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Instructions for Building Two Live Traps for Small Mammals

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ABSTRACT

The two live traps described herein, tested in the field over a period of 10 years, are sturdy, long-lasting, and relatively inexpensive to build with readily available materials and simple tools.

The all-weather live traps described here are modifications of a type designed by Fitch (1950). The principle of the Fitch trap is that when the small mammal walks through a swinging treadle to reach the bait in the nest box, the gravity-operated door drops behind it. The nest box for the traps, made from a 12 ounce drink can, is held by a friction connection that is easily broken when the contents are emptied into a bucket or bag. The Fitch live trap is a multiple-capture trap in which second and subsequent animals can enter by pushing against and then sliding under the dropped metal door. These two live traps have been used extensively in field studies of small mammals in southeastern Virginia and elsewhere, where a range of species and sizes to 150 g has been taken in the trap made from hardware cloth. The smaller trap, with a trap body made from 2.54cm square acrylic tubing, excludes mammals heavier than 20-25 g, thereby permitting only the smallest members of the small mammal community to be studied.

THE HARDWARE CLOTH (MESH) TRAP

To build the mesh trap (Figure 1a), a 23.5cm by 23.5cm piece of galvanized hardware cloth (also called hail screen) is bent into a 5.5 by 5.5cm trap body that is 23.5cm long. Hardware cloth with three meshes to the inch is best suited to building these traps but this size often is difficult to obtain in hardware or supply stores. (One-half-inch hardware cloth is most commonly available but if used to make traps the meshes are too large to hold harvest mice and most shrews; one-quarter-inch mesh is difficult to bend and even more difficult to make into a secure trap body, but traps built with this material will hold the smallest mammals.) The square of hardware cloth is trimmed on three sides, but the long ends of the fourth side are retained to be bent to build a sturdy trap body.

To make the trap body, a 24 to 30cm length of wooden board 50-51 mm square is used to bend the piece of hardware cloth into a square tube. Place the board on the hardware cloth at the edge of a table, and with the untrimmed side pointing away, bend 1cm of hardware cloth up with your thumbs. Then roll the board away from your body and bend the hardware cloth at 90° to form one side of the tube; continue this rolling movement, squaring up the corners as you go, until the square tube of the trap body has been fashioned. After the last bend, place the untrimmed wires through the first-bent corner. Next, using a needle-nosed pliers, bend each wire end around an adjacent mesh wire to make a symmetrical and sturdy trap body.

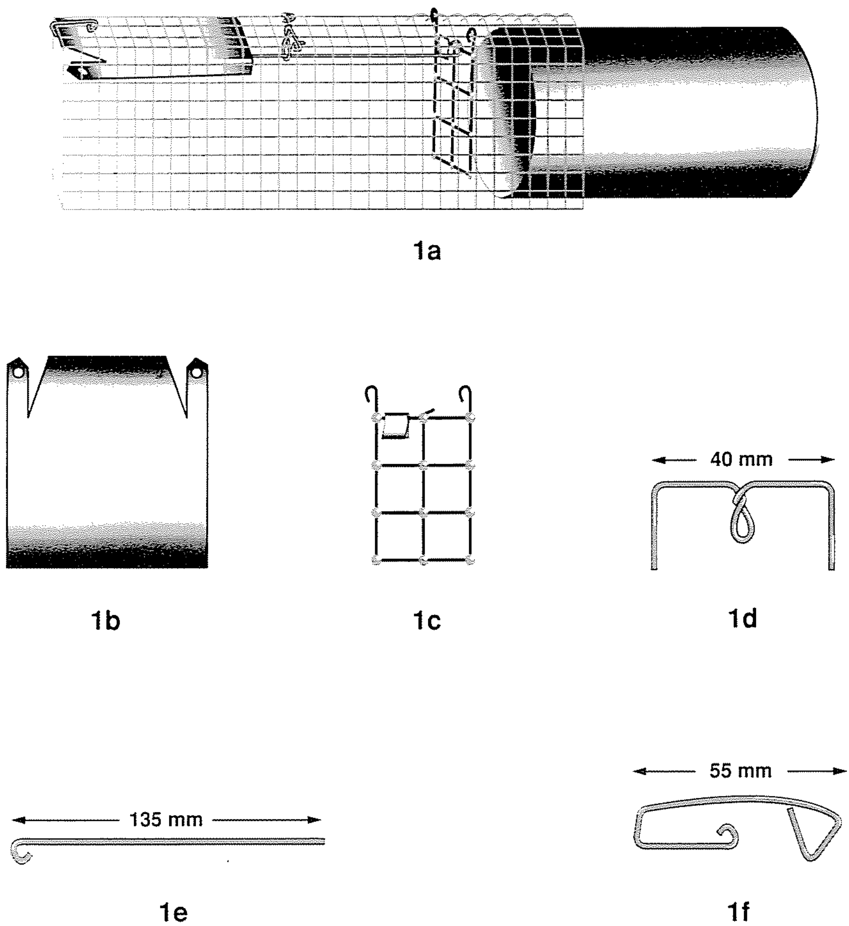

FIGURE 1. Model of completed Fitch trap made from galvanized mesh, together with patterns of the hand-made components.

If the hardware cloth is not square, some adjustments will have to be made to build a symmetrical and sturdy trap body.

Other components needed for construction are shown on Figure 1. The sheet metal door (Fig. 1b) is made from medium-weight (28-gauge) galvanized material that may be obtainable at low cost (as scrap) from a heating and air-conditioning or similar contractor. Each door is made from a 6.25-cm square, with small holes drilled in one side and then notched and rounded (Figure 1b), using a sheet-metal scissors. Then, using a board with a 6-mm deep saw cut, bend the two sides of the door to 90°. The door and hinge will work best if the top of the door is bent to 30° with fingers, a pliers or an angular cut in a board.

The swinging treadle is made from galvanized hardware cloth; the one shown in Figure 1c is made from two-meshes per inch galvanized mesh, but other mesh sizes will work too. The treadle (and indeed every part of the trap) is trimmed of sharp edges to minimize the possibility of the injury of captured animals. However the treadle is made, it should be symmetrical when hanging from the two wires, so that maximum sensitivity and sturdiness can be achieved. A small metal tab between the suspending wires minimizes the lateral movement of the trigger wire, thereby increasing the sensitivity of the trap too.

Parts 1d and 1e are made from 18-gauge galvanized wire. Especially for the trigger wire (1e), the wire must be pulled to straighten and strengthen it. To straighten wire, wrap one end around an eye-hook screwed into a post, run out 5 or 10 m of wire, cut and pull using a pliers, two hands, and your back. When pulled in this manner, the wire will stretch about 1-3 percent, and more importantly, the wire then becomes more ductile. For the size of Fitch trap described here, the hinge and trigger wires should be cut to 16cm lengths. The traps can be assembled most quickly if a supply of all components is available for use after several trap bodies have been made.

To assemble, place several trap bodies in a row, each with the seam on the table; there are fewer jagged edges for both small mammal and investigator if the seam is on the floor of the trap. Next, insert a door into the front of each trap. (Trap bodies and doors will vary slightly in dimensions, so matching the correct sizes at this stage saves time). Then, bend a hinge wire into an L-shape, with the short arm about 5.5cm long. While holding the door in the "up" position, insert the hinge wire inside and through the leading edge of one side of the trap body, through both holes of the metal door, and out the other side of the trap body. Next, using the needle-nosed pliers, bend the short arm of the hinge wire half-way down its length so that the bent end will pass into the trap body; then bend the leading end of the hinge wire up and insert it so that the wire can be crimped tightly and firmly around the trimmed hardware cloth at the front of the trap body. Bend the hinge wire down and repeat these steps on the other side to make the hinge complete. Afterwards, use pliers to raise or lower of one side of the hinge wire to make the bottom of the metal door level with the floor of the hardware-cloth trap body and to permit the door to drop freely and completely. When completed, each end of the hinge wire is wrapped firmly around the leading edge of the trap body.

Next, while holding the door in the "up" position, place a trigger-wire holder (Fig. 1d) about 2.5cm from the back (bottom) of the door. Using the pliers, bend the ends of the wires through and around the meshes of the hardware cloth so that this loop is well secured (see Fig. 1a). Next, hang the treadle about 4cm from the back end of the trap body so that it swings freely. Crimp the hooks to secure the treadle to the trap body. Then, to measure the exact length of the trigger wire (Fig. 1e), place its hooked end on the same transverse wire of the trap body from which the treadle is suspended. Raise the door into the "up" position while holding the end of the trigger wire with the same hand; cut the end of the trigger wire to the closest (back) edge of the trap's door. Next, use the pliers to hold the trigger wire by the loop end and insert it into the back of the trap body so that the trigger wire comes to rest next to the metal tab of the treadle while its end passes through the trigger-wire holder (Fig 1d), already in place. Crimp the loop of the trigger wire to secure it next to the tab of the treadle; this is more easily done if the loop is above, and the trigger wire below, the transverse wire with the metal tab. (If you wish to allow the smaller mammals to come and go without being caught, use a shorter treadle, one that will not swing when the smallest animals walk under it.) The functional trap body is now complete.

An easy to use spring-clip can be fashioned and attached that will quickly and effectively lock open the trap during prebaiting or between trapping periods. This optional part (Figure 1f) is made from a 12cm piece of spring metal, bent into the appropriate shape and then crimped onto the third transverse wire from the front of the trap. (Adjustments are required here if hardware cloth of 2- or 4-meshes to the inch is used.) When properly made and installed, this clip will hold the door in the "up" position in prebaiting periods, permitting animals to freely enter and leave the trap without being caught. The best spring metal is stainless steel, but any non-corrosive springy metal about 18 or 19 gauge will work.

This Fitch trap uses a 12 ounce (355 ml) drink can as a nest box, but traps of different sizes can be built to accommodate larger or smaller cans. (The original Fitch [1950] trap used a 46 ounce [10.5cm diameter by 17.5cm long] tin can as the nest box, and the trap body was about 9cm by 9cm and 30cm long. Before bending, the hardware cloth is 30 X 37cm. Using a 10cm by 10cm square of sheet metal for the door and appropriately larger other components, this larger Fitch trap can be built using the directions given here.) The tops of drink cans cannot be easily removed because the deeply recessed lids cannot be cut with the standard can opener. The most effective and quickest way to open the top of a drink can is to use a sanding wheel; coarse grit cuts through the aluminum top in seconds, allowing the top to be pulled out easily. (Recently, a can opener has been marketed that might work safely; it cuts off the entire top, including the crimped lid). Once cleaned and filled with non-absorbent cotton or polyester fiber and bait, these cans become effective and long-lasting nest boxes.

To assemble the trap and nest box, use your fingers to bend and round up the back of the trap body and then slide it onto the open end of the can. A tightly fitting friction joint is crucial so that the trapped mammal cannot separate the trap body from the nest box by running back and forth. Steel drink cans, although rarer now, are sturdier than aluminum cans and will last for several years of continuous use in the field. These traps, when baited with wild birdseed (sometimes with extra sunflower seeds) have caught small mammals ranging from 6-8 g *Blarina carolinensis*, the southern short-tailed shrew, to 150 g *Sigmodon hispidus*, the hispid cotton rat. I have also caught one female *Mustela frenata*, long-tailed weasel, in the trap; earlier I caught a pair of long-tailed weasels in a larger Fitch trap (with 46 ounce can as nest box). This larger size also catches chipmunks, squirrels, and Norway rats (though the treadles and trigger wires often are damaged by these larger animals). These traps can be easily marked and anchored using surveyors' flags, with the 21" or 30" wires placed through the hardware mesh of one side of the trap body.

Two types of all-mesh live traps recently were reported to be superior to the standard all-metal Sherman live trap for capturing desert rodents (O'Farrell et al., 1994). The Fitch trap described above has a mesh trap body, where heat can be

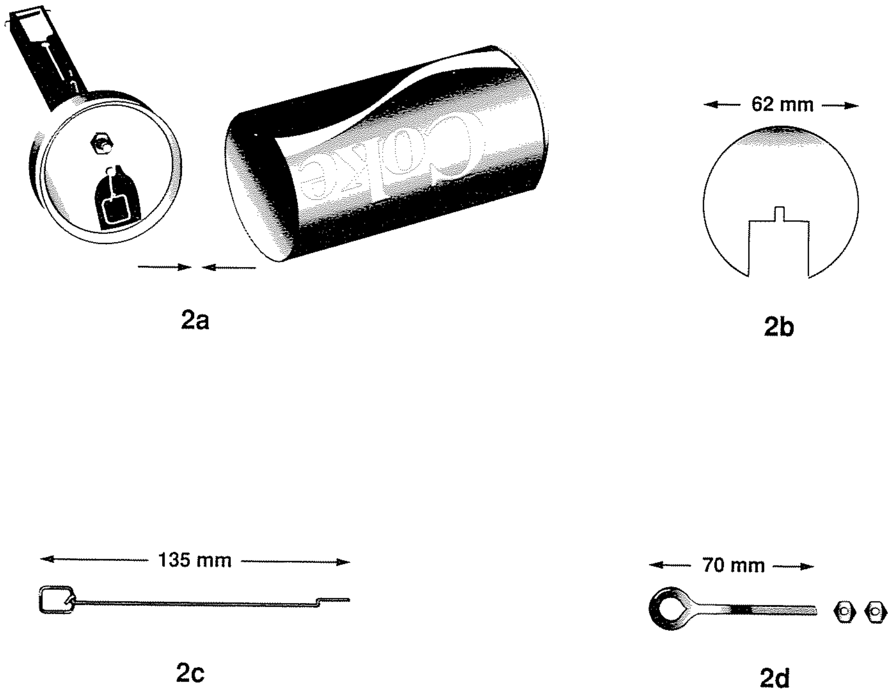

FIGURE 2. Model of completed trap mechanism and nest box of Fitch trap made from square acrylic tubing, together with pattern of the hand-made components (2b and 2c) and the purchased component (2d).

dumped, and a nest box, where the mammal can seek shelter to stay dry and conserve heat.

THE SMALLER TRAP MADE FROM SQUARE ACRYLIC TUBING

The raw materials to build this smaller trap are square acrylic tubing, 22 gauge wire, plexiglass, an eyebolt, and a drink can (Figure 2a). The trap body is made from 2.54cm clear tubing purchased in 10-foot sections at a plastics store and cut into 14cm lengths using a fine-toothed band saw. The door is hung on 22 gauge galvanized wire run through holes drilled near the top of the front of the trap. (A pair of similar holes, when drilled 1.5cm behind the holes for the hinge wire, can be used to hold a wire to lock the trap open during prebaiting or between periods of active trapping.) The door, 20mm wide and 30mm long, was made from a piece of discarded aluminum venetian blind, cut with an office paper cutter. One end of the rectangle of aluminum was rolled, using a sawed groove in a board and needle-nosed pliers, into a tube through which the hinge wire was inserted. The 3cm hinge wire then was bent at both ends to hold the hinge in place. Counting the thickness of the acrylic tubing and the head room for the door, the opening of this trap is about 17-18mm high and 21mm wide. This small size of opening effectively prevents mammals larger than 20-25 g from entering the traps.

The acrylic tubing is attached to the nest box by means of a plexiglas or lexan "shield," a 62mm disk with a U-shaped cut as shown in Figure 2b. A tight fit is needed so that the acrylic tubing can be strongly "welded" to the 6-8mm thick shield using Resin-Bond or similar solvent. The small notch in the shield is needed to accommodate the trigger wire, which in this trap lies outside and on top of the trap body. The trigger wire is made from galvanized 22 gauge wire, pulled and straightened as described above, and then bent as shown in Figure 2c. The.front end of the trigger wire is sent through a 5mm hole that has been drilled in the top of the trap body, about 42mm from the front of the trap. The trigger wire is the last component of the trap to be assembled (see beyond).

The nest box for this trap also is made from a 12 ounce aluminum drink can. Remove the tab from the can and then cut off the top 1.2-1.5cm, using a fine-toothed band saw. Then, place the plexiglass shield and attached trap body inside the top of the can so that the openings in the lid of the drink can and the back of the trap body are aligned. While holding these parts in alignment, drill a 6mm hole in the shield and lid about 1.5 to 2cm above the top of the acrylic trap body. A 7cm long by 4mm (2 3/4" by 3/16") eyebolt (Fig. 2d), with a nut on each side, is used to hold the shield and trap body to the top of the drink can. A rubber washer (which can be made from a piece of tire inner tube) should be placed between the lid and the plastic shield before using a wrench to make this connection secure. Then, use a good sheet-metal scissors to enlarge the opening in the lid of the aluminum can in order to match the opening with the inside dimensions of the acrylic tubing at the back of the trap body. After some cutting, the edges should be made flat and smooth with a file, again to reduce the possibilities of injury to the captured mammals.

Now install the treadle by running the wire (Figure 2c) through the notch in the shield and along the top of the acrylic body, and then inserting the tip through the 5mm hole in the top. Then, bend the squarish end part of that wire (Figure 2c) downward so that it becomes the treadle. As the mouse or shrew moves through this treadle, the wire moves and the door drops. Thus, the section of wire holding up the door must be trimmed to the appropriate length so that the door will drop when the treadle is moved as the mammal moves into the nest box for the bait.

Next, use the scissors to trim the rough edges from the remainder of the drink can. Then, using the eyebolt as a handle, the two parts of the trap are joined, as shown in Figure 2a. Because the two parts are so tightly held by friction, the eyebolt, and not the acrylic tubing, should be grasped to separate the trap body from the nest box when trapped animals are emptied into a bucket or bag.

When built of clear acrylic tubing, these traps proved to be ineffective in catching small mammals. However, when the clear acrylic tubing was made opaque by spray-painting it with black acrylic paint, an excellent trap resulted. (During a year-long study of oldfield small mammals in southeastern Virginia [Cawthorn and Rose, 1989], about 30 *Cryptotis parva*, least shrew, and a few hundred each of *Reithrodontomys humulis*, eastern harvest mouse, and *Mus musculus*, house mouse, were taken with these traps.) Before spray-painting with acrylic paint, a 3cm piece of masking tape was placed at the end of the trap; after painting, the tape was removed, enabling the investigator to see without stooping over and looking into the trap at near ground level whether the trap had been set off by a small mammal entering it. In fact, one of the advantages of Fitch traps is that it is easy to see at a glance and often from a distance whether the trap door is in the up or dropped position.

In summary, the two traps described here can be built cheaply (the latter is more costly to build, and takes much more time to construct) with readily available materials and using simple tools. However, a band saw, drill press, and sanding wheel will speed production. Besides being inexpensive, these traps are sturdy, do not rust or corrode excessively, and remain in good working condition after years of continuous use. The trap made of hardware cloth (Figure 1) does not need cleaning, because the animals defecate in the wire part of the trap. This feature also makes it easy to collect fecal samples of individual animals simply by placing a piece of paper under the mesh part of the trap. The painted acrylic traps were left continuously in the field for a year, and eight years later after intermittent use they still have not become brittle. Thus, these traps also hold promise for a long period of usefulness.

ACKNOWLEDGMENTS

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