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A SNOWSHOE HARE SNARE SYSTEM TO MINIMIZE CAPTURE OF MARTEN

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Harvest of snowshoe hares (*Lepus americanus*) is a major recreational and subsistence activity for Newfoundlanders. It occurs over most of the island, and it is common for individuals to operate several hundred snares over a few weeks (Thompson 1991). However, snares are not selective and incidental captures may significantly affect the future of Newfoundland's American marten (*Martes americana*) populations (Thompson 1991).

Marten previously occurred throughout central and western Newfoundland (Bergerud 1969). Because of a lack of long-term integrated forest management planning, the species is now restricted to small numbers in a few isolated areas of the island (Thompson 1991). These areas act as reservoirs from which martens can disperse to other suitable habitats, but dispersers cannot survive the incidental trapping pressure (Thompson 1991). Since 1986, American marten has been listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (Phillips 1987).

Newfoundlanders commonly use a 0.02-gauge stainless steel wire to snare snowshoe hares because it is easy to set and inexpensive (O. Forsey, Newf. Wildl. Div., Gander, pers. commun., 1991). However, when captured in a conventional neck snare, martens cannot escape. Based on the behavior of animals snared in simulated natural environments, we developed a new snare system to capture snowshoe hares and minimize marten capture. Our objectives were to determine the diameter and height of an efficient noose for hares and to develop a snare set that would allow martens to either avoid this noose or escape from it if they were captured.

STUDY AREA AND METHODS

We conducted the study in a 2.2-ha compound in Vegreville, Alberta from November 1991–May 1992. Groups of 4 snowshoe hares were kept in 200 m^2 test enclosures with poplars (*Populus* spp.), thick clumps of willows (*Salix* spp.), and a herbaceous understory. They were fed willow and poplar branches and commercial rabbit pellets. Martens were kept individually in 290 m^2 test enclosures with poplars and various shrubs. They were fed 150–200 g of commercial ranch mink feed daily. All animals were allowed a minimum of 3 days to acclimate to the simulated natural environment before any tests were conducted. All enclosures were monitored by remote control video camera system. Facilities and equipment were detailed by Proulx et al. (1990).

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Snare Wires

Marten usually cannot escape from a snare made of 0.02-gauge stainless steel wire. Thus, we initiated our work with a weaker 0.015-gauge stainless steel trolling wire of lower tensile strength (93 newtons) than the 0.02-gauge wire (158 newtons; Proulx et al., unpubl. rep., 1992). We used this wire in subsequent approach tests. However, preliminary kill tests showed that this wire would not remain tightened (it does not kink easily and the noose does not stay closed) around a snowshoe hare's neck and would not kill. Consequently, the 0.02-gauge stainless steel wire was used for subsequent kill tests.

Approach Tests

Approach tests were conducted to determine characteristics of snares that consistently capture snowshoe hares. The animals were allowed to approach snares (total wire length = 50 cm) set at different heights (10, 12 and 15 cm above ground) with a 10.2-cm diameter noose. Approach tests also were conducted with 12-cm high snares with a 7.6-cm diameter noose. These tests did not injure animals because a stop prevented full closure of the snare. Snares were anchored to a crossbar over the animals' trails. Apple pieces were spread on the trails to attract hares to the testing area. On traplines, trappers usually examine their snares daily. We considered a test to be acceptable if the snare captured at least 1 hare during the first 24 hours of testing. A snare was considered efficient if in 5 of 6 tests (a control level without implied statistical significance to justify subsequent kill tests), it captured 1 hare/24 hours. A dye was applied to a captured hare's forehead before release into the enclosure. We did not count recaptures of those animals. A t-test was used to compare the mean number of passes of snowshoe hares in approach tests with different snares (Dixon and Massey 1969).

An efficient snowshoe hare snare with the greatest distance between the noose and the ground (to allow small animals to pass under) was selected for marten tests. Snares were anchored to a crossbar over the animals' trails. A test was judged acceptable if the snare failed to capture a marten after 24 hours of testing. The snare passed the approach tests if it captured ≤ 1 of a maximum of 6 martens (a control level without implied statistical significance to justify subsequent kill tests).

Kill Tests

In order to promote marten escapes, we equipped snares with release devices. By twisting the wire and applying pressure on the noose, an animal could open the snare. These release devices could not be assessed in approach tests because a stop kept the noose loose around the animal's neck.

One series of kill tests was initiated with a split washer as the loop of the snare wire noose. However, after 2 kill tests both hares and martens were able to escape. Two more series of kill tests were initiated with 12-gauge high-tensile fence wire shaped into a 3-coil or 5-coil spiral used as snare anchors (Fig. 1). The anchor was originally stapled to a crossbar and the end of the snare wire was slipped over the coils of the spiral. Based on observations from approach tests, we hypothesized that martens could spin their body around and either slip the snare wire off the anchor or kink and break it. Because no pressure would be applied to the snare, the noose would eventually become loose and fall off the animal. However, snares tended to slip off the 3-coil anchor on their own allowing snowshoe hares to escape. With the 5-coil anchor, the wire did not slip off on its own. However, martens entangled the wire in the crossbar and could not consistently bring the snare down the spiral anchor.

The 5-coil anchor was subsequently stapled to a vertical post or a sapling on the side of the animals' trails. There were no crossbars and all debris and branches that could get caught in the snare wire were removed from the snaring site (Fig. 1). This snare system was judged efficient if it killed 9 of 9 hares (a control level used in trap testing; Proulx et al. 1990). On the basis of a one-tailed binomial test (Zar 1984), this snare could be expected, at a 95% level of confidence, to kill $\geq$70% of all snowshoe hares captured on traplines (Proulx et al. 1993). This snare system was considered safe for marten if it allowed 9 of 9 captured martens to escape. Then, it could be expected, at a 95% level of confidence, to release $\geq$70% of all martens snared on traplines (Proulx et al. 1993). During this last series of kill tests, because of a shortage of animals, 7 of 9 martens previously had been used in behavioral studies (not involving snares) or approach tests. The tests with these 7 martens were judged valid because these animals behaved like naive martens which had never approached a snare.

There are no humane standards for the testing of snares (Proulx and Barrett 1990). In this study, we considered that the animals should not be left in a distress (exerting escape movements with repetitive collapses) situation for >5 minutes. We did not approach animals laying on their side until complete cessation of movements occurred. All animal husbandry and research procedures were approved by the institutional Animal Care Committee and carried out in accordance with the guidelines of the Canadian Council on Animal Care (1984).

RESULTS

Approach Tests

In a first series of 6 approach tests with a 10.2-cm diameter noose set 10 cm from the ground, 6 snowshoe hares were captured. We released 5 that had been snared by the neck. One hare was captured by a foot and, after a few fighting bouts, escaped. On average, we recorded 1.3 passes/approach test (SE = 0.8) (animals ducked under or jumped over) before capturing a snowshoe hare.

Six snowshoe hares were neck-captured in snares set 12 cm above ground. On average, 1.8 passes (SE = 1.0) were recorded before a capture. This value was not different ($t = 0.39$, $P = 0.80$) from the passes/approach with the 10-cm high snare.

After 5 days of trials, only 2 of 5 hares were captured in 15-cm high snares, both by the neck. On average, 15.8 passes (SE = 5.3) preceded a capture. This value was greater than passes recorded with the 10-cm ($t = 2.69$, $P = 0.05$) and the 12-cm ($t = 2.58$, $P = 0.05$) high snares. The 15-cm high snare failed to efficiently capture snowshoe hares.

Snares set 12 cm from the ground with a 7.6-cm diameter noose did not capture any snowshoe hare after 2 days of testing. Hares continuously ducked under the snare (≥40 passes/day). We rejected this snare set.

The 12-cm high snare with a 10.2-cm diameter noose was selected for testing with martens. Five of 5 martens were easily captured in the snares. Only 1 animal bypassed a snare once. The martens walked or jumped into the noose. Three were captured by the neck and escaped by twisting their head. These escapes may have not occurred without a stop that prevented full closure of the noose. Two martens were snared in the abdominal region and could not escape.

Neither species broke the 0.015-gauge wire. Snowshoe hares, which fought less than martens, mostly jumped back and forth and entangled the wire in the surrounding vegetation. All martens fought intensively and spun their body on the ground while keeping the snare wire taut.

Kill Tests

The 0.02-gauge wire–5-coil side anchor snare system killed 9 of 9 snowshoe hares. On average,

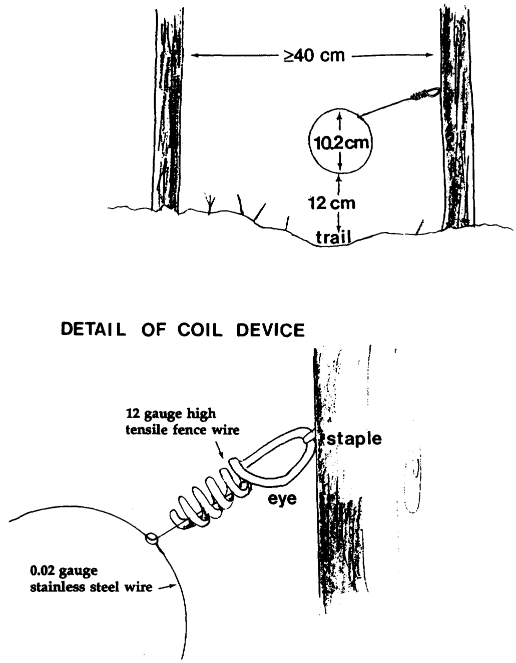

Fig. 1. Diagram of snowshoe hare snare with a 5-coil snare anchor.

time to confirmed death was 18 minutes (SE = 4.4) after capture of the animals. The sum of exerting escape attempts lasted, on average, 2.5 minutes (SE = 0.4). Hares spent an average of 15.5 minutes (SE = 4.1) nibbling on surrounding vegetation or passively standing, sitting, or laying on their side. This study showed that a 0.02-gauge stainless steel wire set 12 cm above ground with a 10.2-cm diameter noose and slipped on a 5-coil spiral anchored to the side of animals' trails can be expected, at a 95% level of confidence, to kill ≥70% of snowshoe hares captured on traplines.

Nine of 9 captured martens (4 neck, 4 abdomen, and 1 thorax) escaped the snare system. Eight slipped the wire from the anchor by spinning their body on the ground or by moving in circles. The ninth animal's rotations twisted and broke the wire. No martens collapsed or showed signs of choking caused by a tightening snare. On average, martens spun their body 8.0 times (SE = 2.8) and spent 23.3 minutes (SE = 8.0) in the snare. In 3 cases, the noose fell off when we recaptured the animals immediately after the test. Six martens were left in the enclosure for 72 hours after the tests. Four snare nooses fell off ≤24 hours after the test; 1 fell off between 24 and 48 hours; and 1 fell off at 72 hours (the noose was hanging loose around the animal's neck and fell off during recapture). None of these martens were injured by the snare wire. This study showed that our snare system can be expected, at a 95% level of confidence, to release ≥70% of martens captured on traplines.

DISCUSSION

Development of a manual snare to efficiently harvest snowshoe hares and minimize the frequency of capture of martens was difficult because both species are similar in size. We could not avoid marten captures by selection of height or diameter of the snare noose. However, this study showed that snared martens behaved differently from snared snowshoe hares. This information led to the development of a selective manual snare.

Although there are no humane standards for snares (Proulx and Barrett 1990), we do not believe that snares used in the harvest of hares are humane. A humane killing device should render an animal irreversibly unconscious as quickly as possible (Proulx and Barrett 1989). Also, in the past a 3-minute period to loss of consciousness was used by researchers working on mechanical traps (Proulx and Barrett 1991). Snares currently used to harvest hares keep the animal conscious for markedly longer time periods and require modifications to meet such a humaneness criterion. However, if the harvest of snowshoe hares must continue in its present form, our snare system should at least be used to reduce marten incidental captures.

Martens escaped either by removing the snare from its anchor or by breaking it. All martens spun their body, and in most cases (89%) the wire slipped off the anchor. During their escape attempts, martens changed the direction of their body rotations. Clockwise rotations brought down the wire. Counterclockwise rotations walked it back up the coils. Most martens rotated enough to slip the wire off the anchor. However, in one case, the rotations solidly snagged the wire at the top of the anchor. Consecutive rotations twisted and broke the wire. Snowshoe hares did not escape the snare because their back-and-forth jumps did not cause the snare wire to slide down or twist on the coil.

We believe that our snare system will not reduce snowshoe hare trapper's annual catch. This snare system should be acceptable to the trapping community because the anchor can be homemade at low cost with a 12-gauge wire; trappers already use 0.02-gauge stainless steel wire to build their snare. However, because we describe a system, no components can be eliminated or changed without affecting system efficiency. For example, Proulx et al. (unpubl. rep., 1992) found that the 0.015-gauge metallic line with a lower tensile strength was, on average, 3.5 times more resistant to breakage by twisting than the 0.02-gauge wire. It would therefore be more difficult for an animal to escape by twisting a 0.015-gauge wire. To achieve results similar to ours, the set must be identical to the one used in this study. The 12-cm high snare with a 10.2-cm diameter noose must be set on well established snowshoe hare trails. Crossbars and all branches or debris that could interfere with the animals' rotations must be removed from the trapping site (0.5-m radius around the snare). The sapling with the snare anchor must be ≥40 cm away from other saplings and bushes to avoid wires entangling in trunk or branches. The efficacy of our snare system in simulated natural environments now warrants field studies to compare its capture efficiency to that of snares presently used by trappers.

SUMMARY

A study conducted in simulated natural environments showed that snares set 12 cm above

ground with a 10.2-cm diameter noose efficiently captured snowshoe hares. In kill tests, a 0.02-gauge stainless steel wire snare slipped over a 5-coil anchor stapled to a sapling on the side of animal's trails killed 9 of 9 snowshoe hares. However, 9 of 9 captured martens escaped by spinning their body, which either slipped the wire off the anchor or broke it. We recommend this snare system to reduce incidental marten captures in snowshoe hare snares.

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LITERATURE CITED

BERGERUD, A. T. 1969. Status of the pine marten in Newfoundland. Can. Field-Nat. 82:128–131.

CANADIAN COUNCIL ON ANIMAL CARE. 1984. Guide to the care and use of experimental animals. Vol. 2. Can. Counc. Anim. Care, Ottawa, Ont. 208pp.

DIXON, W. J., AND F. J. MASSEY, JR. 1969. Introduction to statistical analysis. McGraw-Hill Book Co., New York, N.Y. 638pp.

PHILLIPS, F. 1987. Newfoundland and Labrador trapper education manual. Book 3: land fur. Newf. and Labrador Wildl. Div., St. John's. 62pp.

PROULX, G., AND M. W. BARRETT. 1989. Animal welfare concerns and wildlife trapping: ethics, standards and commitments. Trans. West. Sect. The Wildl. Soc. 25:1–6.

———, AND ———. 1990. Assessment of power snares to effectively kill red fox. Wildl. Soc. Bull. 18:27–30.

———, AND ———. 1991. Ideological conflict between animal rightists and wildlife professionals over trapping wild furbearers. Trans. North Am. Wildl. and Nat. Resour. Conf. 56:387–399.

———, ———, AND S. R. COOK. 1990. The C120 Magnum with pan trigger: a humane trap for mink (*Mustela vison*). J. Wildl. Dis. 26:511–517.

———, I. M. PAWLINA, AND R. K. WONG. 1993. Re-evaluation of the C120 Magnum and the Bionic® traps to humanely kill mink. J. Wildl. Dis. 29:184.

THOMPSON, I. D. 1991. Could marten become the spotted owl of eastern Canada? For. Chron. 67: 136–140.

ZAR, J. H. 1984. Biostatistical analysis. Second ed. Prentice Hall, Englewood, Cliffs, N.J. 718pp.

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