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Leg injuries to coyotes captured in three types of foothold traps

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Foothold traps are commonly used to harvest coyotes (*Canis latrans*) for fur and as a depredation management tool (E. K. Boggess et al., Traps, trapping and furbearer management, The Wildl. Soc. Tech. Rev. 90-1, 1990; U.S. Dep. Agric. 1994). Opposition to use of traps has increased in recent years because of concern by animal interest groups that foothold traps inflict unacceptable injuries to trapped animals and are judged to be inhumane. Research on padded traps has shown the No. 3 Victor Soft Catch® can be used successfully to capture coyotes while producing only minor injuries (Olsen et al. 1986, Linhart et al. 1988, Linhart and Dasch 1992, Onderka et al. 1990, Phillips and Mullis 1996). In contrast, 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. Despite positive results with improved padded traps, they are not widely used by the trapping community (The Fur Resour. Comm. of the Int. Assoc. of Fish and Wildl. Agencies and The Gallup Org., Inc.,1993, Ownership and use of traps by trappers in the United States in 1992.). Two possible reasons for this are the increased cost of trap replacement and skepticism about research results.

McAllister (1992), Dobbins (1993), and O'Gorman (1993) proposed possible alternatives to using padded traps for capturing coyotes. They suggested that by laminating trap jaws with No. 9 wire, 0.48-cm (3/16 inch) rod or bar stock, foot injuries to trapped coyotes could be reduced substantially. Several types of laminated and wide-jaw traps are used by trappers. The most common are the No. 3 Northwoods® (laminated) and the Sterling MJ600® (wide-jawed).

Recently the Livestock Protection Company (Alpine, TX 79831) developed a new padded trap (the No. $3\frac{1}{2}$ EZ Grip®) designed for capturing coyotes. Data have not been available on injuries caused by these new alternative traps. Our objective was to describe, evaluate, and compare leg injuries for coyotes captured in the Sterling MJ600, the No. 3 Northwoods, and the No. $3\frac{1}{2}$ EZ Grip. Reference to trade names is for identification purposes and does not constitute endorsement by the authors or the U.S. Department of Agriculture.

Traps evaluated

Coyotes were captured by 9 experienced trappers in California, Colorado, Idaho, and Texas from October 1993 to June 1995. The specific traps tested (Fig. 1) were as follows:

- Unpadded Sterling MJ600 with 4 coil springs. Trap jaws were 0.88 cm in width and offset 0.64 cm.
- Unpadded No. 3 Northwoods with 2 coil springs. These traps were 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. Factory jaws were offset 0.79 cm by welding a spacer to the base of each jaw. Jaws were filed to round the edges and to remove any metal burrs.
- Padded double longspring No. $3\frac{1}{2}$ EZ Grip. This trap was similar to a Newhouse coyote trap, except that the jaws had been modified to accommodate rubber pads. Rubber was molded into the hollow steel jaws so that both sides of the jaw surfaces were padded. The inside jaw width was 1.0 cm. The jaws were not offset, thus they closed tightly against each other.

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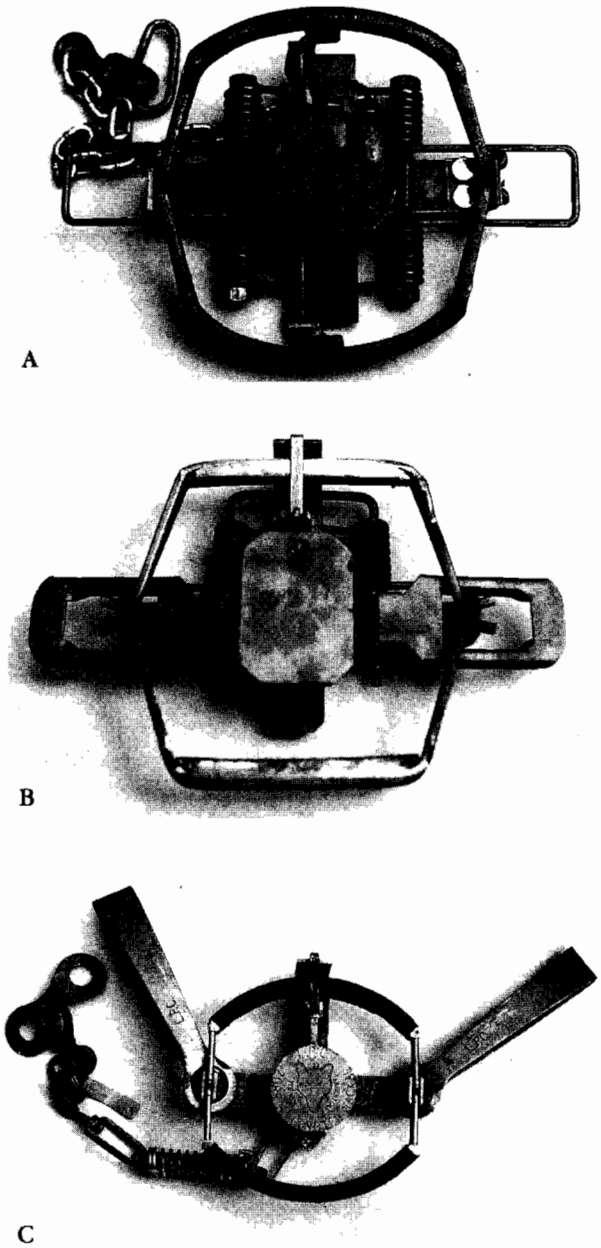

Fig. 1. Types of foothold traps tested in California, Colorado, Idaho, and Texas in 1993–1995 to evaluate leg injuries to coyotes: (A) Sterling MJ600®, (B) No. 3 Northwoods®, and (C) No. $3\frac{1}{2}$ EZ Grip®.

All traps were equipped with a center-mounted, 36-cm, kinkless chain and in-line shock spring. Traplines were established with all traps staked and checked daily. Each captured coyote was euthanized and the trapped leg removed near the elbow or knee joint. All legs were tagged showing the name of the trapper, date, and trap type. Legs were sealed in plastic bags and frozen until necropsies occurred.

Injury scoring

All necropsies were conducted at the University of Wyoming's State Veterinary Laboratory. The pathologist (ESW) performed the necropsies without knowledge of the trap type associated with a particular leg. Leg injuries were identified and assigned numerical scores based on a Trauma Scale (Table 1) developed through the international trap standards process (Jotham and Phillips 1994). Veterinary pathologists from Canada, the Netherlands, New Zealand, Norway, the United Kingdom, and the United States provided input in developing the scale. Pain, loss of function, wound severity, healing potential, and releasability of the animal were all considered in establishing point values. The scale (modified from the Olsen Scale, Olsen et al. [1986]) was used to rank the relative humaneness of different restraining traps on the basis of trap-related injuries that were assigned scores of different magnitude. Limb injury scores were compared among trap types with the Kruskal-Wallis Test (Siegel 1956).

Evaluation of trap injuries

We examined 192 coyote legs (68 from Sterling, 59 from Northwoods, and 65 from EZ Grip traps). Some level of edematous swelling was noted on nearly all the legs (95%) with no apparent difference among trap types (Table 1). Lacerations were observed in 87% of the legs 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 such as joint luxations, major periosteal abrasions, bone fractures, and amputations were noted in the 2 unpadded traps (Table 1). Major periosteal abrasions were observed in 39% and 26% of the legs from laminated Northwoods and Sterling MJ600 traps, respectively. In comparison, only 2% of the legs trapped in EZ Grip traps showed major periosteal abrasions.

Fractures were relatively uncommon but occurred in 10% of Sterling 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, leading us to believe these fractures occurred as the animal struggled to escape from the trap. All other fractures occurred at point of trap impact. Foot amputation occurred in 1 coyote, and a second coyote's foot was nearly amputated after receiving a compound fracture below the carpus. Both of these injuries occurred in Sterling traps. Evidence of chewing footpads was observed on 9 legs (4 from Sterling and 5 from EZ Grip traps).

Table 1. Frequency of injuries to coyotes captured in 3 types of foothold traps in California, Colorado, Idaho and Texas, 1993–1995.

Injury[a]	Points scored	Occurrences by trap type: Sterling MJ600® n = 68 No.	%	No. 3½ EZGrip® n = 65 No.	%	No. 3 Northwoods® n = 59 No.	%
Edematous swelling or hemorrhage[b]	5–15	64	94	63	97	56	95
Cutaneous laceration < 2 cm	5	31	45	13	20	34	58
Cutaneous laceration > 2 cm	10	32	47	7	11	15	25
Minor subcutaneous tissue maceration or erosion	10	18	26	1	2	32	54
Minor periosteal abrasion	10	48	70	2	3	46	78
Minor tendon or ligament severance	25	43	63	4	6	27	46
Amputation of 1 digit	25	1	1	1	2	0	0
Major subcutaneous soft tissue maceration or erosion	30	6	9	2	3	5	8
Joint luxation below carpus or tarsus	30	13	19	4	6	8	13
Major periosteal abrasion	30	18	26	1	2	23	39
Major laceration on foot pads	30	4	6	5	8	0	0
Simple fracture at or below (distal to) carpus or tarsus	50	1	1	0	0	0	0
Amputation of 3 or more digits	100	1	1	0	0	0	0
Amputation above digits	100	1	1	0	0	0	0
Joint luxation above carpus or tarsus	100	0	0	1	2	0	0
Compound or simple comminuted fracture above carpus or tarsus	100	0	0	1	2	1	2
Compound or comminuted fracture at or below carpus or tarsus	100	6	9	1	2	1	2

[a] Each injury category was considered separately and a coyote may be represented in more than 1 row. Total percent exceeds 100.
[b] Mild = 5 points, moderate = 10 points, and major = 15 points.

Median injury scores for limbs of coyotes taken in EZ Grip padded traps were less ($\chi^2 = 37.07$, 2 df, P = 0.0001) than for limbs held in the unpadded Sterling and Northwoods traps (Table 2). The Sterling MJ600 had the highest mean and maximum injury scores of 103.3 and 550, respectively.

Implications for trap use

The reduced number of injuries for coyotes captured in padded EZ Grip traps confirmed the findings of earlier studies (Olsen et al. 1986, Linhart et al. 1988, Onderka et al. 1990). Even though the EZ Grip padded trap was much larger and stronger than the No. 3 Victor Soft Catch, injury patterns we observed appeared to be similar for the 2 traps. The bone fractures observed for coyotes captured in EZ Grip traps could be related to the increased size and weight of this trap in comparison to the Victor Soft Catch. The added weight and size of the trap may have allowed the coyotes enough leverage to incur fractures above the point of trap impact. The rubber pads that extend through the hollow steel jaws appeared to have cushioned the impact of the trap's strong compression force. The rubber pads protected the foot from rubbing on the bare jaws and reduced injuries.

Two possible explanations were offered by McAllister (1992) and O'Gorman (1993) as to how laminated jaws might reduce injuries. First, the increased jaw width allows pressure to be displaced over a larger area of the leg. Second, the addition of a rod or wire to a trap jaw creates a smooth, rounded edge, reducing cuts to the leg of a captured animal. Despite the wide and offset jaws of the Sterling and North-

Table 2. Trauma scores assigned to limbs of coyotes captured in 3 trap types in California, Colorado, Idaho, and Texas, 1993–1995.

Trap type	Trauma score: n	Mean	Minimum	Maximum	SE
Sterling MJ600®	68	103.3	0	550	12.0
No. 3 Northwoods®	59	79.3	0	290	7.9
No. 3½ EZGrip®	65	29.0	0	515	8.6

woods 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. High frequency of periosteal abrasions and severed tendons were observed for both of these traps (Table 1). The bone fracture rates of the Sterling (10%) and Northwoods traps (3%) were considerably less than the 91% fracture rate reported for the unpadded Victor 3NR (Olsen et al. 1986). The present state-of-the-art suggests that padded jaws are the most significant trap modification to substantially reduce foot injuries to captured coyotes.

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