A Comparison of Detector Dogs, Hair Snares, Cameras, and Scent Stations for Detection of Bobcats

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Adequate monitoring and detection of populations of small and medium-sized felids has been difficult to achieve with traditional methods. However, new detection methods have been developed. To compare survey methods for bobcats *Lynx rufus*, I examined the rate of detection, cost, and time required for automatic cameras, hair snares, scent stations, and a detector dog trained to find bobcat feces (scats). This dog produced nearly ten times the number of bobcat detections as the other methods combined. Although the detector dog was the most expensive method and, depending upon weather and number of scats required, took more field time than the other methods, its use required only one visit to each survey site. Use of detector dogs has the potential to achieve detection rates consistently high enough to provide useful indices for the population monitoring of bobcats. Detector dogs may also be used in a laboratory setting to identify bobcat scats within a sample set collected from the field.

Many game management agencies in the United States use harvest statistics (numbers of animals killed by hunters or trappers) or scent stations (scented or baited tracking surfaces) to monitor bobcat populations. These methods offer limited usefulness because harvest statistics do not monitor the portions of populations which are not caught, and visitation rates by bobcats to scent stations have rarely exceeded 10%, a minimum threshold above which scent station indices may be useful for population trend analysis with practical sample sizes (Sargeant *et al*. 2003). However, new methods of detecting bobcats have been developed, including the use of detector dogs, hair snares, and automatic cameras. Detector dogs trained to find scats have been used in studies of several species, including kit foxes *Vulpes macrotis* and grizzly and black bears, *Ursus arctos and U. americanus*. Hair snares are scented devices upon which animals deposit hair by rubbing, and have been used for surveys of Canada lynx *Lynx canadensis*. Although this comparison of the four methods was originally intended as a pilot study, the detection rate of the detector dog was sufficiently greater than the detection rates of the other three methods to warrant reporting.

Methodology

Field work was conducted in Chihuahuan desert habitats in southern New Mexico, USA. I conducted tests along transects following dry creekbeds, roads, or brushy areas. I hired one detector dog and handler team (Packleader Detector Dogs, Gig Harbor, Washington, USA), which beginning at dawn, searched each transect for bobcat scats for 3-5 hours. The length of time that the dog was able to work was limited by temperature and insolation. I collected all scats identified as bobcat by the dog/handler team.

I identified species depositing scats by two methods: mitochondrial DNA analysis and Comparable Species Differentiation (CSD) tests. For CSD tests, two additional detector dogs were trained to discriminate bobcat scats from those of other species potentially occurring within the study area, including coyotes *Canis latrans*, cougars *Puma concolor*, and jaguars *Panthera onca*.

I placed hair snare and scent/camera stations (Fig. 1) alternately at 0.35 km intervals along 3.2 km transects, for a total of 5 hair snare and 5 scent/camera stations on each transect. Transects followed dry steambeds, roads, or brushy areas. Hair snares consisted of 10 x 10 cm patches of carpet with ten nail-gun nails driven through the uncarpeted side and scented with 30 ml of beaver castor, 15 ml of crushed, dried catnip leaves, and five drops of catnip oil. I placed 2-3 strips of flagging tape and hung an aluminum pie tin and a carpet pad scented with beaver castor on nearby branches. I collected deposited hair after two weeks. Species were identified using mitochondrial DNA analysis.

Fig. 1. Bobcat taken in a scent/camera station placed along a trail. (Photo: R. Harrison).

Although bobcats have not been found to respond to scent stations very well, I included scent stations in the study because they are still used as a standard carnivore survey method in many areas. Scent stations consisted of a 1x1 m area cleared of vegetation and covered with a sifted 32:1 mixture of dry sand and mineral oil. A lure consisting of a plaster of paris tablet soaked in beaver castor was placed in a white, perforated plastic capsule stapled to a tongue depressor, and inserted vertically in the center of the scent station. Flagging was placed on nearby shrubs, and one small pie tin with a carpet patch scented with beaver castor was hung over the scent station. At each scent station I placed a Trailmaster 1500 active infrared camera with the infrared beam passing over the center of the station. I checked the stations for tracks for two nights, and removed cameras after two weeks.

Results

I surveyed ten transects, including 700 hair-snare nights, 140 camera nights, and 100 scent-station nights. The detector dog (Fig. 2) located scats later confirmed by DNA analysis to originate from bobcats on 100% of transects (1-13 confirmed bobcat scats/transect), including a total of 78 potential bobcat scats. Of these, DNA analysis identified 56 scats as bobcat, 5 as coyote, 2 as gray fox (*Urocyon cinereoargenteus*) or kit fox, and failed for 15 scats. Of the 68 potential bobcat scats tested through CSD, 62 were identified as bobcat, 5 were identified as non-bobcat, and 1 was undetermined. Of the 62 scats identified as bobcats by the CSD test, DNA analysis succeeded for 48, of which 42 were identified as bobcat, 4 as coyote, and 2 as gray or kit fox. Of the 5 scats identified as non-bobcat with CSD tests, DNA analysis found 3 to be bobcat, 1 to be coyote, and failed for 1.

Bobcat hair was collected from one hair snare. Automatic cameras recorded bobcats at one station each on five transects. No tracks of bobcats were observed on scent stations during the two-night observation period, although bobcats were photographed on scent stations on four transects after that period.

Table 1. Comparison of detection rate, cost, and estimated time required for presence–absence surveys of bobcats by a detector dog, automatic cameras, hair-snares, and scent stations on 10 transects in southern New Mexico (Sept. 2004 – Mar. 2005). Percentages of total numbers of scats tested are in parentheses. Costs include DNA analysis of collected samples but not travel expenses

Method	No. of bobcat detections	Proportion of transects with detections (%)	Cost ($)	Field time required (days)
Detector dog				
DNA verification	56 (72%)	100	4,900	5-10
CSD[a] verification	62 (91%)	100	5,400	5-10
Automatic cameras	5	50	≤2,275/ transect	3-5[b]
Hair-snares	1	10	277	3-5[b]
Scent stations	0	0	<200	3-5[b]

[a] Comparable Species Differentiation
[b] Times do not include return travel time to transects

Costs

The cost of hiring the detector dog/handler team was approximately US$3000, including two 5-day work periods, one 2-day rest period, meals, and lodging, but not including travel expenses between Packleader headquarters and the study site. DNA analysis cost US$23.35/scat. CSD tests cost US$2240 (US$1500 for training and preparation of CSD dogs, plus US$10/scat), plus an additional US$234 to provide ten scats for training that were confirmed to be bobcat by DNA analysis. Altogether, use of the detector dog/handler team cost approximately US$4900 to locate bobcat scats and confirm their species of origin with DNA analysis, and US$5400 to locate bobcat scats and confirm their species of origin with CSD tests. At current prices, confirmation of species of origin for scats is less expensive using CSD tests than DNA analysis if the number of scats to be tested exceeds approximately 112-130, depending on whether training scats must be confirmed by DNA analysis prior to CSD tests. Depending upon weather, intensity of searching, and number of scats required, detector dogs may search for up to 6 hours, 3-5 km per day, or 1-2 transects per day.

Cost of hair snares was approximately US$250 for materials, assuming that all 50 hair snare stations were set at once, plus DNA analysis at US$27.37 per hair sample. Setting 10 transects of five stations each would require 1-2 days, plus a return trip of 1-2 days to collect hair, plus 1 day to prepare snares and handle samples, for a total of 3-5 days, not including travel time between transects or to and from the study area.

At an average price of US$450 for automatic cameras, cameras for 1 transect of 5 stations would cost US$2250. Materials for scent stations cost <US$200 for 10 transects. The time required to set transects of cameras or scent stations is similar to that of hair snares.

Discussion

The detector dog provided the most evidence for the presence of bobcats, producing nearly 10 times the number of bobcat detections as hair snares, automatic cameras, and scent stations combined. In general, the detector dog was very efficient and easy to work with. The dog found many more scats than a human observer would have, especially given the brushy nature of bobcat habitat. Hair snares and automatic cameras provided much less evidence, and scent stations provided none at all. Although the sample size of the study was limited, the rates of bobcat detection found here are similar to results typically reported from studies using individual detection methods. Pending further tests in other habitats, detector dogs appear to be the best available method for statewide surveys of bobcats in New Mexico. Use of detector dogs has the potential to consistently achieve detection rates high enough to provide useful indices for the population monitoring of bobcats. Detector dogs may be especially valuable for searches for rare animals, including endangered small felids. Individual animals may be identified through DNA analysis of scats, although the quality of DNA obtained from scats is usually poor compared to that obtained from hair. It is likely that detector dogs can discriminate between individual animals, but to date dogs have not been used to count individual animals.

The scats located during this study were not all from the target species. Post-collection verification of species of origin is essential. DNA analysis and CSD tests were similar in the percentages of tested scats confirmed as bobcat (89% v. 91%, respectively, not including scats for which DNA analysis failed), but there were discrepancies between DNA and CSD tests on species identification of individual scats. Although laboratory errors can occur, dogs are likely to be

Fig. 2. Detector dog at work (Photo: Pack-leader Detector Dogs)

more susceptible to making errors that are difficult to control. Dogs may become frustrated when scats of the target species are not present, and may instead locate non-target scats in order to get their reward. The level of frustration, and hence errors, will likely increase when dogs become tired, hungry, or hot. It is important that the dog handler be constantly aware of the mental and physical state of the dog, as well as its general personality and limitations.

Detector dogs are the most expensive method of the four tested here. However, since I did not know what percentage of scats collected would be confirmed as bobcat prior to the final analysis, I collected more scats than turned out to be necessary to confirm the presence of bobcats on most transects. If this information had been available right from the start, the transects could have been surveyed in much less time, and in the time thus saved, additional transects could have been surveyed. Purchasing a detector dog instead of hiring one can also reduce costs.

The detector dog required more field time than the other three methods. Field time for hair, camera, and scent stations was similar. However, whereas detector dogs visit a transect only once, cameras, hair snares, and scent stations require multiple visits to survey sites, and travel time between office and survey sites may be significant. Temperature limitations may decrease the time a dog can work each day. The average minimum and maximum temperatures during the detector dog surveys for this study were approximately 11°C and 23°C. Although we began at dawn, the dog began to overheat within a few hours due to high insolation. Dogs may still be used in warm climates and seasons, but they must be habituated and used carefully.

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References

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