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KEITH B. RUSSELL, *Academy of Natural Sciences, Philadelphia, Pennsylvania 19103*. Accepted 10 Dec. 74.

**Growth and fledging age of Sooty Tern chicks.**—The Sooty Tern, *Sterna fuscata*, is a pantropical species. Watson (1908) described qualitatively the development of Sooty Tern chicks. Ashmole (1963) measured growth of Sooty Tern chicks on Ascension Island during two consecutive breeding seasons. All of 27 chicks he weighed during the second season died, presumably of starvation. Ashmole (1963) on Ascension, Ridley and Percy (1958) on the Seychelles, Dinsmore (1972) on the Dry Tortugas, and Burckhalter (1969) on Manana estimated that Sooty Tern chicks fledged at about 8 weeks of age.

The information presented in this paper was obtained in 1972 on Manana or Rabbit Island, Oahu, Hawaii. I established a 12 × 12 foot plot within a densely occupied but accessible portion of the Sooty Tern colony. The quadrat was just above the beach on the southwestern side of Manana. I entered the plot briefly, usually just after sunrise, every day from before the first egg was laid until after the last chick was fledged. I enclosed the quadrat with a 9-in high, 1-in mesh fence of poultry netting when the first chick hatched. Whenever I found a newly hatched chick, I banded it and weighed it in a plastic sack using a 0.5 × 50 g Pesola scale, then measured its culmen to the nearest millimeter with vernier calipers. In addition to these daily activities, every third day I weighed each chick in the plot and measured its culmen. Older chicks from 50 g to 100 g were weighed with a 1 × 100 g Pesola scale, and chicks exceeding 100 g were weighed with a 3 × 300 g Pesola scale.

I also recorded when each chick fledged or could fly "moderately well" (Lack 1968). I used two criteria for this: A chick was counted as fledged if it could rise from the ground and fly about 10 feet or more or if it could sustain level or ascending flight over a similar distance when tossed into the air.

Refer to Figs. 1 and 2 for plots of weight and culmen length against age. Measurements at about 0.5 days of age are available for each chick. Some chicks were also weighed and measured at 1.5 days, some at 2.5 days, and a final portion at 3.5 days of age. These were combined into a 2.5 day age class. Likewise, a 5.5 day age class represents chicks 4.5, 5.5, and 6.5 days of age, etc.

Of the 28 chicks hatched in the plot, the culmen of one was not measured because it was deformed. I found another chick with a broken wing and measured only the initial weight and culmen length. Three other chicks eventually died, apparently of starvation, and were found in the plot. Two other chicks became emaciated and were missing from the plot before they possibly could have fledged. These chicks were probably taken by Black-crowned Night-Herons, *Nycticorax nycticorax*, on the island (Brown 1973). The measurements of these five chicks were taken until the

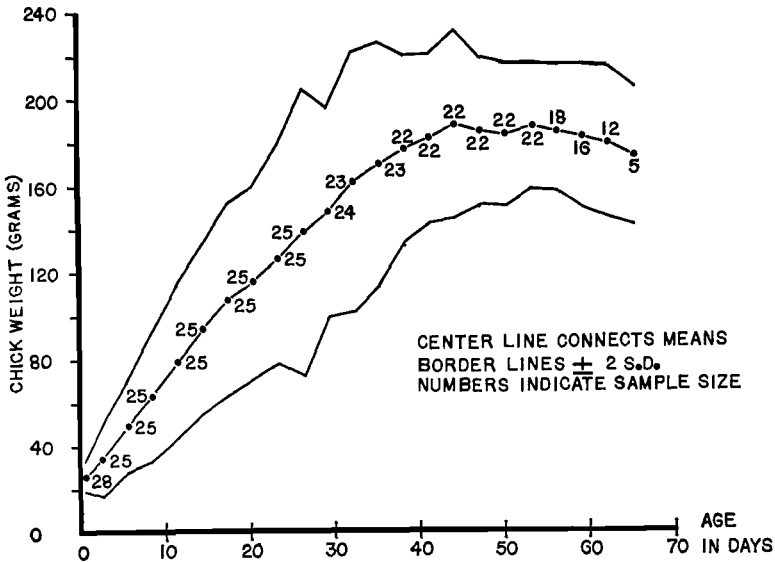


Fig. 1. Weight against age of Sooty Tern chicks in 1972.

chicks died or disappeared and are represented in Figs. 1 and 2. Therefore the figures are not biased toward well-fed chicks. The mean age at fledging of the 22 chicks that fledged was 57.3 days (SD = 3.2 days).

I calculated a growth rate for each of these 22 chicks defined as the mean daily increase in weight over the first half of the nestling period. This was specifically weight at day 29.5 minus the weight at day 0.5 divided by 29. This measure of

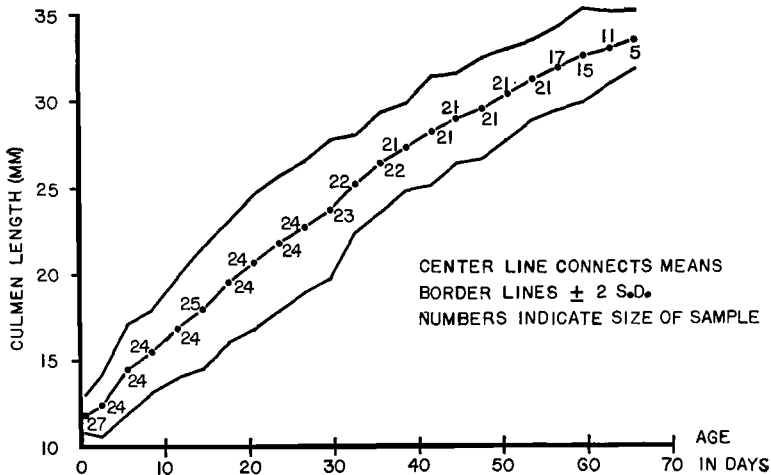


Fig. 2. Culmen length against age of Sooty Tern chicks in 1972.

growth rate ignores much of the information available on the growth of each individual (see Ricklefs 1968), but it makes no assumptions about the shape of the growth functions. Weight growth is usually positive over the entire first half of the nestling period, so the method is sensitive to differences in growth rate.

The mean growth rate was 4.34 g/day ( $N = 22$ ,  $SD = 0.543$  g/day). Chick growth rate and age at fledging were negatively correlated ( $r = -0.605$ ,  $P < 0.01$ ).

The 13 chicks caught and weighed both at fledging age and 3 to 6 days after showed no significant difference between the last weight measured and the weight at fledging. The apparent recession in weight in Fig. 1 results from faster growing and heavier chicks fledging before more slowly growing chicks and not being represented in the last several age classes. Fledged Sooty Tern young are fed by their parents at the nest site for at least several days after fledging (Brown 1975), and this may explain why the young could expend the substantial energy required by flight without significant weight loss.

I recalculated the growth rates of the chicks by using the weight at 26.5 days instead of 29.5 days, and dividing by 26 days. This allowed me to incorporate one chick found dead by starvation on day 29.5. I divided the chicks according to whether they hatched from eggs laid early, late, or intermediate in the laying season. Mean growth rates are plotted above the appropriate group of eggs in Fig. 3. Growth rate decreased significantly over the breeding season in 1972.

The cause of temporal variation in Sooty Tern growth rates on Manana is not clear. Harrington (1974) has shown that younger Sooty Terns lay later than older terns on Johnston Atoll. This may occur on Manana and younger, less experienced parents may be less able to raise young than older parents. It is doubtful that diminishing food supply caused chicks hatching near the end of June (from eggs laid near the end of May) to grow less rapidly because Sooty Terns commonly feed over schools of tuna (Ashmole and Ashmole 1967), and tuna are most plentiful in Hawaiian waters in July (Uchida 1966).

The Sooty Tern growth rate apparently varies between colonies as well. Ashmole (1963) found starvation an important cause of chick mortality on Ascension Island. The mean weight of 14 Sooty Tern chicks aged 28 to 30 days on Ascension in 1959 was 71.8 g. The mean weight of 24 similar aged Sooty Tern chicks on Manana in 1972 was 146.7 g—more than double the Ascension mean weight, and significantly greater ( $t = 9.92$ ,  $P < 0.001$ ). Ashmole also measured growth of several chicks in the season just prior to that cited; the chick growth rates that season were similar to those of Manana in 1972, although the data are few. Robertson (1964) reported that starvation of Sooty Tern chicks on the Dry Tortugas is virtually unknown, and at least from 1968 through 1972 chick starvation on Manana has not been near the degree Ashmole described on Ascension Island. Differences in growth rates and the frequency of starvation between these colonies may be related to the distances of the colonies from feeding grounds (Brown 1975), although the great geographic separation between these colonies suggests at least some genetic component of this variation as well.

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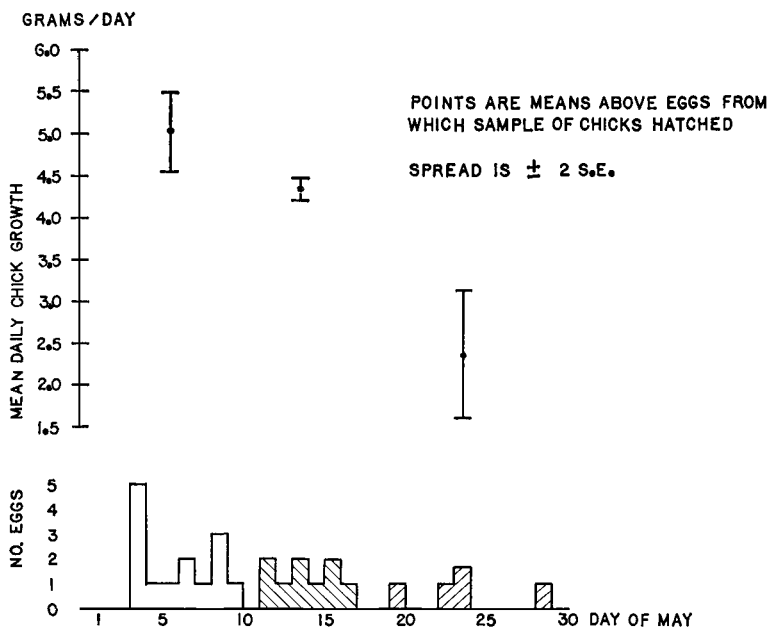


Fig. 3. Growth rate and position in breeding season of Sooty Tern chicks in 1972. The bar graph below represents the number of hatching eggs laid in the study plot on each day of the laying season. The graph above represents the growth rates of chicks hatching from these eggs. One of the 14 chicks hatching from eggs laid 3-10 May and two of the 9 chicks hatching from eggs laid 11-17 May were not used in the calculation of mean growth rate. All five chicks hatching from eggs laid after 17 May survived to 26.5 days and were used to calculate the mean growth rate, although only two of these chicks fledged.

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WILLIAM Y. BROWN, 23 Hudson Street, Cambridge, Massachusetts 02138. Accepted 18 Dec. 74.

**First breeding record of Bewick's Wren in New York State.**—On 7 July 1974 the junior author found a Bewick's Wren's (*Thryomanes bewickii*) nest near Mohonk Lake, Ulster County, in southeastern New York. The nest was 6 feet above ground on a rafter under the slab roof of a small rustic lookout (Fig. 1) at the top of a 200-foot, south-facing sheer conglomerate escarpment of the Shawangunk Mountains at an elevation of 1490 feet. The dominant vegetation in the immediate vicinity was chestnut oak, red oak, pitch pine, mountain laurel, and low bush blueberry.

The nestlings (probably three) were difficult to observe but seemed to be 2-4 days old at first sighting. The songs and alarm notes of the adults were heard and later compared with recordings. Diagnostic plumage markings and actions, especially the characteristic white-tipped tail and the sideways flipping of it, were noted. As the parents approached the nest with food, they alighted momentarily on either the seat back or a roof post of the lookout. Male and female were seen simultaneously. The young left the nest on 17 July and the family group was observed regularly from 22 July (2 adults, 3 juveniles) to 11 August (1 adult, 2 juveniles).

The adults foraged for the nestlings mainly in the more open forest to the east of and below the escarpment, while the family gathered food during the fledgling period in the dense undergrowth on the mountain. Both adults fed the young; only insects and larvae were known to be taken. Interspecific strife was infrequent and restricted to Rufous-sided Towhees (*Pipilo erythrophthalmus*), another ground-feeder. Neither House Wrens (*Troglodytes aedon*) nor Carolina Wrens (*Thryothorus ludovicianus*) were seen or heard in the immediate vicinity, though both species nest nearby at Mohonk.

The nest was removed and found to be roughly triangular in shape (determined by the available space) with sides 13, 14, and 17 cm and height 7 cm. The inner cup was slightly oval, 6 by 7 cm and 3.5 cm deep. The understructure (5 cm high) consisted of twigs and woody plant stems crisscrossed in a loose jumble. It filled the cavity space and supported a cup woven of old grass and oak inflorescences with a thin, soft lining of various kinds of hair woven through small bits of old leaves, feathers, vine tendrils, and pieces of finely divided clear plastic. The nest is now in the collection of The Mohonk Trust.

Bewick's Wren is a western and southern species known to breed as far northeast as central Pennsylvania (Todd 1940, *Birds of western Pennsylvania*, Pittsburgh, Univ. Pittsburgh Press, pp. 417-420; Bent 1948, *U.S. Natl. Mus. Bull.* 195: 180) and once