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Mortality of Geese as a Result of Collision with the Ground

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ABSTRACT: Two incidents are reported in which groups of migrating wild geese were found dead in agricultural fields in southern Manitoba during spring. In each case, the birds died overnight and poisoning was suspected; however, the birds had lesions of severe traumatic injury. The first incident, in 1985, involved about 150 lesser snow geese (*Anser caerulescens caerulescens*); the second, in 2003, involved 62 Canada geese (*Branta canadensis*). Both incidents occurred on dark, moonless nights. One possible explanation is that the birds became disoriented in a manner analogous to spatial disorientation described in aircraft pilots and flew as a flock directly into the earth. In the first incident, geese might have been frightened by sonic booms from aircraft; in the second, there was a thunderstorm with strong gusty winds in the area.

Key words: Accident, *Anser caerulscens caerulescens*, *Branta canadensis*, Manitoba, migration, spatial disorientation, trauma.

Traumatic injury takes "a sizable toll on various birds" (Forrester and Spalding, 2003, p. 1016). Collision with overhead wires or structures is a common cause of death of birds, particularly large species such as swans (Perrins and Sears, 1991). Waterfowl are killed in hail storms (Stout and Cornwell, 1976), and bean geese (*Anser fabalis*; Von Kittler, 1979), lesser snow geese (*Anser c. caerulescens*; Cook et al., 1995) and Canada geese (*Branta canadensis*; Glasrud, 1976; Bye, 1998) have been killed by lightning. We report two incidents in which flocks of wild geese were found dead with extensive traumatic injury indicating that they had flown into the ground.

On the morning of 10 April 1985, approximately 150 lesser snow geese were found dead in a large corn field near Carman, Manitoba (49°29′N, 98°01′W). The birds had not been present in the field the previous evening. Many dead geese had blood running from the beak. A few live geese that were unable to fly also were present in the field. The sky had been clear during the previous night with light winds (9 to 19 km/hr). The moon was past the last quarter, so there had been little or no moonlight. Loud sonic booms were reported in the area overnight, likely as a result of jet aircraft from an airbase to the south of the area.

Fourteen dead and three live geese were submitted to the Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, on 11 April for examination. The live birds were weak, ataxic, unable to fly, and one had rigid extension of the left leg. One bird was killed for necropsy immediately and the other two were held for observation. Eight dead birds were selected arbitrarily for detailed necropsy; all were adult (five male, three female); five were white phase and three were blue color phase; all were in fair to good body condition. The upper alimentary tract was empty in seven; one bird had a few kernels of corn and green vegetation in its gizzard. Gross lesions observed are summarized in Table 1. The most dramatic lesion was massive hemorrhage within the body cavity that originated from laceration (i.e., disruptions of tissue due to stretching) of the liver. The other six dead birds received a less detailed examination but all had lesions of traumatic injury similar to those described above. The live bird killed on 11 April was a juvenile male that had survived for approximately 36 hr after the traumatic event probably occurred. It had extensive sub-

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TABLE 1. Frequency of occurrence of gross lesions in eight Lesser Snow Geese found dead in a field in Manitoba, Canada, in April 1985.

Hemorrhage							
Subcutaneous	Oral	Pectoral muscle	Body cavity	Lung	Liver	Liver laceration(s)	Pulmonary edema
1	3	4	5	5	7	6	1

cutaneous emphysema over the entire body, except for the right wing, probably as a result of rupture of air sacs releasing air into the subcutis. There was hemorrhage in the superficial pectoral muscles, blood clots in the body cavity, and fibrin adhering to the liver capsule overlying a 2 cm diameter area of necrosis in the parenchyma. There was a circumscribed 1×2 cm area of pallor within the gizzard muscle. Tissues from the birds necropsied were collected in 10% buffered formalin, processed routinely, and slides were stained with hematoxylin and eosin for histology. No significant microscopic lesions were found in the birds found dead in the field, except for those associated with acute trauma. The pale focus in the gizzard of the bird that was killed was a sharply defined area of muscle necrosis with no inflammatory reaction. Another live bird, an adult female, was killed on 15 April. It had rigid extension of the left leg as a result of chronic arthritis, with atrophy of the muscles of that leg. It was in poor body condition. Subcapsular hematomas and a healing laceration were present in the liver. The third live bird recovered and was released.

On 30 May 2003, 62 Canada geese, probably giant Canada geese (*B. c. maxima*), were found dead in a field seeded to spring wheat 4 km south of Winnipeg, Manitoba (49°47′N, 97°12′W). The birds died over the previous night during which skies had been heavily overcast (nine to ten-tenths total cloud opacity). Visibility had been limited to 4 km at times in rain and fog, with thundershowers and gusting winds. The new moon occurred on 30 May, so there had been little or no moonlight. Three dead birds were frozen and submitted for necropsy to the Canadian Cooperative Wildlife Health Centre, Department of Veterinary Pathology, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada.

The geese were females in excellent body condition; the ovary and oviduct were not developed in any of the birds, suggesting that they were subadult. Each bird had bloody fluid running from the mouth. All had recently-ingested corn kernels in the esophagus. One had hemorrhage within the right pectoral muscles associated with fracture of the sternum. This and one other bird had a large amount of blood in the body cavity with multiple lacerations in the liver capsule and parenchyma. One bird also had extensive pulmonary hemorrhage. The third goose had several fractured ribs with massive intrapulmonary hemorrhage. Tissues were collected and placed in 10% buffered formalin for histology. Spleen from each goose was cultured aerobically at 37 C on 5% sheep blood agar and MacConkey's agar, and brain cholinesterase was measured by the method of Blakley and Yole (2002). No significant microscopic lesions were identified, other than those associated with acute trauma. No bacterial growth occurred on plates inoculated with splenic tissue. Brain cholinesterase activity (11.50 to 13.81 μM acetylthiocholine hydrolyzed/min/g of tissue [wet weight] at 25 C) was comparable to that of normal Canada geese (11.83±1.68 μmoles) examined in the same laboratory (Blakley and Yole, 2002).

When groups of wild birds are found dead on agricultural land, there often is

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concern that they have been poisoned. Poisoning was suspected initially in both incidents described here; however, the type or the lack of food in the upper alimentary tract indicated that the birds had not been feeding in the field where they were found dead. In the 1985 incident, the snow geese were likely migrating north. The area of southern Manitoba where they died is within the major spring migration corridor for snow geese that winter in Louisiana and Texas (Blokpoel, 1975) and is an important staging site for snow geese prior to a final flight to the arctic nesting grounds. In the second incident the birds were likely non-breeding giant Canada geese in molt migration to arctic and subarctic summer molting areas (Lawrence et al., 1998).

Lesions in geese in both incidents indicated severe blunt trauma to the ventral body surface. There were no overhead wires or elevated structures nearby with which the birds might have collided. The geese were found in a circumscribed area in each instance, suggesting that they were flying as a flock at the time they died. The majority of the birds were found lying on their breast with the wings spread. We believe that most dead birds died immediately after hitting the ground. None of the geese examined had injuries to the wings or legs that might have been expected had the birds collided with each other or with an aircraft, or extended their legs just prior to impact. The force of impact of a goose weighing several kilograms colliding in flight with the ground would be considerable. Spiers et al. (1971) reported that ground speed of migrating goose flocks averaged from 76.6 to 106 km/hr, and Blokpoel (1975) measured the average ground speed of migrating snow geese in southern Manitoba at 82.9 km/hr. None of the birds had breaks in the skin of their abdomen, but rupture of the liver was common. Skin is strong and elastic, in contrast to liver, which has little tensile strength and will split when traumatized (Fierro and Ongley, 1990). In geese, the liver and gizzard are large organs located on the floor of the body cavity near the caudal edge of the sternum, where the pectoral muscles are relatively thin. The gizzard is very stout and necrosis of its muscle, of the type seen in one bird, is unusual. This might be an example of compartment syndrome in which swelling of a muscle enclosed within an inelastic limiting structure results in obstruction of blood supply and infarction (Hulland, 1993). Trauma probably resulted in initial swelling within the gizzard muscle, restricting blood supply, and causing muscle necrosis that became evident in the bird that survived for a few days.

Migrating geese fly in flocks at night in this area (Blokpoel, 1975). We do not know why the birds collided with the ground. One possibility is that the geese were flying on moonless nights and became disoriented in a manner analogous to spatial disorientation that occurs in aircraft pilots, misjudged altitude, and flew directly into the earth's surface. Spatial disorientation is "an erroneous sense or mistaken perception of one's position and motion relative to the earth" (Steuernagle and Roy, 2003, p. 1). Most aircraft accidents resulting from spatial disorientation of pilots occur at night, associated with dark sky, haze, and lack or loss of visible references, particularly the horizon. Mallory et al. (2001) reported a similar mortality event involving a flock of 110 king eiders (*Somateria spectablis*) thought to have flown into the ground on Baffin Island during a period of ice fog and poor visibility. The eiders had substantial internal hemorrhage and many had broken bones. Other factors also might have affected the geese. In the first incident, loud sonic booms in the area might have alarmed or startled the geese into evasive flight. In the second incident there was a thunderstorm in the area. We can not rule out that a strong gust of wind caused these birds to fly into the ground but the maximum wind speed recorded overnight was 33 km/hr. Geese examined from this incident did not

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have feather loss or burn marks reported in geese hit by lightning (Bye, 1998).

This type of mortality is uncommon and insignificant at the population level but illustrates the need for a complete investigation, including necropsy, when groups of wild birds are found in circumstances where poisoning is suspected.

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