Alaska Department of Fish and Game
Division of Wildlife Conservation
2007

Development and testing of breakaway snares

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Research Final Performance Report
1 July 2003–30 June 2007
Federal Aid in Wildlife Restoration
Grants W-33-2 through W-33-5
Project 15.12

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
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PROJECT TITLE: Development and testing of breakaway snares

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FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NR.: W-33-2, W-33-3, W-33-4, and W-33-5

PROJECT NR.: 15.12

WORK LOCATION: Central and northern Game Management Unit 20A, Tanana Flats; Game Management Unit 15A, Kenai Moose Research Center

STATE: Alaska

PERIOD: 1 July 2003 – 30 June 2007

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Snaring is an effective method to catch wolves and is a preferred trapping method for Alaskan trappers (Blejwas 2006). Between 40 and 50% of the wolves harvested annually in Alaska are caught with snares. However, accidental capture of moose does occur in wolf snares. In two moose studies using radio collars (50–125 active radios/year), during most years 1–3% of the radiocollared moose were accidentally caught in wolf snares annually (Boertje and Keech unpublished data, Fairbanks). Most moose caught in wolf snares die either at the capture site or subsequent to release (ADF&G unpublished data). Former studies indicated accidental ungulate catch could be reduced through trapper education and use of snares with improved selectivity (Roy et al. 2004, 2006; ADF&G unpublished data).

To date, most effort to reduce the accidental catch of moose in wolf snares has been to design ways for the moose to break free of the snare. In contrast, my objectives were to 1) identify characteristics explaining vulnerability of moose to wolf snares, 2) determine if improved snare design could reduce moose vulnerability without reducing wolf capture efficiency, and 3) determine if injury severity to accidentally caught moose could be reduced by incorporating a noose stop/breakaway system. Eliminating moose capture in wolf snares is probably not possible but wolf snare efficiency, selection, and humaneness could be improved if the vulnerability of moose to wolf snares is reduced in combination with a more efficient breakaway system.

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

McNay (unpublished data) estimated that wolves could potentially generate 800 lb of force on a solid anchored snare. He developed 2 wolf breakaway snares that had average breaking strengths of 716 lb (Thompson split lock) and 793 lb (camlock pin). The Thompson split lock design was a standard Thompson 3xx snare (0.28 cm, 1×19 twist steel cable) with a #3 Thompson lock that was partially split. The split allowed the cable to pull through releasing the snare loop if enough pressure was applied. The camlock pin breakaway design consisted of #3 camlock on 1/8" (0.32 cm), 7×7 twist galvanized cable with the pin modified to an A5-7 solid aluminum aircraft rivet. The rivet broke when enough pressure was applied. During testing, 30 wolves, 9 moose, and 5 caribou were caught in the Thompson breakaway snare and 1 wolf (3.3%), 3 moose (33%), and 2 caribou (40%) escaped. Three wolves (1 escaped) but no moose or caribou were caught by the camlock pin snare precluding any meaningful analysis.

Alaska trappers continued to improve wolf snare selectivity using a variety of breakaway mechanisms, most commonly a Thompson split lock used on 3/32" 1×19 cable or S-hooks with varying breakaway strengths. The effectiveness of these breakaway modifications has not been critically measured but trapper interviews conducted by ADF&G (unpublished) indicate these breakaway systems work to release moose, unless the moose had tangled the snare wire preventing the moose from generating enough force to break the release mechanism. Also moose caught by the nose frequently did not generate enough force to break free.

These findings are consistent with results from studies that evaluated breakaway snare performance for capturing coyotes and releasing deer (Phillips et al. 1990, Phillips 1996; Roy et al. 2005, 2006). Roy et al. (2005, 2006) documented high release rates of deer (74–88%) using snares with the National 813 S-hook as the breakaway device. The deer that remained restrained were mostly fawns and all were caught by the neck. Phillips et al. (1990) found that coyotes and deer fawns generated similar force on a snare and concluded it would be difficult to design a system that releases all deer and restrains coyotes. Similar problems exist with moose and wolf snares, even though moose potentially exert a much greater force on a snare compared to Interior Alaskan wolves.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

OBJECTIVE 1: To develop breakaway snares with a variety of breaking strengths optimizing snare selectivity for target species and allowing the trapper more flexibility in snaring areas with different ungulate densities.

SNARE SELECTIVITY

During 1–4 February 2005 and 6–9 January 2007 at the Kenai Moose Research Center (MRC), I examined the characteristics of accidental moose capture in wolf snares. The MRC maintains 5-10 semi-tame moose in 2.6 km^2 pens. I placed wolf snares with 60" and 72" circumference loop sizes 18" above the supportive surface, mimicking trail and bait/kill set patterns used by wolf trappers and described subsequent moose encounters.

Snare height and loop sizes used are standards commonly used by Alaskan wolf trappers. I categorized the outcome of a moose encountering a snare as knocked-down, pushed-aside, or catch. A knock-down occurred when the moose contacted the snare and caused it to drop from its original height and form a smaller loop; pushed-aside was when the moose contacted the snare and the snare returned at the initial height and loop size; and catch occurred when the moose was caught by the nose, neck, or leg. If a snare was knocked-down, I recorded the circumference and position of the resulting loop. For each catch, I recorded the initial loop size, catch type (nose, neck, or hind or front foot), habitat, and moose behavior (traveling or browsing).

During 30 December 2005–31 March 2006, I set 3 different types of wolf test snares in trail and bait/kill set patterns in various habitat types in Unit 20A to evaluate catch rates by snare type of wild moose. I set 3-22 of each test snare type at each set. Snares were checked 5 and 21 days after setting. Check times were consistent with check times followed by most Alaskan trappers in areas not requiring defined check periods. Using tracks in the snow and the trip pattern of the snare, I was able to determine if a snare that was encountered by a moose was knocked-down (lock still attached), pushed-aside (snare still operating), or had caught a moose (snare pulled through the lock). Catch type was not used in the analysis unless it could be determined from the track pattern and snare position. For snares that were knocked-down, I recorded the size of loop and for both knocked-down and pushed-aside snares, I recorded the location of the snare after the encounter. I also recorded if the snare dropped due to wind or snow loading. I censored data from snares that had dropped or pulled through but conflicting data prevented me from reconstructing what happened.

At the MRC during 1–4 February 2005 and 6–9 January 2007, I evaluated 283 moose encounters with wolf snares. I found no evidence that moose modified their behavior as a result of wolf snares. Moose initially contacted snares with their chest/shoulder area (59.8%), nose/mouth (33.2%), top portion of legs (3.8%), or rib section (2.2%). Of the 60" and 72" loop size snares that were contacted (224), 65.3% were knocked-down, 21.0% were pushed-aside but remained at the initial loop size and height, and 13.8% caught the moose either by the nose (54%) or leg (46%). There was no difference between the number of nose and leg catches/encounter ($\chi = 0.05$, $P = 0.83$). All leg catches occurred after the snare was knocked-down and the moose stepped in with either its front (25%) or hind foot (75%). Moose were caught by the leg in 4 of the 15 snares (27%) that had been previously been knocked-down and left for 2–12 hours. Catch rates of wild moose (34.7%) were significantly greater compared to catch rates for moose in the pens (13.8%; $\chi = 15.49$, $P<0.001$). Similar to the pens the percentage of moose caught in 72" loop snares (39.4%) was higher compared to 60" loop snares (30.7%), but there was no difference ($\chi = 0.60$, $P = 0.44$) in catch rates.

I added a snare diverter to standard wolf snares to reduce accidental capture of moose. I attached a 11-gauge wire “diverter wire” to the snare so that it extended 28" perpendicular to the snare loop at an angle between 10–20 degrees from the top of the snare. The theory was that a moose would contact these “diverter wires” with their chest, nose, or head and knock the snare aside prior to encountering the loop while wolves would walk underneath unaware of the wire and be fully susceptible to being caught in the snare loop. At the MRC, I observed 23 moose initially contact the diverter wire. No moose were caught by either the nose or leg in the diverter snare. Catch rates for the diverter test snare were significantly less compared to 60" (χ = 5.81, P = 0.016) and 72" (χ = 8.19, P = 0.004) snares. Once knocked-down, diverter snares formed a 6–15" loop along the snow level, 85.3% of the time. There is some evidence that the diverter wire continued to work even after the snare was knocked-down based on significantly fewer leg catches (χ = 1.98, P = 0.16). The catch rate of wild moose by diverter snares (12.1%) was higher than the catch rate of semi-tame moose (0%; χ = 5.65, P = 0.017). The most apparent structural difference, between diverter snares that had caught moose and diverter snares that were encountered, but did not catch a moose, was that the diverter wire was collapsed. None of the diverter wires collapsed following 1 encounter with a moose at the MRC. When tested by private trappers, diverter snares caught and held 9 wolves; 9 moose encountered diverters with no captures. Diverter snares (18.2%) were knocked-down more by wind compared to 152.4 cm (8.0%) and 182.9 cm (10.0%) snares (χ = 0.49, P = 0.02) and therefore may catch fewer wolves if set in windy areas.

SNARE BREAKING STRENGTHS

I investigated the potential of incorporating a noose stop/breakaway system by collecting snare loops from trappers who had caught wolves and moose and measured the circumference. Sample size was not adequate for moose using only snares obtained from trappers. To obtain additional measurements for moose, I collected front and rear legs of hunter-killed calf, cow, and bull moose and attached a snare cable at the most common catch point on the leg, cinched it down, and measured the final loop circumference.

I measured the breaking strength of the noose stop/breakaway system using a Dynalink dynamometer strain gauge (Measurement System International, Seattle, WA, USA, Model 7200) attached to a hydraulic tee cylinder (Prince Manufacturing Corporation, Sioux City, IO, Model SAE-9012). The breakaway portion was constructed by cutting the snare within the loop at either 9.5" or 10.5" from the cable end stop and inserting a 3/32" double ferrule on 3/32" snare cable or 1/8" double ferrule on 7/64" and 1/8" snare cables purchased from the Snare Shop (Carroll, IA, USA) and attached using a swage tool. I inspected each ferrule to ensure inconsistent manufacturing was not a factor in breaking strength. Breaking strength was determined by cinching breakaway snares on simulated wolf necks comprised of a 11" circumference steel pipe wrapped with cotton (size of simulated wolf necks tested = 11", 12.8" and 13"). I also used moose legs collected from hunter kills. I measured the peak force necessary to cause the breakaway component to release. The breakaway system was tested on 3/32", 7/64", and 1/8" 1 × 19 twist snare cables. Each snare type was tested 20 times on simulated wolf necks and on moose legs. I found that the breaking force was significantly less for moose legs compared to wolves with the noose stop/breakaway placed at either 24.1 or 26.7 cm on any size cable. Breaking strength increases as the lock stops further from the breaking mechanism (t = -1.95, df = 19, P = 0.033) indicating that larger wolves would have to exert greater force to break free.

To test the effectiveness of the 9.5" noose stop/breakaway snare on a 7/64" 1×19 snare in releasing moose, I caught a 12-year-old bull and a 3-year-old bull at the MRC. During the tests at the MRC I caught a 3-year-old bull by the hind foot and it broke free in <2 seconds. I also caught a 12-year-old bull by the front leg and it broke free after 2 minutes

21 seconds. The 12-year-old bull had a more difficult time breaking free because the snare wire had become tangled around small, flexible trees. These flexible trees became the anchor preventing the moose from having anything solid to pull against. During the time the bull was restrained, the lock was tight against the breakaway mechanism but the snare loop could be seen rotating around the foot indicating the breakaway mechanism was also working as a noose stop and the restraining loop was not causing substantial injury.

In addition to field testing at the MRC, I hired 2 local trappers to set noose stop/breakaway snares during their normal trapping activities. During trapping seasons 2005 and 2006, 2 private trappers set 9.5" (n = 212) and 10.5" (80) noose stop/breakaway snares without diverter wires during the course of their normal wolf trapping activities. Snares were set in a variety of habitat types and were anchored on both flexible and solid anchors. Using the 9.5" noose stop/breakaway snare, trappers caught and held 29 wolves and 1 wolf escaped. Using the 10.5" noose stop/breakaway, trappers caught and held 9 wolves and 0 escaped. Tracks in the snow indicated the wolf escaped because it was caught by the leg and the noose stop allowed the wolf to slide its foot out of the noose. Trappers caught 6 moose in the 9.5" noose stop/breakaway snare (5 escaped) and 3 in the 10.5" noose stop/breakaway snare (all escaped). The single, lethal 9.5" noose stop/breakaway snare caught the moose around the neck.

IV. MANAGEMENT IMPLICATIONS

Snares are an effective method to catch wolves and are a preferred trapping method for Alaskan trappers but accidental capture of moose is problematic. Using the characteristics of how moose encounter a wolf snare, I found that reducing snare loop size and by incorporating 2 modifications to the snare, resulted in fewer moose catches and fewer injuries to moose. Both modifications can easily be made by trappers or a commercial snare company on any size wolf snare cable size between 3/32"–1/8" and with any lock. Although results are particularly pertinent to Alaska and moose, results are most likely applicable to other areas where wolf snaring occurs in presence of large ungulates or bovids.

V. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN FOR LAST SEGMENT PERIOD ONLY

JOB/ACTIVITY 3. Data analysis and reports.

Analyzed data and completed the Federal Aid Final Research Report. I completed a preliminary draft of an article to be submitted to a scientific journal.

VI. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THE LAST SEGMENT PERIOD, IF NOT REPORTED PREVIOUSLY

None.

VII. **PUBLICATIONS**

Gardner, CL. (in prep.). Moose vulnerability to wolf snares and management recommendations.

VIII. RESEARCH EVALUATION AND RECOMMENDATIONS

Methods used allowed me to adequately evaluate moose vulnerability to wolf snares and use that information to design first generation snares to reduce moose capture but retain effectiveness for wolves. Additional study is needed to better understand how moose are eventually caught in "diverter" snares and if possible engineer a solution.

IX. APPENDIX

LITERATURE CITED

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