A NOVEL SYSTEM FOR CAPTURE AND IMMOBILITATION OF STRIPED SKUNKS

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Abstract: We developed and tested an effective, inexpensive, and safe system for capturing and immobilizing striped skunks (*Mephitis mephitis*). The system consists of a large plastic storage container (50 x 30 x 32 cm) fixed to a 2-m handle. Target animals are approached on foot and the device is placed over them. A detachable internal panel is then used to hold the skunk against the opposite side of the device where immobilizing drugs can be administered through access ports. During a short pilot study, the system was successfully used to capture 7 skunks. Although scenting by skunks did occur on 3 occasions while animals were pursued and 2 times when captured, the long handle and solid walled design of the box successfully protected handlers from direct spraying. This system is most effective in open habitats where skunks can be more easily located and pursued.

TRANSACTIONS OF THE WESTERN SECTION OF THE WILDLIFE SOCIETY 43:56-61; 2007

Key words: California, capture system, immobilization, *Mephitis mephitis*, striped skunk, urban.

Many ecological studies rely extensively on capture and release techniques (Kozlowski et al. 2003). Researchers are obligated to ensure that capture and handling techniques are not only effective, but also safeguard the welfare of both captured animals and research staff. Standard box/cage live traps (e.g., Tomahawk and Havahart traps) have been used with great success in many mammalian studies (Bixler and Gittleman 2000, Lariviere and Messier 2001, Baldwin et al. 2004, Hansen et al. 2004). However, skunks can constitute a particular challenge due to their chemical defenses, and standard capture methods may not be optimal.

We needed to capture striped skunks (*Mephitis mephitis*) as part of a pilot project to examine interactions between this species and endangered San Joaquin kit foxes (*Vulpes macrotis mutica*) in an urban environment. We were able to capture skunks using conventional wire-mesh live-traps (38 x 38 x 107-cm double-door traps; Tomahawk Equipment Company, Tomahawk, WI USA), which were the traps we routinely used to capture kit foxes. However, skunk capture using these traps proved problematic. We were trapping in an area of high human activity, which meant that traps and captured animals might be exposed to an increased risk of vandalism and injury. Also, potential human contact with trapped skunks could constitute a public health hazard. Additionally, the U.S. Fish and Wildlife Service proscribe San Joaquin kit fox trapping during 16 January-30 April so as not to interfere with breeding and early pup rearing. Thus, cage traps could not be used during this period. Furthermore, cage traps provide sufficient space for skunks to move, such that administering immobilizing drugs can be difficult. Finally, we desired a capture method that significantly reduced the potential for field researchers to be directly sprayed by skunks. Thus, we were presented with a unique set of logistical problems that necessitated the development of a novel approach to capturing and restraining striped skunks.

We developed a capture system for striped skunks that (1) was simple and inexpensive to construct, (2) presented minimal risk for skunks, (3) presented minimal risk to the public and to researchers, (4) precluded captures of kit foxes, and (5) facilitated the administration of immobilizing drugs. We then field-tested this capture system in a short pilot project.

STUDY AREA

We tested the capture system on skunks inhabiting the campus of the California State University in Bakersfield, Kern County, California. The campus is in the southwestern portion of Bakersfield, which has a population of over 300,000 people. The campus is surrounded by urban developments consisting primarily of high-density residential areas, retail complexes, and office complexes. The campus is approximately 200 ha in size and large portions of the campus are undeveloped. Several kit fox family groups are resident on campus and produce young annually (Endangered Species Re-

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covery Program, unpublished data). Striped skunks also are abundant on campus and produce young annually as well.

METHODS

Capture System Description

The primary feature of the new system (Fig.1) is a capture box consisting of an inverted solid-walled, transparent plastic storage container (approximate dimensions 50 x 30 x 32 cm). The box is suspended from a 2-m long section of PVC piping (3.5-cm diameter), which is used as a handle. Skunks are approached on foot (Fig. 2). The box is placed over the skunk thereby securing the animal and also protecting the trapper from being sprayed.

A restraining device is built into the box that allows the trapper to safely maneuver the skunk into a position from which immobilizing drugs can be easily administered. The restraining device consisted of a section of high-density polyethylene, food preparation cutting board, (approximate dimensions 12″ x 10.5″), that was attached to the interior of the trap box with wire fasteners (Fig. 3). We placed a bolt through the center of the board such that the threaded end of the bolt protruded out through a small hole in the side of the box. Upon successful capture of a skunk, we threaded a long handle onto the bolt. In our case, we used a fiberglass arrow shaft. We then detached the board from the sidewall and used it to gently press the animal against the opposite side of the trap. The board could be easily maneuvered within the box to position the skunk against the trap and prevent the animal from moving behind the deployed board. A series of holes cut into the adjacent side of the box body allowed for the insertion of a syringe to administer the immobilization drugs. We left the box over the skunk until it was fully immobilized.

Field Test

We tested the skunk capture system during January–March 2006. Capture and handling methods were consistent with animal welfare guidelines established by the American Society of Mammalogists (Animal Care and Use Committee 1998). We initially located skunks located by spotlighting from a vehicle using a 1,000,000 candlepower search light. Ideally, we did not attempt to capture a skunk until it moved into an open area far from the protection of buildings and other denning structures. This occasionally required long observation periods before initiating a capture attempt. Once we observed the animal had moved into a suitable open area, one person approached on foot and used the long PVC handle to extend the trap as far out as possible. This not only increased the reach of the trap but also directed spraying from an alerted skunk away from the trapper and towards the trap-box itself. We found that running toward the skunk frequently alerted it to our presence, but that with a slow steady approach making as little noise as

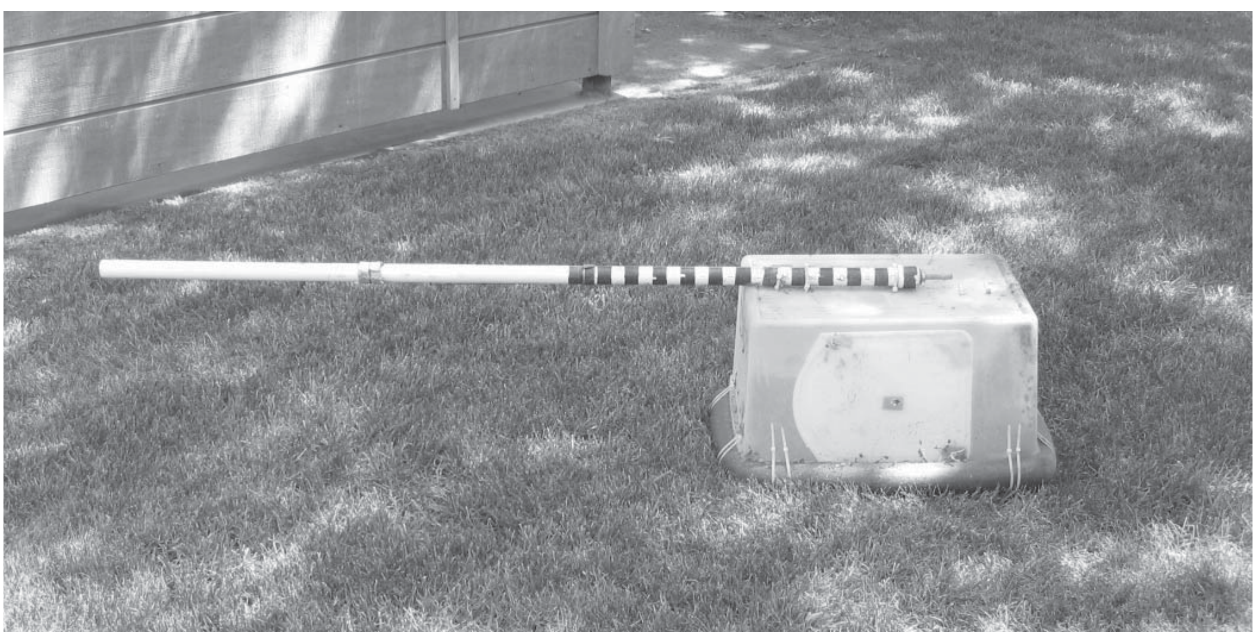

Figure 1. Trap box: The trap design consists of an inverted plastic storage container suspended from a 2-m long PVC handle. An internal restraining device is used to hold the animal against the side of the box so immobilizing drugs can be administered.

possible, by the end of the study the trapper was able to place the box over the skunk before it was aware of our presence.

Once we captured a skunk in the box, we examined it through the transparent sides of the box to determine whether it would be anesthetized. We did not immobilize animals that were too small for radio collars (ca. < 1.5 kg). Also, some animals had neck wounds characterized by alopecia and open sores, possibly associated with a filarial disease (Saito and Little 1997) , and were not suitable for radio collaring. Placing radio collars on these animals could have aggravated their wounds. We quickly and safely released unsuitable animals from the trap by simply tilting the box towards the handler and allowing the animal to exit in the opposite direction.

We anesthetized skunks that were suitable candidates for collaring. We used 0.3 cc of Dormitor (medetomidine hydrochloride) and 0.2 cc of Ketaset (ketamine hydrochloride). Animals were fully immobilized in 5-10 min. For each skunk we determined its sex, weighed ear-tagged it, and examined it for gross injuries. We placed radio collars, weighing approximately 39 grams, (Advanced Telemetry Systems, Isanti, MN model # M3910) on most animals. Processing required ca. 15-20 min, and the skunks usually were beginning to exhibit signs of recovery from anesthesia at that time. We then placed animals in a safe location (e.g., away from roads or water), and we administered 0.3 cc of Antesedan (Atipamezole hydrochloride) to reverse the Dormitor. Skunks usually were mobile in 5-10 min.

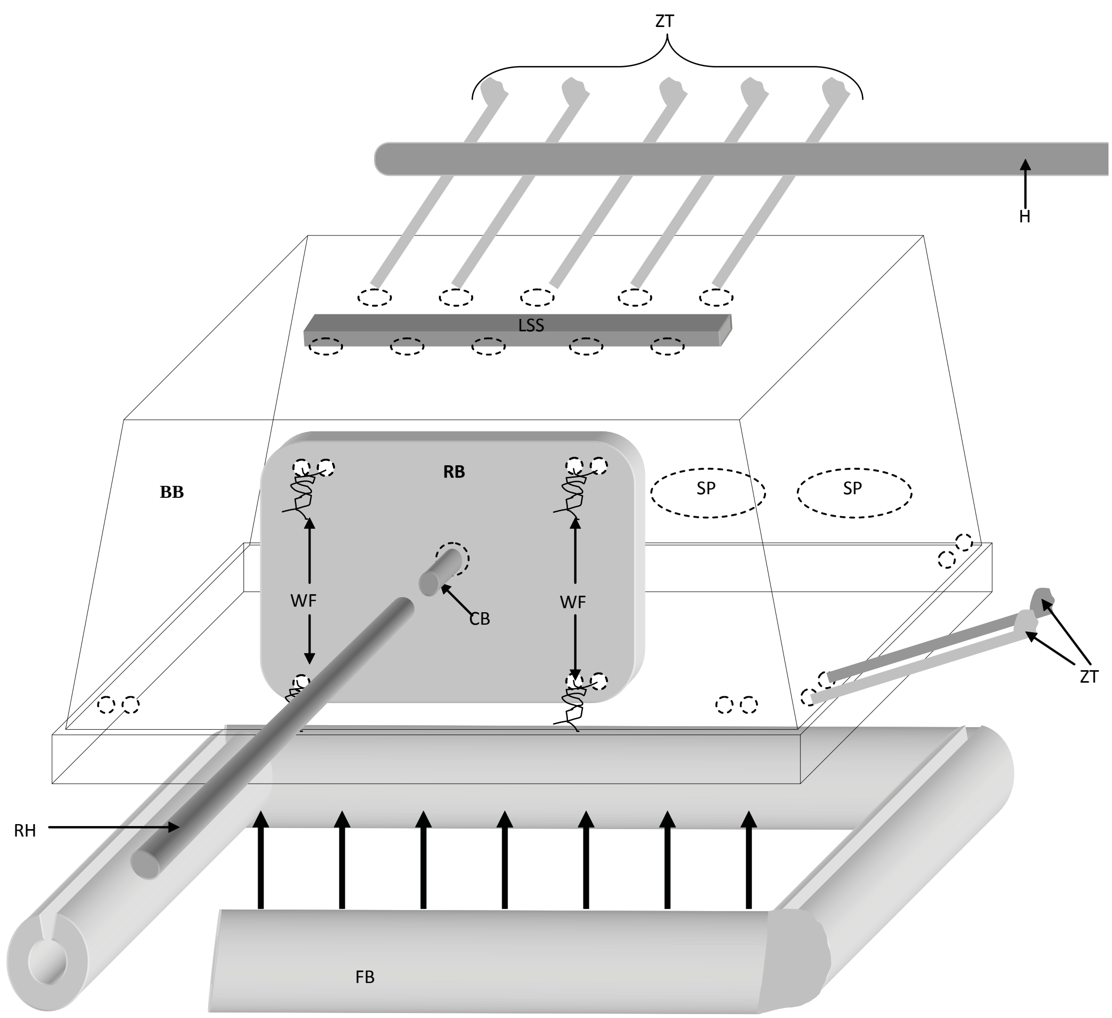

Figure 2. Exploded diagram of trap box assembly. BAP = Bumper Attachment Points (only two sides shown), BB = Box Body, CB = Central Bolt, FB = Foam Bumper, H = Handle, HAP = Handle Attachment Points, LSS = Lath Stake Support, RB = Restraining Board, RH = Restraining board Handle, SP = Syringe Ports, WF = Wire Fasteners, ZT = Zip Ties. For detailed instructions on assembly of the trap box, contact the author.

RESULTS

We attempted to capture skunks for ca. 2 hours per night on 8 nights. We captured 7 skunks in 9 attempts with the new system. Of these, 4 were anesthetized and collared, 1 was a recapture, and 2 were released immediately due to their small size and neck wounds, respectively. Two attempts were unsuccessful because skunks became aware of the approaching trapper and were able to retreat to the safety of a den before they could be caught. On 3 occasions skunks did spray before being captured. These incidents occurred during early capture attempts when skunks detected the approaching researcher and then sprayed while fleeing. On all 3 occasions, the researcher ran towards the skunk with the intention of capturing the animals quickly before

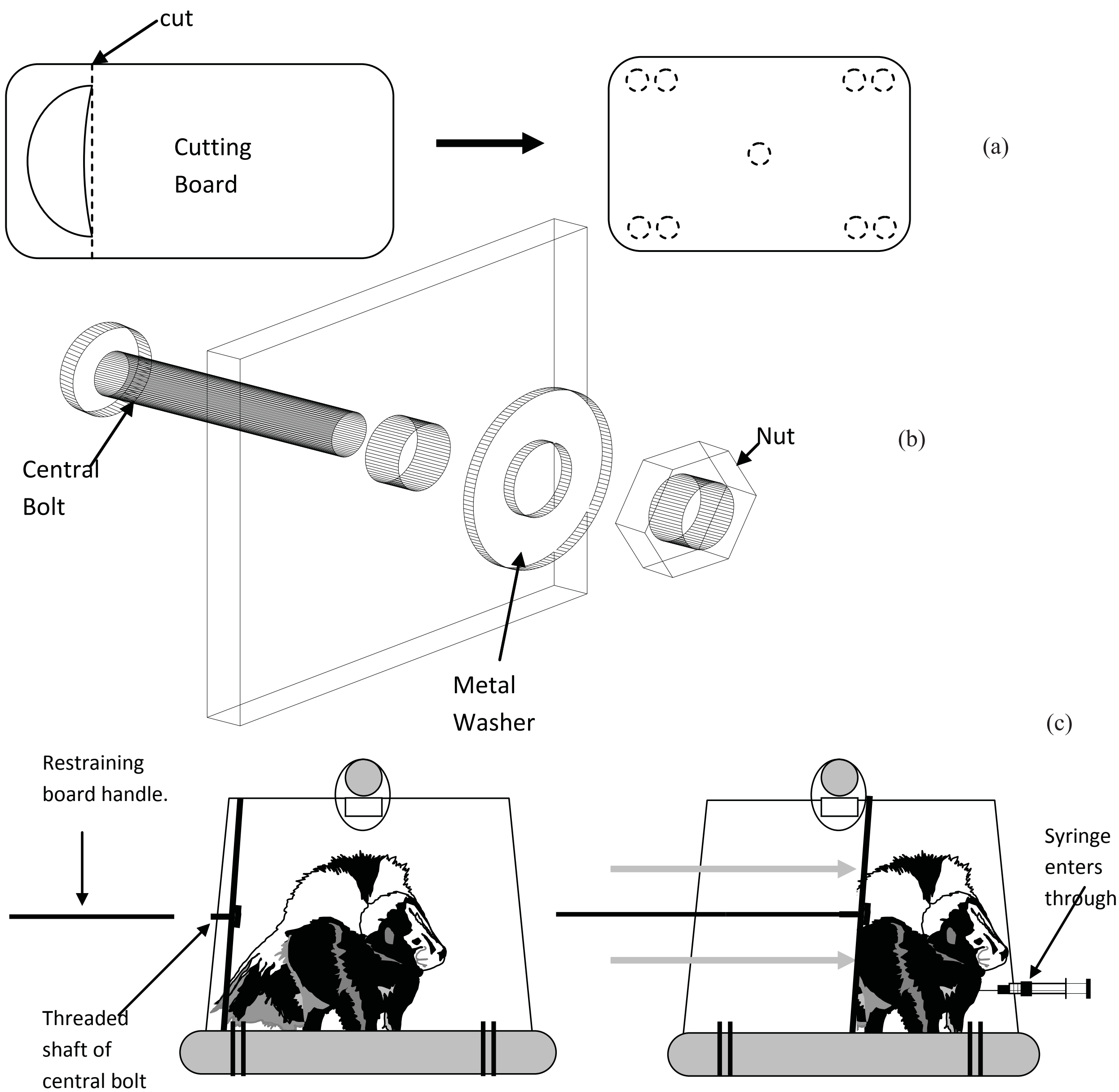

Figure 3. Internal restraining device: (a) Preparation of the restraining board, removal of the handle and position of holes for the central bolt and wire fasteners. (b) Attachment of the central bolt to the restraining board. On successful capture of a skunk the restraining board handle is threaded onto the central bolt of the restraining board (c). The handle is then used to gently press the skunk against the opposite side of the box (d) where immobilizing drugs can be administered through the syringe ports.

they could react. On these occasions, the researcher was not hit directly as the spray was aimed at the outstretched trap box. Adjusting the approach strategy so that the researcher approached the skunk in a calm slow manner from behind ensured that the animal was not alerted to the presence of the researcher until the trap was deployed. On 2 separate occasions captured skunks did spray inside the box trap when initially trap, however, the solid walled design of the box trap reduced the dispersal of the odor. The box was easily cleaned with skunk odor remover. (Nature's Miracle®, Pets 'N People, Hauppauge, NY 11788). No animals sprayed during deployment of the restraining board or release.

DISCUSSION

Many studies have successfully used traditional cage trapping to capture skunks (Bixler and Gittleman 2000, Lariviere and Messier 2001, Baldwin et al. 2004, Hansen et al. 2004). The new system presented here provides an alternative or supplemental means for the live capture and immobilization of skunks, particularly in situations were traditional methods are less desirable or are restricted. Similar methods for the live capture of skunks, with animals initially detected via spotlighting and then being captured on foot, have been described previously (Adams et al. 1964, Jacobson et al. 1970, Rosatte 1987, Gehrt 2005), but these methods have primarily relied on nets or additional restraining steps that could potentially expose handlers to spraying.

This system is inexpensive and simple to construct. Materials for one system cost ca. $40. In addition to being inexpensive, this new system offers a number of advantages: it significantly minimizes the risk of injury to skunks; there are no moving parts (e.g., trap doors) by which animals might be struck or caught; and animals are immediately anesthetized or released. With conventional cage trapping, animals may be in traps for hours, which increases the potential for injury (e.g., chewing on metal traps), prevents the animals from foraging, and increases the potential for discovery by the public and potential predators. Eliminating access to animals by non-researchers not only helps protect the skunks, but also helps protect public health, as skunks are known carriers of a number of communicable diseases (Verts 1969, Rosatte and Larivière 2003) and have been identified as the primary terrestrial host of rabies in California (Crawford-Miksza et al. 1999). Captured skunks can be easily anesthetized in a manner safe for them and also for researchers. If deployed properly, this system helps limit the potential for researchers to be sprayed by skunks. The potential for vandalism or theft of unattended traps is eliminated.

This system also eliminates captures of non-target species. This was particularly important in our situation where capture of endangered San Joaquin kit foxes is seasonally proscribed. Also, individual skunks can be selected for capture, whereas undesirable individuals can be excluded. In our situation, small individuals that could not be radio collared and individuals with head or neck wounds that precluded collaring could be avoided. Conversely, the system would provide a means of targeting highly desirable individuals, such as previously captured individuals requiring a new collar or additional data sampling (e.g., serial physiological monitoring).

A significant limitation of the capture system is that it is unlikely to be very effective in habitats with dense vegetation. Such vegetation would make spotlighting difficult, impede the pursuit of skunks, and offer refuge in which the skunks could escape capture. The system will be most effective in open habitats such as grasslands or forests with an open understory, and in anthropogenically modified habitats such as urban (as in this study) or certain agricultural environments. Also, spotlighting can alert an animal to the presence of humans thereby allowing them to seek refuge before capture can be attempted. A potential countermeasure would be to use a red filter on the spotlight to avoid premature detection by skunks.

A high likelihood of spraying is still associated with this method if the researcher is detected before the trap is deployed, although the chances of receiving a direct discharge are greatly reduced. As a precaution, we highly recommend the use of a full-face safety visor and protective clothing. We found that disposable hazardous materials suits ($59.98 per case 40 ct.; All Heart.com) worked extremely well to protect skin and clothing from drifting odor.

MANAGEMENT IMPLICATIONS

This new skunk capture system will facilitate investigations on skunks in habitats that do not lend themselves well to traditional cage trapping. In particular, skunks commonly are found in urban environments generating nuisance and public health issues. This capture system will provide an additional tool for use by researchers seeking to gather information on the demography and ecology of skunks in urban areas and epidemiological data, particularly with regard to zoonotic diseases.

ACKNOWLEDGMENTS

Funding for this project was provided by the Central Valley Project Conservation Program and the U.S. Bureau of Reclamation. The California State University-Bakersfield granted access to its campus for this project. We thank S. Bremner-Harrison, C. Van Horn Job, C. Fiehler, C. Bjurlin, and C. Wingert for field assistance, J. McGraw and L. Beaver for assistance with anesthetics. We also thank reviewers John H Harris and anonymous for their constructive input.

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