

A TRAP DESIGN FOR CAPTURING INDIVIDUAL BIRDS AT THE NEST

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Abstract.—We describe traps designed for the trapping of particular individual parent birds during the nestling phase of the breeding cycle. These traps have been used successfully with large cup-nesting birds (egrets) and small cavity-nesting birds (House Sparrows). The common features shared include a dropping wire door that prevents escape and an electronic radio-release triggering mechanism that allows the researcher to control the precise moment of capture from a considerable distance away. The radio technology is modified from commercially available units developed for remote-control toy craft. The sparrow trap includes a mechanical motion-amplifier, adapted from a standard rat-trap. Both traps have been successfully field tested many dozens of times and currently result in captures on approximately 90% of attempts.

UNA TRAMPA DISEÑADA PARA CAPTURAR AVES DE FORMA INDIVIDUAL EN SUS NIDOS.

Sinopsis.—Describimos el diseño de trampas para atrapar individuos particulares durante la fase de anidamiento. Estas trampas han sido utilizadas exitosamente para atrapar aves que construyen nidos grandes y abiertos (ej. garzas) como también aves pequeñas que anidan en cavidades (ej. gorrión inglés). Entre los artefactos de esta trampa se incluyen una puerta que cae y cierra la trampa y un mecanismo electrónico que permite que el observador deje caer la puerta en el momento adecuado a una distancia considerable. La tecnología de radiotransmisión es una modificada de la actualmente utilizada en unidades de control remoto de muchos juguetes. La trampa para aves pequeñas que anidan en cavidades incluye un amplificador de movimiento adaptado de las trampas usualmente utilizadas para atrapar ratas. Ambos tipos de trampas han sido probadas muchísimas veces y tienen una eficiencia de captura de aproximadamente 90%.

In many field studies of birds, it is necessary to trap particular nesting adults. For example, in energetics research based on the doubly-labeled water technique (e.g., Hails and Bryant 1979, Bryant and Westerterp 1980, Moreno et al. 1997), individual birds must be in hand for bleeding at a rather precise time (24, 48, or 72 h after cocktail injection, \pm ca. 2 h). In various behavioral, hormonal, and DNA fingerprinting projects, one parent may have been captured, banded, and bled already, so the remaining task is to catch its partner without re-trapping the first adult needlessly. With this problem in mind, we describe the application of two components, one mechanical and one electronic, that have proven useful in designing nest traps for Cattle Egrets (*Bubulcus ibis*) and House Sparrows (*Passer domesticus*) and that can be modified into other trap designs.

Our traps are based on the principle of an enclosed space that adults must enter to reach the nest. A door or gate is initially rigged so that it cannot close while the birds habituate to the apparatus, then modified subtly so that it will close instantaneously at the moment chosen by a distant observer. The key features of our traps are the speed of door closure, the variable distances over which the mechanism operates (up to

200 m), and the convenience of no wires or other physical connections between observer and trap. These features allow quick set-up and flexible field application.

In both traps, the triggering mechanism is a commercially available remote-control system (i.e., a simple radio transmitter/receiver set operating on one or more pre-determined frequencies) used with model airplanes, boats, and cars. We use a Futaba model BP-2PB system that costs about US \$70 and operates on 12 AA-batteries. In about 0.05 s, the signal broadcast from the distant transmitter (when the human observer depresses its trigger) is translated into a small but strong quarter-rotation by a cross-shaped object called the servo. This modest amount of work shuts the trap's door in one of two ways (depending on the trap).

In our cylindrical egret trap (adapted from Jewell and Bancroft 1991) the servo is modified to pull on a piece of monofilament that plucks out a door block (made from a twig). To amplify the servo's arc and thus modestly increase the take-up length, we extended one arm of the servo by 5–8 cm (using epoxy and a popsickle stick), connecting the monofilament firmly through a pre-drilled hole in the stick's tip. The whole receiver apparatus (battery pack, servo, on-off switch, etc.) is affixed to a 20 × 20 cm piece of plywood and mounted upside down within a plastic sandwich box (for weather protection) that has been rendered opaque with spray paint (Fig. 1). In most cases, we habituate the target bird(s) for a day or more, wiring the door open and including a dummy receiver (empty painted sandwich box); the focal parents quickly (typically within 20 min) learn to enter the trap without hesitation. Later, when the trap's door drops, the parent inevitably tries to escape by scrambling upwards (for ease of moving the trap, we do not even have a floor) and the researcher merely hurries from hiding place to trap, opens the door, and catches the parent by hand. We use this trap when nestlings are less than a week old, and none has been injured by the brief period of parental panic.

In our experience, House Sparrows are much warier than egrets, so their capture at the nest requires a more complicated door-closing mechanism. The basic scheme of this trap involves a short 'hallway' (about 9 × 9 cm and 12–15-cm long), through which the parents enter and leave their nest-box. The hallway is also useful in thwarting larger chick-predators (starlings, shrikes, etc.). At every nest-box in our study area, we routinely attach regular (non-trapping) hallways, taking care to watch the nest for 2–20 min from a distance of >50 m to make sure the parents accept this alteration. The day before we intend to trap a given parent (typically 3–10 d after hatching to minimize risk of desertion; Seel 1968), we replace the old hallway with a specialized 'trap hallway' that differs solely in having a bent-wire trapdoor hanging from the ceiling at the entry point (Fig. 2). During habituation, this door is locked open with a small twist of flexible wire and the removable pin is placed in position, as if the door's openness depended on the pin's presence. To that pin we tie a nonfunctional length of monofilament line that leads through a screw-

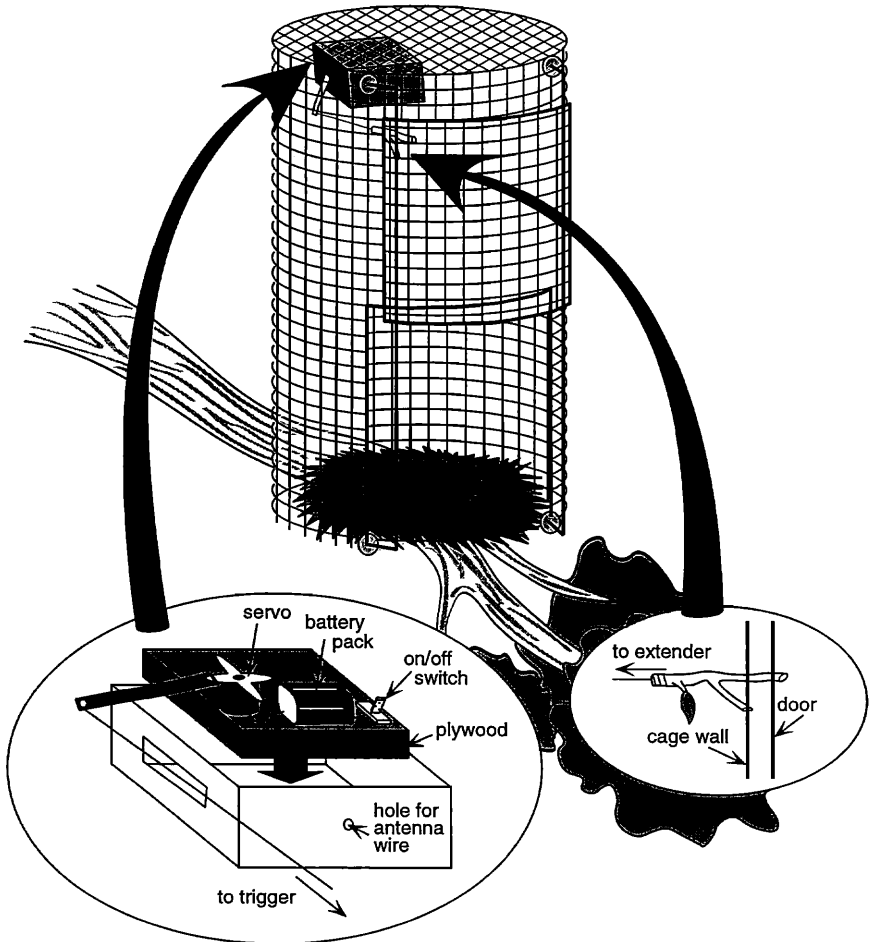


Fig. 1. Elements of the egret trap with inset close-ups of sandwich box layout for electronic components and the prop that holds the door open prior to trapping.

eye line guide and down to a second guide where it is tied. The idea of this pre-trapping protocol is to give parents time to habituate to these new materials that will soon capture them. Most parents are suspicious about even these few changes, but quickly come to accept them and resume normal nest-visits within a few minutes (again confirmed from a distance).

The more elaborate triggering mechanism for this trap (vs. that used with egrets) is due to the sparrows' greater caution: we rely on a much longer monofilament line to the pin and that extra length of line forces the addition of an extra device to take up lots of slack quickly. On the day of trapping, we replace the 2-m monofilament with one that is 10-

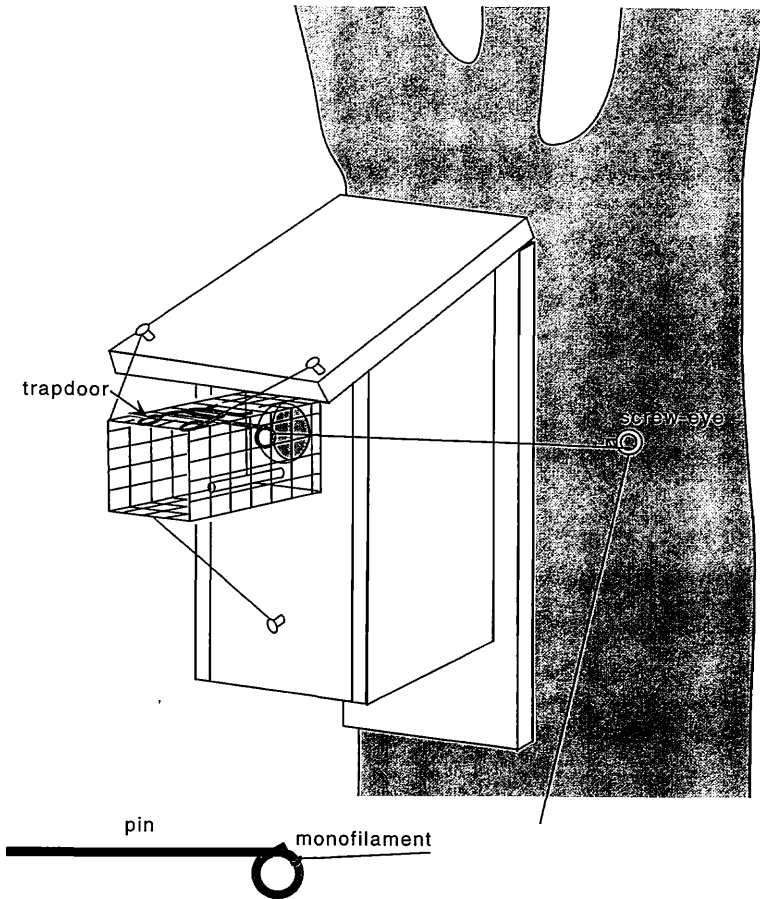


Fig. 2. Sparrow trap-hallway. In study areas where nest-boxes can be attached to barns and out-buildings, the monofilament can often simply be hand-pulled by a concealed observer (J. Wingfield, pers. comm.), but in open habitats and where boxes must be attached to trees or telephone poles, the automatic take-up system becomes necessary.

20-m long, running through the screw-eye guides down to ground level (i.e., hugging the wall, telephone pole, or tree that supports the nest-box), then straight out along the substrate to an apparatus whose sole purpose is to make a 30–50-cm piece of fishing rod (or doweling) snap through an arc rapidly. Because the end of the monofilament is tied to this rod's tip, it is jerked forcefully, causing the pin on the other end to be snatched away cleanly, dropping the trap door. We use a rat-sized snap-trap to power the rod's sudden sweep. The rat-trap is anchored to a wooden brace and its bait-trigger is connected by a short length of monofilament to the radio-controlled servo (Fig. 3). When the targeted parent

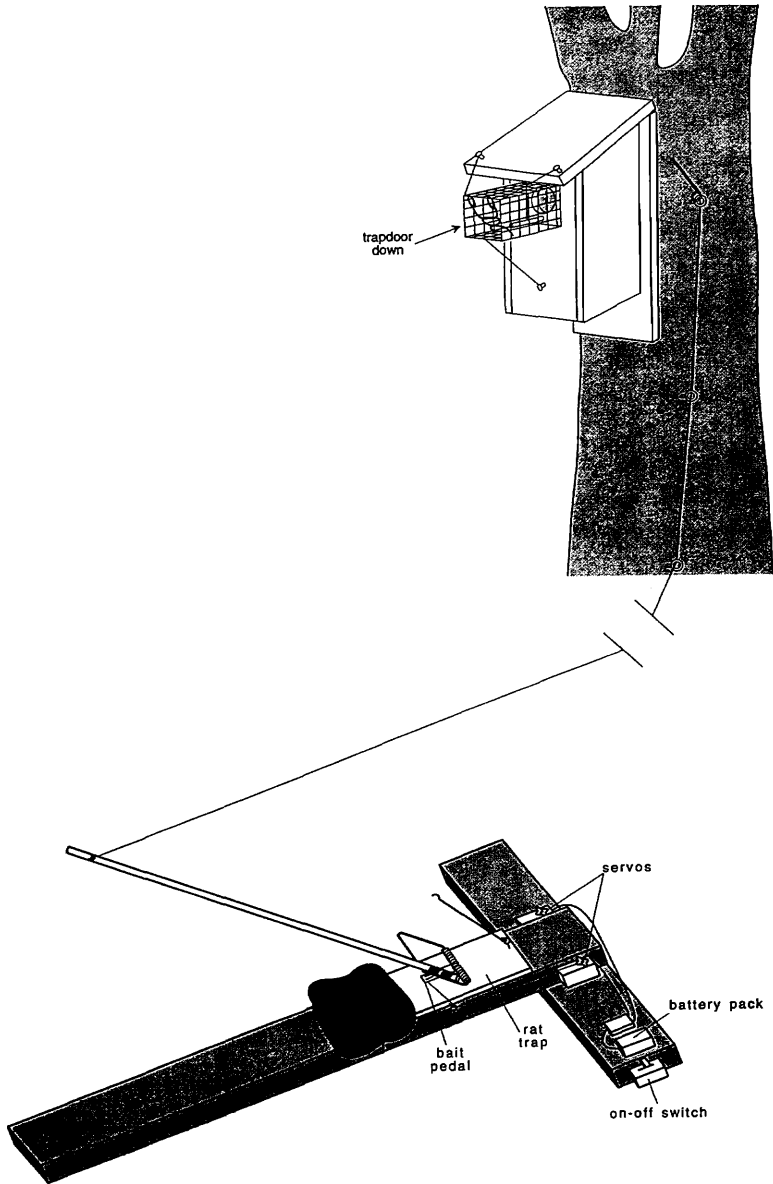


Fig. 3. Rat-trap apparatus in action (tension taken up, pin yanked from trapdoor). The mechanical rat-trap is triggered by an electronic signal and simple pulley system.

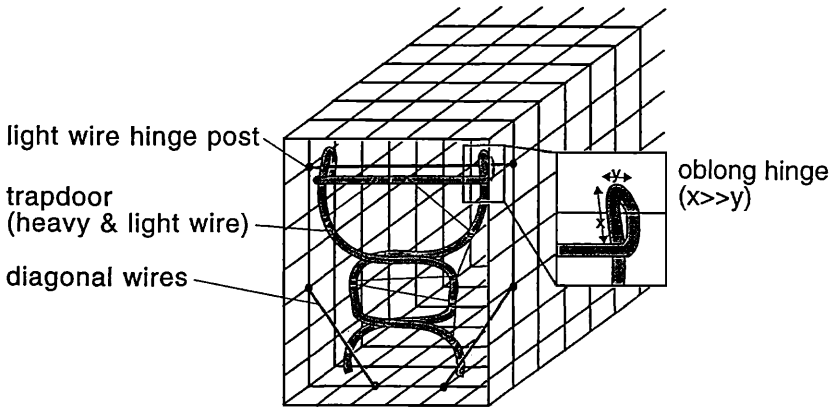


Fig. 4. Close-up of trapdoor mechanism. The frame of the door itself is made from heavy wire bent to shape around a needle-nose pliers to fit the space available and lighter gauge wire can be wrapped around the frame as needed, to eliminate any places where an adult might squeeze through. The lighter wire is also used to make a horizontal hinge post across the top and two diagonals that narrow the hallway near the opening. The inset shows the oblong hinge shape that allows door to slide downward and lock into the floor's hardware cloth.

enters the nest box, a distant observer activates the transmitter, making the servo spring the rat-trap, and causing the door to drop.

Three refinements are worth considering. First, as soon as the trap door drops, some House Sparrows rush out and try to lift it before the researcher can get there. We lost several birds before we modified the shape of the hinge from round to oblong (Fig. 4). This slight alteration lets the trapdoor slide approximately 5 mm farther down, such that its wire feet lock in the hardware cloth of the hallway's floor. Second, two small diagonal pieces of wire can be rigged just outside the trapdoor's 'down' position (Fig. 4), effectively narrowing the hallway at the spot where parents try to pry the door open.

Third, the operation of this trap is predicated on the parent being far enough into the hallway that the door will fall cleanly to the floor without catching on the subject's tail. Because we have found that parents accept short hallways more readily than longer ones, this means that the adult must enter the box almost completely. With house sparrows, entering the box is routine when the chicks are very young, but declines in frequency (especially for males) as nestlings grow capable of begging at the hole. Feeding at the hole is likely to create problems in other species and is one reason why some earlier trap designs that assume full entry of the adult (e.g., Lombardo and Kemly 1983) could not be used. To compel full or partial entry, we found that one can fashion a wire square (that matches the inside dimensions of the box) and attach a piece of black cheesecloth to its frame. When the stubborn parent leaves after making a perch delivery, this cloth can be quickly inserted in such a way that it

does not crowd the nestlings. The parent returns with prey and hears vocal begging, but apparently sees only blackness at the hole. Most enter nervously after a few min, at which point they are easily caught. The successful removal of a trapped bird from its nest-box mainly requires care in keeping all escape routes blocked while one reaches inside and manually extracts the adult: the hallway is removed and its hole plugged with a small rag, then the box itself is opened minimally to allow a hand to slip inside. Beginners may wish to mask the surrounding space with an old pillowcase until the knack is acquired.

Repeatedly trapping parents in their nests can cause brood desertions, so we use these traps only once per individual. For doubly-labeled water studies of House Sparrow energetics, we make our first pre-injection capture with standard methods (mist-nets, various baited walk-in traps) that do not require precise timing, do not target specific individuals, and do not involve the nest-box. Usually, we try to make the second capture with these less traumatizing techniques also, relying on the nest trap as a back-up. When used correctly, though, these traps have proven highly effective.

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