A PASSIVELY TRIGGERED FOOT SNARE DESIGN FOR AMERICAN BLACK BEARS TO REDUCE DISTURBANCE BY NON-TARGET ANIMALS

STEVEN R. REAGAN, U.S. Fish and Wildlife Service, Mandalay National Wildlife Refuge, 3599 Bayou Black Drive, Houma, LA 70360, USA, email: Steve_Reagan@fws.gov
JANET M. ERTEL, U.S. Fish and Wildlife Service, Mandalay National Wildlife Refuge, 3599 Bayou Black Drive, Houma, LA 70360, USA, email: Janet_Ertel@fws.gov
PAT STINSON, U.S. Fish and Wildlife Service, 6578 Dogwood View Parkway, Suite B, Jackson, MS 39213, USA, email: Pat_Stinson@fws.gov
PAUL YAKUPZACK, U.S. Fish and Wildlife Service, Mandalay National Wildlife Refuge, 3599 Bayou Black Drive, Houma, LA 70360, USA, email: Paul_Yakupzack@fws.gov
DON ANDERSON, U.S. Fish and Wildlife Service, Tensas National Wildlife Refuge, 2312 Fred Morgan, Sr. Road, Tallulah, LA 71282, USA

Abstract: American black bears (*Ursus americanus*) are commonly captured throughout their range for research or management purposes. However, with the most commonly used capture devices, capture of non-target animals and disturbance of traps can substantially reduce capture efficiency. Here, we describe a passively-triggered snare designed to capture black bears and reduce such trap disturbance. The passively triggered snare system was designed to secure the snare to the foot of the bear as it attempts to access bait in the bottom of a hole by hooking a screen on top of the bait with its claws, pulling a PVC tube upward and gently tightening the snare to its wrist. We qualitatively compared this design (143 trap-nights) with 2 conventional methods, spring-activated snares (574 trap-nights) and culvert traps (129 trap-nights). Passively-triggered snares captured bears 15 of 74 times (20%) the traps were disturbed, spring-activated snares 22 of 360 times (6%), and culvert traps 25 of 63 times (40%). Both the passively-triggered snares and culvert traps prevented lost trap-nights to non-target species, such as raccoon (*Procyon lotor*). Passively-triggered snares prevented bear cubs from being captured, although several were observed attempting to take bait from the sets. Passively triggered snares, like culvert traps, require no concealment, but unlike culvert traps, are highly portable. The passively-triggered snare provides the same advantages as other snare designs, but has the potential to increase capture efficiency when disturbance by non-target animals is common. The results of our study suggest further evaluation of this technique is warranted. Comparisons with other techniques should be based on equal number of trap-nights and a study design that incorporates different environmental conditions.

Ursus 13:317–320 (2002)

Key words: Aldrich foot snare, American black bear, animal safety, capture efficiency, capture injury, culvert trap, non-target species, trap design, *Ursus americanus*

Wildlife managers and researchers often use culvert traps and Aldrich foot snares to capture American black bears. Culvert traps were designed in the early 1900s primarily to capture nuisance bears in national parks (Erickson 1957). Culvert traps have withstood the test of time, and various styles and modifications of this trap design remain in use. Because culvert traps are difficult to move, their use is generally restricted to areas near roads. The primary advantage of culvert traps compared with snares relate to human safety; culvert traps can be safely used in areas frequented by people and captured bears can be transported or released without the need of immobilization.

The Aldrich foot snare with its spring-activated trigger has been used widely as an alternative trap design since its development by a Washington Forest Protection Association hunter, Jack Aldrich, in the 1960s (Poelker and Hartwell 1973). This trap provides a safe and effective capture method for black bears in a variety of field conditions (Johnson and Pelton 1980). Bait generally is used with both traps to attract bears to trap sites.

Baits can attract numerous non-target animals to trap sites. Trap efficiency can be greatly reduced by non-target animals exposing or disabling traps while attempting to remove the bait. Reduced capture efficiency is of particular concern in areas with relatively low bear densities and high densities of non-target species. Moreover, the capture of non-target animals is generally undesirable and has received more public scrutiny in recent years. Our objective was to develop a passively triggered trap that would be less sensitive to disturbance by non-target species, but comparable with other trapping methods in terms of bear and human safety and efficiency.

STUDY AREA

Trapping efforts were focused within the upper Tensas and the coastal Atchafalaya River Basins in Louisiana. The study area in the Tensas River Basin (Deltic Tract study area) was approximately 30 km^2 and consisted of small, isolated tracts of bottomland hardwood forest surrounded by large expanses of agricultural land. Primary agricultural crops included soybeans, cotton, rice, corn, wheat, and sorghum. In the coastal Atchafalaya River Basin, a 80-km^2 area of drained cypress–tupelo (*Taxodium distichum–Nyssa aquatica*) and bottomland hardwood forest was trapped. Only a small proportion of the habitat was associated with agriculture, primarily in the form of sugarcane.

METHODS

Three trapping methods were used to capture black bears from 14 April to 27 September 2000: modified Aldrich snares with a passive trigger, modified Aldrich snares with a spring-activated trigger, and culvert traps. Our intent was not to rate the efficiencies of the different traps because we could not control for the individual effects of the trappers, effort, or sites within which traps were set. Thus, comparisons of effectiveness among trap types are for general reference only.

Passively-triggered Aldrich snares consisted of the snare design described by Johnson and Pelton (1980). We replaced the standard spring-activated trigger with a passive trigger designed to secure the snare to the foot of the bear as it attempts to access the bait in the bottom of an earthen hole by hooking a screen on top of the bait with its claws, pulling the entire tube upward and gently tightening the snare to its wrist.

The passive trigger was made from two 15.2-cm diameter schedule-40 (0.6 cm wall thickness) PVC (polyvinyl chloride) pipe sections. The sections were joined top to bottom and placed into an earthen hole of equal diameter and deep enough to leave the top of the pipe flush with ground level (40 cm). We found that a standard post-hole digger provided a neat and efficient method to prepare the earthen hole. The lengths of the top and bottom sections measured 10.2 cm and 27.9 cm (Fig. 1), respectively, and corn bait was placed under a 1.3- x 1.3-cm wire screen fixed into the bottom of the joined PVC pipes (Fig. 2). The dimensions of the trigger reduced the potential for jaw captures. The upper edge of the top section of PVC-pipe was beveled inward, thereby discouraging bears from standing on the lip of the pipe while investigating the bait.

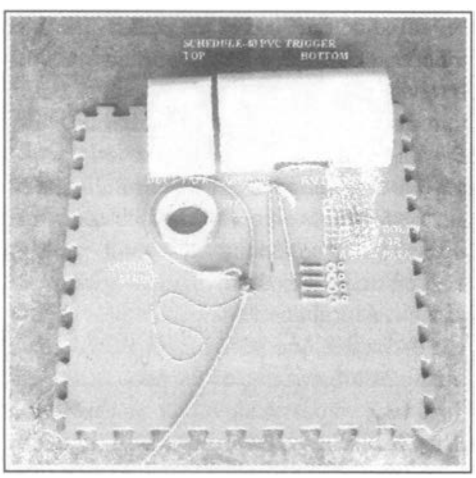

Fig. 1. Unassembled passive trigger designed to be used with the modified Aldrich foot snare for the capture of black bears.

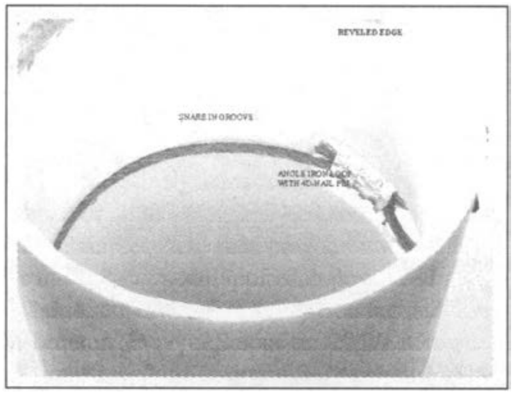

Fig. 2. The fixed bait screen inside the bottom of the trigger protects the bait from non-target species while providing a clawing surface for bears (passive trigger fully assembled).

Both sections received a matching and adjoining notch and groove; these features both concealed and retained the snare loop and angle iron (Fig. 3). Each notch had a depth of 1.3 cm and length of 10.2 cm. Both interior and exterior edges associated with the notch were rounded to allow smooth snare movement during triggering. The groove was along the full circumference of the pipe's interior and had a height of 0.3 cm and a depth of 0.5 cm., with both the top and bottom sections having a rabbet of 0.15 cm height and 0.5 cm depth. Duct tape was used to secure the sections together, thereby matching the top and bottom notches and grooves without covering the notch.

We ensured proper closure of the snare by using a 4D nail (3.8 cm length) as a pin to secure the snare's angle iron to the trigger. The upper 2.5-cm length of the nail was pressed into a 'U' shape. The cable's eye, used to hold the angle iron on the cable, was placed over the pin (Fig. 4). The remaining length of the pin was inserted into a small hole drilled in the center of the bottom notch. An additional cable clamp was placed along the snare loop just behind the angle iron. When the snare was set, this

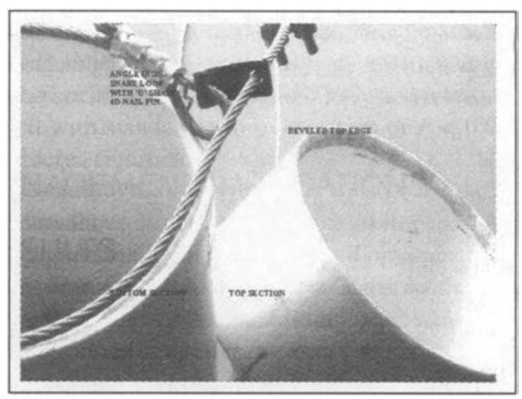

Fig. 3. The passive trigger's top edge is beveled and the snare cable is hidden and secured using a wall groove and 4D-nail pin (passive trigger fully assembled).

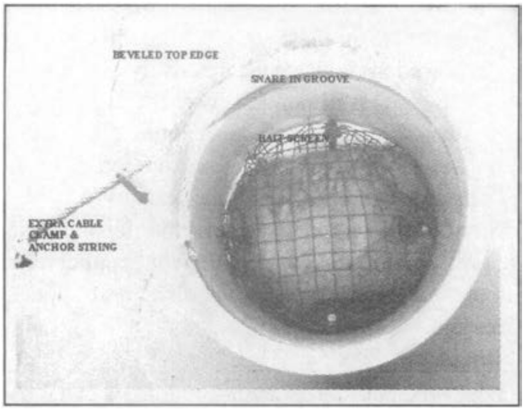

Fig. 4. The 4D nail placed within the eye of the cable secures the angle iron to the passive trigger (passive trigger partially assembled).

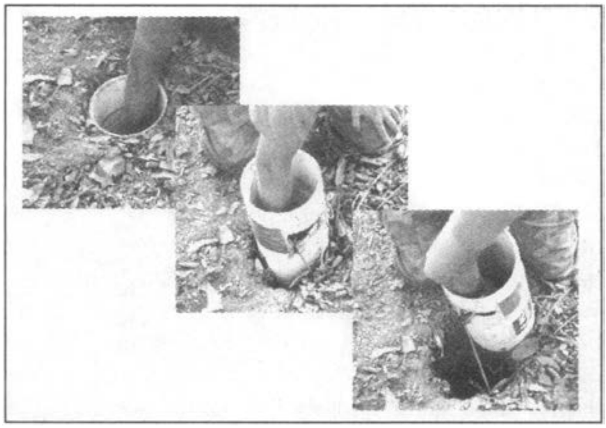

Fig. 5. The passive trigger closes the snare's loop when the PVC pipe is pulled out of the ground by hooking the screen fixed within the bottom of the pipe.

clamp was attached using nylon string to an anchor placed 12 cm down the wall of the earthen hole. The string between the snare cable and anchor was securely tightened by tightening the cable clamp on to the string when the string was pulled snug. The attached anchor, a welding rod, provided the resistance necessary to close the snare but gave way once the bear was captured (Fig. 5).

Spring-activated modified Aldrich foot snares were used as described by Johnson and Pelton (1980). Trees and heavy brush that could potentially bind snare movement of trapped bears were removed. However, light brushy vegetation, used to construct trap cubbies and direct the movements of approaching bears, remained within the snare circle. Bait was hung in the area of the trap and placed as an enticement behind the trap.

Culvert traps were constructed from corrugated aluminum culvert pipe with a 91-cm exterior diameter and a total length of 213 cm. One end of the culvert was blocked using 1.9-cm No. 9 raised expanded steel. The entrance consisted of an aluminum plate door of 0.6 cm thickness. Bait was attached to a trigger at the rear of the culvert. Additional bait was either hung or placed on the ground near the front of the culvert.

All traps were placed in well shaded areas and in areas receiving little human disturbance. All traps were checked daily.

RESULTS

A total of 143, 574, and 129 trap-nights were accumulated using passively triggered snares, spring-activated snares, and culverts traps, respectively (Table 1). Trapping efficiency, measured by trap-nights/bear was greater for passively triggered snares than spring-activated snares, but less than culvert traps (Table 1). Each trap design captured individual bears more than once.

Spring-activated snares were responsible for 1 hind-foot capture, 1 toe-capture, and 1 catch part way up the leg. The passively triggered snares placed the snare loop consistently between the interdigital and metacarpal pads on the front foot, except in 2 cases when the catch was on the posterior side of the interdigital pad. Capture-related injuries included minor cuts and abrasions to feet, 1 broken incisor, and 1 severely torn toe and front pad (Table 1). The broken tooth and the severely torn toe were for 2 bears captured with the spring-activated foot snares.

DISCUSSION

Capturing black bears can be challenging because bears quickly become trap smart and learn to avoid capture. The resulting decrease in capture efficiency is exacerbated when non-target species interfere and disable traps prior to a bear's visit. We developed the passively-triggered

Table 1. Summary of effort and capture success of American black bear with passively triggered snares, spring-activated snares, and culvert traps, upper Tensas and coastal Atchafalaya River Basins, Louisiana, April–September 2000.

Trap type	Trap nights	Bears captured	Trap–nights/bear	Traps triggered	Ratio: caught bears/triggered trap	Injuries
Passively triggered snare	143	15	9.5	74	0.20	3 (20%)
Spring-activated snare	574	22	26.1	360	0.06	8 (36%)
Culvert trap	129	25	5.2	63	0.40	2 (8%)

snare to safely capture target bears and to prevent non-target species or bear cubs from taking the bait or tripping the trap. Our trigger design allowed medium-sized mammals, such as raccoons and bear cubs, to investigate the bait without triggering the trap. The trigger requires a long forearm reach and a direct pull upward on the bait screen to close the snare loop. Small animals were unable to both reach the screen and to exert the strength required to pull the pipe from the ground and tighten the snare; although we observed several attempts by cubs to take the bait, the trap sets remained undisturbed. Because passively triggered snares prevented disturbance by non-target animals, the number of opportunities to capture bears increased. In contrast, spring-activated snares were frequently disturbed by non-target animals. Culvert traps demonstrated the greatest capture success, but site selection required vehicle access. Both snare systems allowed greater flexibility in site selection.

The passive trigger provided consistent catches behind the interdigital pad of the front foot. Thus, this trap design may increase handler safety by eliminating toe and hind-foot captures. As an additional advantage, passively triggered snares required no concealment or structural materials. Such materials may be one cause of injuries to captured bears. Although our sample sizes are low and the study was not designed to compare injury rates among the 3 methods, our preliminary data suggests that injuries may be less severe and less frequent with the passively-triggered snare.

Techniques that prevent capture of non-target animals are valuable. Capturing non-target animals could present conservation and management concerns when the captured animals are endangered or game species. Even captures of nuisance species, such as raccoons, can raise concern with the general public and usually these concerns need to be addressed in animal welfare protocols.

Our observations indicate that passively triggered snares can capture black bears and prevent the capture of non-target animals, thereby increasing capture efficiency. The passively triggered snares seemed as effective as spring-activated foot snares for capturing bears. We believe the passively triggered snare merits further testing based on studies designed to assess its effectiveness under various environmental conditions, among different trappers, and within different regions.

ACKNOWLEDGMENTS

We are thankful to the many private landowners who provided access to their properties, Louisiana's Trial Lawyers Association, and U.S. Fish and Wildlife Service for funding, and for comments from the reviewers that were both well intentioned and constructive.

LITERATURE CITED

ERICKSON, A.W. 1957. Techniques for live-trapping and handling black bears. Transactions of the North American Wildlife Conference 22:520–543.

JOHNSON, K.G., AND M.R. PELTON. 1980. Prebaiting and snaring techniques for black bear. Wildlife Society Bulletin 8:46–54.

POELKER, R.J., AND H.D. HARTWELL. 1973. Black bear of Washington. Biological Bulletin 14. Washington State Game Department, Olympia, Washington, USA.

Received: 18 May 2001.
Accepted: 14 January 2002.
Associate Editor: van Manen.