TIMING OF ANNUAL MOLT IN THE GLAUCOUS GULLS OF NORTHERN ALASKA

By David W. Johnston

In northern Alaska there are many adaptations for the successful existence of birds and mammals in a cold climate. Important among these adaptations are those of both anatomical and physiological natures. Some of these have been discussed recently by Irving (1960).

The majority of the birds breeding under these northern climatic conditions encounter an abbreviated season for the important processes of reproduction and molt. It is well known, for example, that many of the small passerine and shorebird species arrive in arctic Alaska about the first of June and depart for the south at least by mid-August. In this brief period they complete the entire breeding process and begin, or even complete, the annual or postnuptial molt. These two major events are therefore condensed into a shorter period than would be the case in warmer latitudes. In larger species, such as the Common Raven (*Corvus corax*) and Glaucous Gull (*Larus hyperboreus*), there are two additional problems: the incubation periods are longer, and the large flight feathers require more time for replacement. The present investigation will discuss these features of the Glaucous Gull as they pertain to the arctic breeding period.

During the summer of 1960 I was a consultant for the United States Public Health Service, along with several other ornithologists, to study the bird life of the arctic coast of Alaska in the vicinity of Cape Thompson (latitude 68° 06′N, longitude 165° 46′W). These investigations were supported by the Division of Biology and Medicine of the Atomic Energy Commission (Agreement No. SF–54–373, environmental studies of Project Chariot). Since our work dealt mainly with populations of small passerine species in terrestrial communities, the observations reported here were incidental to our major duties, a detailed account of which will appear later. My colleagues, John Q. Hines, Max C. Thompson, Francis S. L. Williamson, and Jerry Tash, gave valuable assistance in collecting specimens, and Leonard Belson and George W. Cox have provided a few unpublished breeding data from the cliff-nesting population. Special acknowledgments are due Francis S. L. Williamson for his pertinent suggestions in the preparation of this paper.

OBSERVATIONS

In the Cape Thompson region, Glaucous Gulls appear in the spring toward the latter part of April or early May, their appearance and numbers depending largely upon the melting of the sea ice. Upon my arrival at Cape Thompson on May 30, I immediately noticed to my surprise that *all* the Glaucous Gulls flying along the shore were symmetrically replacing their primaries. This fact assumed greater significance when it was realized that this species had either just begun to incubate or had not yet laid any eggs. At best, these observations suggested that the local Glaucous Gulls had begun their annual molt before or soon after incubation had begun, a rather unusual phenomenon among birds. In order to determine the validity of such an interpretation, I decided to take at random occasional samples of adult gulls throughout the summer months and to learn, within the limitations of time, as much as possible about the local breeding population in relation to molt. No specimens were taken directly from the nest sites but rather from the nearby ocean shores where no doubt individuals from the cliffs and lagoons foraged together.

As the result of previous investigations by a team of workers from the University of Alaska, it was already known that there existed on the sea cliffs at Cape Thompson a

small, scattered colony of nesting Glaucous Gulls along with thousands of murres and other species. In 1960, the first nests with eggs were discovered on June 6, but presumably some of the eggs had already been incubated for about two weeks. Although the first young gulls were seen at these cliff nests on June 16, other nests still containing eggs were in evidence as late as June 30. If the incubation period for this species in northern Alaska is 28 days (see Bent, 1947:55; Witherby, *et al.*, 1941:109), some eggs in the colony were probably laid as early as May 19 and some as late as June 2. Furthermore, two adult females, taken June 5 and June 11, still had collapsed follicles in evidence, indicating that egg laying had occurred recently.

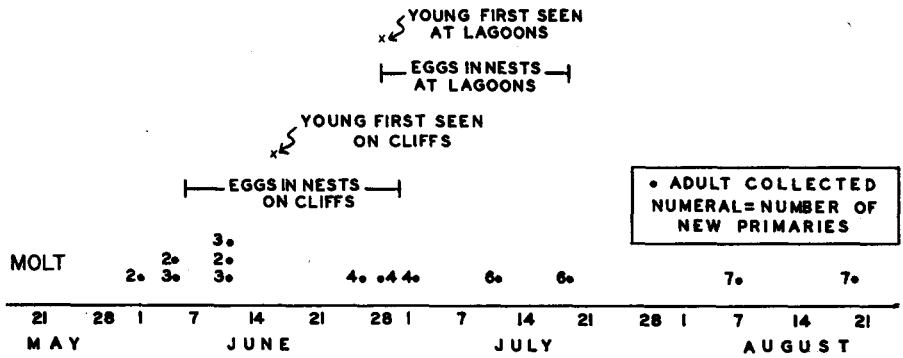

Fig. 1. Sequence of selected reproductive stages and primary molt in adult Glaucous Gulls at Cape Thompson, Alaska.

In addition to Glaucous Gulls nesting on cliffs, we located many scattered pairs nesting at the edges of lagoons both north and south of the Cape Thompson cliffs. Most of these lagoon-nesting pairs were near the mouth of the Kukpuk River or in the Point Hope area, up to fifteen miles northwest of the cliffs. Other nests were discovered about twenty-five miles southeast of the cliffs near the mouth of the Singoalik River, and we suspected that the gulls were breeding around some of the larger lakes inland from the cliffs. Unfortunately these lagoon sites were not always readily accessible except by occasional airplane visits, so less detailed observations were made there. Nonetheless, the first young gulls at lagoons were seen on June 28, at which time some nests still contained eggs. Eggs were seen in nests as late as July 19. The first possible date for egg laying would have been about June 1. It is of passing interest to note here that the cliff-nesting Glaucous Gulls in general nested earlier than the lagoon-nesting ones, but this was to be expected since the cliffs are free of snow and ice before the lagoons.

Figure 1 summarizes these events in the nesting cycle for this species in the Cape Thompson region. Included also in the figure are the dates when adult specimens were taken and the extent of each bird's primary molt. Although details of body molt were not studied extensively, it was evident that the specimens taken as early as June 1 and 5 were beginning to molt flank feathers. Body molt did not become extensive, however, until the end of June. From that time through August 19, body molt was "heavy."

The departure of Glaucous Gulls from the Cape Thompson region appears to be rather leisurely and is dependent, at least in part, on the reappearance of the sea ice. According to the observations of Max Thompson, many were still present along this stretch of the coast as late as November 10.

DISCUSSION

The breeding cycle of the population of Glaucous Gulls at Cape Thompson seems to differ little from that of other populations in Alaska. Grinnell (1900:10) noted arrival of this species at Kotzebue on May 11. Bent (1947:61) stated that eggs were laid in northern Alaska between May 26 and June 28, whereas Kessel and Cade (1958:59) reported birds at Umiat between June 4 and September 8, with young hatching at the Colville River delta as early as July 6. Glaucous Gulls leave Point Barrow about November 1 (Bent, 1947:61). The breeding season in Spitsbergen is reported by Witherby, *et al.* (1941:109) to extend "from end May to mid-June." It would appear from these reports and from the data presented in this paper that the Glaucous Gull is a relatively early nester in the Arctic.

Few precise data are available for the annual molt. Dwight (1925:94) remarked that for any large gull with a four-year plumage cycle in the northern hemisphere, "postnuptial molt is mid-July to the end of September," and for *hyperboreus* he stated that there is a complete postnuptial molt in August and September. Johnston (1955:204) noted that four adults taken at St. Michael on June 7 were molting primaries. On Nunivak Island, Swarth (1934:36) reported: "September adults are molting, and two specimens collected on October 8 are the only ones in which molt of the remiges had advanced as far as the replacement of the outermost primaries, which in these birds are partly grown." Clearly, however, the Glaucous Gulls of the Cape Thompson region had already replaced two of their primaries by June 1. In this species the precise rate of replacement and growth of the primaries is not known, but from the specimen data presented in figure 1 it is probable that the first (smallest) pair of primaries required about ten days for replacement and the larger ones about thirteen or fourteen days each. If this were true, it would mean that molt of the first primary occurred about May 11. Considering then the molt data and the evidence for time of egg laying, it seems obvious that this species begins its annual molt of primaries either before the first eggs are laid or certainly immediately thereafter.

Many instances could be cited for species of the temperate zone which effect their annual molt after their eggs are hatched or after the young have left the nest, this sequence being the rule for many of the other species breeding in the Cape Thompson region. Even in the Black-legged Kittiwake (*Rissa tridactyla*), the other common breeding larid of the Cape Thompson region, adults procured in late July and early August when they had young in the nest had not yet begun the annual molt of primaries. Kittiwakes are apparently late nesters elsewhere in Alaska (Gabrielson and Lincoln, 1959: 457) and in England (Witherby, *et al.*, 1941:116). By way of contrast, the California Gull (*Larus californicus*), breeding in California, lays its eggs by May 11, with the adults molting their primaries from mid-June (after the eggs hatched) until September 1 (Johnston, 1956:140).

Various authors have related the timing or inception of the annual molt to such factors as photoperiod, amount of food, or changes in temperature (Pitelka, 1958; Lesher and Kendeigh, 1941:169). In the Glaucous Gull, the beginning of this molt and its duration are related especially to size of the bird and the available time for breeding. In other words, since the breeding season is relatively short in the Arctic and since much time is required for the molt of the large primaries, these two events are telescoped so that they overlap broadly. The early beginning of the molt allows this species to complete its molt and reproduction on the breeding grounds. Since this species evidently does not suffer from a dearth of food even in late autumn and since it does not migrate especially early from arctic Alaska, it seems unlikely that this early molt has any present

adaptive value. Nevertheless, there are several speculations which seem to be appropriate. The early molt could have originated at a time when it was adaptive. Or, it could be adaptive now on an overall basis in the event of occasional early inclement weather conditions in the fall. It would seem beneficial to the species if the energy-demanding process of molt could be consummated before migration.

A final point relating to the timing of breeding in the Glaucous Gull is worthy of mention. Gabrielson and Lincoln (1959:458) state that "farther north the place of the Glaucous-winged Gull is taken by the Glaucous Gull" as chief predator on the eggs and young of the kittiwake. In the Cape Thompson region, however, a cursory study of predator-prey relationships of the sea birds indicated that this large gull was more omnivorous than the foregoing statement would imply. It preyed upon the abundant murre eggs and, more so, was a conspicuous scavenger of murre, puffin, and aquatic mammal carcasses. In fact, throughout the summer we could almost always find a group of these large gulls feeding on walrus and whale carcasses, some of which had been lying on the beach for at least a year. One might be tempted to suggest that the nestings of the Glaucous Gull are timed in such a fashion as to have readily available food for their own young (the nest contents of kittiwakes and murres). But such a hypothesis is untenable when the ready availability of other food items is considered carefully.

SUMMARY

In the Cape Thompson region of arctic Alaska, the Glaucous Gull (*Larus hyperboreus*) lays its eggs in late May or early June. Adults begin their annual molt before or soon after the eggs are laid, that is, by the end of May. This early molt is believed to be an adaptation whereby this species is able to complete, or nearly complete, both breeding and molt during the abbreviated summer period.

Glaucous Gulls were found nesting in two distinct habitats: (1) on precipitous sea cliffs and (2) on small islands or peninsulas or at the edge of lagoons and lakes. The cliff-inhabiting individuals bred before those at the lagoons.

The timing of nesting is not necessarily related to an abundant supply of eggs and/or young of kittiwakes since other food items are readily available throughout the summer.

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