

FROM FIELD AND STUDY

Temperature Fluctuation in the Turkey Vulture.—A great deal of information has been accumulated recently regarding fluctuation in body temperature in birds. Most such information relates to small birds. Observations on lowered body temperatures and especially torpidity have been reviewed by Bartholomew, Howell, and Cade (Condor, 59, 1957:145-155). Warren (Condor, 62, 1960:293-294) subsequently found temperature fluctuation in the Smooth-billed Ani (*Crotophaga ani*) from Panamá. This study of the Turkey Vulture (*Cathartes aura*) indicates the presence of temperature variation in a large bird as well.

A 2230-gram, male Turkey Vulture was maintained at a constant environmental temperature of 15°C. with a 12-hour light cycle. The bird was kept in a cage 61 by 45.5 by 45.5 centimeters and was fed on a diet of raw lamb liver. Measurements of body temperature were made to the nearest 0.25°C. at frequent intervals, using a Yellow-Springs thermister probe inserted five centimeters into the cloaca. The body temperature decreased during the night from 38.0°C. to 34.0°C. (fig. 1). The diurnal cycle of temperature variation was followed for eight days, two in complete darkness. Body temperature was taken every eight hours after the first two days.

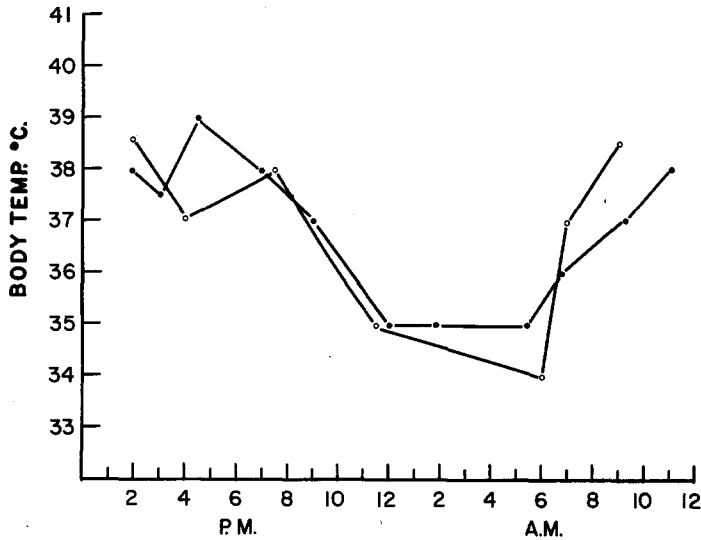


Fig. 1. Diurnal temperature fluctuation in the Turkey Vulture (*Cathartes aura*). The solid dots represent temperature measurements taken on the first day; the open circles, the second day. The bird was in darkness from 6 p.m. to 6 a.m. Note the variation in body temperature during the light hours.

During the light hours, the bird remained active, moving about the cage and feeding. On one occasion considerable difficulty was encountered in inserting the probe due to defensive posturing, wing flapping, and pecking. After a delay of two to three minutes a temperature record of 41.0°C. was obtained. It is possible that the animal may experience equally high temperatures prior to and during flight.

Within an hour after the cessation of light the vulture became quiescent. The head either drooped or was placed under the wing. The eyes were closed, and the bird was apparently asleep. On several occasions the bird was not awakened during the temperature measurement until the probe was inserted. Upon awakening the vulture began to shiver. During such measurements, the body temperature rose from 34.0°C. to 37.5°C. in three minutes. This rate of increase of body temperature may be compared to that of small birds. The body temperature of the Smooth-billed Ani (Warren, *op. cit.*) increased

6.4°C. in nine hours at an ambient temperature of 25–30°C., or 0.73°C. per hour. Bartholomew, Howell, and Cade (*op. cit.*) report an increase of about 2.0°C. per hour at an ambient temperature of 25.0°C. in the Poor-will (*Phalaenoptilus nuttallii*) and 1.0 to 1.5°C. per minute in the Anna Hummingbird (*Calypte anna*). In view of an ambient temperature of 15°C., the rate of increase in the Turkey Vulture of 0.83°C. per minute is extremely rapid. This may be accounted for by a more effective use of shivering as well as by the more favorable surface-to-mass ratio of the vulture for the conservation of heat compared with the other species.

Considering the variable nature of the food supply in a carrion feeding bird such as the Turkey Vulture, the ability to lower its body temperature for half of the day must constitute a favorable device for saving of energy. Vultures observed in nature often spend fifteen to thirty minutes in the morning sitting quietly, backs to the sun with the feathers raised to allow the sun's rays to reach the bare skin of the back. Such basking may supplement metabolic energy in raising the body temperature from the nocturnal low point.

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Observations on the Breeding of Golden Eagles at Lake Peters in Northern Alaska.

—Although Golden Eagles (*Aquila chrysaetos*) are seen rather frequently in the mountains and in the foothills of northern Alaska, most of the birds are immature, and breeding pairs are seldom encountered. For instance, Irving (U.S. Nat. Mus. Bull. No. 217, 1960) and his Eskimo associates were unable to find nesting eagles during extensive studies covering a period of 12 years in the Anaktuvuk Pass region of the Brooks Range, although the Nunamiuts there know that eagles do nest occasionally in the mountains. Similarly, during five seasons of raptor censusing along the cliffs of the Colville River in the foothills, Cade (Univ. Calif. Publ. Zool., Vol. 63, 1960) encountered no nests of the Golden Eagle. Discounting the second-hand observations mentioned by Bee (Univ. Kan. Publ., Mus. Nat. Hist., 10, 1958:180), the only satisfactory breeding records for northern Alaska are the set of eggs reported by Bailey (Colorado Mus. Nat. Hist., Popular Series No. 8, 1948) from the mountains south of Barter Island and the advanced nestling observed by Campbell (Condor, 62, 1960:298) in the mountains five miles west of the Anaktuvuk River. Records from other northern countries (Snyder, Arctic Birds of Canada, 1957; Dementiev, Birds of the Soviet Union, 1, 1951) indicate that Golden Eagles reach the northern limit of their circumboreal breeding range at 69° to 70° N. Details about breeding from any part of northern Alaska are, therefore, of interest because they concern peripheral and quite possibly marginal reproductive attempts by this species.

Lake Peters is located on the northern front of the Brooks Range in northeastern Alaska at 69° N and 145° W. Glacially scoured mountains rise abruptly to 4500 feet above the lake, which lies at an altitude of 2800 feet. The 9200-foot summit of Mount Chamberlin is only three miles away. Our observations on eagles in this area cover parts of four years as follows: June 19 to August 28, 1958 (Hobbie); April 29 to August 15, 1959 (Hobbie and Cade); May 28 to June 19 (Cade) and August 23 to November 30, 1960 (Hobbie); January 1 to August 31, 1961 (Hobbie, and Cade for part).

Eagles were seen on several occasions during the periods of observation in 1958 and 1959, but no indication of breeding was obtained in these years. In 1958 all the detailed sightings were of immature birds, but in 1959 a pair of adults was observed several times in the months of May and June. Also in the latter year, two old stick nests located about 20 feet apart were found on a quartzite outcrop situated on the steep wall of the valley about a quarter of a mile north of Chamberlin Creek in the southeastern sector of the lake. The nests were about 500 feet above the lake on a rock-studded slope, which drops down to a lateral moraine 300 feet below the nests. The vertical face of the outcrop was about 30 feet high. One well-constructed nest about three feet in diameter was situated near the top on a ledge under an overhanging projection of rock, and the other, older, nearly disintegrated nest was located in a deep fissure in the face of the rock about 10 feet from the bottom. In 1959, neither nest showed signs of recent use, and no birds were seen near them.

The following year the aerie was first visited on May 28, 1960. Even from a distance it was