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One step closer to a better starling trap

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Field Note

One step closer to a better starling trap

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Abstract: European starlings (*Sturnus vulgaris*) are an invasive species in the United States that damage agriculture, personal property, and threaten human health and safety. The U.S. Department of Agriculture Wildlife Services provides technical support to mitigate damage by controlling starling populations at concentrated animal feeding operations, landfills, utilities, and urban areas. Wildlife Services uses DRC-1339, a registered toxicant, to reduce starling populations. Trapping can also be an effective tool but requires more time at a higher cost than DRC-1339. Trapping starlings, however, may be needed to provide a viable alternative to mitigate damage in areas where toxicant use may be restricted. To address this need, I developed a unique and effective starling trap to increase catch rates. I began testing multiple trap designs in November 2007 at cattle (*Bos taurus*) feedlots, meat processing plants, and urban staging areas in a 45-km radius of the city of Omaha, Nebraska, USA. In December 2011, I designed a 4-chamber, basket-style starling trap that has been instrumental in a nearly 90% reduction of the roosting starling population in downtown Omaha. Herein, I discuss the development and testing of the trap and provide guidelines and instructions for building and strategic placement of the trap.

Key words: decoy trap, European starling, human–wildlife conflicts, invasive species, Nebraska, roosts, starling trap, *Sturnus vulgaris*, trapping

The European starling (*Sturnus vulgaris*; starlings) is a non-native invasive species that is not protected by federal or state law, but there may be city ordinances related to bird control (Homan et al. 2017). Starlings spend the spring and summer scattered across the landscape producing young. The young collect into juvenile flocks by late summer, and adults join in the fall to form even larger flocks that use a communal roost throughout the winter. During the fall of 2004, thousands of starlings moved into downtown Omaha, Nebraska, USA and roosted that winter on building ledges, fire escapes, landscaping, and trees in the city park. Areas below the roosts became covered in starling excrement. Damage included considerable financial loss from clean-up and threats to human health and safety (e.g., histoplasmosis). The damage was so severe that a property owner power-washed their sidewalks each morning to prevent excrement from entering the building on the bottom of shoes. Property owners who attempted to haze starlings off their buildings were unsuccessful, and the starlings eventually dispersed in the spring (J. R. Thiele, personal observation).

Approximately 25,000 starlings returned the following winter of 2005–2006 to the downtown Omaha roost (Thiele et al. 2012). Months before, Nebraska Wildlife Services (WS) was requested to create an integrated pest management plan to reduce starling damage. This plan was called the Omaha European Starling Control Project (OESCP). I was first introduced to trapping starlings that winter after being hired as a wildlife specialist by WS for the OESCP. We used modified Australian crow (*Corvus coronoides*; MAC) traps with a v-shaped roof to capture starlings for a banding and telemetry project, not population control (Figure 1). Radio-tagged starlings were tracked to feeding sites where WS conducted DRC-1339 applications to reduce the starling population roosting in downtown Omaha. Banded starlings that were retrapped or recovered after DRC-1339 applications provided insight on starling movements between roosting, feeding, and staging areas. By the spring of 2006, the downtown Omaha starling roost was reduced by approximately 99% (Thiele et al. 2012). Over the next 14 winters, the OESCP maintained a downtown roosting starling population of 1,000–3,500 starlings

Figure 1. Modified Australian crow (*Corvus coronoides*) trap with a v-shaped roof.

Figure 2. Downtown Omaha (star) is located in eastern Nebraska, USA. Trapping research was conducted in Nebraska at 2 urban sites (circle) and 3 feedlots (triangle) and in Iowa, USA at 4 feedlots (diamond; *map created by J. Fischer, National Wildlife Research Center*).

representing a nearly 90% reduction of the population seen during the winter of 2005–2006.

For starling damage management, the primary tool used by WS is the registered avicide DRC-1339, which is more cost-effective and less labor-intensive than trapping (Homan et al. 2017). Through the years, I realized that DRC-1399 has limitations and restrictions depending on available supply, location of application, time of year, public perception, and companies not allowing toxicant use on their properties. In urban/suburban areas, DRC-1339 applications are only allowed Monday through Friday without prior approval from the regional office to ensure WS personnel were available during the week to collect bird carcasses. The affected township/city and the appropriate state and federal agencies were notified prior to DRC-1339 applications in the event a property owner or concerned citizen called to report dead starlings. Additionally, I have postponed DRC-1339 applications due to severe weather, which consequently required prolonged preparation. A trap would not be affected by such limitations. My goal was to design a starling trap that could consistently catch hundreds of starlings a day to serve as an effective tool for starling control when DRC-1339 is not an option.

Study area

This study was conducted within a 45-km radius of downtown Omaha (41°15′27.33″N, 95°56′9.11″W), the largest city in Nebraska. Omaha is in eastern Nebraska along the banks of the Missouri River and borders Iowa, USA, where about half the trapping research was completed (Figure 2). Traps were tested in both urban and rural areas where starling damage was taking place.

The first urban trap site was on the grounds of an electrical substation located in an industrial area where a large starling roost had been located. This roost was within 1.5 km of a hide processing plant, a rendering plant, and 3 meat processing plants. The other urban trap site was at a meat processing facility in an industrial area. These sites were 5.76 km and 12.41 km from downtown Omaha, respectively.

The rural trap sites were located at cattle (*Bos taurus*) feedlots. These facilities serve as the final stage in cattle production, where steers and heifers are fed a high energy grain-based diet until they reach a desired market weight and are then sent to a meat processing plant. The feedlots were primarily surrounded by agricultural land used for the production of field corn (*Zea mays*) and soybeans (*Glycine max*). Of the 7 feedlots where my testing was conducted, 3 were located in Nebraska and 4 were in Iowa. The feedlots were within 16.6–44.3 km of downtown Omaha.

Methods

Starling trap development

My initial efforts were focused simply on setting more traps in the fall of 2007. I built several smaller MAC traps and other traps of my personal design out of cattle feedlot panels covered in poultry netting. These were easy to

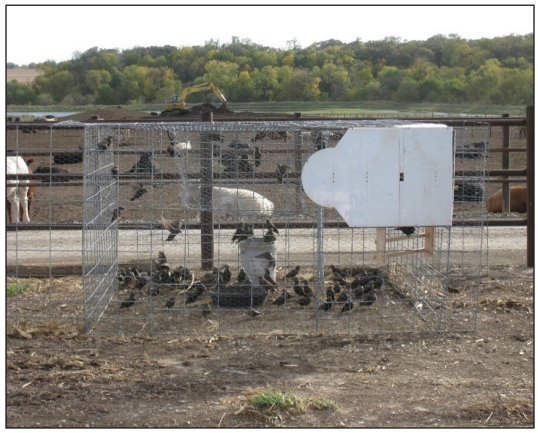

Figure 3. An early version of the basket-style, drop-in decoy trap.

Figure 4. The 4-chamber, basket-style starling (*Sturnus vulgaris*) trap.

transport, store in the off-season, and were also weather-resistant due to a galvanized coating. I continued to redesign and test starling traps, but none were a true innovation in terms of a significant increased catch rate. My MAC traps caught a few starlings to >200 per day, but there was no noticeable consistency. In January 2009, a WS colleague conducting starling research in another state sent me information on a basket-style, drop-in decoy starling trap with an opening centered in the top of the trap. A basket with woven wire sides and a fencing wire bottom hung from the opening. The trap loosely resembled blackbird/starling funnel-net decoy traps with a drop-through entrance described by Meanley (1971) developed in the 1960s.

Using the galvanized MAC trap panels, I designed and built a crude trap (2.44 x 2.44 x 1.27 m) with a drop-in basket centered in an opening (0.81 x 1.02 m) in the top (Figure 3). Starlings could drop through the openings (5.08 x 10.16 cm) in the bottom of the basket but rarely found their way back out. This trap's basket provided a much larger area for the starlings to enter compared to the narrow, elongated opening on the MAC trap. Additionally, the bottom of the basket was much closer to the bait, roughly half the distance. This single-chamber trap repeatedly outperformed the MAC trap when tested side by side, and I deployed the traps as part of the OESCP. This initial trapping success inspired me to improve the drop-in basket design. I built several traps that were successful at capture but did not prevent the starlings from escaping.

After 2 years of experimentation, in the fall of 2011, I successfully designed and built a 2-chamber starling trap that consistently caught >100 starlings per day. I noticed this larger trap actually became more effective as additional starlings were caught by attracting more starlings and creating a feeding frenzy. These results were satisfactory, but I felt this design could further evolve. That winter, the 2-chamber trap became a 4-chamber, basket-style (FCBS) starling trap (4.88 x 4.47 x 1.27 m; Figure 4). This final design was born from nothing more than necessity. I had a limited number of panels and wanted to build as many traps as possible. I realized that if 4 chambers were arranged in a square pattern and shared interior walls, I needed fewer panels than building the chambers individually or in a row. I trapped >25,000 starlings during the winter of 2011–2012 using the newly designed FCBS starling traps and MAC traps. Using FCBS starling traps, I removed more starlings through trapping than DRC-1339 in 7 of the last 8 previous winters.

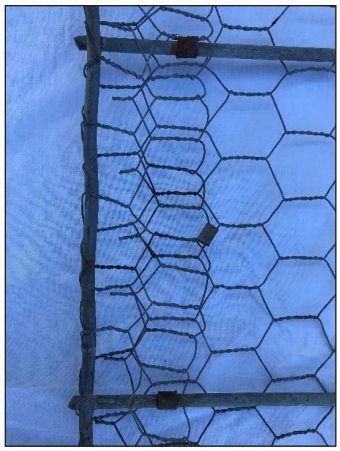

Figure 5. Fold the poultry netting over and attach with j-clips.

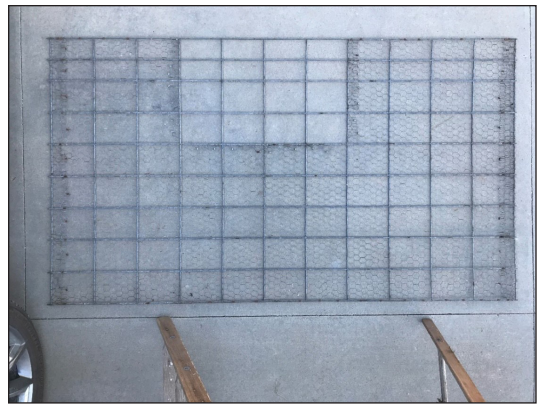

Figure 7. A top panel with a 0.81 x 0.51-m open area. Two panels are needed for each chamber top creating the 0.81 x 1.02-m opening for the drop-in basket.

Figure 6. One of 3 openings in the upper interior corners. Starling (*Sturnus vulgaris*) door is in the open position.

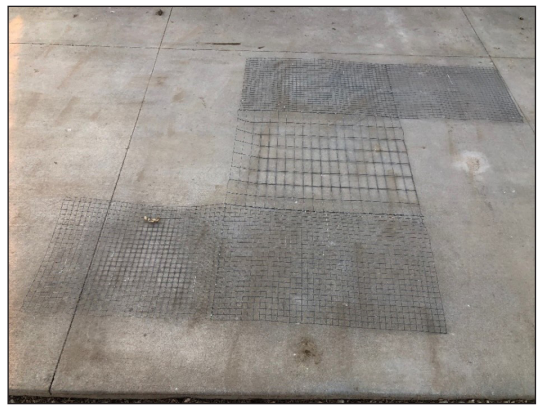

Figure 8. A drop-in basket built in this configuration can be quickly assembled for use or folded up for storage.

FCBS design

Each chamber has an opening (0.81 x 1.02 m) roughly centered in the top to which a drop-in basket is attached. All trap panels were made from cattle feedlot panels (4.88 x 1.27 m) cut in half, creating a 2.44- and 2.24-m-long panel. They are different lengths because a 0.2-m section is removed when creating the 2 new panels. Some of these panels are halved again for the access doors. The panels are 1.27 m tall, but poultry netting 1.22 m wide can be stretched to fit and attached with j-clips. I cut the poultry netting longer than the panel and folded the ends over before attaching with j-clips (Figure 5). This kept the sharp ends of the poultry netting contained to prevent me or the birds from getting injured.

At the trap's center, 3 of the chambers have an opening in the upper corner of the interior wall (Figure 6), with a starling door of the same dimensions. The openings can be various sizes, but 0.61 x 0.46 m was ideal. The top panels were modified to account for the opening where the drop-in basket was attached. The open section is not removed because it would weaken the panel. Poultry netting is not attached to this area (Figure 7). The top panels were built using a combination of the 2 lengths created from halving the original cattle feedlot panel. I have used poultry netting, nylon netting, and hardware cloth for the drop-in basket's sides. All were sufficient, but I preferred 2.54 x 2.54-cm hardware cloth because it is virtually predator resistant and the basket can be constructed to collapse for easy storage (Figure 8). I used hog rings to hold the trap panels together because they are easy to work with and readily available at most farm supply stores. Hog-ring pliers

Figure 9. Three-sided holding pen with quail (*Coturnix* spp.) coop in place.

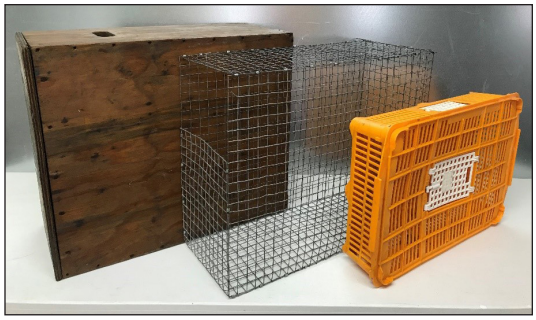

Figure 10. Euthanasia chamber (left), gathering cage (middle), and quail (*Coturnix* spp.) coop (right).

Figure 11. Gathering cage attached to outside of cage, opposite the holding pen.

can be operated with 1 hand, and this allowed me to easily put the traps together by myself.

Trap deployment and operation

To set the trap up, I connected the exterior and interior walls of all 4 chambers and added the top, starting with a longer top panel. I did this because it hung over the interior chamber wall, supporting the panel when I attached it to the exterior wall. I then set a shorter top panel for the next chamber on top of the overhanging section to balance that panel while it was attached. I completed this process working from the inside out until all the top panels were in place. I did not always have the correct number of longer panels to complement the shorter panels, so I simply used the ones I had available. I then added the drop-in baskets and a top-hinged starling door to 3 of the upper interior chamber corners. The starling doors were attached to open in the direction I wanted the starlings to move. A pull rope tied to the bottom of each starling door went through the top panel and over to an exterior wall where it was securely tied off.

In 1 of the 2 chambers with a solid interior wall, I attached an extra access door panel to the outside wall between the drop-in basket and the solid interior wall. It ran parallel to the inside panel but 0.61 m away, creating a 3-sided holding pen that starlings were chased into when emptying the trap (Figure 9). I attached the access doors to open at the outside corners and used bungee cords to hold them closed. With experience and ideal conditions, the FCBS starling trap can be set up in about 3 hours and torn down in 2 hours.

Emptying traps

To empty the trap, I opened all 3 starling doors and chased starlings from 1 chamber into the next, closing each starling door as I worked in a circular pattern toward the chamber with the holding pen. I was not concerned about getting all starlings out of each chamber because some needed to be left for decoys. I entered the last chamber with quail (*Coturnix* spp.) coops (Figure 10), chased starlings into the holding pen, and blocked the open side with my body and a quail coop set on its side (Figure 9). I hand-caught the starlings and placed them in the quail coops. This proved to be an effec-

tive and efficient way to remove starlings, but I had to enter the trap that is only 1.27 m tall. Most starling traps are built 1.83 m tall, which is advantageous for removing trapped starlings because you can stand up in them. Another option is to add a small gathering cage on the outside of the top upper corner of the last chamber that starlings could be chased into without entering the trap (Figure 11). I have tried several different devices to remove starlings, but none have worked as effectively as entering the trap. My preferred method for euthanizing large numbers of starlings is CO_2. I built a euthanasia chamber (Figure 10) that can hold 2 quail coops or a gathering cage (Figure 10). Immediately release any non-target birds and euthanize starlings per approved American Veterinary Medical Association (2020) methods and dispose of the carcasses properly.

Results

The FCBS starling trap has outperformed any other starling trap that I tested side by side, and I have removed thousands of starlings with this trap. My best example for the potential of the FCBS starling trap was during the winter of 2019 when I caught 508 starlings with 1 trap in <3 hours. Many factors contribute to the catch rate, but it is not uncommon for the FCBS starling trap to catch >200 starlings per day.

Discussion

I have spent countless hours observing starlings in the field and their behavior around many different styles of starling traps. These observations, along with trapping results, refined my trapping techniques and design. The FCBS starling trap is most effective when used with live decoys. I have frequently had starlings land on the FCBS starling trap in <30 seconds after adding the decoy starlings. If a decoy is not available, bait can be placed on or near the trap to attract starlings, but this may take several days. The first starling caught is the most important. One decoy works, but I prefer at least a dozen. I like to say, "If you give me one starling, I can give you a thousand."

The FCBS starling trap will catch starlings year-round but is most effective from late July through the end of spring. This timeframe will vary depending on location, temperature, and migration. A large percentage of starlings trapped from late summer to early fall will be juveniles.

It is important to provide decoys with humane care and treatment because healthy decoys will attract more starlings. A trap in an area with a high starling population should be checked daily to ensure ample bait and water for a potential catch of hundreds of starlings. The bait and water will continue to be used by any captured starlings, and this amount will have to be adjusted depending on catch rate and weather conditions. Place bait in feed pans under the drop-in baskets because feeding decoy starlings will entice starlings on the outside to enter the trap. In the spring and fall, I used metal feed pans with holes in the bottom for rainwater to drain and switched to rubber feed pans in the winter.

I prefer cat (*Felis catus*) food for bait because it is readily available, affordable, and starlings love it. Cat food with a small kibble size of several colors works best, but dog (*Canis lupus familiaris*) food can substitute if the kibble is small enough. At feedlots, I have used distillers grain, field corn silage, or cattle feed mix straight out of the feed bunk. Bait preference may change with the season or location, so I used a variety of baits.

Provide decoy starlings plenty of water for drinking and bathing. During warmer months, a 19-L bucket of water with a floating platform made from scrap lumber or Styrofoam for the starlings to land on and drink is effective. Rubber feed pans can be used year-round because they act as bird baths in the summer and do not get damaged if the water freezes. In winter, the black rubber acts as a heat sink absorbing the sun's radiant heat energy melting small amounts of ice. During very frigid weather, provide water daily and place snow inside the trap when available. On many occasions, I have observed free-flying starlings eating snow during negative degree days when no water was available.

The starling doors were open when the trap was set and allowed captured starlings to move between the 4 chambers to escape predators and ensured access to all available food, water, roost sticks, and shelter. Starlings are attracted to feeding starlings, and this may be an issue if the chambers were not connected because many starlings could collect in 1 chamber and deplete all resources.

A sheltered roosting area provides trapped starlings protection from the wind, sun, precipitation, and predators. Cool, wet weather can be especially tough on starlings, and predators will damage the traps if starlings do not have a place to hide. I put several layers of roost sticks in 1 corner of each chamber and added plywood or rubber mats for shelter above and on 1 side. The rubber mats I use are actually repurposed semi-trailer mud flaps. I do not recommend tarps for shelter because they can flap in the wind and scare starlings away.

Starlings are attracted to open ground when there is snow-cover, making it worthwhile to remove snow from inside the trap. Also, it is no fun to crawl into a trap to remove a couple hundred starlings when the ground is covered in melted snow and starling feces. A concrete placer (concrete rake) is the best tool for removing snow because the trap's low height makes using a shovel difficult. I leave a pile of snow under the roost sticks because most droppings collect there and can be easily scooped out with the top layer of snow to keep the trap clean. Once the ground inside the trap is cleared, the sun will quickly warm up the ground and finish melting any remaining snow and ice. The open ground inside the trap also provides a place for trapped starlings to rest and remain dry.

A live decoy may be the most important factor contributing to trapping success, but a close second is trap placement. Ideally, the trap should be easily observed by any starlings in the area, out of the wind, near starling feeding sites or staging areas, under large perches, and on level ground. Level ground aids in the ease of trap construction and prevents birds from escaping under gaps at the bottom of the panels. Even with all the above precautions, predators can wreak havoc on your trapping success, especially feral and farm cats. I have had cats sit on or near the starling traps for hours, rendering it useless. Equally important is accessibility to the trap via vehicle after rain or snowstorms. Trust me, I have learned this the hard way. Place the trap out of the way of equipment and animals at feedlots. Cattle have used my traps as a scratching post when given the chance and even crawled inside after I left a door open, bending panels and smashing drop-in baskets. In urban areas, make sure the trap is not located in an area where snow might get piled after a snowstorm.

Conclusion

Unlike other starling traps with a few small drop-in entrances, the FCBS starling trap has 4 drop-in baskets that each provide a large area for starlings to enter, making it more efficient at catching starlings. The MAC traps I first used had a 1.52 m x 152.4 cm (677.4 cm^2) elongated slot for starlings to enter the trap that was 1.4 m above the ground and bait. Conversely, just 1 drop-in basket on the FCBS starling trap provides 8,258 cm^2 of area for starlings to enter the trap and is only 0.66 m above the bait and feeding decoy starlings. The distance between the bottom of the drop-in basket and bait is key in reducing a starling's initial commitment to enter the trap. I have repeatedly watched starlings enter the trap without a moment of hesitation. Additionally, the large basket makes it easier for the starlings to find a way into the trap.

All measurements for the FCBS starling trap are based off the cattle feedlot panels I initially bought to build the MAC traps. Based on my experiences, I do not believe that the exact dimensions are as important as the large basket size, distance from the sides of basket to the walls, and the distance from the bottom of the basket to the ground. That being said, I would try to replicate the trap as closely as possible. This trap design will work as a single-chamber if you are limited on resources or space, but I suggest using the 4-chamber design when possible. The initial cost for supplies and time to build the trap panels may be significant. However, with minimum maintenance, this trap will last over a decade. I am still using the same trap panels I built in 2007.

I have used this trap for years with great success in my quest to reduce starling numbers, and I am confident it also has great potential for catching other species such as cowbirds (*Molothrus ater*). The FCBS starling trap would be a valuable tool for bird control at dairies and airports. The FCBS starling trap is a work in progress, and I hope others can use the design to increase their starling catch rate or possibly create an even better starling trap.

Acknowledgments

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