**Appendix 1: Supplementary Material**

**for *Bye-bye bycatch: A remotely closing trap for targeted songbird capture***

## Description of Materials

Note: all materials are available in large online retailers like Amazon.com.

- Galvanized steel hardware cloth: Metal mesh sold in a roll in hardware/home improvement stores. Sometimes inaccurately described as chicken wire, which is similar. Different gauges, mesh sizes, and lengths and widths might be needed for traps built for different sized birds. Metal-cutting tools, such as metal snips and nippers are needed to trim the hardware cloth to the correct sizes, which are also available in hardware stores.
- Corrugated twinwall plastic sheets: Plastic sheets that are similar to corrugated cardboard. Two layers of plastic separated by 4 mm corrugations. Can be cut with box cutters, craft knives, or similar tools. Found in hardware stores. Although cardboard can replace these plastic sheets, the cardboard cannot withstand rain, nor can it be easily cleaned.
- Report cover with sliding bar: Intended to enclose a paper report. Comes in typical paper sizes, but the item's size is not important for the construction of the trap because the sliding bars are cut down to the size of the doorway. Only the sliding bar was used for the trap. Can be cut with typical desk scissors, box cutters, etc.
- Perch suggestions: A straight peg hook designed for a peg board affixed with a zip tie. A garden staple bent about halfway along its length and with the open ends running in and out of the mesh below the doorway.

- Plant sticks for the tube of the door mechanism: Sticks/stakes of various materials and sizes intended to support a plant. The type we used were hollow and fiberglass. Many plant sticks are not hollow, so they will not work for the tubes required for the door mechanism. Any tube that is used for this purpose needs to be cuttable. Fiberglass worked well because we could cut it with a hacksaw.
- Metal dowels for the door track: Many dowels might work for this purpose, but they must have the following properties: cuttable, very straight, smooth and slick, bendable only under considerable force. Hardware stores carry metal dowels but we had difficulty finding ones with the correct properties there. Instead, we found a 36 inch metal wreath easel at a craft store. We were able to cut it with heavy duty nippers. A 45° - 90° angle bend near the top end of the dowel will prevent it from falling through the brace on the trap. The wreath easel has numerous bends in it, so it can be cut strategically to use the already-existing bends. However, if bending is necessary, it can be done by using two pairs of pliers to hold and bend the dowel.
- Universal car keyless entry system (includes a car door lock actuator, remote, and receiver): Available at Amazon.com and in some car parts stores. Many brands of these are available. Most come with two or four actuators. Most of them also have rather complicated receivers because they are designed to be simultaneously connected to all the doors, plus possibly the truck and the headlights. These extra wires can be ignored/removed, or a simplified receiver (below) can be purchased to replace the complex one. If multiple traps will be deployed at once and closed at different times, multiple receivers are required.

- Wireless receiver: The “12VMonster Single Channel Remote Control Wireless On Off Switch Controller Set” is a very simple-to-use receiver that we recommend. Available at Amazon.com.
- 12-V battery: In theory, a car battery could be used, but we recommend a smaller one with lower amperage for convenience, affordability, and safety. A very large range of amperage is available in these batteries, and we found that 1.3AH was sufficient for our needs. These types of batteries can be found at hardware and battery stores and hobby shops. These 12-V batteries have to be charged with a car battery charger or similar device, which is inconvenient. It would likely be far more convenient to use a USB power bank, but this conversion would require more extensive electrical expertise than we have.

**Extended Discussion Topics**

*Weatherproofing*

Car door actuators are designed to withstand some water and humidity, but are not completely waterproof. The receiver and battery are less resistant to water. In wetter conditions, all of these could be made more water- resistant with, for example, plastic food storage containers with small holes drilled in them to pass wiring through. However, experts advise against capturing during rainy weather (Fair et al. 2023), so extensive weatherproofing might be unnecessary.

*Habituation*

From our previous work with the House Sparrows, we knew that they were very cautious about any changes that occur to the feeder. If the target species is similarly wary, we recommend using a habituation period, in which the trap is put out regularly with the door(s) secured open (and

optionally, the top flap can be left open) so the birds can become accustomed to going in and out. We recommend not leaving the trap unmonitored for extended periods of time in case an animal enters the trap and can't find its way out even with the doorway open (we noticed that some birds had trouble finding the door for exit). If predators might become present, we recommend staying close to the traps (e.g. being able to reach the trap within 30 minutes), because predators may attempt to use the trap to catch birds. If a predator is seen, we recommend removing the trap.

*Trap vs. mist net capture comparison*

The greater number of targeted House Sparrows captured in nets is likely due to multiple factors. First, we strategically set up the mist nets such that they were in known flight paths toward the trap, thus many birds that were on their way to the feeder/trap were captured by a net before arriving at the trap. The second reason is that, when mist nets were used, they were deployed for the entire day at most locations (and birds were often captured throughout the day), whereas when we used traps alone they were open only for a few hours at a time. Finally, House Sparrows in our area appear to be very wary of any changes to the feeder (e.g., changing out one type of feeder for another caused House Sparrows to stop feeding there for days or weeks), which is consistent with the high variability in House Sparrow populations and individuals in object and spatial neophobia (Dusang et al. 2025).

*Disease and injury in captured birds*

We trapped one bird that appeared unwell due to an unknown disease or other condition (poor body condition score, low weight, lethargy; these were not apparent before we chose to trap him). Because he was lethargic and made little attempt to escape the hand, extracting him from

the trap was extremely quick and easy. Thus, it is possible that the trap decreases the amount of time sick birds experience capture-related stress, making it particularly useful for disease ecology studies. Furthermore, we were able to disinfect the trap relatively easily by wiping it down with a Lysol disinfecting wipe and then allowing it to dry, reducing the risk of disease transmission from capture. Conversely, for studies wishing to exclude visibly ill or injured individuals, selective trapping is ideal for avoiding such individuals.

All capture methods have some inherent injury risk, but injury rates are rarely reported. We assume that the risk of the remotely closing trap is similar to that of Potter and other walk-in traps. We observed one minor injury over the course of our study (injury description: very small crack in beak and small droplet of blood on the skin where the beak joins the soft tissue). When the bird entered the trap, there was already another bird inside the trap on the feeder, and the first bird attacked the entering bird. The closing of the trap door stopped the fight. The cause of the injury is unknown. The injury could have been present before trapping, could have occurred during the fight, or could have been caused by the bird trying to escape the trap. We are confident that the injury did not occur because of the door closing, because the bird never touched the door. The novelty of our design relative to other caged traps is the sliding door, and although it caused no injuries during our usage, the potential for injury associated with the sliding door is not known. We therefore encourage researchers using the design to report their injury rates so the risk associated with the novel closing mechanism can be assessed, mitigated, or discontinued if it causes many injuries. Importantly, we do not expect the injury rate to differ from the more commonly used Potter trap and injury rate is likely to vary by species for this trap, as it does for any capture technique (e.g. Duarte 2013).

*Comparison to other capture methods*

Mist nets were the only capture method that we used simultaneously to the remotely-closing traps we constructed, but based on past experiences with and literature about other traps, we can make some general comparisons in usability. After mist nets, food-baited Potters traps and funnel traps might be the most used capture method for song birds. These traps tend to be somewhat more expensive to purchase (typically over $100 per trap, depending on size) than our trap was to construct. One of the main differences between our trap and Potter or funnel traps is that both of the latter are typically placed on the ground, whereas our trap is suspended around a hanging bird feeder. Thus, our trap might be more likely to capture birds that avoid feeding on the ground, while Potter and funnel traps might be more likely to capture birds that prefer ground feeding. Whereas our trap is always selective, funnel traps are non-selective, but Potter traps can be either selective (the door held open with a rod that is pulled by a string when the researcher wants to close the door) or non-selective (a treadle releases the door when the bird steps on it). Potentially, our door and closing mechanism could be adapted to a Potter trap to make selective trapping easier. Our traps can either trap a single bird or multiple at once. By comparison, funnel traps can trap multiple birds at once, and Potter traps typically capture one bird at a time when used non-selectively, but can capture multiple individuals if used selectively. We presume that the injury and mortality rate would be similar among all of these traps due to the similarity of the materials and method of confinement, but injury and mortality rates for these traps are exceedingly rare in published literature. Stress caused by all three types of traps are likely similar. Based on past experience, Potter and funnel traps are similar in their ease-of-use to our trap regarding deployment and ease of bird extraction, although the fact that our trap is at human

height rather than on the ground might make extraction slightly easier. Similar to our trap, Potter and funnel traps require little maintenance while deployed beyond monitoring, but don't require constant monitoring as our trap does, except if Potter traps are set up for selective capture. Potter and funnel traps are likely slightly more robust than our trap because of the complexity of our door mechanism and the electronics. Portability of Potter and funnel traps will vary depending on size, with smaller traps being at least as portable as ours, but larger traps being more cumbersome to transport than ours.