Poster Presentation

Pathogenic Diseases and Movements of Wintering European Starlings Using Feedlots in Central Kansas

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Abstract: Kansas is a major producer of livestock and has an abundance of over-wintering European starlings. Roost sizes for over-wintering starlings can be as large as 5 million individuals. Starlings cause a substantial amount of economic damage to farmers. *Escherichia coli* O157:H7 and *Salmonella* can cause illness in both livestock and humans, and cattle with Johne's disease must be culled. Crohn's disease in humans is suspected to be caused from *Mycobacterium avium* subsp. *paratuberculosis* (Johne's disease). We banded, leg-flagged, and radio-tagged starlings using feedlots near Great Bend, Kansas. Our objectives were to track daily movements of starlings visiting feedlots in this area and screen starlings for *E. coli* O157:H7, *Salmonella* spp., and *M. a.* subsp. *paratuberculosis*. Preliminary data show that starlings in Kansas are moving among feedlots rather than remaining at one feedlot. Pathogens were detected at a low prevalence. Our results can be used to develop plans for the management of transmissible diseases carried by starlings.

Key Words: *E. coli*, feedlots, Johne's disease, Kansas, *Mycobacterium avium* subsp. *paratuberculosis*, *Salmonella*, starlings, *Sturnus vulgaris*

Proc. 23rd Vertebr. Pest Conf. (R. M. Timm and M. B. Madon, Eds.)
Published at Univ. of Calif., Davis. 2008. Pp. 280-282.

INTRODUCTION

The introduction of 50 pair of European starlings (*Sturnus vulgaris*) into New York City in 1890 and 1891 resulted in permanent establishment of this Old World species in North America (Cabe 1993). Sixteen pair survived the introductions. From these colonists, the population expanded rapidly, and by 1942 European starlings (henceforth, "starlings") were observed in California (Jewett 1942). The North American population is estimated at 200 million, which is about one-third of the world's starling population (Feare 1984). Starlings were the second-most-common bird species found on census routes of the North American Breeding Bird Survey (USGS 2005).

Except for the breeding season, starlings roost communally. Composition, behavior, and size of roosting flocks vary with the seasons. Roosting aggregations are smallest during the reproductive period (March-July). During late summer and early fall, smaller flocks coalesce into larger roosts. Roosts of 50,000 to 100,000 birds are not unusual during winter. Starlings are especially attracted to feedlots during the winter because of the ample food supply (Johnson and Glahn 1994) and can potentially spread infectious diseases to livestock by contaminating the feed (USDA 2000). One study involving swine producers showed that starlings passed transmissible gastroenteritis (TGE) to the swine through the birds' feces. During the winter of 1978-1979, starlings started an outbreak of TGE in Nebraska and resulted in the loss of 10,000 pigs in one month alone (Johnson and Glahn 1994). Starlings can cause other economic damage to farmers; for example, in FY 1999, three feedlot operators in Kansas reported a loss of $600,000 from bird damage alone (USDA 2000). Birds can carry both *S. entrica* and shiga toxin-producing *E. coli* (Pedersen et al. 2006), and starlings are known to carry the same strain of *E. coli* and *Salmonella* spp. that can infect livestock (USDA 2000). Pedersen et al. (2006) tested rock pigeons for *E. coli* on dairy farms in Colorado and found that 80% of the birds tested were positive. In another study, starlings tested positive for *Mycobacterium avium* subsp. *paratuberculosis*, which is the cause of Johne's disease in cattle (Corn et al. 2005) and is suspected of causing Crohn's disease in humans. Johne's disease is responsible for $200 to $250 million of damage annually on dairy farms in the U.S. (Beard et al. 2001). The most common way animals become infected with *M. a.* subsp. *paratuberculosis* is by ingesting fecal-contaminated feed or water (Collins 2003). The role of starlings in passing diseases to livestock is still unknown and needs further study (Johnson and Glahn 1994).

METHODS

Modified Australian Crow traps, also known as drop-in traps, were used to capture European starlings using feedlots. Four traps were used at site A because of the large population of starlings present; only two traps were used at site B. Each trap was supplied with loose hay,

perches, food, and water. Each captured starling received a U.S. Fish and Wildlife Service size #2 metal band on the left leg and a colored leg flag on the right. Colors of the leg flags correlated with the feedlot in which the bird was initially trapped (pink streamers were used at site A and white at site B).

Forty-seven radio transmitters were available for use. Each radio had a figure-8 harness that slid over both legs of the bird and fit snuggly into the proximal portion of the thigh. The radio transmitter rested on the dorsal surface of the bird's fused pelvic region.

A total of 200 cloacal swabs were collected to screen for *E. coli*, *E. coli* O157:H7, and *Salmonella* spp. Sterile culture swabs in a collection and transport system were prepared the night prior to collection by placing the swab in the media-filled tube. Swabs were shipped to the Department of Veterinary and Microbiological Sciences at North Dakota State University. Cutting boards were placed under perches in the traps to collect >2 g of fecal material for the analysis of *M. a.* subsp. *paratuberculosis*. A total

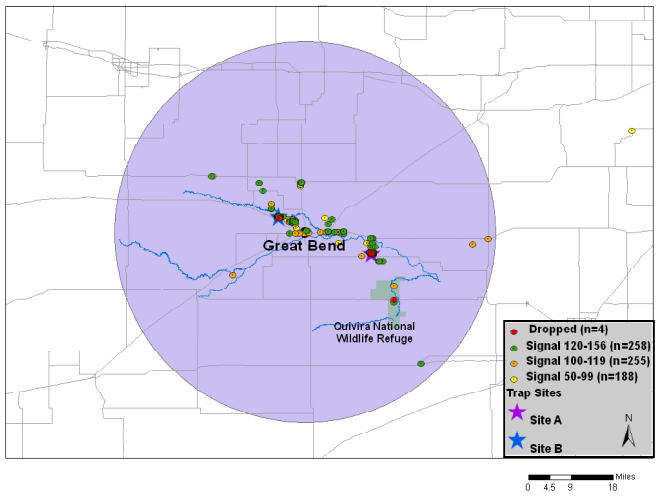

Figure 1. Winter range of radio-tagged and leg-flagged starlings using feedlots near Great Bend, Kansas.

of 32 samples were collected and shipped to Veterinary Diagnostic Lab at North Dakota State University.

RESULTS

The approximate distance starlings traveled from the roost to the feedlot was 19 kilometers. However, local movements of radio-tagged and leg-flagged (n =3,963) birds were up to 40 kilometers from sites of capture (Figure 1). A total of 8 roost sites were located. Five of these roost sites were used by starlings from site B, and the other 3 were used by starlings from site A (Figure 2). The main roost at Quivira National Wildlife Refuge harbored several million blackbirds and starlings. By February, the Quivira roost began to break up. Returns from the USFWS bands indicated migration into Nebraska, South Dakota, and Wisconsin.

Detection of pathogenic organisms was low. *E. coli*, a normal intestinal microfloral, was detected in 52% of the cloacal swabs, whereas pathogenic *E. coli* O157:H7 was detected in 0.5% of the swabs. *Salmonella* spp. and *M.*

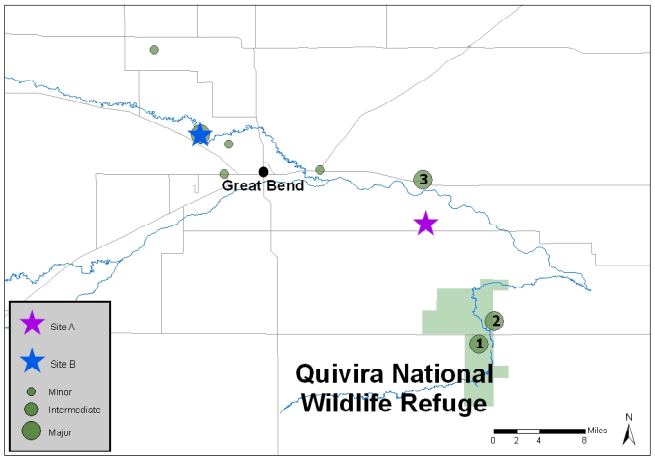

Figure 2. Winter roosts of starlings near Great Bend, KS. Roosts 1-3 were the same flock of birds that moved to new roost locations during the study period.

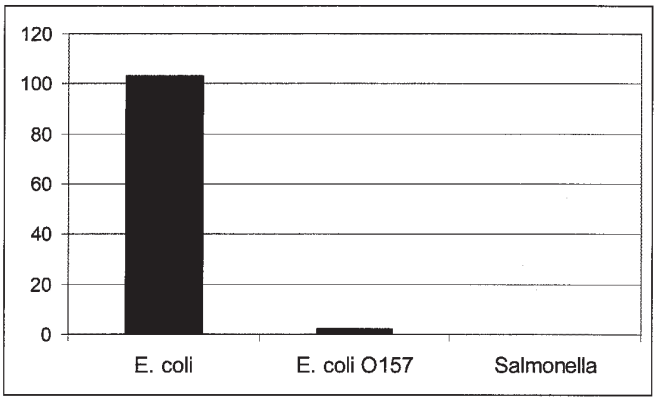

Figure 3. Results from 200 cloacal swabs sampling for *E. coli, E. coli* O157, and *Salmonella* spp.

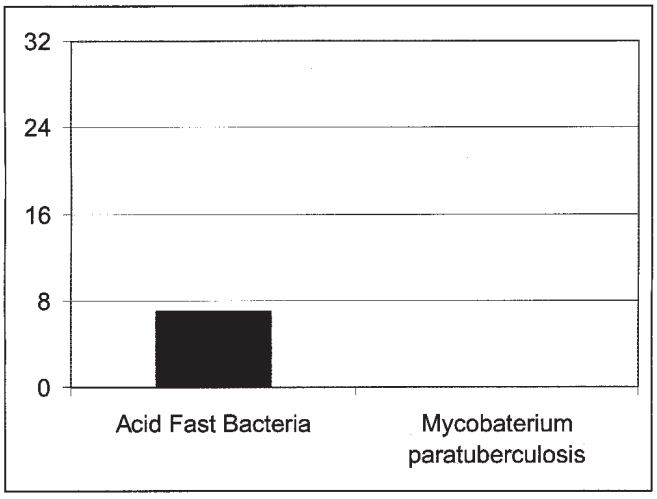

Figure 4. Results from 32 samples testing for *Mycobacterium avium* subspp. *paratuberculosis.*

a. subsp. *paratuberculosis* were not detected (Figure 3). However, an acid-fast bacterial agent was detected in 19% (Figure 4). Acid-fast bacteria have a high lipid content in their cell walls that resists decolorization by acids during staining (Shinnick and Good 2005). Positives in this study

were most likely *Mycobacterium avium* subsp. *avium*, which is common in birds.

DISCUSSION

The behavior of the wintering starlings was consistent. Their behavior was predictable; even the few that did not behave consistently with the larger flock had predictable behavior. The starlings tended to travel back and forth from the feedlot to the roost site. Band returns were at greater distances than suspected. One was found 1,287 km away.

The prevalence of pathogens was low in the sampled starlings. Some reasons for the low detection rate could be due to an ingredient in the livestock rations at these feedlots known as is distillers' grain, which is a residue from corn ethanol fermentation. Distillers' grain has a high content of *Lactobacillus*, an additive that is considered to be a probiotic (Pedersen et al. 2004). Probiotics help the natural gut microflora re-establish themselves and ultimately help immune function. Detecting other types of bacteria in distillers' grain is often difficult (Pedersen et al. 2004).

The starlings may have been infected with either of these agents, but the levels may have been too low to detect; therefore, they are not a risk to cattle or each other until they are stressed and begin shedding the organism (Vlahović et al. 2004). Cloacal swabs may not be the best way to detect these organisms, due to the small nature of the sample size and transient shedding by wild birds. Tissue samples may be a better way to detect if starlings are actually carriers of pathogenic bacteria (Wobeser and Finlayson 1969).

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