sites of these original eggs or being laid in them by different females (Brown 1975). Parents with "two-egg" clutches sometimes incubate only one egg at a time, apparently causing the long incubation period.

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**LITERATURE CITED**


