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Mass Death of Wintering American Robins (*Turdus migratorius*) in Decatur, Illinois

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ABSTRACT

A flock of American Robins (*Turdus migratorius*) congregated around a fruiting tree and nearby building on the campus of Millikin University in Decatur, Illinois in early 2011. Thirty-four robins were found dead around campus buildings during 8-17 February, after a blizzard passed through central Illinois. We investigated potential causes for the high number of deaths including examinations of gizzard contents and feces for both food eaten and internal parasites, and observed robin behavior. The robins apparently congregated around one of the few food resources available in the area during this blizzard. They were subject to starvation intensified by poor nutritional quality, parasitic infection, and aggressive defense by conspecifics, and were more susceptible to other forms of mortality including bird-window collisions.

INTRODUCTION

Mass deaths of birds are not uncommon, but largely go unnoticed. Mass deaths can be regional or local in scope and are a result of both human and natural causes including collisions with human structures (Klem 1990), poisoning (Dolbeer et al. 1995), and disease (LaDeau et al. 2007). Poor weather is also a factor causing mass deaths (Jehl 1998). For example, while rare, starvation deaths during the winter can occur during extreme winter storms (Bednekoff and Houston 1994). We investigated the mass death of American Robins (*Turdus migratorius*) that had congregated around a single fruiting crabapple tree (*Malus* spp.) at a building on the Millikin University campus in Decatur, Illinois. We hypothesized that starvation was the primary cause of robin mortality, and secondary factors including nutritional quality, parasitism, and aggressive defense by conspecifics intensified starvation.

METHODS

We observed American Robins at Millikin University in Decatur, Illinois starting on 8 February 2011 when a blizzard occurred in central Illinois with temperatures reaching a low of -12°C and snow accumulation of 30.5 cm. We began receiving notifications of dead robins along the south side of Staley Library, as well as surrounding buildings, immediately preceding the blizzard and the days after. We collected dead robins and observed the flock of several dozen robins that continued to congregate around the crabapple tree next to the library until the snow receded on 17 February.

Dead robins were weighed, gizzard and intestine dissected, and feces analyzed. Identification of internal parasites was performed following McQuistion and Wilson (1989). The nutritional content of the crabapples was analyzed by Eurofins Nutrition Analysis Center (Des Moines, IA, USA; % carbohydrates determined via CFR 21-calculation, % lipids calculated via acid hydrolysis – AOAC 954.02, % protein calculated via combustion – AOAC 990.03, and calories determined via CFR Atwater calculation). Ten-min observations were made of the behavior of the robins twice each day. Feeding behavior, resting behavior, and social interactions including aggressive defense of the food resource among robins were noted. We defined any instance where one robin would chase another robin from the food resource as aggressive defense (Pietz and Pietz 1987).

RESULTS

Thirty-four dead robins were found over the 10-day period. Twenty-six robins were weighed, gizzard and intestine contents analyzed, and feces examined for internal parasites. The other eight robins had been scavenged or decomposed prior to collection. The mean weight of 26 robins was 50 g (range from 37 to 67 g). Eighteen of 26 robins (69%) had empty gizzards. Four of eight robins with full gizzards had whole undigested crabapples within the gizzard. The other four robins had unidentifiable food in the gizzard. The crabapples contained 30.9% carbohydrates, 1.2% lipids, 2.5% protein, and an energy content of 1.45 kcal/g. Thirteen of 26 robins (50%) had internal parasites. Six robins had parasites of the phylum Acanthocephala. We found parasites of the genus *Capillaria* in five robins and in one robin we found *Hymenolepis* (spp.). Three of 26 robins were in a position directly underneath windows where window collisions have been observed in the past (DJH, unpubl. data). We noted at least three instances of aggressive defense of the food resource during our behavioral observations.

DISCUSSION

On average, American Robins weighed 77 g throughout the year in Pennsylvania and 86 and 84 g for males and females, respectively, during winter in Ithaca, New York (Sallabanks and James 1999). The weight of every dead robin we found was at least 10% under the average weight of 77 g recorded for robins in Pennsylvania. Many species, particularly smaller birds, maintain fat reserves below their physiological capacity in winter and have only enough reserves to survive the coldest night at a certain location at a certain time (Lima 1986, Krams et al. 2010). Thus, American Robins at our location may not have had the fat reserves necessary to survive multiple days in below-zero temperatures with limited access to food. This may be a result of a trade-off between the benefits of fat reserves to prevent starvation and the risk of predation (Lima 1986). Birds with higher fat reserves may be more likely to survive cold winter nights, but they are also more vulnerable to predation due to increased body weight and decreased take-off speed (Lima 1986). We conclude the mass kill was primarily a result of starvation. Other factors possibly contributed including the nutritional quality of the food source, parasitism, aggressive defense, and collisions with windows.

Nutritional Quality

The robins' main food source was apparently limited to crabapples because of the blizzard, and particularly the ice and snow on the ground. These fruits may not have met their nutritional requirements. Studies have found robins will consume more fruits with higher lipid concentrations during the autumn (Lepczyk et al. 2000). Lipid-rich fruits may be important for fattening, as thrushes achieve the highest energy assimilation rates when choosing fruits high in lipid content (Witmer and Van Soest 1998, Lepczyk et al. 2000). At a time when energetic demands were high in the robins we studied, the amount of lipid-rich fruits in their diet and presumably energy assimilation rates was low.

A 55-g robin requires 30.7 kcal/day (Hazelton et al. 1984). Thus, a similar-sized robin in our study would have needed to eat 21 g, or 74 crabapples, per day to meet nutritional requirements. Crabapple seeds also contain cyanide (Seigler 1976), and this poison can cause death when consumed in large amounts by Cedar Waxwings (*Bombycilla cedrorum*, Woldemeskel and Styer 2010). We found evidence in the gizzards of partially digested crabapple seeds and it is possible these robins may have been exposed to cyanide.

Parasitism

American Robins are known to be infected by a large number of parasites including coccidia, trematodes, nematodes, cestodes, and acanthocephalans (Welte and Kirkpatrick 1986). Collectively, over 40 helminth parasites have been identified in robins (Cooper and Crites 1976). In our study, parasites were found in 50% of the dead robins, and three different types of parasites were discovered. Robins with parasitic infections may have reduced metabolism, inactivity, and weight loss at the time where increased metabolism and activity were most needed. Acanthocephalans are known to reduce metabolic rate in European Starlings (*Sturnus vulgaris*, Atkinson et al. 2008). *Capillaria* spp. are digestive tract parasites that have been found to cause inactivity, anorexia, weight loss, vomiting, and death in guinea fowl (De Rosa and Shivaprasad 1997). Rates of parasitic infection in other studies were similar to ours and ranged from 33-77% (Welte and Kirkpatrick 1986, McQuistion and Holmes 1988).

Aggressive Defense

We observed multiple instances of defense of the food source. Typically, one robin would chase other robins to gain access to fruits on the ground. In robins, defense of fruits is rare except when temperatures are extremely low in which case it will last for a few days (Sallabanks 1993). Robins with winter territories have feeding bouts that are five times longer, ingest twice as much food per bout, but forage half as fast as robins that intrude onto a territory (Sallabanks 1993). Given the large food requirements and defense displayed, some robins may not have had access to the food source and subsequently did not meet their nutritional requirements.

Window Collisions

The number of bird-window collisions is approximately 7-8 birds per building per year on the Millikin campus, and the library is one of the buildings with the most collisions (DJH, unpubl. data). The proximity of the crabapple tree to the building may have influenced the number of window collisions. Birds can become intoxicated from eating large amounts of overripe fruit (Woldemeskel and Styer 2010), which may in turn make them more vulnerable to collisions.

There were several factors that we were unable to control in this study. Given the cold weather, we were not able to capture living birds in the area and weigh them to compare the weights of living birds with the dead ones we found. For the same reason, we could not compare parasitism rates between surviving birds with those that died. Finally, future studies should compare the number of birds that died to the number of living birds in the area, and perform additional behavioral observations.

Singularly, factors such as starvation, low nutritional quality, cyanide poisoning, parasitism, resource defense, and window collisions can result in bird death. Collectively, we suggest that these factors, and particularly starvation, resulted in a kill of 34 American Robins under harsh and stressful weather conditions at Millikin University in February 2011. While the death of 34 robins is small relative to the overall population of robins in central Illinois, this study can provide insight into the causes of future localized mass deaths.

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