

Handling tree squirrels with a safe and efficient restraint

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Abstract The most desirable handling techniques consider the safety of the study organism and the researcher, maximize efficiency by minimizing handling times, and reduce costs. I detail a handling device for tree squirrels that is safe, efficient, inexpensive, and portable. The restraint has been used to handle >3,500 individuals of 7 species of tree squirrel with a mortality rate of <0.01%. The cloth device enables handling of tree squirrels with minimal mortality in the field.

Key words handling techniques, squirrels, Sciuridae

Tree squirrels (Sciuridae: Sciurini and Tamiasciurini) are found throughout Eurasia, North America, and South America (Wilson and Reeder 1993), where they are handled for various motives, including pest control (Jackson 1983), educational studies (Brown and Downhower 1987), and scientific research (Gurnell 1987, Steele et al. 1998). Live trapping typically is accomplished with a modified box trap; capture success is enhanced by prebaiting and cool sunny weather (Baumgartner 1940, Perry et al. 1977, Gurnell and Pepper 1994). The most efficient means of handling squirrels is to fit a device over the trap entrance that allows a squirrel to move from the trap directly into the restraint, thereby minimizing the risk of escape and injury due to direct handling. Metal mesh or wire handling devices (Baumgartner 1940, Halvorson 1972, Day et al. 1980, Holm 1987), cloth net bags (Horwich 1972), and bags that permit the head to protrude (Arenz 1997, Becker et al. 1998) have been used by numerous researchers to physically restrain tree squirrels.

Tree squirrels are susceptible to shock (Guthrie et al. 1967). None of the previously described devices covers the eyes of the animal subject; cover leads to the maintenance of a normal heart rate and amelioration of other signs of stress in tree squirrels (Smith and Johnson 1984). Chemical immobilants including injectibles (Kantola and Humphrey 1990,

Arenz 1997, Venning et al. 1997, Lavenex et al. 2000) and inhalants (Barry 1972) have been used in the handling of squirrels with some success, yet the costs, regulations, potential for overdose, and recovery time for these arboreal animals may not be desirable. Having used a variety of previously reported methods with only moderate satisfaction, I desired a method of restraint that was portable, restrained the animal effectively without chemical immobilants, permitted access to the entire body except the mouth, and decreased the likelihood of handling shock. Herein, I report on a cloth handling bag that meets all of these criteria and has been used effectively on 7 species of tree squirrel.

Methods

Design

The handling bag was constructed with light or medium-weight cotton denim, canvas, or other strong fabric with all Velcro®-type fasteners attached by standard nylon or polyester embroidery thread (Figure 1). The cloth was rolled into a cone shape, and the adjustable fasteners were attached to provide a strong and yet flexible cloth restraint device that tapered to a small opening through which the snout protruded. A single 2.5- or 3.8-cm-wide fastener was attached along the length of bag to permit access to any portion of the

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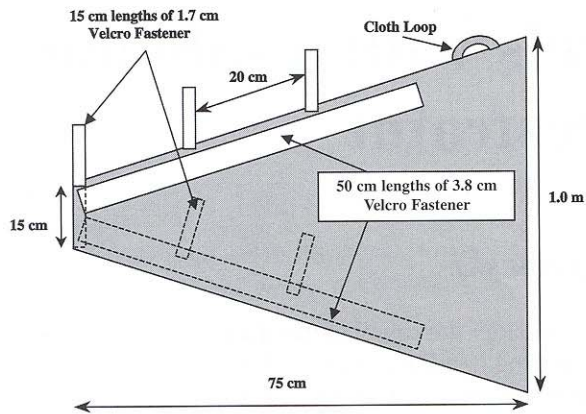


Figure 1. Handling cone design with cloth cone opened and expanded to present the inside of the bag. Dotted lines signify attachment of the loop portion of the fasteners on the underside of the cloth (shaded) while the hook portion of the fasteners is placed on the upper side of the cloth.

animal between the pieces of longitudinal fastener (Figure 2); 1.7-cm-wide strips of fastener were sewn perpendicular to this length to provide a lateral support and further restraint as the researcher accessed the animal. A small loop was affixed to facilitate weighing of captured squirrels with a portable spring scale after cinching a distal lateral fastener. The cost of newly purchased materials was under US \$30 in 2001.

Use of the cone

The handling cone was fit over the end of standard-sized box traps used for squirrels (approximately 15.2 cm × 15.2 cm × 48.3 cm), enabling the animal to be flushed into the tapered end of the



Figure 2. Determining the reproductive condition of a female Abert's squirrel restrained in the cloth handling cone. Photo courtesy of A. Edelman and J. Edelman.

cone. Chemical restraint was not necessary. The handling cone permitted easy access to selected body parts of squirrels through the fastening straps. For instance, I affixed ear tags and radiocollars by cinching the distal straps near the hip and opening the longitudinal fastener immediately posterior to the head; the bag restrained the animal from turning to escape through the small portal. I have assessed body mass, hind foot length, shin length, tail length, ear length, testis length, ectoparasitism, external wounds, reproductive condition, and body fat composition of animals restrained in the bag (Figure 2). I also have collected tissues by ear notching and blood from nail cores. Furthermore, the design enabled the application of fur dye and freeze marks.

Results and discussion

Although susceptible to handling shock, squirrels can be handled with minimal mortality using the handling cone. While a squirrel is restrained in the cone, its heart and respiration rates drop noticeably from the elevated rates characteristic of newly captured squirrels. No mortalities or injuries occurred in 47 Douglas squirrels (*Tamiasciurus douglasii*), 8 red squirrels (*T. hudsonicus*), 13 Abert's squirrels (*Sciurus aberti*), 65 western gray squirrels (*S. griseus*), 43 Mexican fox squirrels (*S. nayaritensis*), and 857 fox squirrels (*S. niger*) handled with this device. Among eastern gray squirrels (*S. carolinensis*), only 3 of 2,458 (0.01%) died or were injured during handling using the cloth cone. Two of the mortalities appeared related to physical exhaustion. Both animals were first captures and in the lower twentieth percentile of body mass. The population was well marked with >80% of observed and captured animals previously marked, suggesting that the new animals may have been transients. The third mortality was the result of suffocation when the front paw lodged in the throat while the animal was in the cone. A quick initial check of the location of the front feet in the handling cone is now part of the standard handling protocol to minimize the likelihood of reoccurrence. The overall handling mortality rate using this device across tree squirrel species was only 0.009% of 3,491 individual captures. Furthermore, the handling cone was used on 97 rock squirrels (*Spermophilus variegatus*), 31 Townsend chipmunks (*Tamias townsendii*), 18 northern flying squirrels (*Glaucomys sabrinus*), 16 cliff chipmunks (*T. dorsalis*),

8 least chipmunks (*T. minimus*), and 4 California ground squirrels (*S. beecheyi*) without mortality, suggesting the wider potential applicability of this device.

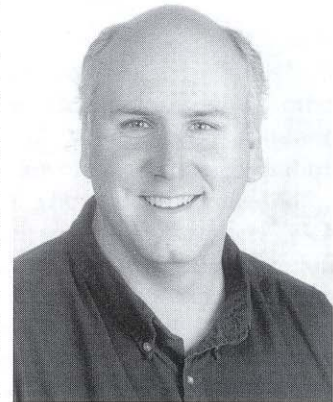
The cloth handling cone enables a single researcher to efficiently and safely handle numerous squirrels in the field without the need to retain animals that must recover from anesthesia (Arenz 1997). The handling bag easily compacts to a cylinder 24 cm long and 8 cm in diameter that can be carried in the pocket of a small backpack. The design is machine-washable and can be sprayed or soaked with disinfectants in the field. I have routinely used individual handling cones for 5 years. The portability, efficacy, reasonable cost, and durability of the cloth cone described here provide a feasible and safe alternative for handling tree squirrels.

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