# Designs for nest box, owl stopper, and patio trap for Eurasian Scops-owl (*Otus scops*) and other small cavity-nesting owls

## Planos de caixa-ninho, dispositivo de captura e armadilha de entrada para mocho-d'orelhas (*Otus scops*) e outras aves de rapina noturnas cavernícolas de pequeno porte

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## ABSTRACT

In 2017, we began conducting migration and demographic work on the Eurasian Scops-owl (*Otus scops*) in Turkey. This paper focuses on three practical aspects of conducting Eurasian Scops-owl research using nest boxes and related equipment. Based on the literature and input from other researchers, we developed and built nest boxes, a device (owl stopper) to capture owls by keeping them from exiting the nest boxes upon our approach, and a patio trap for capturing adult owls. We offer specific plans with dimensions, material lists, and construction instructions and techniques to enable researchers to build and use these items for research on Eurasian Scops-owls and other small cavity-nesting owls.

**Keywords:** nest box, *Otus scops*, research methods, trap design and construction

# RESUMO

Em 2017, iniciámos o estudo da migração e da demografia do mocho-d'orelhas (*Otus scops*) na Turquia. Este artigo foca-se em três aspetos práticos relacionados com o uso de caixas-ninho na investigação do mocho-d'orelhas. Com base na literatura e em contributos de outros investigadores, desenvolvemos e construímos caixas-ninho, um dispositivo (*owl stopper*) para capturar os mochos impedindo-os de sair das caixas-ninho durante a aproximação do captor, e uma armadilha de entrada para capturar mochos adultos. Disponibilizamos os planos com dimensões, lista de material, instruções de construção e técnicas para permitir que outros investigadores construam e utilizem estes métodos para estudar o mocho-d'orelhas e outras aves de rapina noturnas cavernícolas de pequeno porte.


**Palavras-chave:** caixa-ninho, metodologias de investigação, *Otus scops*, planos e construção de armadilhas

# Introduction

In 2017, we (and colleagues) began demographic work on the Eurasian Scops-owl (*Otus scops*) in Turkey, Slovenia and Spain. We wanted to be able to capture, band/mark, and in subsequent years recapture, a large number of owls. In order to do this, we established networks of nest boxes, with boxes spaced at about 200 m increments, in landscapes that held few (if any) natural cavities. Our two study sites in Turkey had 30 and 40 nest boxes, respectively. The intention was to provide nesting sites for owls, at a large-enough spatial scale, so that when owls moved from one nest site to another, or new owls moved in, we would have sufficient nesting sites to allow us to routinely capture *all* of the owls involved. To aid us in this work, we designed a nest box, an owl stopper, and a patio trap. This methods paper describes these three research tools.

## Nest Box for Eurasian Scops-owl

We made nest boxes from 20 mm-thick wood or plywood (Fig. 1). We centered the 60 mm diameter entrance hole 240 mm from the bottom and 120 mm in from either side. The sides were cut at a 14 degree angle, giving a slope to the top. The back edge of the top was cut at a 15 degree angle, to allow a snug fit between the top and back. The top was attached with two hinges. We drilled four or five 5-mm diameter drain holes through the bottom. A total of four 5 mm diameter holes were drilled - two through the top and two through the bottom of the back plate, 25 mm from the ends of the back and 60 mm in from the sides - to allow a wire for wrapping around the tree trunk. We placed about 75 mm of fine wood chips or sphagnum inside the nest box for the female owl to dig her nest cup into and to support the eggs and young.

## Owl Stopper

The intention of the owl stopper is to capture the adult female inside of the nest box. It is used by quietly approaching the nest box (typically during daylight hours), and putting the owl stopper into the entrance hole of the nest box, blocking the owls' escape. This design is for a nest box with a 60

Figure 1 - Eurasian Scops-owl (*Otus scops*) nest box design.

Figura 1 - Esquema de caixa-ninho para mocho-d'orelhas (*Otus scops*).

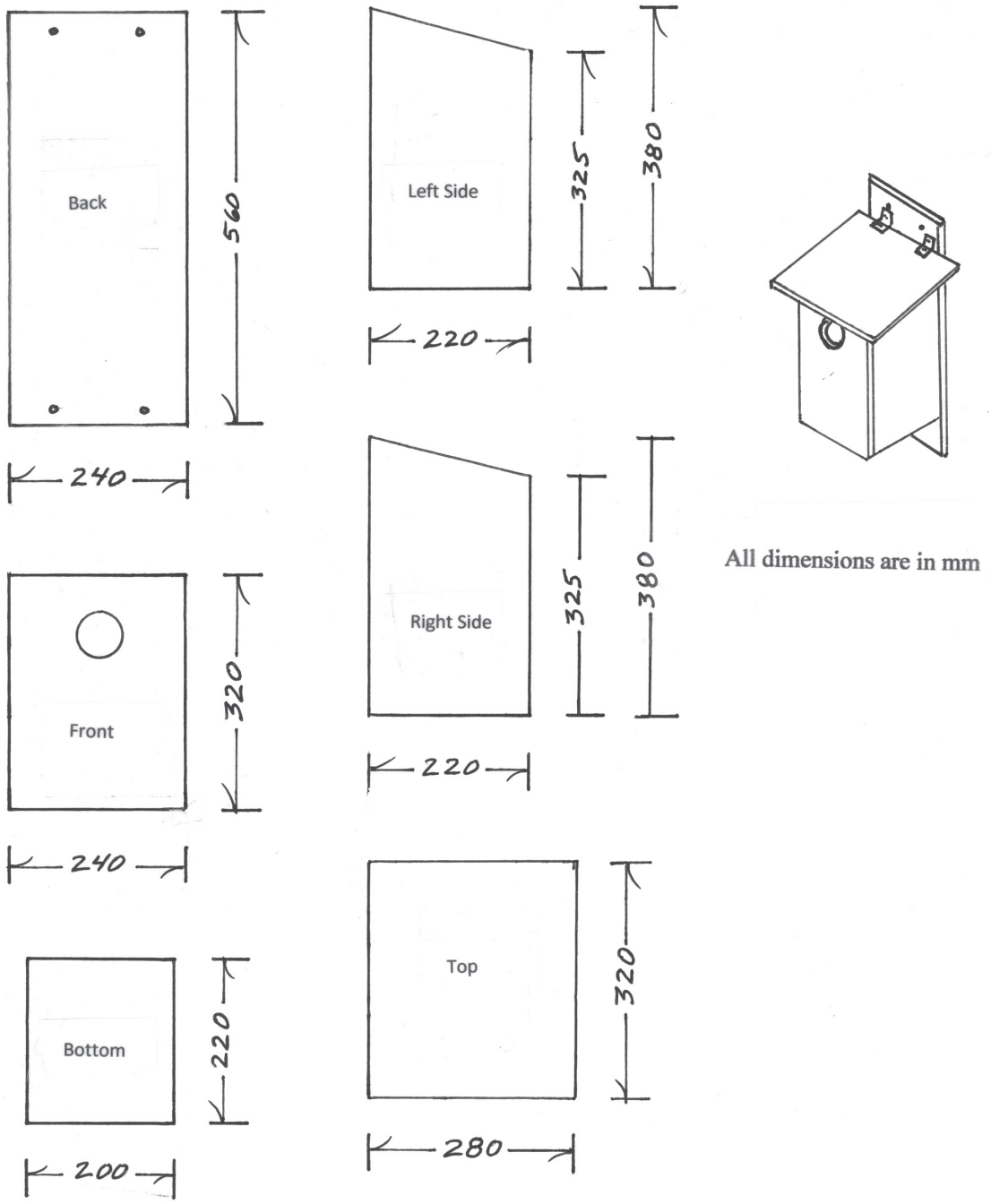


Figure 2 - Schematic design of the owl stopper.

Figura 2 - Esquema do dispositivo de captura.

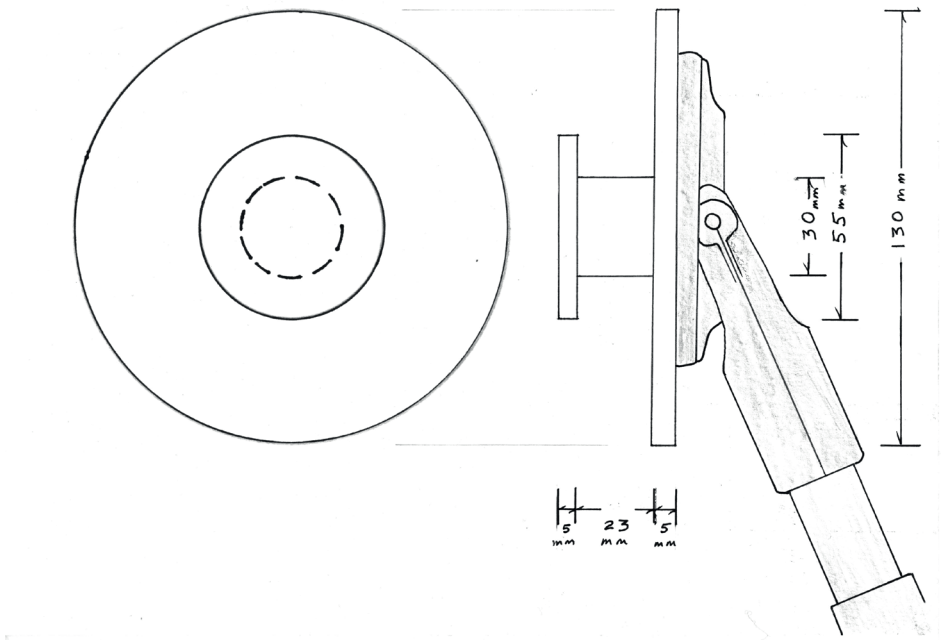



Figure 3 - Photo of owl stopper by nest box opening.

Figura 3 - Foto do dispositivo de captura na entrada da caixa-ninho.

Figure 4 - Patio trap attached to front of nest box on tree.

Figura 4 - Armadilha de entrada fixada em frente à caixa-ninho, numa árvore.

Figure 5 - Front view of patio trap.

Figura 5 - Vista frontal da armadilha de entrada.

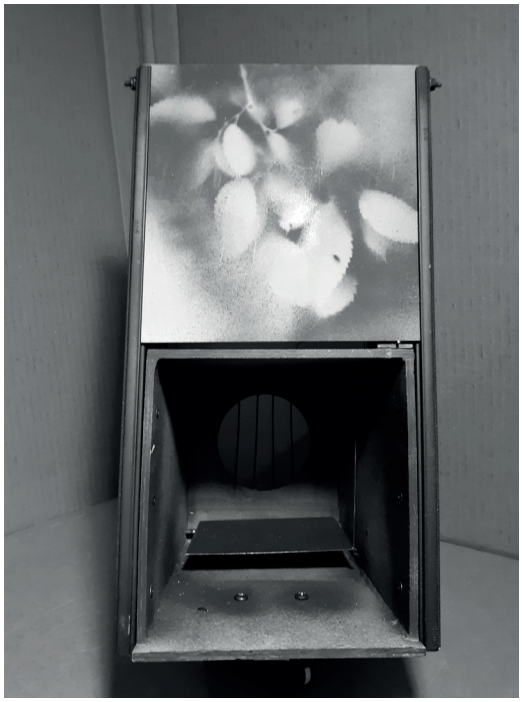
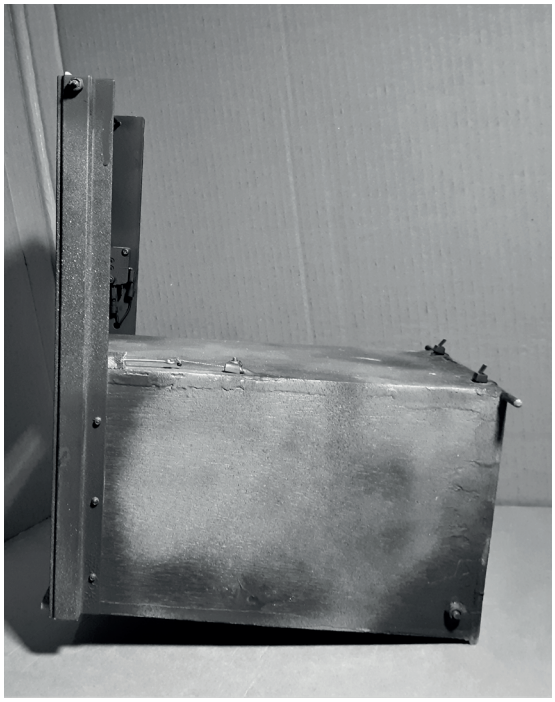


Figure 6 - Side view of patio trap.

Figura 6 - Vista lateral da armadilha de entrada.



mm diameter entrance hole. The headpiece consists of two round discs of 5-mm plywood (55 and 130 mm diameter) and a 30 mm diameter x 23 mm thick spacer dowel epoxied together. This headpiece is attached to a swiveling drywall sanding block, cut to fit the 130 mm plywood disc, and held on with two pop-rivets (Figs. 2, 3). This allowed the headpiece to tilt in two directions (vertically and horizontally). The owl stopper setup is attached to a wooden, plastic, or metal extendable pole handle. After inserting the owl stopper into the entrance hole leave it hanging in the entrance hole while the owl is handled inside the nest box. We captured 30-50% of adult females that remained in the nest box when approached using the owl stopper or similar device (unpubl. data).

## Patio Trap

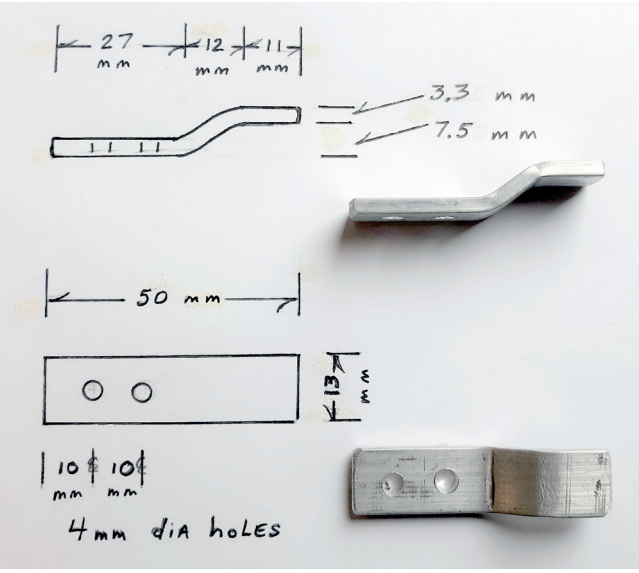
We developed a modified version of a patio trap (Saurola 1987, Kivelä 2001) to capture small owls (80-120 g), particularly males, at their nests at night (Figs. 4, 5, 6). Our goal was to capture every adult owl in the study areas; while up to half of the females were readily captured inside the nest boxes, a patio trap was needed for the other females and all of the males. Thus far, with the design offered here, and an earlier prototype design, we have captured 50 adult Eurasian Scops-owls. The trap captured owls as they tended to young inside the nest box. The patio trap is made from 5 mm plywood, and is 152 mm wide, 160 mm tall, and 277 mm in total length; two-part, quick-cure epoxy was used

Figure 7 - Patio trap hung on front of nest box with two aluminum hanger clips.

Figura 7 - Armadilha de entrada fixada na frente da caixa-ninho com dois suportes de alumínio.

Figure 8 - Schematic and dimensions of aluminum hanger clips.

Figura 8 - Esquema e dimensões dos suportes de alumínio.



in its construction. To increase acceptance by owls and trap longevity, we camouflaged the trap using flat tan and black spray paint. A painted, finished trap weighed about 910 g. The patio trap is attached to the face of the nest box using a 5 mm metal rod across the rear of the trap and two small aluminum hanger brackets attached to the face of the nest box (Figs. 7, 8). As the aluminum hanger brackets are attached to all nest boxes during the non-breeding season, patio traps can be easily moved, as needed, from box to box. After entering the trap, the owl walks toward the rear hole area of the patio trap, and its weight triggers the treadle, and the plexiglass door drops shut. After setting the trap, we left the area; traps were set around sunset and checked every 50-60 min thereafter. Researchers use a ladder to reach nest boxes and safely attach and remove traps.

## Top, Bottom, Left and Right Sides of Patio Trap

The top and both sides of the patio trap are all the same dimension, i.e., 260 mm x 152 mm. The bottom of the trap is 272 x 152 mm. The two sides are mirror images, and each has one 5 mm hole drilled through them in the lower rear corners; the hole is centered 12 mm from the bottom and 12 mm from the rear of the side. These holes hold the 5 mm threaded rod that spans the width of the trap and passes through the holes in the treadle. The bottom is longer than the sides and top, as it extends forward and 'catches' or stops the door when it drops. The bottom of the trap is epoxied to the bottom of the sides, and then the top of the trap is epoxied onto the top of the sides. The top has 2 slots (2 x 5 mm) cut into it for zip ties, located 5 mm from the back and 20 mm in from the sides.

## Back of Patio Trap

The back of the Patio Trap (the portion adjacent to nest box entrance) is 160 mm x 152 x 5 mm thick (Fig. 9). Using a hole saw, we cut an 85 mm diameter hole, centered 76 mm from the sides and 62 mm from the top. After cutting the hole, cut a 36 mm strip from the lower part of the back – save this lower strip for later reattachment using epoxy (Fig 10; see below). We used four metal rods (1.5 mm diameter) to create "bars" positioned vertically across the hole, so that the female does not escape from, or the male does not go into, the nest box. Using a 2 mm drill bit, drill the first hole 50 mm from a side of the back, and then drill three subsequent holes at 17 mm increments apart (Fig. 9). Next, flip the back piece (top to bottom) and drill corresponding rod holes. Insert the metal rods (120 mm long each) into the holes, and reattached the lower strip of wood using epoxy. When the lower strip is cut, about 2 mm are lost from the height of the back due to the saw kerf, this is not a concern. When the back was epoxied onto the trap frame, it was only attached to the two sides and bottom of the trap – the 5 mm metal hanger rod was epoxied on the top of the back and against the end of the trap frame (Fig. 11).

Two slots (2 x 5 mm) were drilled into the top of the back piece (5 mm from the top, and 20 mm from the sides). Companion slots were drilled into the top of the patio trap. The 5 mm metal hanger rod, bedded in epoxy, was then held fast by two 5 mm plastic zip ties [these zip ties were required to keep the hanger rod in place, as the epoxy was not sufficient on its own] (Fig. 12).

## Treadle for Patio Trap

The treadle was made of 1 mm-thick aluminum sheeting (Figs. 13, 14) and started out being 155 mm wide and 128 mm long in size. Two 5 mm holes were drilled in opposite corners, centered 7 mm from the sides and 8 mm from the ends of the sheet. The corners of the aluminum sheet were rounded slightly with a metal file. The sides (13 mm) of the aluminum sheet were then sharply bent at a 90 degree angle. After this, trim the metal sides at an angle – from 13 mm wide at

Figure 9 - Schematic of back of patio trap.

Figura 9 - Esquema da parte posterior da armadilha de entrada.

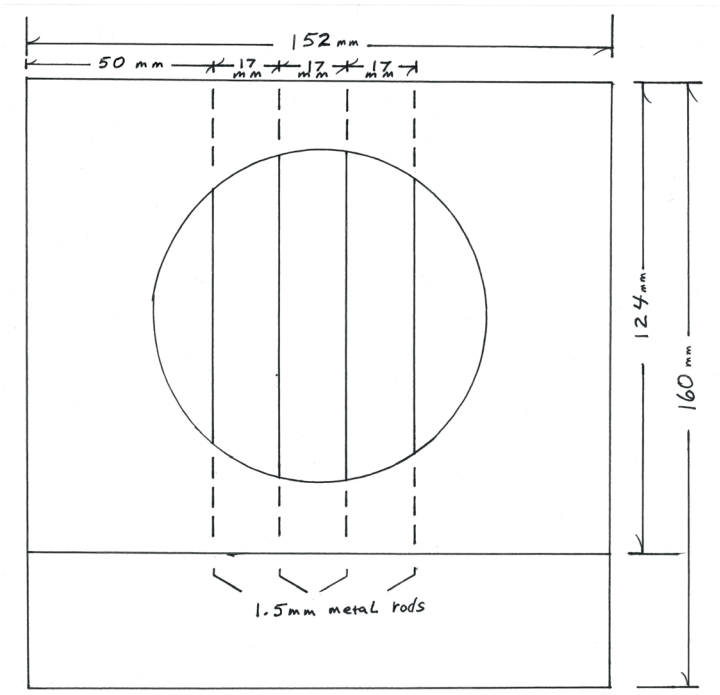



Figure 10 - Photograph of back pieces for two traps under construction. The bottom strip of the back has been cut off, to allow access for drilling holes for vertical 1.5 mm rods. With rods in place, the bottom strip is reattached with epoxy.

Figura 10 - Fotografia das peças posteriores de duas armadilhas em construção. A ripa inferior posterior foi cortada para permitir o acesso para fazer as furações para as varas verticais com 1,5 mm. Após instalação das varas, a ripa inferior é reposicionada e fixada com resina.

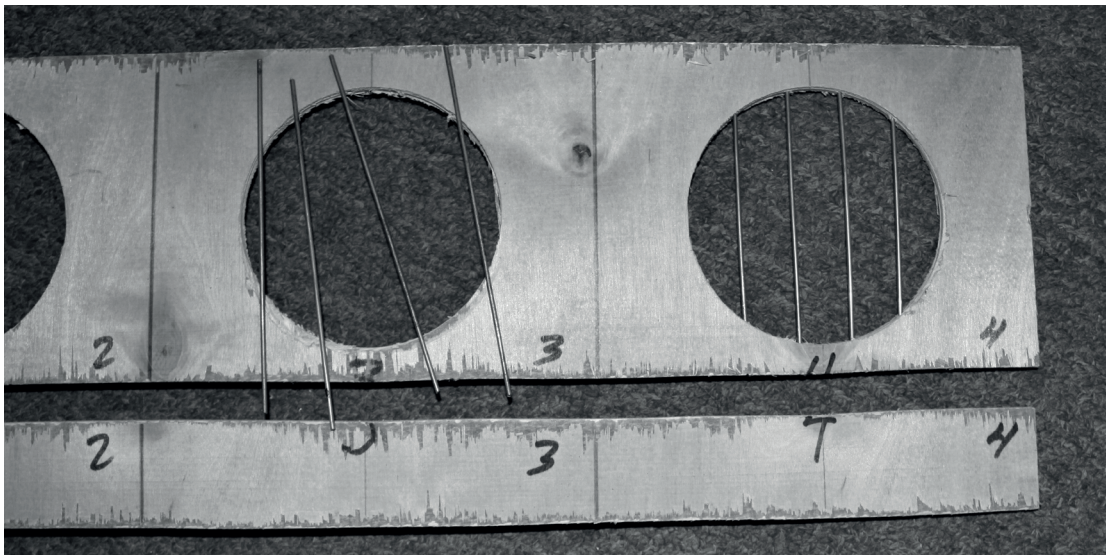


Figure 11 - Schematic of trap, with highlighted area showing hanger rod placement.

Figura 11 - Esquema da armadilha. A área sombreada mostra a posição da vara de encaixe.

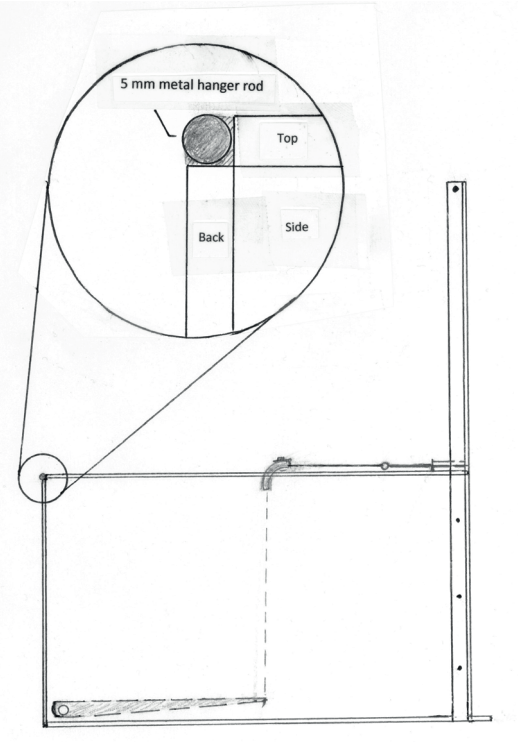



Figure 12 - Photograph of back of patio trap, showing zip ties.

Figura 12 - Fotografia da parte posterior da armadilha de entrada, mostrando as abraçadeiras de plástico.

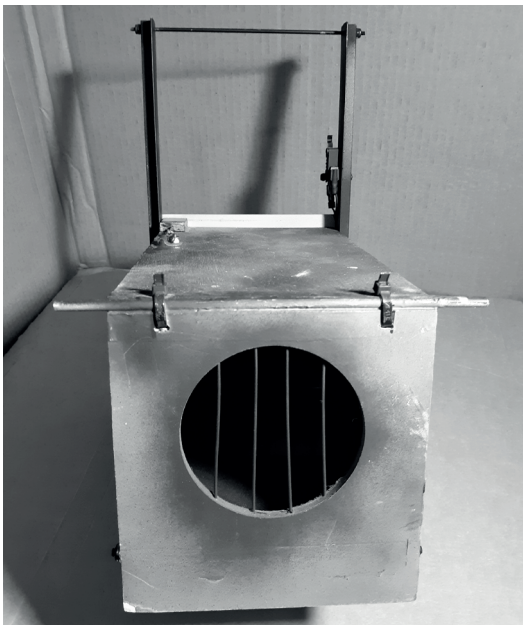


Figure 13 - Schematic of treadle, showing bending and trimming areas.

Figura 13 - Esquema do pedal, mostrando a localização das dobras e dos cortes.

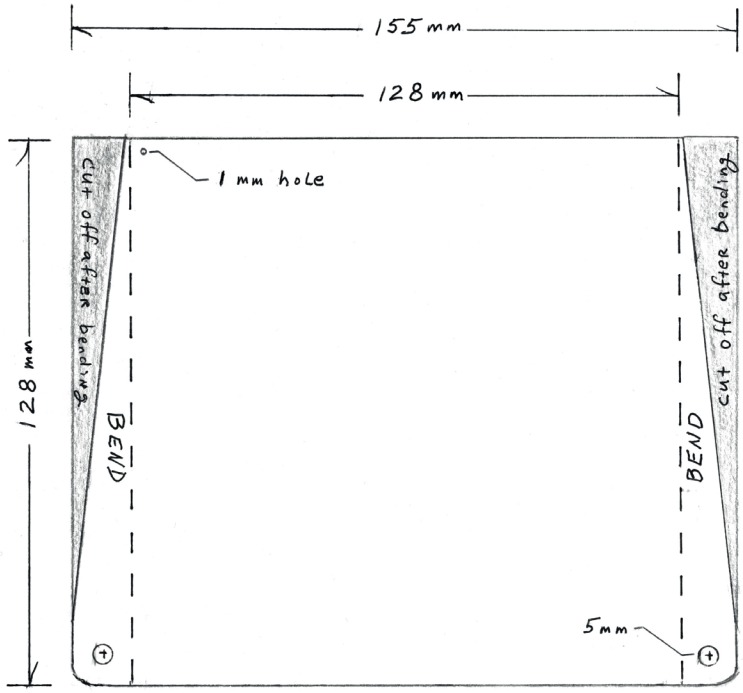
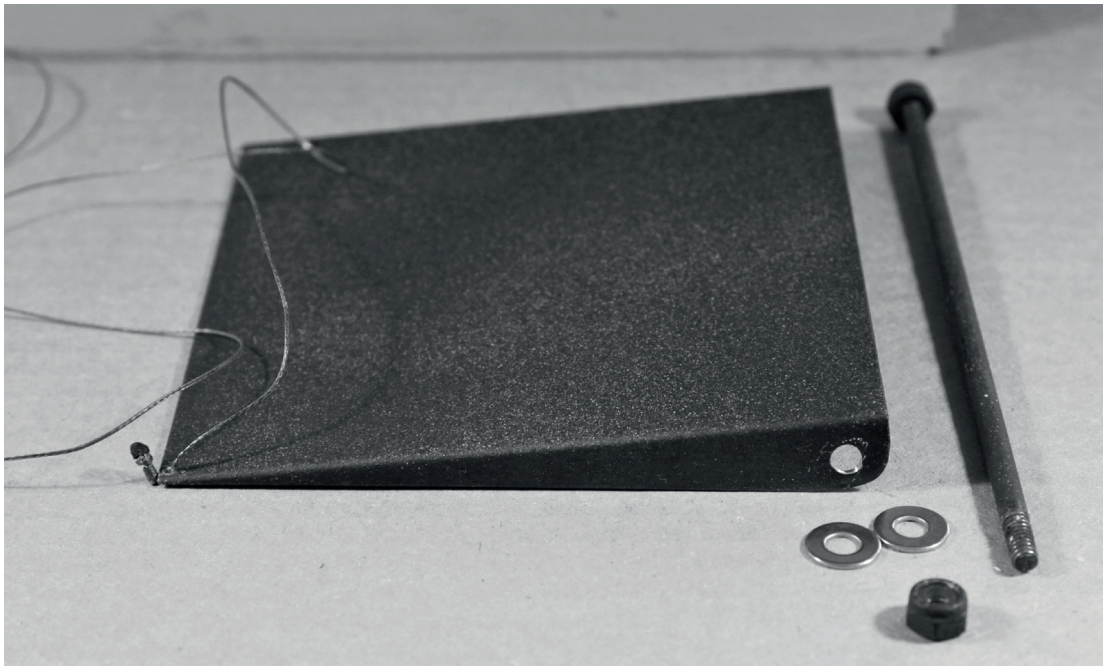



Figure 14 - Photograph of treadle, threaded rod, washers, lock nuts, and Spectra line.

Figura 14 - Fotografia do pedal, vara roscada, porca, anilhas planas e linha de fibra Spectra.



the back to 2 mm wide at the front. This trimming will allow the treadle to fall a few mm more when triggered by the owl. The finished *surface* of the treadle is 128 mm long x 128 mm wide. Drill a 1.0 mm hole 2 mm from the left front corners of the treadle as part of the trigger mechanism. After the corner holes were drilled, sides bent and trimmed, and the small hole drilled for the trigger mechanism, acetone was used to clean the top and bottom of the aluminum treadle. A very thin coat of flat black paint was then applied to the bottom and sides and allowed to dry. Then, the top was painted again, with some fine sawdust quickly sprinkled on the top of the treadle (to soak into the paint) to offer a non-slip walking surface for the owl. Textured paint is an acceptable alternative to the sawdust. A further light coat of spray paint was sometimes needed to hold the sawdust. Very importantly, the treadle must be as lightweight as possible. After the treadle was painted, an 80 cm long piece of 40 kg Spectra braided fishing line was put through the 1 mm hole, and triple knotted on the underside of the treadle; this is the trigger line.

## Trigger Mechanism

A 2 mm (inner diameter) copper tube was placed through the top of the trap, 110 mm from the front of the trap and 10 mm from the left side (Fig. 15). This copper tube was 50 mm in length, and critically important, it needed to have a smooth 90 degree bend in it. Such copper tubing is often used for brake fluid lines in vehicles. The tube was placed directly above the corner of the treadle, such that the Spectra line goes directly up from the treadle, through the copper tube, and to the stainless steel trigger pin. The copper tube was held in place with a plastic tie, bolted through the top of the trap. Epoxy was used to seal the copper tube in place and to waterproof the hole. The Spectra line had to run very smoothly through the copper tube. The trigger pin was made of 2.0 mm stainless steel wire, with an 'eye' bent into one end. The initial length of the trigger pin was 76 mm; finished length was 72 mm (Fig. 16). The weight of the owl (~80 g) was enough to drop the treadle, pulling the Spectra line, and thereby pulling the stainless steel pin from beneath the plexiglass door.

## Plexiglass Door and Metal Frame for Patio Trap

This patio trap uses a 'guillotine' style plexiglass door that slides freely inside an external metal frame (Figs. 4, 5, 6). The door was 166 x 166 x 2 mm in size; it was painted front and back, with flat tan and black spray paint, in a camouflage-leaf pattern. The metal frame that holds the door in place was an aluminum window frame used for holding insect mesh. Two pieces of this metal frame were used; each were 330 mm long. Each of the two frame pieces were attached to the outer sides of the patio trap with three pop rivets (each about 2.5 mm diameter x 10 mm long in size). Holes for the pop rivets were drilled through the metal uprights first, and thereafter clamped and drilled through the patio trap sides. The metal frame that holds the trap door extended about 2 mm in front of the trap sides and top. Because the bottom of the trap was longer than the top or sides, the trap door was stopped by the trap bottom when it dropped. Note: Attaching the two metal uprights for the door is one of the very last steps in the patio trap assembly process, after the completion of the trap box and treadle efforts.

## LED Lighting

We added a light to the bottom of the patio trap which turned on when the trap closed and was easily visible at 40 m. A single, white, LED light was affixed in a white (or clear) plastic frame and was bolted (with 5 mm stainless steel bolts) to the bottom of the trap (Fig 17). The light was powered with 2 AAA batteries. A microswitch (OMRON

Figure 15 - Copper tube fastened and extending through top of patio trap. The Spectra line runs smoothly through this, between treadle and trigger pin.

Figura 15 - Tubo de cobre fixado e a trespassar a face superior da armadilha de entrada. A linha de fibra Spectra passa no interior do tubo, ligando o pedal ao pino do gatilho.

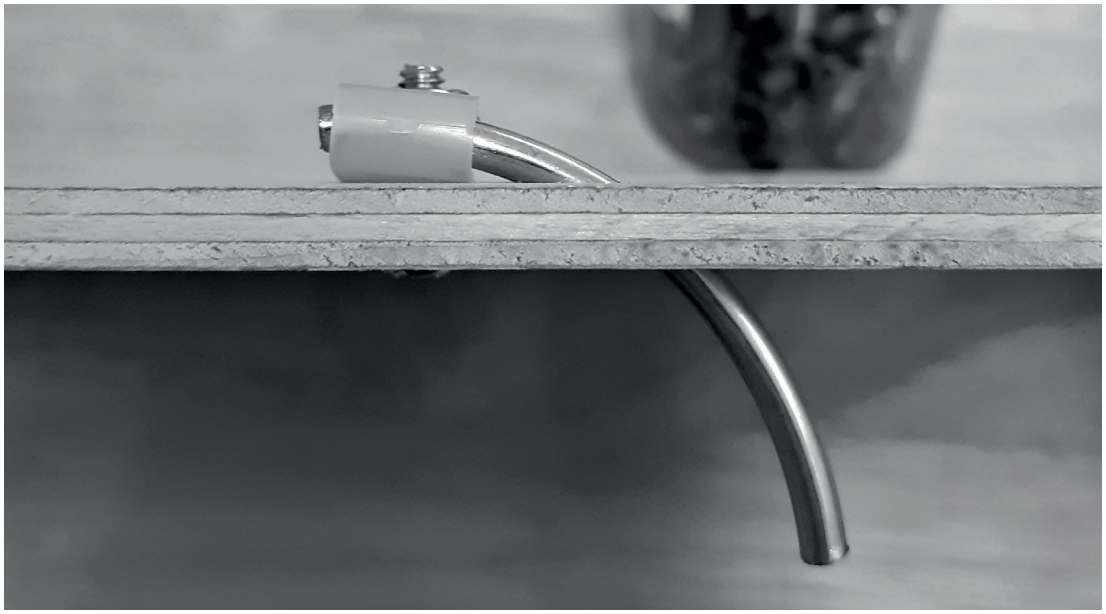


Figure 16 - Trigger mechanism for patio trap door.

Figura 16 - Mecanismo do gatilho da porta da armadilha de entrada.

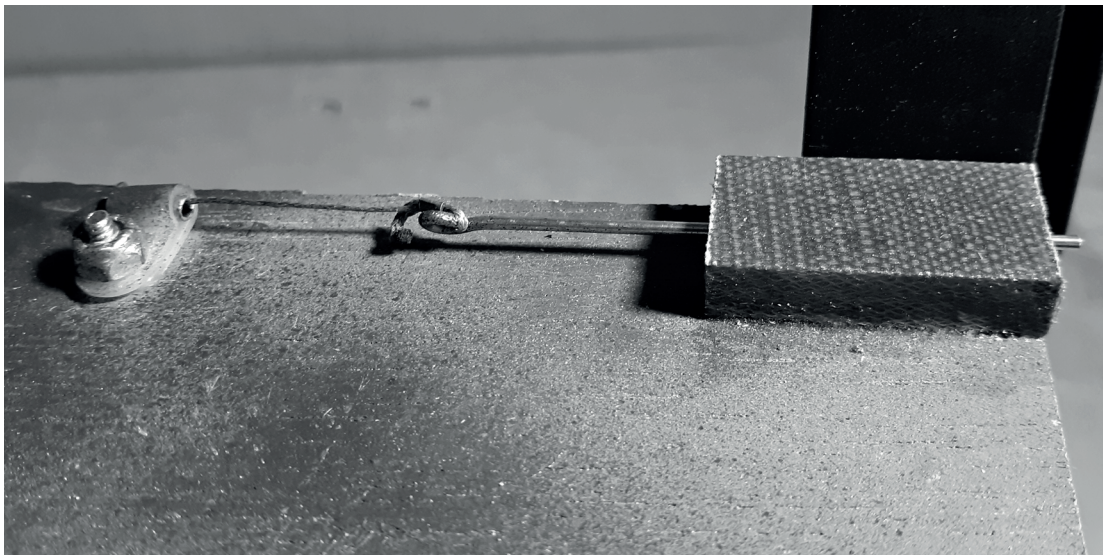


Figure 17 - An LED light fixture bolted to the bottom of the patio trap.

Figura 17 - Luminária LED aparafusada à base da armadilha de entrada.

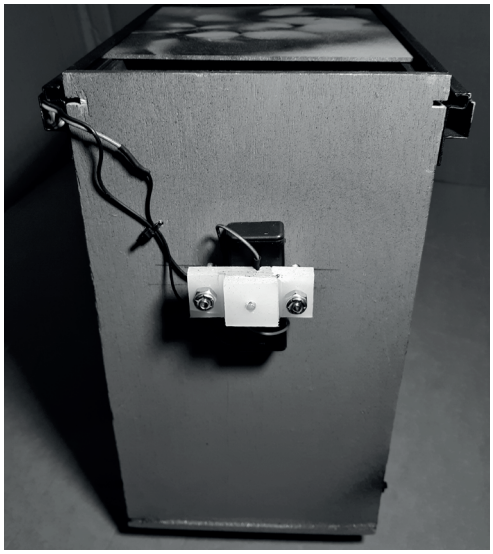
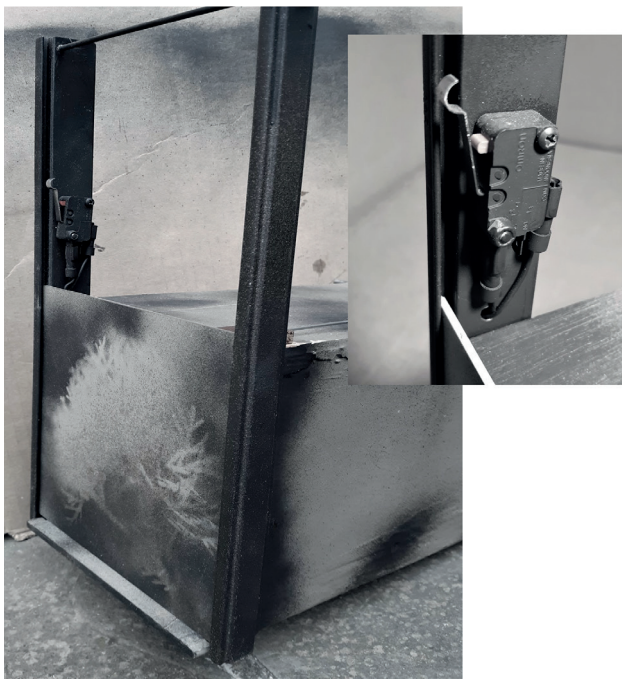


Figure 18 - View of the microswitch mounted on the inside of the right-side vertical bracket; trap door is down (as if owl was captured).

Figura 18 - Vista do micro-interruptor instalado no interior do suporte vertical do lado direito; a porta de guilhotina da armadilha está fechada (como quando um mocho é capturado).



basic/snap-action miniature switch, part D3V-014-1C23, simulated roller lever) was mounted to the inside of the right metal upright (Fig. 18). When the door was up, the microswitch was closed, but when the door dropped down, the microswitch was open, and the LED light came on. The light was mounted to the bottom of the trap, as most nest boxes were about 4-5 m above the ground, and the light projected from the bottom was more easily seen. This allowed researchers to determine when an owl was captured in the trap and likewise to stay away from the nest site when the light was off, thereby minimizing disturbance to the owls.

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