SPOTLIGHTING AS A METHOD TO LOCATE AND STUDY BLACK-FOOTED FERRETS

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ABSTRACT

Spotlighting is an effective method to locate and study black-footed ferrets (Mustela nigripes). Its application to ferret studies began in South Dakota and continues to be an integral part of surveys to determine presence or absence as well as complementing nearly all ongoing activities on this species. The use of spotlighting as a search and research method, both historically and present day, is discussed. Results of a pilot study to assess ferret responses to this technique are presented.

INTRODUCTION

The highly secretive and exceedingly rare black-footed ferret presents several major obstacles for searchers and researchers in order to study or even simply observe this endangered mammal. The largest source of these obstacles arises from the fact that ferrets spend much of their time below-ground and are generally only active above-ground at night.

Spotlighting is a common method to locate and observe nocturnal animals, especially effective when searching for animals whose eyes reflect in the spotlight. Hunters and poachers have long used spotlighting to locate coyotes, foxes, bobcats, badgers, deer, antelope, and many other animals. The fact that ferret eyes reflect a bright emerald green when spotlighted has given searchers an effective method to locate them.

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BACKGROUND

The use of spotlighting as a method to locate and study black-footed ferrets is relatively recent and was developed in South Dakota. Henderson et al. (1969) used spotlighting to locate ferrets as early as 1964. No prior reference to spotlighting has been found. The use of artificial lights to find and observe ferrets was a logical idea since the animals were known to be nocturnal. Only after spotlighting the first ferret was it discovered that ferret eyes reflected green and that eyeshine could be observed out to 183 m (Henderson et al. 1969, Hillman 1968, Fortenbery 1972).

SPOTLIGHTING TOOLS

Two spotlighting systems are presently being used by experienced black-footed ferret searchers and researchers. One system uses a vehicle and the second uses a portable backpack unit.

The vehicle spotlight system was first developed in South Dakota and remains much the same today. The actual spotlight can be roof-mounted or hand-held; the roof-mount permits better forward and lateral coverage and shelter from poor weather conditions and is recommended. The Unity Model #S6, 6-inch roof-mount spotlight with a General Electric #4537 100-watt aircraft landing light bulb (200,000 candlepower) work well. A dual-battery system separated by an isolator switch is suggested for each survey vehicle. One battery powers the vehicle and the other the spotlight; both batteries are charged from the alternator. The spotlight battery should be a full-sized, 12-volt, deep-cycle battery such as Napa #8240. The dual battery system prevents total discharge of a single battery when spotlighting, which could leave the searcher stranded, possibly far from assistance. This dual system also accommodates the simultaneous use of a second spotlight if desired.

The portable backpack battery system is necessary to spotlight areas inaccessible to vehicles. A hand-held spotlight powered by a smaller 12-volt battery is carried in a backpack. A Brinkman Q-Beam Model Professional Super Spot modified with battery terminal clips is adequate although other spotlight brands and models are available. The battery should be a half-sized, 12-volt, deep cycle such as American Western's

Model GT9LDC. Fully charged, this battery will power a 200,000-candlepower spotlight for approximately 2.5 hrs. The backpack can be one of many types or brands but an internal frame, full-volume backpack is suggested. A 10-amp battery charger is essential to the backpack system to keep batteries fully charged.

Some ferret searchers have recommended using red filters placed over spotlight bulbs to reduce disturbance to ferrets caused by white artificial light (Henderson et al. 1969). Filters reduce the amount of light transmitted through the spotlight and are not recommended at least during survey work. Filters may be justified during research when ferrets are observed for long periods if a significant disturbance can be documented.

The mentioning of brand names does not necessarily mean that either Biota or the U.S. Fish and Wildlife Service endorses these brands.

SPOTLIGHTING DURING BLACK-FOOTED FERRET SURVEYS

The black-footed ferret is listed as endangered under the 1973 Endangered Species Act. The 1969 National Environmental Policy Act requires a determination of potential effects on endangered species for all federal actions causing environmental disturbances. With regard to black-footed ferrets, their presence or absence must be determined.

Prior to the enactment of NEPA, black-footed ferret surveys were not legally required and, therefore, not conducted to any great extent. Surveys which were conducted used methods developed in South Dakota (i.e., Henderson et al. 1969) and involved at least some spotlighting (M. Schroeder, USFWS-DWRC, pers. comm.). Between 1969 and 1978 ferret surveys increased. Methods again centered around South Dakota techniques with emphasis placed on spotlighting.

In 1979, a set of survey guidelines were developed by the U.S. Fish and Wildlife Service - Denver Wildlife Research Center and endorsed by the Black-footed Ferret Recovery Team in an effort to standardize and ensure the quality of ferret surveys (M. Schroeder, USFWS-DWRC, pers. comm.). This draft document, "Recommended Criteria and Procedures for Black-footed Ferret Surveys", although not approved by the USFWS Director until 1981, was pivotal in directing black-footed ferret surveys between 1979 and 1983. It relied heavily upon both diurnal and nocturnal methods developed in South Dakota but incorporated new ideas and techniques as well. One major difference is that, intentionally or not, it downplayed the significance of spotlighting as a ferret survey method by recommending that 3 consecutive nights of spotlighting be conducted on colonies only when ferret sign (defined as diggings, plugged holes, green eyeshine) was found. Suggested procedures involved spotlighting at intervals of 5 min. on/5 min. off from a stationary position for a 1 hr. minimum with stationary spotlighting positions scattered throughout the colony. This temporal spotlighting procedure apparently follows Fortenbery (1972). Surveys were to be conducted between 15 May and 30 October.

Between 1973 and 1977, Biota Research and Consulting, Inc. independently developed an alternative set of ferret survey guidelines

(Clark and Campbell 1981) which we first implemented in 1978. These guidelines were based on traditional South Dakota techniques as well as 5 years searching experience and were also endorsed by the Black-footed Ferret Recovery Team. The two sets of guidelines are similar in that both draw from South Dakota techniques. One difference, however, centered around spotlighting techniques. Biota's guidelines continued to view spotlighting as the primary survey tool and recommended three consecutive nights of spotlighting between 10 July and 30 September on all colonies to be surveyed. Continuous spotlighting from a moving vehicle on an established spotlight circuit through each colony was recommended to give as complete spatial and temporal coverage as possible.

Our most recent survey guidelines (Clark et al. 1984) and the soon-to-be-released USFWS guidelines both reflect the evolution of spotlighting as a technique to locate ferrets. The spotlighting procedures closely follow those developed by Clark and Campbell (1981) except for 1) the annual survey period, and 2) the intensity of the search effort per hectare of prairie dog colony.

SPOTLIGHTING AND BLACK-FOOTED FERRET RESEARCH

Spotlighting as a Research Tool

Henderson et al. (1969) documented the presence of at least 14 different animals (3 litters) between 1964-1967 with spotlights after an initial diurnal observation of an individual in South Dakota. Hillman (1968) located and studied 21 ferrets and Sheets (1970) found 14, most or all with spotlights.

Spotlighting continues to be an important ferret research tool today in Meeteetse, Wyoming. Censuses, litter surveys, trapping for visual telemetric marking, behavioral observations and visual examinations of telemetered animals in some way involve spotlighting.

Black-footed Ferret Responses to Spotlighting

Ferret responses to spotlighting are poorly understood. Henderson et al. (1969) found that bright white light (such as from spotlights) usually disturbed ferrets. Fortenbery (1972) described that ferrets often turn away from the light when it first passed over them, suggesting some aversion to the light. In contrast, Hillman (1968) concluded that spotlighted ferrets appeared "unalarmed" by the spotlight, vehicle or observer.

To better understand the responses to ferrets to spotlighting, a pilot study was initiated at Meeteetse. Our objectives were: 1) to document potential spotlighting effects on black-footed ferrets, and 2) to assess the capability of displacement-type analysis of human-induced disturbances. If determined feasible and appropriate, larger scale disturbance studies on ferrets to direct which human activities (e.g., research methods, oil exploration methods, well drilling) should continue and which should be modified or perhaps discontinued.

We compared the movements of two undisturbed radio-instrumented ferrets with the movements of the same animals while they were spotlighted. The two ferrets monitored were an adult male and a juvenile female. The 16-night experiment, conducted during October 1983, was divided into pre-spotlight (4 nights), spotlight (6 nights), and post-spotlight (6 nights) periods. During the spotlight period, some forays of ferret activity were left undisturbed and others were spotlighted. During spotlight sessions, walking observers using backpack units followed the ferrets at 50-75 m, alternating 6 min of light with 6 min of darkness. Telemetric fixes were taken on the animals at the beginning and midpoint of each 6-min "lights on" and "lights off" period. Most other (undisturbed) movements of these 2 ferrets during the 16-day experiment were also documented with fixes at 3-min intervals. All telemetric fixes were taken by triangulation from stations fitted with dual-beam 5- and 11-element Yagi antenna arrays used as a peak/null system. Radio trackers plotted animal movements on a map and coordinated the activity of spotlighters with 2-way radio communication. The resulting data were summarized as amounts of time each animal was moving or stationary in five experimental categories (Table 1.). We used chi-square tests to evaluate moving time versus stationary time during lighted and unlighted periods. Values with probabilities less than 0.05 were judged significant.

Table 1. Amount of time in minutes spent moving (M) and stationary (S) by 2 black-footed ferrets during pre-spotlight, spotlight, and post-spotlight periods.

		Adult male			Juvenile female		
Period	Experimental	S	M	%M	S	M	%M
Pre-spotlight	Undisturbed	96	502	83.9%	64	343	84.3%
Spotlight:	Undisturbed	16	245	93.9%	111	238	68.2%
	Light on	60	312	83.9%	65	69	51.5%
	Light off	51	326	86.5%	66	38	36.5%
	Entire period	27	883	87.4%	242	345	58.8%
Post-spotlight	Undisturbed	48	1015	95.5%	5	684	99.3%

Both ferrets spent significantly more time moving during the post-spotlight period than during the pre-spotlight period. This could be due to normal variation in ferret activity, or could be a post-experimental "release" reaction if the spotlighting did indeed inhibit ferret movements. There is some evidence for such inhibition for the adult male, but the juvenile female seemed to react more strongly to the spotlight. She spent

significantly less time moving during actual spotlighting sessions ("light on" and "light off") than during all undisturbed periods. The adult male spent significantly less time moving during the spotlight sessions than during the undisturbed forays of the spotlight period, but not when compared to the forays of the pre-spotlight period.

The young female ferret spent significantly more time moving when the light was on than when the light was off. This increase could have been an attempt to avoid or escape the light, but that explanation is somewhat inconsistent with interpretations given above, suggesting that spotlighting generally depressed ferret movement. Furthermore, we believe that ferrets are far more likely to attempt to escape a perceived threat by diving into a burrow than by trying to outrun it. If the increased movement during the lighted minutes is real, the explanation may come from our understanding of dark adaptation in the human eye. Far more time is required to adjust to dark conditions from extremely bright conditions (up to 30 minutes for complete dark adaptation) than the reverse (Anon. 1977). Thus, the ferrets may be temporarily "night blind" after first contact with the light, and only able to see adequately during subsequent lighted periods. However, we are left with unsubstantiated theories because movements of the adult male ferret were similar for both "lights on" and "lights off" periods. This evidence suggesting differences in reaction of individual ferrets to the light is not surprising; from many hours of spotlighting a large sample of ferrets we developed a strong impression that such differences existed.

Future experiments designed to assess the reaction of ferrets to disturbances, should incorporate the following: 1) A larger sample of animals so that individual variation can be more effectively evaluated; 2) A sample of "control" animals that are not subjected to any disturbance (this may allow separation of differences due to periods from those due to treatment); 3) Alternation of experimental and control periods each night rather than 4 to 6 consecutive nights of each (this should decrease the differences between periods due to shifts in patterns of ferret movements).

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