



Use of dairies by postreproductive flocks of European starlings

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ABSTRACT

Knowledge of the behavior and movement patterns of European starlings (*Sturnus vulgaris* L.) is important to wildlife managers that seek to resolve conflicts at livestock facilities. We captured and radio tagged 10 starlings at each of 5 dairies in northeastern Ohio. From September 19 to October 31, 2007, we obtained sufficient data from 40 birds to study their behavior and movements. The birds visited the dairies where they were initially captured (home sites) on 85% of the days, spending 58% of each day at the dairies. Onsite arrival and departure times were 2.5 h after sunrise and 3.1 h before sunset. Daily visits by radio-tagged cohorts from the other dairies were greatest for the 2 most proximate dairies (1.3 km apart), with number of visits between this pairing >7× that of the 9 other pairings combined (4.1–6.5 km apart). Two birds used their home sites intermittently as roosts, arriving 3.8 h before sunset and departing 0.2 h after sunrise. In addition to using home-site roosts, these birds also used a distant roost (22 km) that was used by 36 of the 40 birds. The efficacy of starling management programs, especially lethal management, depends on degree of site fidelity, use of other facilities, and roosting behavior. For example, starlings that use dairies as roosting sites may require a different management strategy than required at dairies used as daytime sites because of differences in arrival and departure behavior. Our research will help resource managers evaluate current management strategies already in place and change them, if needed, to fit the behavior profile of starlings using dairies and other types of livestock facilities.

Key words: behavior, dairy, radio telemetry, starling

INTRODUCTION

Complaints about European starlings (*Sturnus vulgaris* L.) occur most often during fall and winter, when

flocks of thousands amass at livestock facilities to eat, loaf in barns, and drink and bathe in watering troughs. The economic effects of starlings include losses from consumption and spoilage of feed stocks, deterioration of feed nutrient quality through selective foraging, and corrosion of facility infrastructure from acidic excreta (Besser et al., 1968; Bernardi et al., 2009; Depenbusch et al., 2011). Starlings cost Pennsylvania dairy producers about \$10 million annually in feed losses (Shwiff et al., 2012). However, starlings also asymptotically carry bacterial pathogens, including *Salmonella enterica* and several *Escherichia coli* serotypes, harmful to both livestock and humans (Pedersen and Clark, 2007; Gaukler et al., 2009; Carlson et al., 2011; Cernicchiaro et al., 2012). The added veterinary costs incurred from starlings transmitting and amplifying bacterial pathogens probably exceed the economic losses from consumption of feed. Veterinary costs at Pennsylvania dairies with 1,000 to 10,000 starlings were 38% higher (\$91 cow/yr) than at dairies with no starlings (\$66); when veterinary costs were analyzed in a simple main-effects ANOVA, presence of starlings had a highly significant effect (Shwiff et al., 2012).

During the fall of 2007, we captured 50 starlings at dairies in northeastern Ohio and used radio telemetry to monitor use of dairy sites and daily movements. Our goals were to gather baseline behavioral data and describe, given that starlings are potential vectors of disease, the epidemiological implications of their presence at dairies. We collected data on daily use, visitation rates to neighboring dairies, and roost-site behavior. These data are important to resource managers as well as epidemiologists and can provide valuable insight for those managing large or persistent starling infestations, which often require the use of the avicide DRC-1339 (3-chloro-4-methylaniline hydrochloride; Homan et al., 2010a).

MATERIALS AND METHODS

We visited dairies in Wayne and Holmes counties in northeastern Ohio. We selected 5 dairies near Sterling, Ohio (40.967°N, 81.848°W), in rural Wayne County

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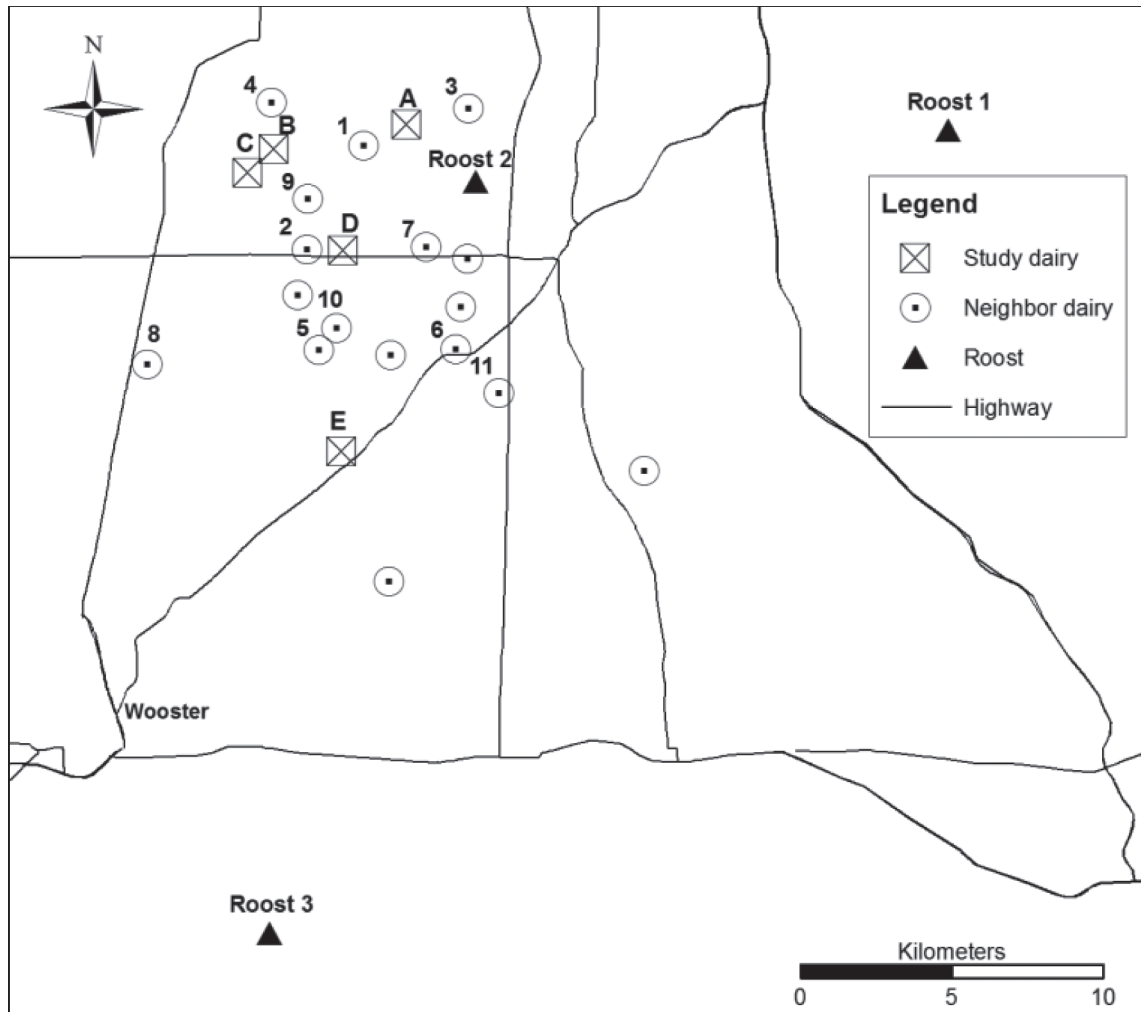


Figure 1. Locations of 5 study dairies (A–E), neighboring dairies (1–11), and roosts (1–3) used by 40 radio-tagged European starlings tracked in northeastern Ohio during September and October 2007. Six neighboring dairies that were monitored but not used are not numbered. The neighboring dairies were ranked first by number of radio-tagged birds attending [maximum 10 (1), minimum 1 (8–11)] followed by number of days visited [maximum 23 (2), minimum 1 (11)].

(1,400 km²). Habitat composition of the county was 60% crop, 12% pasture, 22% forest, 5% urban, and 1% other. Over 400 dairies were in the county, with the preponderance holding ≤ 200 head (Clark et al., 2008; NASS, 2012). Wayne County ranked second among Ohio counties in number of dairies. We conducted the research during September and October, the seasonal peak for pathogen prevalence at dairies in northeastern Ohio (Wetzel and LeJeune, 2006). The 5 small-sized dairies (A–E) were an average of 5 km apart, ranging from 1.3 to 11.0 km in distance (Figure 1). These dairies were chosen because of their proximity to one another and their consistency of use by starlings numbering $\geq 1,000$. We used this design to provide a reasonable chance for exchange of radio-tagged cohorts among the dairies.

We radio tagged 10 starlings at each dairy; however, 1 transmitter malfunctioned and therefore only 49 birds were radio tagged. We captured the starlings from September 17 to 24, spending ≤ 2 d at each dairy. We captured birds with mist nets at barn openings. We used external characteristics for identifying age and sex (Kessel, 1951; Smith et al., 2005). We attached the radio transmitter (model ANTC-M4-2L, Lotek Wireless Inc., Ontario, Canada) with an elastic loop harness that positioned the transmitter over the anterior portion of the bird's back (Rappole and Tipton, 1991). Total mass of radio and harness was 2.4 g. To meet the criterion that the radio unit be $\leq 3\%$ of body mass, we used only adult birds weighing ≥ 80 g. We released the starlings at the capture site immediately after tagging. We allowed a 2-d acclimation period following the day

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