

Methods for Capturing Free-Ranging Black Bears, *Ursus americanus*, in Difficult Locations

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Long-term research or monitoring studies involving radiomarked Black Bears (*Ursus americanus*) conducted in areas with high human and road densities may require that radiocollars be replaced or bears recaptured for other purposes. The use of trained bear hounds is particularly suited to recapturing specific bears. However, in certain situations, hounds may not be used safely or bears may seek refuge in difficult locations. Effectiveness of two methods to capture bears via remote darting and chemical immobilization are described: (1) stalking and rushing females with cubs; and (2) allowing treed bears to descend. Both methods rely on assumptions about Black Bear behavior. Nine captures of eight individual bears are discussed; one bear drowned after being immobilized, and all others survived >5 months after capture.

Key Words: Black Bear, *Ursus americanus*, capture, immobilization, stalking, Massachusetts.

Researchers have employed a variety of techniques to capture Black Bears (*Ursus americanus*). Common and effective techniques for initial captures include the use of Aldrich foot snares (Johnson and Pelton 1980), culvert traps (Erickson 1957) and trained hounds (Elowe 1990). Visitation of the dens of previously radiomarked animals is often employed in bear research to document reproduction and cub survival take physical measurements, and to replace or remove radiocollars. Yearling bears denned with their radiocollared mother can be fitted with collars as well. The choice of capture technique is often dictated by resources available, the study area location and terrain (e.g., for culvert traps), legal restrictions (e.g., for hounds), skill of personnel, availability of radiomarked animals (for den visits), and human use of the study area. No technique is applicable to every situation and a variety of problems can arise with each.

Culvert traps and foot snares simplify the immobilization process because the bear is confined either within the culvert trap or restricted to a small radius of movement by the snare. Snares may not be the method of choice in areas of high human use where the physical security of both captured bears and the public is at risk. Culvert traps may be difficult to use in areas far from roads. Den visits are relatively straightforward; under ideal conditions the bear remains in the den when approached and the researcher is able to immobilize it *in situ*. In less than optimal conditions, the bear vacates the den and the researcher must attempt to recapture the bear another day. In other cases, the den is difficult to enter; this is often the case for tree dens (Godfrey et al. 2000). Except in rare circumstances, however, den visits involve recapturing bears that were previously captured and radiocollared by other means.

Trained hounds allow researchers the ability to seek out bears that may be difficult to capture through trapping, either because they are in remote areas or are trap-shy. Hounds are also useful to recapture specific radiocollared bears. By radiotracking the target individual and moving to a close proximity such that the hounds have the bear's trail before they are released, researchers can often recapture specific bears (Fuller 1993). Individual bears vary in their response to hounds; not all chases result in a capture or the capture of the target individual, but in many instances the chase ends with a treed bear. However, the task remains to immobilize the bear and retrieve it from the tree. Usually, this is accomplished by darting the treed bear and allowing it to fall from the tree into nets; sometimes the bear does not fall from the tree and the researcher must climb the tree and lower the bear to the ground.

In Massachusetts, I employed all of the techniques mentioned above and all were successful (McDonald 1998). Part of my research involved recapturing radiocollared females with cubs during the late spring to obtain milk samples. Many other bears fled their dens when approached during the winter and needed to be captured when active in the spring in order to replace their radiocollars. Hounds were the method of choice for capturing these bears because of the ability to target specific bears. However, many of the bears in my study frequented areas on the fringe of or in the midst of towns. In these developed areas, the high road and housing densities sometimes precluded the use of hounds to capture specific bears or the hounds were not available.

Another problem that I encountered when using hounds was the choice of tree in which the bear sought refuge. Many bears treed in multi-stemmed Eastern

White Pines (*Pinus strobus*) that posed certain risks. The main concern was that an immobilized bear would fall into one of the many forks or crotches of the tree rather than falling to the outside and into the net. Other bears chose trees under which we could not set nets, because of the steepness of the terrain or a lack of nearby trees to which we could fasten the net. Given the effort expended to chase and tree these bears, and my desire to harass them as little as possible, I was reluctant to abandon the capture attempt and in collaboration with my field crew developed a simple method to capture bears in these situations.

This paper describes two techniques for immobilizing free-ranging bears in difficult circumstances. The techniques are variants of each other. The first method is specific to the capture of radiocollared female bears with cubs. The second method can be used with any treed bear.

Study Area

My study was conducted in western Massachusetts (42° 27' N, 72° 41' W) on the 150-km² Conway-Williamsburg study area (CWSA). The CWSA was 70% forested and >90% privately owned with elevations ranging from 30 m to 450 m (Fuller 1993). Hardwood dominated forests consisted of Northern Red Oak (*Quercus rubra*), Red Maple (*Acer rubrum*), Black Birch (*Betula lenta*), Sugar Maple (*A. saccharum*), and hickories (*Carya* spp.). Major softwoods were Eastern White Pine and Eastern Hemlock (*Tsuga canadensis*).

Corn was the major agricultural crop present in the CWSA. Usually between 10 and 20 cornfields were present in the CWSA each year, ranging in size from 0.4 to 4.0 ha. Other human-related food sources included apiaries, apple orchards, and home bird feeders. Human densities in the study area ranged from 18/km² to 459/km² (Homer 1996). Road density in Massachusetts Deer Management Zone 4N, which contained the study area, was 1.77 km/km² (W. A. Woytek, Massachusetts Division of Fisheries and Wildlife, personal communication). However, in areas around town centers and the city of Northampton road density was higher.

Methods

Initial Capture and Handling

I captured female bears between 1993 and 1998 using foot snares and trained bear hounds; some bears were originally captured during previous research (Elowe 1984; Fuller 1993) or were captured as yearlings in winter dens with their mother. I immobilized bears using a mixture of ketamine hydrochloride (10–17 mg/kg body weight) and xylazine hydrochloride (1–2 mg/kg body weight) or a mixture of tiletamine hydrochloride and zolazepam hydrochloride (i.e., Telazol; 3.9–7.3 mg/kg body weight). I found that a standard dose of 300 mg of Telazol was sufficient to safely

immobilize most free-ranging adult female bears, regardless of body weight.

Recapture Techniques for Radiocollared Females with Cubs

To obtain milk samples from free-ranging female bears with cubs, I attempted to recapture them during late May and early June, 1994–1996. Most were recaptured using trained hounds as described above. However, several adult females were located in areas with high road densities or among homes; usually the bear would be in a small wetland area abutted by homes. My judgement was that these were inappropriate settings to attempt to chase the bear with hounds due to the risk of the bear and hounds crossing heavily traveled roads or causing too much general commotion in developed areas (i.e., treeing in a front yard). At other times, the bear may have been in a remote area but the hounds were not available when I needed to capture a specific bear to remain within my sampling window. In both of these circumstances, if I elected to try to capture that specific bear in that situation I employed a stalking technique that required a minimum of two people equipped with dartguns and two-way radios.

I radiotracked the bear and when I determined we were within about 100 m (based on signal strength or sighting the bear) of the bear we attempted to close in as quickly as possible. If we could see the bear we would rush toward it. The objective was to get the female to put the cubs up a tree (cub tree) that we could identify, either by seeing the cubs or hearing them climb the tree. If we could identify the cub tree, we would get to it as quickly as possible, making noise to let the female know where we were. After several minutes of observation of the site, one person with a dart gun would take up a position within 15 m of the cub tree, the other person or people would then noisily walk away in a direction roughly perpendicular to the female as determined either visually or by the radio signal. The objective here was to persuade the female that all of her pursuers had left the cub tree and it was safe to return. When she did return, the hidden person would attempt to dart her. If darting was successful, the bear would run off and would be located by radio-tracking.

In practice, several outcomes may present themselves with this technique: (1) the cubs tree and the female departs, (2) the adult bear trees with the cubs, (3) the cubs tree and the female holds her ground at the base of the tree or bluff charges the pursuers, (4) the cubs tree, the female departs, but the cub tree is not identified, and (5) all bears depart. The first outcome is as discussed in the technique description above. If the adult trees with the cubs, then she can simply be handled like any treed bear, providing the appropriate equipment (i.e., nets and ropes) is available. If the female holds her ground at the cub tree, the situation becomes more difficult. Some females

would allow us to approach within darting range (20 m) and it was tempting in such instances to simply dart the female. However, there was a risk that when darted the female would climb the cub tree. At that point, there would only be 5 to 15 minutes to set up nets before she became immobilized and fell. Bears that charged usually would not climb the cub tree; these bears could be darted when they stopped their charge and could be treated as in situation 1.

In some instances, a female would put her cubs up a tree when we were a long distance off and then she would depart. In those cases, if the cubs climbed into the canopy of the tree, especially Eastern White Pines or Eastern Hemlocks, we could not locate them. At this point we would simply leave the area. In other instances, the cubs were quite large (>10 kg) by the time we were trying to capture them and instead of treeing would simply move off with the female. If we determined this to be the case we would leave the area.

Treed Bears in Difficult Locations

For bears chased with hounds that eventually treed, the tree itself sometimes posed risks to safe capture by means of chemical immobilization. As described above, many bears sought refuge in multi-stemmed trees that posed serious injury risks to immobilized bears that might fall into a fork or strike another stem. Other bears sought refuge in otherwise suitable trees but were too high (or behind thick screening, especially in hemlock trees) to dart. For bears in otherwise suitable trees, we would first attempt to get the bear to change position, thus offering a shot, by repeatedly and rapidly striking the tree with hand-held rocks, clubs cut on site, or whatever suitable equipment we had (e.g., small shovels or the back of an axe). This noise and vibration frequently caused bears to move around in the tree and often resulted in our being able to dart them. Sometimes striking the tree caused the bear to descend and leave the tree, and we could dart it.

However, in some instances with both unsuitable and suitable trees, we could not safely dart the treed bear. In this case we would employ a variation of the method described above for adult females. One or two people equipped with dart guns would hide within 15-m of the tree. When these people were hidden, the other people on site would noisily leave with the dogs and all the equipment. When the departing crew members were away from the tree, the bear would descend and could be darted on the ground. The bear would then leave the site and be located by radio-tracking when immobilized. This technique could be employed on bears with existing radiocollars. Barbed, transmitter darts allowed the method to be used to locate immobilized bears not previously radiocollared. Uncollared immobilized bears were also found by using a leashed hound to locate them.

Results

Radiocollared Females with Cubs

I captured four individual females with cubs five times using the track and rush method. One female was captured by this method in two different years. Three additional stalking attempts were unsuccessful; one of these females was subsequently captured several days later using this method, one was later captured with hounds, and no attempt was made to recapture the other. In one case the female held her ground and I darted her; she subsequently treed with the cubs and fell about 8 m to the ground after immobilization. I did not detect any physical injuries from the fall; she recovered and survived for >4 years. Two females treed with their cubs and were darted in the tree; nets were erected under both trees. One bear descended after being darted and became immobilized <100 m from the tree; the other became immobilized in the tree and I climbed up and lowered her to the ground with a rope. Two other bears were tracked and rushed and the cub trees identified. Both were darted on the ground when they returned to the cub tree after the second person had departed. Both were recovered within 50 m of the cub tree. I did not keep an accurate record of the time between the departure of the second person and the bear's return, but in both cases it was less than 10 minutes.

One of the failed stalks was the first attempt and the person hiding by the cub tree climbed a nearby tree and may have been visible to the bear. The second person in this attempt did not completely move out of the area, but moved noisily away and then was able to watch the bear with binoculars. After about 45 minutes of waiting, we abandoned the attempt. In another failed attempt, I was unable to locate the cub tree and the female moved off. This bear was later recaptured with hounds. In the final failed stalk, four people were involved and instead of completely leaving the area several of them stayed too close to the cub tree and the female would not return. This bear was captured by stalking several days later using only two people.

No bears died during handling with this method. One female was killed as a nuisance bear five months after capture and I could not determine the fate of her cubs. A second female and her cub were both killed during the hunting season four months after capture (her other cub had been killed by a vehicle prior to the stalk and capture event). One female that was captured twice by this method had three cubs during the first capture in 1994, two of which were present in her den the following winter; the next time (1996; this was the occasion during which she fell from the tree) she had two cubs, both of which were present in her den the following winter. The other female had three cubs when captured and could not be captured

in the den the following winter but snow-tracking indicated that at least two of the three cubs were with her at that time. The lone bear not recaptured after a failed stalk rejoined her three cubs and all were present in the den the following winter.

Bears in Difficult Trees

I captured four individual bears (one in 1994, three in 1996) by hiding near the tree and having the crew and dogs leave. One of these bears, a female that treed with a yearling in 1994, drowned after being darted. I darted her as she left the tree; the bear ran about 150 m before becoming immobilized with her head under water in a small stream (about 2 m wide and <0.5 m deep). I located her <20 minutes after darting and tried mouth-to-nose resuscitation but could not revive her. The other three bears were recovered within similar distances and all survived ≥ 3 years after capture. Again, I did not record the time from crew departure to bear darting but I was present as shooter in all instances and all four bears descended <5 minutes after the crew was out of sight of the tree. In one instance the bear treed within sight of our vehicles, although >100 m away, and would not descend until the last vehicle departed. Within 1 minute of that vehicle departing, the bear descended. One additional bear, not included in the tally above, treed after fleeing her den during the winter. I employed the same technique of hiding a shooter near the tree and the rest of the crew moved off and hid. This bear was darted when still about 6 m up the tree; she climbed back up the tree, became immobilized and fell about 10 m to the ground. The ground was covered with about 1 m of snow and the bear recovered, had cubs the following winter, and survived until being taken during the hunting season 18 months later.

As stated above, the three bears captured during 1996 all survived >3 years after capture. At the time of capture (2 June) one of the three appeared to have already lost the entire litter of cubs ($n=2$) she had during the winter; her nipples were small and we could not express any milk from her, even after injection of 100 IU of oxytocin. All of the cubs from the other two females (one litter of two and one litter of three) were present as yearlings in their 1997 dens.

Discussion

The methods I used to capture bears in difficult settings allowed me to minimize the risks associated with hound pursuit in a roaded area and the number of times we had to harass individuals to perform research tasks. The one mortality was due to my judgement that it was better not to immediately chase the darted bear and to allow 10 minutes for her to become immobilized before tracking. That mortality was especially regretful as only the bear's head was under water, not even up to its ears, and the stream was the only water source within 0.5-km of the tree. After that event, we pursued

bears darted on the ground as quickly as possible, remaining at a distance where we could see them and ensure their safety.

It was important that all crew members leaving the bear tree moved off quickly and noisily and did not try to take up a position where they could watch the bear descend the tree because the bear would not descend if it could see or hear people and dogs. Departing crew members need to keep their radios on to receive instructions from the shooter(s) about the need to move farther off, as in the above case with the vehicles, or to return to help pursue the darted bear. Conversely, the shooter's radio should be off unless they need to initiate contact. Patience was required to overcome the temptation to dart the bear while it was still in the tree. In my experience, the descending bear would pause at the bottom of the tree and look around before moving off; that was the time to dart it.

More judgement was required when darting females returning to the cub tree. This technique relies on the basic tolerance and low degree of aggressiveness of Black Bears (DeBruyn 1999: 76). Certainly, every individual bear will behave differently and I have tried to present the types of responses that can be expected. There are two premises to this technique: (1) adult female bears can not count and will observe the departing crew and think that all have left; and (2) the adult female will not be overly aggressive and attempt to contact the crew at the cub tree. The latter was my experience and therefore we never carried firearms for deterrence. Some bears would bluff charge, but all stopped short of contact (this included bears I encountered with cubs at other times, too).

Wind direction did not appear to influence the female's approach. The bear could often be observed circling in the distance while crew members were at the cub tree. I relied on the fact that the bear would observe the departing crew and would then feel comfortable about approaching the tree, regardless of human scent. However, the hidden shooters wore dark or drab clothes to minimize the risk of returning or descending bears spotting them.

The method of capturing radiocollared females with cubs obviously has limited utility. But, as more bears live in highly populated regions and biologists are required to do research on basic life history parameters in order to justify management actions, there will be times when this method can be useful. Given the availability of radio-equipped darts and non-narcotic drugs that can immobilize adult bears with small volumes (e.g., Telazol) I think the method described for treed bears will have a wider application.

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