A review and summary of recent published research on the use of modified foothold or leghold traps

by

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Introduction

The objective of this document was to review and summarise recent published scientific results on foothold traps. Most published results were from studies conducted on coyotes (*Canis latrans*) in North America. Hopefully this information will inform current policy and stimulate future research on this topic in South Africa.

Steel-jawed foothold traps commonly are used to capture coyotes for fur, for biological research, and for depredation and population management (Shivik *et al*. 2000, 2005).

Foothold traps, or leghold traps, are highly selective devices (especially when targeting individual animals) and can be used to target specific species in locations (such as in urban areas) where use of firearms or poisons may be inappropriate (Muth *et al.* 2006). In such cases, foothold traps are often the best option available to control damage-causing animals.

The primary value of foothold traps is their versatility. They are portable, economical, efficient, and can be used in a variety of sets and cover types. Trap sets can be designed to select for target species, and they permit release of non-target animals, making them particularly useful for restraining mammalian predators that often are too wary to be trapped efficiently in other trap types (Earle *et al.* 2003).

Issues surrounding trapping

Standard steel-jawed foothold traps cause significant injuries to captured coyotes (Olsen *et al.* 1986, 1988; Onderka *et al.* 1990; Phillips *et al.* 1992) and other species (Olsen *et al.* 1986, 1988). For this reason, trapping has been criticized as being inhumane (Linscombe & Wright 1988), and lead to increased opposition (Olsen *et al.* 1986) and numerous attempts to restrict or eliminate such traditional coyote management tools (Huot & Bergman 2007). One reaction in the wildlife profession has been to encourage and support the development and use of more humane traps (Linscombe & Wright 1988).

According to Turkowski *et al.* (1984), Animal Damage Control (ADC)[1] efforts by the United States Fish and Wildlife Service (USFWS) have been hampered when traps set for coyotes were sprung by other animals. Traps are important tools in the ADC program. Therefore, the USFWS has investigated modified foothold traps intermittently since 1962 (see Olsen *et al.* 1986) and efforts were initiated to modify foothold traps, reducing leg injury to restrained animals (Linhart *et al.* 1981) and increasing selectivity (Turkowski *et al.* 1984). Studies to effectively pad the jaws of foothold traps were begun in 1980 (Olsen *et al.* 1986). Padded-jaw foothold traps significantly reduce foot injuries to captured coyotes and other species, compared to standard and laminated steel-jaw traps (Andelt *et al.* 1999).

[1] On March 1, 1986 the ADC programme was transferred from the USFWS to the USDA (later on August 1, 1997 to become the Wildlife Services of the USDA-APHIS) (Hawthorne 2004).

Attempts to test the performance of traps and assess the extent of trap-related injuries emphasised evaluating and minimising the frequency and severity of trap-related injuries without compromising trap performance (Earle *et al.* 2003). According to Olsen *et al.* (1988) and Hubert *et al.* (1997) padded jaws are the most significant trap modification and are a more humane method for capturing coyotes. Studies have shown that Soft Catch traps cause fewer and less severe injuries than unpadded leghold traps (Saunders & Rowsell 1984, cited by Olsen *et al.* 1986; Olsen *et al.* 1986, 1988; Onderka *et al.* 1990; Phillips *et al.* 1992) while having similar capture rates (Skinner & Todd 1990; Linhart & Dasch 1992; Phillips & Mullis 1996; Kamler *et al.* 2000). Additionally, smaller non-target species can be excluded while still effectively capturing target species if the trigger mechanisms on Soft Catch traps are set to go off at an appropriate weight (Kamler *et al.* 2002, as cited by Kamler *et al.* 2008).

Description of different foothold traps

Some examples of basic designs of different foothold traps [published by the International Association of Fish and Wildlife Agencies (IAFWA)[2] as Best Management Practices (2006)] are shown below.

However, the reader is referred to the original scientific publications for more detail on the specific devices[3] used in different studies.

The Victor 3 coil spring is a double coil spring trap with stamped, fully closing smooth steel, unpadded jaws, which have a spread of 15 cm. The trap is triggered by a pan and dog assembly and has a 24 cm chain attached by a swivel to one end of its base (Skinner & Todd 1990).

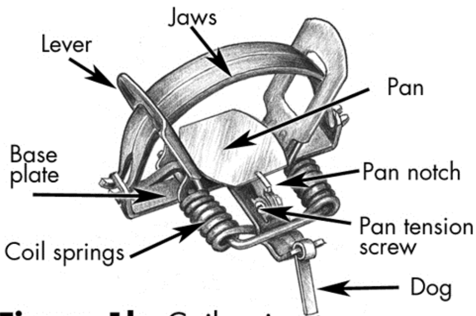

Figure 1b. Coil-spring trap

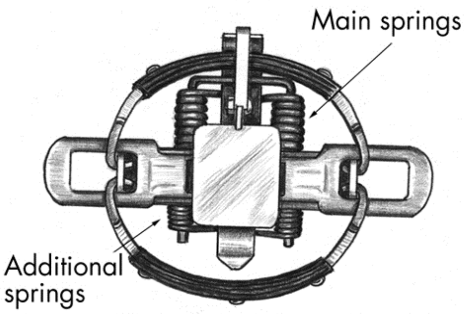

Figure 14. Additional springs (four-coiling)

The Victor No. 3 is an unpadded, double coil spring trap with stamped, offset jaws and a center-mounted 15 cm chain with no shock spring (Linhart & Dasch 1992).

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[2] *"The International Association of Fish and Wildlife Agencies (IAFWA) was founded in 1902. It is an organization of public agencies charged with the protection and management of North America's fish and wildlife resources. The 50 state fish and wildlife agencies, as well as provincial and territorial governments in Canada, are members. Federal natural resource agencies in Canada and the United States are also members. The Association has been a key organization in promoting sound resource management and strengthening state, provincial, federal, and private cooperation in protecting and managing fish and wildlife and their habitats in the public interest."* Copyright IAFWA 2006.

[3] Reference to trade names or companies does not imply endorsement of commercial products.

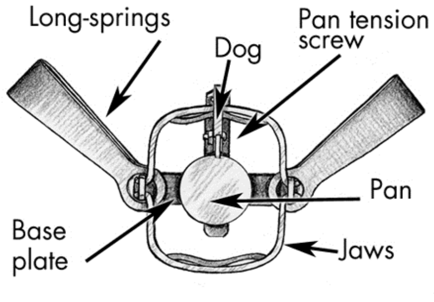


Figure 1a. Longspring Trap

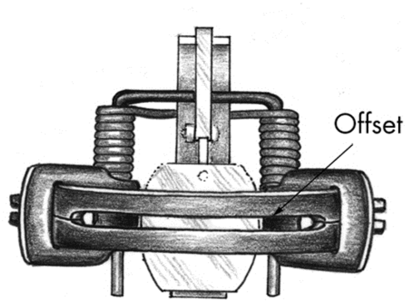


Figure 10. Offset jaws

The Victor 3NM is an unpadded, double longspring trap with offset malleable jaws and a 1 m kinkless chain, and is routinely used by the USDA's Animal Damage Control Program for coyotes (Linhart & Dasch 1992).

Improvements to traps have focused on improving the humaneness of devices towards the target animal, eliminating non-target captures, complying with regulations, and meeting political correctness (Huot & Bergman 2007). Modifications to foothold traps through time have included padded jaws, laminated jaws, pan-tension devices, inline springs, multiple swivels, and center-mounted chains to increase effectiveness, humaneness, and to reduce non-target capture.

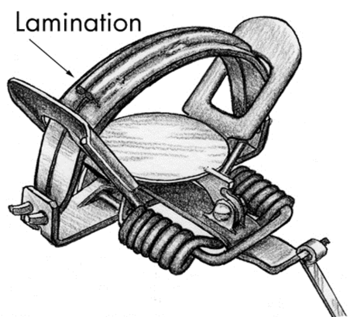


Figure 12. Laminated jaws

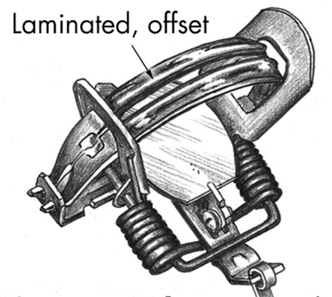


Figure WC7b: Laminated, offset trap

The No. 3 Northwoods (laminated) and the Sterling MJ600 (wide-jawed) traps are the most common types of traps used by trappers (Kamler *et al.* 2008). The unpadded Sterling MJ600 tested by Phillips *et al.* (1996) is equipped with four coil springs, a center-mounted, 36 cm kinkless chain and in-line shock spring. Trap jaws are 0.88 cm in width and offset 0.64 cm.

The No. 3 Northwoods is an unpadded trap equipped with two coil springs, a center-mounted, 36 cm kinkless chain and in-line shock spring. In a study by Phillips *et al.* (1996), this trap was modified by welding a 0.79 cm, rolled-steel lamination (key stock) strip across the bottom of each jaw making the total jaw width 1.28 cm, and jaws were filed to round the edges and to remove any metal burrs.

Laminating trap jaws substantially decreases cutting to the limbs of captured animals (Huot & Bergman).

Unpadded traps such as the Victor 3NM and 3NR, the No. 3 Victor coil spring, and the No. 4 Newhouse produce major injuries to coyotes (Phillips *et al.* 1996).

Several humane trapping methods have been developed in the United States to reduce or eliminate injuries to target species (Kamler *et al.* 2008). Foothold traps equipped with rubber padded jaws are commonly used as a predation management tool to control coyote populations.

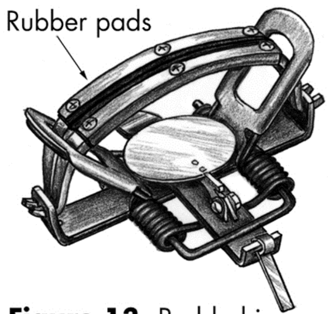


Figure 13. Padded jaws

The Soft Catch trap is a modified (with padded rubber jaws) Victor double coil spring trap which is similar in size and design to the Victor No. 3 coil spring, but the coil springs are somewhat weaker (Skinner & Todd 1990; Mowat *et al.* 1994). It has reduced foot injury sustained by most captured animals (Linhart & Dasch 1992).

An early model of the Soft Catch trap had lower capture rates than standard traps (Andelt *et al.* 1999). Inconsistencies regarding its efficiency in comparison with unpadded traps likely resulted in part from varied trapper experience and trapping techniques, the environmental factors associated with different test sites, and possibly the species trapped (Linhart & Dasch 1992).

Woodstream Corporation responded to complaints of poor trap performance prior to 1999 by marketing No. 3 Victor Soft Catch traps with minimally pre-tensioned No. 3 springs instead of the No.1.75 springs originally designed for this model (Earle *et al.* 2003). This produced a faster trap with only a modest increase in clamping force. Andelt *et al.* (1999) reported that the latest (1997) version of Soft Catch traps has been manufactured with stronger springs, which may increase capture efficiency during wet conditions; and that additional springs also may increase efficiency.

Research showed that the newer and improved No. 3 Victor Soft Catch traps, when properly set, were as efficient as unpadded traps in capturing coyotes (see Andelt *et al.* 1999).

The No. 3½ EZ Grip is a padded double longspring trap, equipped with a center-mounted, 36 cm kinkless chain and in-line shock spring (Linhart & Dasch 1992). Phillips *et al.* (1996) described this trap as being similar to a Newhouse coyote trap, except that the jaws had been modified to accommodate rubber pads. Rubber is moulded to the hollow steel jaws so that both sides of the jaw surfaces are padded. The inside jaw width is 1.0 cm. The jaws are not offset, thus they close tightly against each other.

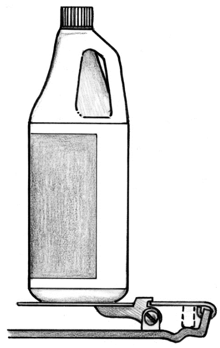
Victor No. 3 Soft Catch or other padded foothold traps can be very effective when used by experienced trappers (Skinner & Todd 1990; Huot & Bergman 2007).

Other devices designed to improve efficiency and selectivity of foothold traps

Several alternatives to padded jaw traps for capturing coyotes have been proposed in an attempt to simultaneously address animal welfare concerns and the widespread perception of inefficiency associated with the Soft Catch trap (Hubert *et al.* 1997).

Trap selectivity for large species, such as coyotes, can be increased significantly by attaching a pan tension device, which increases the weight on the pan required to fire the trap, thus excluding small animals (see Andelt *et al.* 1999). Traps modified with pan tension devices exclude 92-100% small non-target animals, whereas unmodified traps excluded only 6% (Turkowski *et al.*1984).

Turkowski *et al.* (1984) tested the shear-pin tension (Paws-I-Trip) device, which is installed on traps by replacing the dog, trap pan, and shank; as well as the leaf spring device. The Paws-I-Trip pan-tension device is capable of reducing non-target captures without adversely impacting performance of several popular coyote traps, the Victor No. 3 Soft Catch, Victor 3NM, and No. 4 Newhouse (Huot & Bergman 2007).



Improving technologies suggest that electronic monitoring of foothold traps and other capture devices can be made practical and cost-effective (Huot & Bergman 2007). Such remote monitoring technologies will save time in monitoring traps by reducing travel time, also allowing an increase in the number of devices that can be checked by one individual. They will also permit more immediate response to activated devices, thus reducing stress to captured animals and permitting timely release of non-target animals.

Publications

Relevant aspects are cited as a summary from recent scientific publications during specific timeframes regarding foothold or leghold traps.

1980-1990

Turkowski, F.J., Armistead, A.R. & Linhart, S.B. 1984. Selectivity and effectiveness of pan devices for coyote foothold traps. *Journal of Wildlife Management* 48: 700-708

Trap selectivity and efficacy are major issues raised by proponents of restricting or prohibiting use of steel traps. One method of increasing trap selectivity for coyotes is to increase the force required to spring them so that smaller species are excluded, and various trap pan tension devices have been developed for that purpose.

This paper discusses the relative selectivity and efficacy of three types of pan tension devices (shear-pin, leaf spring, steel tape) on 3NM (malleable jaw) Victor steel traps under various field conditions and compares their performance with the standard 3N-M trap[4].

Coyote capture rates in initial field tests were lower for modified traps than standard traps when set in wet clay or alkali soils. Shear-pin and leaf spring devices were then modified and zinc-plated to reduce rusting caused by moisture and to improve trap performance. Exclusion rates (percentage of animals that stepped on pans and were excluded) in subsequent field tests for all designated non-target animals for the wet soil test were 92, 100, 95, and 6% for shear-pin, leaf spring, steel tape, and standard traps, respectively. Improvements increased the coyote capture rate in wet clay or alkali soils from 62% (prototype) to 89% (improved) for shear-pin traps and from 46% (prototype) to 94% (improved) for leaf spring-equipped traps in the same test areas used in 1980. Either a single improvement or a combination of two or more improvements was responsible for better performance.

Mean exclusion rates for combined designated non-target species for shear-pin and leaf spring-equipped traps were 91 and 90%, respectively. Only 30% of the animals that stepped on standard traps were excluded. Modified traps excluded a greater percentage of non-target animals in each test state. Modified traps occasionally failed to capture coyotes, but by excluding many non-target animals, more traps remained set and operable for taking coyotes. Overall, coyote captures should therefore increase through the use of trap pan tension devices, the devices also decrease time and effort required to release or dispose of trapped non-target animals, remove carcasses, and reset traps.

Linhart, S.B., Dasch, G.H., Male, C.B. & Engeman, R.M. 1986. Efficiency of unpadded and padded steel foothold traps for capturing coyotes. *Wildlife Society Bulletin* 14: 212-218

Although steel traps are one of the most versatile techniques for controlling coyote damage, society has become increasingly opposed to steel traps and trapping. This article reports on the effectiveness of four padded traps compared to a so-called standard trap.

The Victor 3 NM is the trap most widely used by the USFWS and co-operators for capturing coyotes that depredate livestock, and was selected as a “standard” against which to test the effectiveness of the padded Victor 3 NR and Victor No. 3 Soft Catch[5].

Closure speed of foothold traps is one measure of trap efficiency. Traps that operate slowly may have lower catch rates, particularly under marginal trapping conditions or when set for animals with rapid avoidance responses such as foxes and coyotes. The padded traps had slower closure speeds, and rates of catching coyotes in the field were lower than with the unpadded traps normally used by ADC personnel.

The ability of traps to function under marginal conditions, such as in wet and frozen soils, is another measure of efficiency. While the padded-jaw traps were somewhat less efficient, they were able to capture and hold coyotes under moderate trapping conditions. Unpadded traps sprung more frequently than padded traps when coyotes stepped on trap pans. More coyotes

[4] Test trap lines were similar to those used for routine depredation control activities. Traps were set in the usual manner and were normally checked daily.

[5] Predator control specialists supervised by the ADC program conducted field tests. All were experienced trappers selected by their supervisors as well qualified to collect and record data. Trappers checked trap lines daily, removed any coyotes caught, and completed a daily field data sheet.

pulled out of padded than unpadded traps, and the number of toe-caught coyotes was higher for the padded 3 NR than for the Soft Catch or unpadded traps. According to the manufacturer, some of the problems causing lessened efficiency have been corrected.

Olsen, G.H., Linhart, S.B., Holmes, R.A., Dasch, G.J. & Male, C.B. 1986. Injuries to coyotes caught in padded and unpadded steel foothold traps. *Wildlife Society Bulletin* 14: 219-223

The study compared the extent of injury to coyotes and kit foxes (*Vulpes macrotis*) in padded and unpadded traps. Coyotes were captured with Victor long-spring 3 NR steel traps having padded and unpadded jaws and with Victor coil spring No. 3 Soft Catch traps.

Legs from coyotes caught in unpadded traps had more injuries than legs from coyotes taken in the padded-jaw traps. All models of padded foothold traps reduced but did not eliminate trap-related foot injuries in coyotes and kit foxes. No statistical differences in extent of leg injury were found among the padded foothold traps, but injuries were reduced by 48-71% with the padded traps compared to the unpadded traps. Saunders and Rowsell (1984, as cited by Olsen *et al*., 1986) evaluated Victor coil spring padded traps No. 1½ and No. 3 and concluded that coyote and red fox (*Vulpes vulpes)* injuries were reduced by 80-85%.

Unpadded traps were associated with compression fractures. The type of leg damage encountered with the unpadded 3 NR trap was most often (67%) complete or nearly complete amputation

Linscombe, R.G. & Wright, V.L. 1988. Efficiency of padded foothold traps for capturing terrestrial furbearers. *Wildlife Society Bulletin* 16: 307-309

The Victor "fox" and "coyote" Soft Catch padded traps and Nos. 1½ and 3 Victor coil spring traps were compared in this study.

Traps were redesigned to eliminate pan creep (which possibly causes low capture rates) and measures were taken to ensure better quality control in manufacture of the pads.

Nearly the same capture ratio was reported with standard traps and padded traps as in the study by Linhart *et al.* (1986), which suggests that padded traps might be expected to catch about 66% of the coyotes that could be captured with standard traps. However, as trappers learn to set new traps properly and with modifications to improve the traps, it is expected that this difference would decrease. The "coyote" padded and the standard No. 3 traps performed similarly in capturing coyotes.

Olsen, G.H., Linscombe, R.G., Wright, V.L. & Holmes, R.A. 1988. Reducing injuries to terrestrial furbearers by using padded foothold traps. *Wildlife Society Bulletin* 16: 303-307

The type and magnitude of limb injury sustained by furbearers captured by padded versus standard foothold traps were compared. Two standard foothold traps (Victor coil spring traps Nos. 1½ and 3) and two padded traps (the "fox" and "coyote" Soft Catch) were tested[6].

Most bobcats (*Lynx rufus*) were not seriously injured even with the No. 1 ½ standard trap. This low level of injury may be a result of the relatively large size of the foot, the shape of the foot, or the passive response of a trapped bobcat. The "coyote" padded trap caused less

[6] State biologists instructed selected trappers on procedures.

injury to both coyotes and bobcats than the No. 3 standard trap, which agrees with the results of Olsen *et al*. (1986). These results indicate that padded traps can substantially reduce limb injury to coyotes, bobcats, red and gray foxes (*Urocyon cinereoargenteus*), and raccoons (*Procyon lotor*) compared to injuries from standard foothold traps. Properly used, the padded trap has the potential for reducing injury.

Onderka, D.K., Skinner, D.L. & Todd, A.W. 1990. Injuries to coyotes and other species caused by four models of footholding devices. *Wildlife Society Bulletin* 18: 175-182

Limb and oral injuries to coyotes and other animals were compared among captures with padded (Victor No. 3 Soft Catch) and unpadded (Victor No. 3 coil spring) traps and Fremont and Novak foot snares.

Self-mutilation by chewing or biting was not observed. When evident, oral injuries were generally minor, such as chipping or loss of premolar teeth. More serious dental injuries were uncommon but distributed among all four devices. It is apparent that padding foothold traps may result in fewer and less severe oral injuries.

The Fremont foot snare and the padded trap generally caused fewer and less severe limb injuries. Moreover, fractures did not occur in coyotes or other animals caught in these two traps, although they were common in the unpadded trap and the Novak foot snare. Limbs of coyotes captured in the Fremont snare or padded trap were never fractured, but fractures commonly occurred in the Novak snare (50%) and unpadded trap (48%). Foot amputation occurred only in one coyote. Neck, shoulder, and chest injuries were not observed.

Among coyotes, limb injuries were affected by the mode of trap and anchoring for the Novak snare, and were three times higher for coyotes in traps which were tied down than for those fastened to drags.

Both the padded trap and the Fremont foot snare appear vastly superior to the unpadded trap and the Novak snare for capturing and holding terrestrial furbearers with minimal injury.

Skinner, D.L. & Todd, A.W. 1990. Evaluating efficiency of footholding devices for coyote capture. *Wildlife Society Bulletin* 18: 166-175

The efficiency of three modified foothold devices and a standard, unpadded foothold trap for capturing coyotes were compared. The types and occurrences of trapping failures are also described, and ancillary information on trap placement, use, and performance, and visitation of trap sets by coyotes is provided, as an aid to interpreting findings on comparative capture efficiency[7].

The capture efficiency of foothold traps was three times that of foot snares but did not differ between models of foothold traps or foot snares. Potential captures did not differ among devices. However, the capture rate was much higher for foothold traps than foot snares (45%

[7] Trappers were chosen on the basis of their skill at trapping canids and willingness to participate. Studies in each area were conducted by the trapper and a technician. The continuous technical supervision was intended to discern and hopefully eliminate any device-specific bias among trappers which might affect capture efficiency. The trapper was responsible for selecting trapping sites and making sets, whereas the technician collected data and checked sets. Technicians checked individual trap sets daily and recorded captures or animal activity in the vicinity.

vs. 15%), which suggests that the devices themselves were the major factor affecting trap performance.

No significant difference was found in the capture performance of the padded and unpadded foothold traps.

1991-2000

Linhart, S.B. & Dasch, G.J. 1992. Improved performance of padded jaw traps for capturing coyotes. *Wildlife Society Bulletin* 20: 63-66

Earlier field tests (Linhart *et al*. 1986, 1988) of the capability of the No. 3 Soft Catch trap to capture coyotes showed it to be less effective than unpadded traps. However, a fourth-generation model of the Soft Catch trap that differed mechanically from the previous prototypes subsequently became available. Moreover, setting procedures for the Soft Catch trap and familiarity with the trap by field personnel affected its performance.

A standard, unpadded Victor 3 NM double long-spring trap with offset malleable jaws; a standard, unpadded No. 3 Victor double coil-spring trap with stamped offset jaws; and the fourth-generation No. 3 Victor Soft Catch with replaceable synthetic rubberlike jaw pads, were tested.

Capture rates did not differ among long-spring, coil-spring and Soft Catch traps. The capture rate for the Victor 3 NM (83%) was similar, but the capture rate for the Soft Catch trap was much greater (79%) than was previously reported by Linhart *et al*. (1986, 1988). These results indicate that performance of the fourth-generation Soft Catch trap was improved by either the shortened levers or the use of the trap manufacturer’s recommended setting procedure, or both.

The data indicate that the coyote capture rate for the fourth-generation Soft Catch trap is comparable to that for unpadded models, at least in southern Texas at a time of year when trapping conditions are generally favourable.

Mowat, G., Slough, B.G. & Rivard, R. 1994. A comparison of three live capturing devices for lynx: capture efficiency and injuries. *Wildlife Society Bulletin* 22: 644-650.

Lynx (*Lynx lynx*) were captured using wire box traps (Tomahawk 110A and 209.5), padded jaw foothold traps (Victor 3 Soft Catch), and foot snares (Freemont)[8]. The capture efficiency and injury rates of these devices were compared under conditions of freezing and subfreezing temperatures and accumulated and falling snow.

Lynx were found to avoid box traps and leg snares more than foothold traps. The capture rate of box traps and foot snares was about two thirds that of foothold traps. Use of foothold traps at temperatures below -8°C resulted in an unacceptable risk of freezing injury. However, because the foothold trap has a low risk of injury, is very easy to use, requires little modification, is less expensive, and is highly efficient, it may still be preferable for summer

[8] All traps were examined daily. To prevent the capture of most small animals, pan tension of foothold traps was set at 1 kg by filing the dog.

live-capturing of lynx. Foothold traps were used occasionally if overnight temperatures were above -10°C.

The Freemont foot snare as modified for this study achieved a capture rate equal to the box trap and near that of the padded foothold trap, and is recommended for live-capture of lynx in winter. The capture rate was more than 3 times that reported by Skinner and Todd (1990) for coyotes. Capture rates for lynx can be expected to be higher than for coyotes because coyotes are more cautious when approaching a trap, are more powerful, and have smaller feet. The capture rate for Soft Catch traps (91%) was also higher than reported for coyotes by Skinner and Todd (1990; 45%) or Linhart and Dasch (1992; 79%).

Box traps were not recommended for lynx live-capture because they had low efficiency, were cumbersome to transport, and were expensive.

Phillips, R.L. & Mullis, C. 1996. Expanded field testing of the No 3 Victor Soft Catch trap. *Wildlife Society Bulletin* 24: 128-131

Four types of traps have been evaluated: (1) No. 3 Soft Catch padded jaw trap, (2) standard unpadded No. 4 Newhouse double-long spring trap, (3) standard unpadded Victor 3 NM double-long spring trap, and (4) Sterling MJ600 trap[9].

Capture rates ranged from 83% (No. 4 Newhouse) to 100% (Sterling MJ600) but did not differ statistically among the 4 trap types. These rates were similar to those reported by Linhart and Dasch (1992) and Phillips *et al.* (1992).

The MJ600 had significantly fewer toe captures than the Soft Catch or the Victor 3 NM. The No. 3 Victor Soft Catch trap was found to be as effective as other unpadded traps used for capturing coyotes under a variety of trapping conditions in the western United States. However, not all of the adverse trapping conditions that could occur were evaluated, and therefore this paper could not comment on the performance of the Soft Catch trap in all soil and weather conditions. According to the authors, the Soft Catch trap performed well in this study because the participants followed recommended trap-setting procedures. It is suggested that wildlife managers consider the results of this study in making decisions on the use of various types of traps.

Phillips, R.L., Gruver, K.S. & Williams, E.S. 1996. Leg injuries to coyotes captured in three types of foothold traps. *Wildlife Society Bulletin* 24: 260-263

The Livestock Protection Company in Alpine, Texas developed the No. 3½ EZ Grip padded trap for capturing coyotes. Since data have not been available on injuries caused by such new alternative traps, the objective of this publication is to describe, evaluate, and compare leg injuries for coyotes captured in the unpadded Sterling MJ600, the unpadded No. 3 Northwoods (modified with added lamination strips to the jaws), and the padded double longspring No. 3½ EZ Grip[10].

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[9] Personnel were selected on the basis of their trapping experience and geographic location so that trapping would be conducted in a variety of soil types and weather conditions. As traplines were established, a trapping specialist accompanied each ADCS to provide additional instruction on Soft Catch trap-setting procedures and to monitor the early phases of data collection.

[10] Traplines were established with all traps staked and checked daily.

Some level of edematous swelling was noted on the limbs of nearly all the captured animals (95%), with no apparent difference among trap types. Lacerations were observed in 87% of the limbs from unpadded Sterling and Northwoods traps while only 31% of the coyotes captured in EZ Grip padded traps received cuts. A higher frequency of more serious injuries was noted in the two unpadded traps.

Despite the wide and offset jaws of the Sterling and Northwoods traps, many severe injuries were observed. Most of the injuries probably resulted from cutaneous lacerations which opened a wound, allowing further tissue damage to occur. The Sterling MJ600 had the highest mean and maximum injury scores.

Fractures were relatively uncommon but occurred in 10% of Sterling MJ600 captures and in 4% of the EZ Grip and Northwoods captures. Two of the fractures in legs from the EZ Grip traps occurred at locations above the point of the trap impact, which lead to the conclusion that these fractures occurred as the animal struggled to escape from the trap. All other fractures occurred at point of trap impact. The reduced number of injuries for coyotes captured in padded EZ Grip traps confirmed the findings of Olsen *et al.* (1986), Linhart *et al.* (1988) and Onderka *et al.* (1990). Even though the EZ Grip was much larger and stronger than the No. 3 Victor Soft Catch, the injury patterns observed appeared to be similar for the two traps. The bone fractures in coyotes captured in EZ Grip traps could be related to the increased size and weight of this trap in comparison to the Soft Catch. The added weight and size may have allowed the coyotes enough leverage to incur fractures above the point of trap impact.

Hubert, G.F., Hungerford, L.L. & Bluett, R.D. 1997. Injuries to coyotes captured in modified foothold traps. *Wildlife Society Bulletin* 25: 858-863

The kind and severity of injuries to coyotes captured in standard and modified No. 3 Bridger coil spring traps were compared and differences evaluated between whole-body and trapped-limb-only injuries[11].

No significant reduction of injuries to coyotes using the larger No. 3 Bridger coil spring trap was detected, but the trend was for lower injury scores and fewer animals with severe injuries in the modified traps. Also, the injury performance threshold of the modified traps was 33% lower than that of the standard traps.

Some reduction in trap-related trauma of coyotes may be realised by using modified, unpadded No. 3 coil spring traps instead of standard, unpadded models. However, this reduction will likely be less than the 48-85% decreases which have been documented using No. 3 Soft Catch padded jaw traps (Saunders & Rowsell 1984, cited by Olsen *et al.* 1986; Olsen *et al.* 1986; Onderka *et al.* 1990).

The use of smaller traps may lead to further improvement in the welfare of trapped coyotes. Additional research using No. 1 ½ and No. 1.75 size traps for coyotes to better assess the potential of these devices to reduce trap-related injuries is recommended. Researchers are also encouraged to focus on traps with padded jaws as these appear more likely to minimise

[11] Trappers were selected based on their skill at trapping coyotes and willingness to participate. All had extensive experience (>15 seasons) using foothold traps to capture coyotes. Investigations on each trapline were conducted by a technician and one or more trapper. The continuous technical supervision was intended to eliminate any device-specific bias among trappers and insure accurate record-keeping. Traps were staked solidly, and checked daily, as required by law.

injuries than other models. Efficiency studies using these smaller traps for coyotes, in particular, are needed.

Kamler, J.F., Richardson, C. & Gipson, P.S. 2000. Comparison of standard and modified soft catch traps for capturing coyotes, bobcats, and raccoons. *Proceedings of the 9th Wildlife Damage Management Conference*

Capture rates and injury rates of coyotes, bobcats and raccoons captured in standard No. 3 Soft Catch traps were compared with those captured in the same trap type modified with the Taos Lightening Spring (TLS) double torsion spring. All traps were equipped with Paws-I-Trip pan tension devices and were successful in excluding most small non-target species.

Capture rates for coyotes were higher in TLS modified traps (92%) than standard traps (27%), whereas capture rates were similar for raccoons and identical for bobcats (100%). Injury rates were minimal (<9%) for coyotes and bobcats in both types of traps.

The TLS modified traps capture coyotes higher on the foot, providing a better grip than standard traps. The low number of captures by standard traps is possibly due to coyotes springing the traps and pulling away before the traps close, and being caught by the toes and pulling out. When the standard traps catch a coyote, the grip is generally poor, resulting in "toe catches".

Despite the findings of Phillips *et al.* (1996), that standard No. 3 Victor Soft Catch traps are as effective as three types of unpadded traps in capturing coyotes, field personnel with the USDA Wildlife Services program commonly modify No. 3 Soft Catch traps by replacing or supplementing the existing springs to increase capture efficiency (Gruver *et al.* 1996).

The low injury rates to coyotes and bobcats are similar to that found by other studies that investigated injury rates of Soft Catch traps (Olsen *et al.* 1986, 1988; Phillips *et al.* 1992; Gruver *et al.* 1996).

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Earle, R.D., Lunning, D.M., Tuovila, V.R. & Shivik, J.A. 2003. Evaluating injury mitigation and performance of #3 Victor Soft Catch traps to restrain bobcats. *Wildlife Society Bulletin* 31(3): 617-629

The objectives of this study were to use commercially available traps or to modify existing trap hardware to: 1) minimise trap-related injuries to bobcats, and 2) maintain trap performance at or above the level of an appropriate control trap[12].

The No. 3 Victor double coil spring trap was commonly used in this geographical area to capture the target species, and was used as the control trap. After modifying the No. 3 Victor Soft Catch traps used in this study to catch bobcats, capture rates generally exceeded the No. 3 Victor double coil spring trap used as a control, while significantly reducing the injury scores of captured bobcats. The modified traps showed greater jaw closure velocity, clamping force, and impact force than the unmodified Soft Catch traps.

[12] All traps were checked from dawn until after sunset on a consistent schedule approximating 24 hr.

The No. 3 Victor Soft Catch trap can be used to trap bobcats with minimal trap-related injury and a high level of performance. However, it may be necessary to modify the traps as received from the manufacturer for optimal use with bobcats.

Shivik, J.A., Martin, D.J., Pipas, M.J., Turnan, J. & DeLiberto, T.J. 2005. Initial comparison: Jaws, cables, and cage-traps to capture coyotes. *Wildlife Society Bulletin* 33: 1375-1383

In an initial evaluation, wildlife managers were surveyed for information on cage-trapping; using these data, a field study of four coyote capture systems for animal damage management was conducted. The Soft Catch, Collarum, Wildlife Services-Turman (WS-T), and Tomahawk, systems were tested for capturing coyotes.

A capture efficiency of 0% for the Tomahawk cage-trap, 87% for the Collarum (snare), 88% for the WS-T throw arm (snare), and 100% for the Soft Catch was estimated in the field evaluation. Cage-traps were least selective, capturing no non-coyote animals. The WS-T and Soft Catch devices showed intermediate selectivity of 50% and 69%, respectively. All devices showed low injury scores relative to jawed devices in previous studies; 92%, 57% and 92% of coyotes captured in the Collarum, WS-T, and Soft Catch showed no indicators of poor welfare, respectively.

Phillips and Mullis (1996) reported capture efficiencies of 95, 89, and 100%, using the Victor No. 3 NM, Victor No. 3 Soft Catch, Newhouse No. 4, and the Sterling MJ600, respectively. More recently developed devices appeared to be less efficient (78% for the Belisle, 8.3% for the Panda, 41% for the Collarum, and 66% for the Wildlife Services system; Shivik *et al.* 2000). However, the devices evaluated in this study (with the exception of the cage-trap) show that new, innovative designs can be more efficient for capturing coyotes. Soft Catch traps performed well in this study, with efficiency similar to that previously reported (Phillips & Mullis 1996). They may outperform the other devices tested due to their relative simplicity, plus the advantage of being a design more common and familiar to most trappers.

Kamler, J.F., Jacobsen, N.F. & Macdonald, D.W. 2008. Efficiency and safety of Soft Catch traps for capturing black-backed jackals and excluding non-target species. *South African Journal of Wildlife Research* 38: 113-116

In Africa, black-backed jackals (*Canis mesomelas*) have been captured in modified foothold traps, including Soft Catch traps. However, although capture rates were reported in some of these studies, none reported the capture efficiency of Soft Catch traps or the exclusion efficiency of non-target species. In this paper the efficiency and safety of Soft Catch foothold traps for both capturing black-backed jackals and excluding non-target species in South Africa is evaluated.

Black-backed jackals were captured with Victor No.1.5 Soft Catch traps that were set according to Woodstream Corporation's recommended procedures, as described by Linhart & Dasch (1992). With the pan tension set at 1.75 kg (approximately 25% of the body mass of black-backed jackals, or the approximate weight of one black-backed jackal limb standing on the ground), the capture efficiency was 88% for black-backed jackals. Black-backed jackals exhibited no (80%) or very minor (20%) visible injuries, similar to those reported for coyotes by Olsen *et al*. (1986, 1988), Onderka *et al*. (1990) and Phillips *et al*. (1992). The exclusion efficiency for non-target species was 93%. The results of this paper indicate that black-backed jackals can be safely and efficiently captured in Soft Catch traps wile excluding most non-target species, if traps are checked regularly and pan tensions are set at the appropriate weight.

Conclusions

According to Shwiff and Bodenchuk (2004) predation management is a controversial and often misunderstood reality of livestock management. Few on either side of the argument would believe that some sort of management is not necessary to limit livestock losses. Opposition to the lethal removal of predators characterizes most debates.

Capture devices are of international concern, and such concerns highlight the need to monitor newly developed capture systems relative to accepted animal injury standards (Shivik *et al.* 2005).

Application in South Africa

Very few scientific studies have been conducted in South Africa and the results published.

The following excerpt from Kamler *et al.* (2008) discusses the implications of the use of Soft Catch traps in South Africa:

Black-backed jackals (*Canis mesomelas*) can be safely and efficiently captured in Soft Catch traps that offer a humane alternative to standard foothold traps, and concluded that these traps could be a useful tool for conservation of smaller carnivores in small-livestock farming areas of southern Africa. Additionally, Soft Catch traps might be particularly useful for research studies in which black-backed jackals need to be captured and released unharmed, as jackals rarely can be captured efficiently using other methods such as cage traps (Fuller *et al.* 1989; Kaunda 2001; Loveridge & Macdonald 2002). If foothold traps must be used to control black-backed jackal populations, then using Soft Catch traps with the appropriate pan tension may prevent unnecessary captures, injuries, and/or deaths of non-target species.

Aardwolves (*Proteles cristatus*), a species similar in body mass to the black-backed jackal, can not be efficiently excluded from Soft Catch traps. However, as with black-backed jackals, these traps cause no visible injuries to the aardwolves. It is recommended that lures and baits specific to the coyote should be used when trapping in areas where aardwolves and black-backed jackals are sympatric, instead of using general lures and meat which might attract a variety of other carnivore species.

Because of their larger body mass, large carnivores might easily spring Soft Catch traps and pull the traps completely out of the ground, causing serious injuries to themselves. Additionally, large carnivores might kill any black-backed jackals or other species found in the traps. Therefore, the results in this study regarding safety of Soft Catch traps and exclusion of non-target species are not applicable to regions where large carnivores are present, and using any foothold traps in such areas is not recommended.

Management practices

The following segment covers recommendations made by Andelt *et al.* (1999) on the use of foothold traps:

Trap selectivity depends not only on the mechanical attributes of a trap but also on where and how the trap is set, factors influenced by the knowledge and skill of a trapper. Properly set traps can effectively capture specific depredating animals and permit release of non-target animals. Trapper education courses are needed to ensure proper use of existing devices and incorporation and acceptance of new, more humane and selective trapping devices and techniques. The delay in adopting padded traps suggests that considerable educational efforts are needed before trappers will adopt padded traps and other trapping improvements. The slow adoption of Soft Catch traps was probably influenced by low capture efficiency of early models, and therefore foothold traps and trapping techniques developed to be more humane or selective should be comparable in capture efficiency to standard traps if they are to be acceptable to trappers (Andelt *et al.* 1999; Hubert *et al.* 1997).

Since the use of any new trapping system involves a learning process, trappers must be given ample time to become fully proficient with new devices to fairly assess their performance Hubert *et al.* (1997). Therefore, to enhance adoption of padded traps, educational programs are suggested that incorporate:

1. The assistance of respected trappers who have successfully used padded traps.
2. Discussions of public expectations for humane capture devices and techniques compared to those who do not.
3. Possibly field demonstrations and videos that show the proper use and capture effectiveness of padded traps.
4. Opposition to trapping decreased with increased knowledge of trapping issues. Education that provides objective and accurate information is needed so that the public can make informed decisions.

Many animal welfare and animal rights organisations oppose padded traps because foot, leg and tooth injuries are not completely eliminated and even padded traps may be painful. Concerns are also expressed about lack of food and water and the stress endured by animals in traps, and therefore opponents of trapping have recommended that all live-holding devices set on land should be checked daily. The public appears more supportive of trapping when it is limited and regulated. Public acceptance of trapping likely will be highest if wildlife managers provide educational information emphasising current regulations that minimise injuries and trauma in animals, promote selective capture, avoid seasons when females have dependent young, emphasise that it is illegal to trap threatened and endangered species, and emphasise publicly acceptable reasons for trapping, such as minimising economic damage. Using smaller traps and daily, early morning trap checks have reduced injuries to trapped animals (Andelt *et al.* 1999).

Ultimately, new devices and techniques promoting humane and selective capture of animals should be incorporated in Best Management Practices, or in National or international standards, and in regulatory changes that indicate to the public that real changes have been made and will continue to be made. Without adopting new research-based findings, trappers and wildlife managers will be confronted with increased critical public scrutiny (Andelt *et al.* 1999).

Huot and Bergman (2007) cautioned that biologists and regulators need to keep abreast of advances in equipment involved in wildlife damage management. While technology will never resolve the underlying philosophical arguments of individuals at the extreme end of the animal rights/welfare view point, technology can provide some common ground where those of good will can find workable solutions.

It is important to note that a trap deemed inappropriate today may be modified and become more acceptable tomorrow (Huot & Bergman 2007). This statement by Huot and Bergman

(2007) is substantiated with the following example: *"In 1996, the citizens of Massachusetts were confronted with a ballot initiative in which they were asked to ban snares and any trap that grips the body of an animal, because they were deemed inhumane. The law's use of broad and inclusive language effectively banned traps that had not even been invented yet, irrespective of their humaneness or species-specificity. In light of this wildlife management debacle, it behoves legislators to enact restrictions on specific formulations of traps rather than on the mechanism of the trap, because later developments and inventions could permit the trap to ultimately pass humane standards. While it may seem daunting for biologists to be tasked with the responsibility to "educate" the public about how one trap differs from another, with sufficient support, attitudinal change is possible*."

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