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.

I wish to thank Dr. Kenyon C. Lint of the San Diego Zoological Society for the loan of the vulture used in this study. This study was undertaken during tenure of a Traineeship, Mental Health Training Program, National Institute Mental Health, USPHS training grant number 2-M-6415.—JAMES EDWARD HEATH, *Department of Zoology, University of California, Los Angeles, California, September 1, 1961.*

Observations on the Breeding of Golden Eagles at Lake Peters in Northern Alaska.—Although Golden Eagles (*Aquila chrysaëtos*) 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

obvious from the droppings on the rock that the nest under the overhang was being used, and an adult eagle was observed to fly up to the nest and settle down in it. On May 29 the nest was approached closely enough by Carroll Rock and Cade to determine that a single egg was present. During succeeding days the adult eagles were often seen flying to and from the nest. Usually they approached the nest from the north, soaring close to the east wall of the valley. Their comings and goings were accurately reported by the whistled alarm cries of the marmots (*Marmota caligata*) living among the rocks along the east side of the lake. A single egg was still present in the nest on June 17, which was the last close observation made that year. It is not known whether the egg ever hatched, but after general observations were resumed by Hobbie on August 23, no eagles were seen in the area until September 1. Since the camp is only half a mile from the nesting cliff, it seems unlikely that a fledgling eagle would have gone unobserved.

In 1961 the pair of eagles first appeared on April 28, and four days later mating activities were underway. On May 2 both birds were seen soaring some 2000 feet above the lake in the late afternoon. Coming lower, one perched on a ledge and was joined by the other minutes later. The first eagle immediately launched back into the air, followed soon after by the other. This sequence was repeated several times. Finally the female perched on a grassy ledge, and the male landed on a cliff about 100 yards from her. After ten minutes, the female flew 50 yards to the nest under the overhang and remained there for three minutes before returning to her perch. Twenty minutes later the male flew out of sight, but both birds could be heard screaming a duck-like *wak-wak-wak* several times, and after fifteen minutes the male suddenly appeared again and landed three feet from the female. Less than a minute later, he jumped onto the female's back and began copulating with his wings folded and his tail drooped over one side of hers. The act lasted 15 to 20 seconds, during which the female appeared to be moving up and down slightly and one or both of the eagles uttered loud cries. The male flew away immediately afterward, but the female remained on the ledge to eat some kind of prey evidently brought there previously by the male.

During the month of May the eagles were seen several times bringing sticks to the nest and making repairs. On May 5, a bird flew out from the nest to a stand of willow brush on the wall of the valley east of camp, pulled some branches off a small willow with its feet, and flew back to the nest with them. On May 10 one of the eagles picked up some sticks from the ground and carried them to the nest, and on May 15 one was seen carrying a branch three feet long. Both birds were at the nest for some time on May 25, arranging materials and tidying up. Calling was heard almost every day until May 29, and at least one eagle was seen at the nest for short periods of time on 20 days during May; but no egg was laid during this time, and the eagles abandoned the nest at the end of the month. Eagles were seen in the area several times during June, but they showed no further interest in the aerie.

Thus, during four consecutive years, an aerie that appears to be long established has remained unproductive. Eagles were present in the same area in 1952, and a young bird may have been produced that year (Bee, *op. cit.*). In 1959 and 1960, extensive surveys of breeding raptors were carried out over approximately 100 square miles of country around Lake Peters without revealing the presence of any other pairs of eagles.

An instructive comparison can be made between what is now known about the occupancy of the Brooks Range by eagles and what is known about their occupancy of the Alaska Range, which lies some four hundred miles southward between latitudes 64° and 60° N. In contrast to their sparseness and seemingly marginal reproductive performance in the Brooks Range, Golden Eagles are common and successful breeders in the Alaska Range. This fact has been obscured in the account of the Golden Eagle given by Gabrielson and Lincoln (Birds of Alaska, 1959:267), who failed to note an important piece of work by A. Murie. In the "sheep hills" which occupy about 750 square miles of Mount McKinley National Park, Murie (Nat. Parks Fauna Series No. 5, 1944:222–229) found 10 active eagle aeries over a three-year period and 13 other nests that were not in current use. He estimated a total breeding population of about 25 pairs in this area. Nine observed nests yielded 13 nestlings and two unhatched eggs. By comparison with the Alaska Range, then, the north slope of the Brooks Range appears to represent a difficult environment for breeding eagles.

Two related factors in the life of these eagles may account for their tenuous hold in the Brooks Range. The period of time from the laying of eggs to independent existence of the young is longer for the Golden Eagle than for any other raptor nesting in northern Alaska. As pointed out by Pitelka,

Tomich, and Treichel (Ecol. Monogr., 25, 1955:107) for the Snowy Owl (*Nyctea scandiaca*) and by Cade (*op. cit.*) for the Gyrfalcon (*Falco rusticolus*), successful reproduction by raptors nesting at high latitudes is promoted by an early start, which increases the likelihood that the young will be able to care for themselves before the advent of the fall and winter period of food scarcity. To gain such an advantage, however, raptors with long reproductive periods must begin nesting quite early in the Arctic—long before most other birds start nesting and at a time of the year when conditions may be quite harsh. In the case of the Golden Eagle, incubation lasts about 45 days, the young start flying at an age of about 75 days but remain dependent upon their parents for food until they are at least 90 to 100 days old (see Bent, U. S. Nat. Mus. Bull. No. 167, 1937; Dementiev, *op. cit.*; Brown, Eagles, 1955), so that the total period of development after laying is approximately 135 to 145 days.

In the Alaska Range, Murie (*op. cit.*) found that arctic ground squirrels (*Spermophilus undulatus*) made up over 80 per cent of the prey eaten by eagles during the breeding season, and it seems likely that this same dependence also holds in the Brooks Range because ground squirrels are the only suitable prey that is widespread and common there. If their reproductive effort is contingent upon a supply of ground squirrels as the basic food, then the eagles must arrange their timing of reproduction to correspond with the rather precise timing of the spring emergence from hibernation and the fall disappearance of the ground squirrels (Hock, Bull. Mus. Comp. Zool., 124, 1960:156). Particularly in the Brooks Range, with the disappearance of the ground squirrels in the last part of September virtually all readily available food for the eagles is gone. Rock Ptarmigan (*Lagopus mutus*) are sporadically available, but by then the young ptarmigan are strong on the wing, and a juvenal eagle would probably find it difficult to catch them. Five species of microtine rodents are available, but even though eagles do catch these mice in northern Alaska, their small size probably renders the effort involved in their capture uneconomical for a bird as large as an eagle.

In other words, the young eagle must be independent and ready to leave the north side of the Brooks Range by the middle of September. Hence, the adult eagles must lay their eggs not later than the first week of May, with hatching taking place no later than mid-June. As pointed out by Campbell (*op. cit.*), this estimate is consistent with the date of the eggs reported by Bailey and with the age of the young found by him in August.

It is difficult to say what proximate factors set the precise time of reproductive onset in eagles attempting to nest in the Brooks Range, but weather and feeding conditions are plausible modifiers. Our earliest dates for the appearance of eagles at Lake Peters are April 24, 1960 (Carroll Rock) and April 28, 1961. Irving (*op. cit.*) gives a number of early dates for Anaktuvuk Pass ranging from March 23 to April 10. At this season winter conditions still prevail with subfreezing temperatures and a snow cover that has not yet begun to thaw. Food is scarce and must consist mainly of ptarmigan, because the ground squirrels and marmots do not appear until the latter part of April and do not reach maximum spring numbers above ground until the first part of May. Unusually harsh weather in April, poor stocks of ptarmigan, or lower than average spring populations of ground squirrels appearing at the end of April may make the difference between success and failure in the initial reproductive effort.

As far as weather is concerned, winter conditions are just as harsh in the Alaska Range when the eagles arrive, but the variety of prey available there is much greater. In addition to three species of ptarmigan, there are also present at the edge of the forest three species of grouse, the snowshoe hare (*Lepus americanus*), the red squirrel (*Tamiasciurus hudsonicus*), and a number of other less probable species of prey; but it is not known to what extent any of these species are actually utilized by eagles during the first part of the breeding season.

These studies were aided by grants from the Arctic Institute of North America with funds provided by the Office of Naval Research and the Air Force Cambridge Research Center, and by the National Science Foundation. Logistics and field support were provided by the Arctic Research Laboratory.—John E. Hobbie, *Department of Zoology, Indiana University, Bloomington, Indiana,* and Tom J. Cade, *Department of Zoology, Syracuse University, Syracuse, New York, August 28, 1961.*

Further Information on the Caribbean Martin in México.—On April 17, 1961, Davis noted approximately 30 Caribbean Martins (*Progne dominicensis*) flying over a steep, pine-covered ridge 3 miles north of Tzitzio, Michoacán, México. The birds were in small groups but within these groups pairs were evident. A male with the left testis 5 mm. long and a female with the largest follicle 1 mm. in diameter, were collected. Both birds were noted as having "much fat," suggesting recent arrival.