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GENERAL NOTES

Age of effective homeothermy in nestling Tree Swallows according to brood size.—The development of thermoregulatory abilities in altricial nestlings has often been studied under laboratory conditions (Dunn, Condor 77:288–293, 1975), but rarely in nature. Dunn (Wilson Bull. 88:478–482, 1976) showed that large broods of House Wrens (*Troglodytes aedon*) in nest boxes with natural nests could thermoregulate effectively at half the age as could a single nestling. This note presents data collected in the same manner for nestling Tree Swallows (*Iridoprocne bicolor*).

Methods are described only briefly here; for full details see Dunn (1976). Nest boxes in Port Rowan, Norfolk Co., Ontario, were visited on cool mornings (15–25°C) in June 1977. Telethermometer probes were used to monitor ambient temperature (T_a) and air temperature inside the box. The latter was only once more than 4°C above T_a. Body temperatures (T_b) of the nestlings were measured with a small animal probe inserted into the gullet. I removed 1 nestling immediately upon my arrival at the box, measured its T_b, and quickly replaced it in the box. Different young (if possible), were removed at 5-min intervals for T_b measurement, until 20 min had passed. To determine age of physiological endothermy (the age at which a single nestling without insulation from parent, sibs or nest could thermoregulate; Dunn 1976), a single nestling was placed on a sheet of cardboard and protected from wind and direct sunlight. Measurements took place as described above.

Thermoregulatory performance was standardized by converting the difference between average T_a over the 20-min interval and T_b at each measurement to a percentage of the difference between average T_a and adult T_b (taken as 40°C). Thus, a nestling with a T_b of 25°C in an average T_a of 20°C showed 25% of adult thermoregulatory capacity. Age of effective homeothermy was arbitrarily defined as that age at which 75% of adult thermoregulation could be maintained after 20 min of exposure to a T_a of less than 25°C.

Fig. 1 shows the results of these measurements. My best estimate of the age and weight at which young Tree Swallows can thermoregulate effectively in various brood sizes, based on the data in Fig. 1, is given in Table 1.

The variability in the data was much greater for Tree Swallows than for House Wrens (Dunn 1976), perhaps due to a greater variability in the degree of nest insulation. Tree Swallows build a platform of dead grasses with a shallow cup, then line this with feathers. Linings ranged from 1 or 2 small feathers to luxurious cups of downy swan feathers curling over the young. House Wren nests were more uniform. In addition, a prolonged cold spell during the study period may have adversely affected the swallows' normal growth pattern.

The summary in Table 1 shows that in spite of greater variability, Tree Swallows have ages of effective homeothermy at each brood size very similar to those of House Wrens, even though adult swallows weigh about twice as much as House Wren adults. Growth rate *K*, a constant relating to the growth curve and representing the rate at which asymptotic weight is achieved (Ricklefs, Ibis 110:419–451, 1968), is 0.428 for Tree Swallows and 0.464 for House Wrens (Dunn 1975); and the age of physiological endothermy (endothermy of single nestlings under standard laboratory conditions) is about 9.5 days for both species. Overall developmental rate has been shown to be the best predictor of age of physiological endothermy (Dunn 1975), and the similarity of growth pattern of the 2 species, combined with their similarity of nesting situation, probably accounts for the closeness of ages of effective homeothermy in various brood sizes.

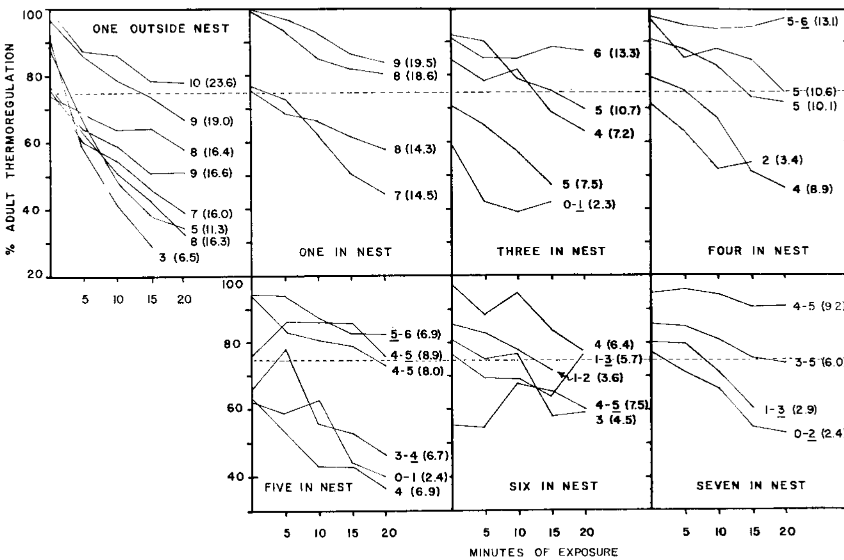

FIG. 1. Body temperatures of Tree Swallow nestlings after 5, 10, 15 and 20 min without parental brooding, expressed as percent of adult thermoregulation (see text). Each line represents 1 series of measurements on a brood. The age in days and average weight of nestlings (in parentheses) is given at the end of each cooling curve, with the predominant age underlined where appropriate. The dashed line shows level of effective homeothermy, defined as 75% of adult thermoregulation.

It is notable that Tree Swallows show a large drop in age of effective homeothermy in the nest once the brood size is larger than 1 (broods of 2 were not tested), but there is little change from small to large broods (Table 1). House Wrens, on the other hand, show a marked drop in age of effective homeothermy in broods of 4 and above. The difference probably results from different huddling behavior of the 2 species. Tree Swallows, even in broods of 7, sat next to each other in a single layer; while House Wrens nesting in

TABLE 1

AGE AND WEIGHT AT WHICH NESTLING TREE SWALLOWS CAN THERMOREGULATE EFFECTIVELY IN VARIOUS BROOD SIZES (SUMMARIZED FROM FIG. 1)

	Out of nest	Inside nest and nest box				
Brood size	1	1	3	4	5	6	7
Age (days)	9.5	8	6	5.5	5	4	4
Average weight (g)/nestling[a]	21–23	16–18	12–13	11–12	9	6	6

[a] Range of weights indicates that g/nestling at a given age varies from brood to brood.

similar-sized boxes made a single layer with 3 or fewer young, but a double layer in larger brood sizes. In both species, the average weight of nestlings at age of effective homeothermy can be less in larger broods, even though age of effective thermoregulation remains about the same. The difference in behavior and nest construction might affect thermoregulatory abilities in hot weather, but this has not been tested in either species.

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The Oilbirds of Los Tayos.—A comprehensive investigation of the fauna of the Los Tayos caves (3° 06′ S, 78° 12′ W), in the Morana-Santiago Province of Ecuador, was one of the main objectives of the 1976 Ecuadorean-British Los Tayos Expedition. I studied the population of Oilbirds (*Steatornis caripensis*) inhabiting the caves.

The Los Tayos caves are situated in forested country at an elevation of 550 m in the eastern foothills of the Andes. The main entrances to the caves are 2 vertical shafts 55 m and 75 m deep and approximately 60 m apart. While the total cave system is large and complicated, with a surveyed length of 4900 m including several parallel systems, some with narrow exits, only the area within 200 m of the 2 main shafts was occupied by Oilbirds. The extent of the Oilbird's occupation was assessed by the position of the large deposits of seeds in the cave regurgitated by the birds after digestion of the pericarp.

Size of the Los Tayos colony.—The large size of the seed deposits, at least 2.5 m deep, indicated a long occupation by a large colony of Oilbirds, but relatively few of them (ca. 170) were in the caves during our visit. Indirect evidence of the probable size of the colony was obtained from local Indians. Traditionally these people harvest the young Oilbirds each year in April; in April 1976 they claim to have taken 500 young birds. A long-term investigation of the biology of the Oilbird in Trinidad (D. W. Snow, Zoologica 46:27–48, 1961; Zoologica 47:199–221, 1962) showed that on average a little over 2 young were reared per pair. If the nesting success at Los Tayos was similar then approximately 500 adults will have reared the 500 young birds killed. As many nesting ledges in the caves were very high and inaccessible to the Indians and annual harvesting of the young is a long cultural tradition, the proportion taken is likely to be a sustainable yield, indicating a total adult population of well over 500 birds, probably at least 1500.

On 14 July and 2 August between dusk and 21:00, I censused the Oilbirds as they left both vertical shafts of the cave to forage. On both evenings nearly all the Oilbirds left via the wider 75 m shaft. They negotiated the shaft singly using their echo-locating clicks as they circled upward. When they got out of the shaft they stopped echo-locating and flew into the forest. On 14 July 156 birds emerged and on 2 August 13 did so. On the former date after the main exodus a few adults could be heard still calling and clicking in the cave.

Breeding, and post-breeding exodus.—I entered the caves on 15, 20, and 24 July by means of a winch erected by the caving team. The occupied nesting ledges were all high and inaccessible, but from the cries of the young begging for food and from what I could view from below, I estimated that there were probably 10 to 15 nests with large young