

hour. The Great White perched atop a mangrove about 100 yards away with several alarmed Great Blues where it moved about but did not return to any nest before darkness forced us to leave.

On the second visit we saw the Great White Heron even before we landed, perched against the skyline in the same general area. Again we concealed ourselves at different vantage points. This time observation was complicated by a dozen pairs of nesting Common Egrets (*Casmerodius albus*).

In a half hour the Great Blues began coming back to their nests, and a few minutes later the Great White came in and lit within 2 feet and slightly above a Great Blue that was either on a nest or standing on its edge. The birds maintained their positions without change for 30 minutes. When another Great Blue started to settle nearby, the Great White responded with a powerful thrust of its bill and drove it away.

Shortly thereafter something, perhaps a movement from one of us, disturbed the birds and they flew off. We then went to examine the nest. It was 8 feet from the ground in a black mangrove growing out of a cactus clump. This location was lower than most of the other Great Blue nests. In it was one downy young which we judged to be about 10 days old and showing the starting feathering of a juvenile Great Blue. Most of the other Great Blue nests contained two to four eggs or young.

We concealed ourselves again where we could watch this nest. In 20 minutes both birds came back almost together. The Great Blue took a position just over the nest and the Great White some 3 feet away. Except for an occasional movement by the Great Blue neither bird changed position for the next hour at which time darkness again forced us to leave.

In early April Andrew J. Meyerriecks and I flew over the island. We saw an adult Great White Heron perched on the rim of a large nest, which it was most reluctant to leave, even though the pilot made several low passes over the island.

It is worth noting that for several years on Christmas bird counts and at other times, a single Great White Heron has been seen across the Sound on Captiva Island, which may or may not be the same bird that has now joined the Great Blue nesting colony.—GRIFFING BANCROFT, *Captiva, Florida* 33924.

Starvation of Alaskan Ruffed and Sharp-tailed Grouse caused by icing.—Late in January 1968 residents of Minto Village in central Alaska (64° 54' N, 149° 10' W) informed the Alaska Department of Fish and Game that they were finding dead grouse along trails near the village. At least 10 dead grouse were discovered from late January to 7 February, 3 of which (1 female Sharp-tailed Grouse, *Pedioecetes phasianellus*, and 1 male and 1 female Ruffed Grouse, *Bonasa umbellus*) were sent to the department for examination. These birds were very thin, and the possibility that they had died of starvation led us to investigate the situation in some detail. Our conclusion was that grouse in the vicinity of Minto suffered fairly heavy mortality in January 1968 when thick accumulations of ice cut off food supplies and roosting sites. This die-off is reconstructed below as far as our evidence allows.

Although central Alaska is normally cold and dry in winter, storms from the south and west occasionally bring warm, moist air to the interior valleys. Nearly every winter one or more of these storms causes icing on the snow and vegetation. According to the U. S. Weather Bureau's Local Climatological Data, glazing occurred on 4 days in December 1967 at Nenana (25 miles south of Minto, and the closest weather station), with liquid precipitation totalling 0.63 inches, and on 3 days in January 1968, with liquid precipitation amounting to 0.10 inches. Heaviest icing occurred on 29 December when 0.60 inches of rain fell at Nenana. At this time all

exposed vegetation near Minto was coated with about $\frac{1}{2}$ inch of ice which persisted for 5 weeks. During this storm, Fairbanks (50 miles east of Minto) received only 0.36 inches of rain, and the resultant ice-coating, approximately $\frac{1}{4}$ inch, remained only 2 weeks. In Fairbanks and Minto an icy crust on the snow prevented grouse from roosting in burrows under the snow for about 3 weeks before new snow allowed resumption of normal subnivean roosting.

Minto residents had been seeing grouse and grouse sign commonly early in the winter, but abruptly stopped seeing evidence of these birds early in January, although light snow accumulations made favorable tracking conditions. Dead grouse were first noticed about 4 weeks after the heavy glaze occurred: live grouse were rarely seen; 38 man hours of searching in early February yielded only one sighting of a live grouse and one dead grouse. Fresh snowfall prevented recovery of others reported earlier.

Microscopic examination of the 3 grouse sent to the department from Minto showed no parasitic infestation or pathological symptoms. The birds contained no visible fat depots, and the breast musculature was severely wasted in all cases. One Ruffed Grouse partly eaten by a predator or scavenger was not weighed. The other Ruffed Grouse, a hen, weighed 436.4 g, 27 per cent less than the mean of 11 females shot near Fairbanks in midwinter. The Sharp-tailed Grouse sent to the department weighed 420.6 g, or 38 per cent less than the average of 6 other females shot in the winter near Fairbanks. The crop of one Ruffed Grouse had a few bracts of *Betula papyrifera*; the others were empty. Gizzards of all 3 grouse contained relatively little food material, mostly seeds of *Rosa acicularis* and shredded twigs.

The less severe icing that occurred near Fairbanks in December and January 1968 did not appear to affect local Ruffed Grouse. Periodic searches throughout the winter revealed no dead birds, no sharp drop in numbers, or emaciation of specimens shot to determine condition. Four Ruffed Grouse taken in December and January 1967-1968 averaged 4 mm of fat along the posterior edge of the sternum, suggesting that the birds were in good condition.

A review of weather records for Fairbanks showed that in the last decade icing occurred on 9 days in 1962-1963, 10 days in 1967-1968, and 0 to 4 days in other years. Most icing occurred in December and January, which are also the coldest months of the year. The return to very low temperatures following glazing could make the effect of icing more severe in interior Alaska than in temperate areas, especially if glazing caused heavy crusting of snow, and thus prevented snow roosting.

So far as I can determine, no instance of ice-caused starvation has been described for Ruffed or Sharp-tailed Grouse, although the subject of icing as related to roosting and predation has been discussed by several authors. (King, R. T., *J. Forestry*, 35: 523-532, 1937; Bump, G., R. W. Darrow, F. C. Edminister, and W. F. Crissey, *The Ruffed Grouse: life history, propagation, management*, New York State Conserv. Dept., 1947; Grange, W. B., *The way to game abundance*, New York, Charles Scribner's Sons, 1949; Larsen, J. A., and J. F. Lakey, *J. Wildl. Mgmt.*, 22: 63-70, 1958).

Several members of the Alaska Department of Fish and Game aided in this study. Robert B. Weeden offered helpful suggestions throughout the investigation; Kenneth A. Neiland and Barbara L. Holden conducted the parasitic and pathological examination. Thanks are also extended to Orrin John from Minto, Alaska, who assisted in the field.—JERRY D. MCGOWAN, *Alaska Department of Fish and Game, 604 Barnette Street, Fairbanks, Alaska 99701.*