CHAPTER 9

A PHOTOTRAPLINE FOR **COLD TEMPERATURES**

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The snow leopard, *Panthera uncia., is* one of the world's most difficult carnivores to observe in the wild. It is highly secretive, very rare and inhabits some of the most difficult terrain for humans to traverse. With the exception of radio telemetry, observations have had to focus on the finding of sign, reports by third parties, and inferences deduced from knowledge of the prey base and habitat. As a means of determining presence and to a lesser extent absence, as well as assessing Individual recognition, the phototrapline technique could potentially be a useful addition to the arsenal of methodologies for studying snow leopards.

The technique has been successfully used In detecting the presence of Persian leopards. Panthera pardus *saxicolor,* Indian leopards. P. pardus *fusca;* Indian lions, P. *leo persica:* jungle cats. *Felis chaus;* European brown bears, *Ursus arctos:* striped hyenas. *Hyaena hyaena;* Iranian wolves, Ccmis *lupus campestris;* golden Jackals. C. aureus; Indian dholes, *Cuon alpinus;* red foxes. *Vulpes uulpes;* Ruppell's foxes, *V. ruppelli,* small Indian civits, *Viuerricula indica;* tody cats, *f'aradoxurus hermaphroditus,* striped necked mongoose, *Herpestes uitttcollis;* small Indian mongoose, H. auropunctatus; and stone martens, Mortes *foina,* to name only the carnivore species. While some of the leopards, bears and wolves were recorded in or near subzero temperatures, it was not known how successfully the equipment would operate in conditions of cold as extreme as that commonly found within the snow leopard's domain. This report describes the technique and reports on testing of equipment in different temperature regimes, including as low as -29°C (-20°F).

TECHNIQUE DESCRIPTION

A phototrapline consists of a series of cameras distributed over an area, each of which is operated by a triggering device set off by animals. While the odds that any given camera may be triggered are low over a 24-houn period, the probability of photographic success for the system as a whole is determined by the sum of the probabilities for each of the cameras in the system. Past experience has indicated a 10% to 40% success ratio per camera per day as normal which, with a minimum deployment of 10 cameras, provides a rate of return sufficient to make the implementation of a phototrapline system usually worthwhile as a means of determining the presence of carnivores in an area.

Given the number of cameras and triggering devices required, special attention has been paid in designing a phototrapline system that minimizes the cost in equipment for each unit. This has been achieved by employing the cheapest cameras on the market (currently less that $20 each in the U.S.A.) and by developing a reliable triggering mechanism for under $2. While such inexpensive cameras have little likelihood of taking magazine cover quality photographs, they offer results that are more than adequate for species identification.

Since most photographs are recorded at night, flash is essential. Cameras that employ flash bars or flash cubes are recommended. They work on a principle that does not require a flash condenser and can be left in a continuous state of readiness. Some examples of cameras that meet the criterion are Kodak Instamatic X-15F, Polaroid One-step, Polaroid Amigo, Polaroid Button, Polaroid Spirit, and Polaroid Pronto. Cameras which have a built-in flash generally are unsuitable for use in a phototrapline because they employ a flash condenser. Keeping it charged in a state of readiness for more than a 24-hour period drains the batteries.

Figure 1 shows the general set-up for each camera. The camera shutter is triggered by an animal either tugging on a bait or moving through a line that is attached to the camera. Baiting with meat is highly selective in favor of attracting carnivores, in contrast to running lines across trails on the off chance that a carnivore and not a herbivore will pass.

Also of major importance is the size of bait. Small pieces of meat weighing 0.5 kg or less, while effective for attracting small carnivores, have not been shown in my surveys to be attractive to medium to large predators. By contrast, large carcasses such as whole wild boar, cows, and goats, are readily fed upon by carnivores of all sizes.

Baiting stations are usually located at the Junction of game trails In order to maximize the chances of being encountered. Each camera is positioned on a tripod about 0.5m off the ground and 1.5 to 3m from the bait. It Is made inconspicuous to some degree either by tucking it into a bush or placing some vegetation up against it. There is no evidence that more than rudimentary camouflage of the equipment is necessary. In almost all cases, the species recorded were documented with the cameras being visible. It has yet to be determined if no camouflaging significantly reduces the number of photographs recorded.

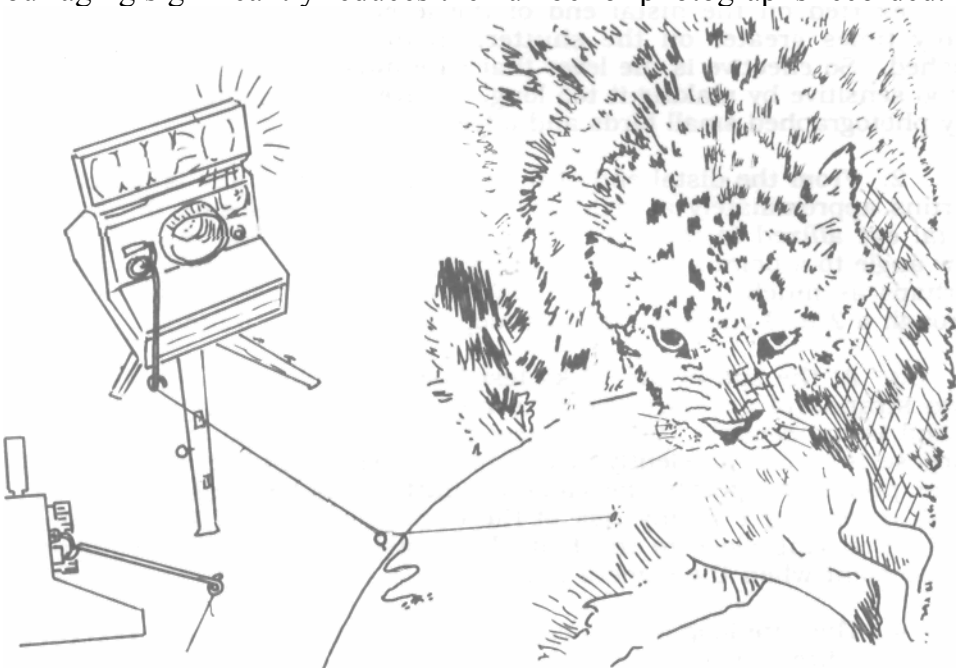

FIGURE 1. Photographic triggering mechanism.

Distance from the camera does appear to be Important in that the photographic success ratio is higher the farther away the camera is from the baiting station.

CAMERA TECHNIQUE

The mechanism for triggering **the** camera is as follows:

1. A wire lever is attached to the camera body just behind or above the shutter. The attachment consists of a 3 cm tube glued or screwed to the camera. The tube serves as a fulcrum through which one end of the wire is passed. The remainder of the wire is directed away from the fulcrum at a right angle. Two or 3 cm from the fulcrum the wire curves in an arc which comes In contact with the shutter, then curves back to the beginning of the arc, and Is directed away from the camera body at an angle parallel to the tripod leg nearest the bait. The lever extends about 15 cm from the fulcrum and ends in a small loop through which a line can be attached. A small downward force exerted on the distal end of the lever exerts a force which is many times greater on the shutter, ensuring that it is adequately pushed. So effective is the lever that care must be taken not to make it too sensitive by making it too long. 1 have on occasion unintentionally photographed small birds and mice.

2.From the distal end of the wire, a 10 kg test line is attached. It runs approximately at right angles to the lever, passing through a metal eye affixed to the tripod leg nearest the bait, and extends at a new angle to a point a few centimeters from the bait. It ends as a loop perhaps as much as 10 cm in length, the end of which just passes through a 2 to 3 cm diameter wire loop affixed to the ground.

3.At the end of the 10 kg test line is attached a I kg test line. (Two strands of ordinary thread serve the purpose quite well. One strand is too weak.) The 1 kg. test line is attached to the bait. Its purpose is to be sufficiently strong to exert enough force on the lever when pulled to operate the camera shutter, yet be weak enough to break before there is any risk of the camera and tripod being pulled over. Breaking close to the bait also restricts the portion requiring replacement when the camera is reset.

4.The wire loop serves as a focal point beside the bait. No mat ter which direction the bait is pulled, including towards the camera, the line will be drawn taunt causing the shutter to release. Four methods are used to affix a wire loop to the ground, depending on the substrate. When the ground consists of Impervious rock, a wire loop is attached by tying it to a root or the end of a rock. If the ground is un usually hard, but not impervious, a wire loop attached to the end of a small peg is pounded into the ground. In substrate that is soft and sandy, a wire loop that has an end coiled in the shape of a cork screw is wound into the ground. For substrate conditions that are only mod erately hard, which is the most common case, a wire loop that has two free ends extending perhaps 10 cm. is pushed or pounded into the ground.

5.When using cameras that automatically advance the film after each exposure, it is possible to set the triggering device to record more than one photograph. This is done by attaching more than one low test line between the bait(s) and the high test line. If a single, large bait is used, then the low test lines should be of unequal length. and/or be tied to the opposite ends of the bait. This is to increase the likelihood that when the carcass is Jostled about both lines will not be pulled simultaneously. Alternatively, several small baits can be at tached, each to a separate low test line. In my own experience, it is not unusual to record three photographs using either method.

6. If a moderate to large size bait is used, it should also be secured to the site with a rope that is sufficiently strong to prevent the carcass from being carried off after the low test lines have been broken. Preventing the carcass from being carried away makes it possible to continue using it as a baiting station until it has been entirely consumed, often lasting over a period of several days.

While it is not known how capable snow leopards are at finding carcasses using their nose, in all probability their ability surpasses that of humans. It is advisable to open the abdominal cavity, as well as place carcasses in sites where the smell is likely to carry. It may also help to drag carcasses from several directions to the baiting stations, allowing the entrails to drag in the process. This will leave both visual as well as olfactory evidence for predators to follow.

In areas where vultures are likely to feed on carcasses, this can be reduced by placing thorn scrub branches on top. yet still making the carcasses accessible to carnivores.

Photographic success is generally lower on the first night than on subsequent nights. This may be attributable to carnivores needing time to learn where the baiting stations are and to accept changes in the landscape, especially those that are caused by man.

TESTING THE EQUIPMENT AT VARIOUS TEMPERATURES

Two Kodak Instamatic X-15F cameras using 126 Kodacolor VR film 200, one Polaroid Pronto camera using Polaroid SX-70 color film, and one Polaroid Spirit camera using Polaroid High Speed color 600 film were tested by hand under controlled conditions. Initially all four cameras, complete with flash and film, were frozen between -27°C and -29°C (-17°F and -20°F). They were then either operated at that temperature or warmed to between 4°C and 7°C (40°F and 44°F) or between 20°C and 22°C (68°F and 72°F). After each test the cameras were refrozen between -27°C to -29°C, if they were not already. This was repeated several times over a one month period.

The choice of temperature regimes spanned all but the most extreme temperatures anticipated under field conditions. They were also readily available. The -27°C to -29°C condition was the normal temperature range for the walk-in-freezer at the Chicago Zoological Park. The 4°C to 7°C range was that found in the zoo's walk-in-cooler. The 20°C to 22°C range was office temperature.

Each shifting of cameras from one temperature regime to another was done over a period of a few minutes. In this sense the tests were more extreme than would normally occur in the field. Condensation would form on the exterior and presumably interior of the cameras when the move was from cold to warm. Before being tested the cameras were maintained at the new temperature until the moisture on the exterior had evaporated.

The Kodak system worked well in all three temperature regimes (Table I). The resulting prints were qualitatively indistinguishable.

TABLE I. Photographic success under different temperature regimes

	-27 to -29C		4 to 7C		20 to 22C	
	#good	**#bad**	**#good**	**#bad**	**#good**	**#bad**
Kodak 1	6	0	3	0	1	0
Kodak 2		0	4		1	0
Polaroid 600		1	3	1	5	

Polaroid SX	1	6	0	1	0

Neither Polaroid camera operated in the lowest temperature regime. This was because the battery contained within the film pack and which operated both the film advance and flash ceased to function at such cold temperatures.

In the 4°C to 7°C range the Polaroid cameras and associated equipment functioned satisfactorily even after repeated freezing. Ten centimeter text could be easily read at a distance of 2-3m. There was some loss in color quality with the photos exhibiting a light bluish or purplish cast at this temperature. The photos were correctly exposed in the center and underexposed around the edges indicating that under these temperature conditions there was a tendency to form a hot spot. Both the automatic film advance and flash operated well.

In the 20°C to 22°C range the Polaroid cameras and associated equipment functioned well. Five centimeter text could be easily read at a distance of 2-3m. Color quality was excellent. There was no evidence of a hot spot. Both the automatic film advance and flash operated as expected.

DISCUSSION

In conditions of continuous sub-zero weather, the Kodak cameras and associated film and flash would be the system of choice, since it was the only one of the two basic systems tested that operated satisfactorily at such low temperatures. In the 4°C to 7°C range, the Polaroid system might be the one of choice. While the results were not as good as that recorded for the Kodak system at this temperature, they would certainly be good enough to correctly identify the presence of snow leopards or other carnivores. So long as this criterion is met, Polaroid's other advantages need to be considered. These are:

1. Each photograph Is instantaneously developed, enabling the surveyor to determine on the spot what is recorded rather than having to remove the film for processing elsewhere.

2. While the cost of producing each photograph is more expen sive using Polaroid than non-Polaroid, It Is generally less wasteful be cause only the exposed pictures are developed with Instantaneously developed film. When non-Polaroid film is used, the surveyor may wish to pull the film for processing after only two or three pictures have been exposed, rather than going through an entire roll before determining what has been recorded. While this adds to the expense, not to pull the film may risk wasting additional film on a subject which later may prove to be unwarranted.

3. Instantaneous development greatly facilitates the surveyor's ability to keep track of what photographs are produced at which site because the surveyor can document the information on the back of each photograph on site. Polaroid photographs, once having been ejected from the camera, are able to withstand sun, rain, freezing, and high humidity. Among the hundreds of Polaroid photographs recorded by animals In the field, none was documented as having been eaten.

With film that must be processed elsewhere, separate documentation Is needed in order to keep track of which roll came from which camera, and which exposures were taken at which sites in order to later key out what information to associate with which print,

4. The Polaroid system automatically advances the film for the next exposure after being operated, whereas the Kodak system does not. This makes it possible to set up each Polaroid camera so as to trigger two or three photos before having to reset, thus greatly in creasing the number of potential results per survey for a given number of cameras and a given amount of effort.

The Kodak system does offer some advantages over the Polaroid system In addition to being able to operate consistently in a wide spectrum of temperatures including sub-zero:

1. Cameras that use 126 film such as the Kodak Instamatlc X-15F are more easily obtainable in countries where snow leopard exist. The 126 film Is also more easily available and at a price which In some countries may be many times less.

2. Preparing multiple copies and making blow-ups is also more easily done with 126 Kodacolor film or the equivalent than is the case with Polaroid film, because a negative is produced as a first step prior to the production of a print.

Field tests have shown that both types of cameras operate satisfactorily when left in the sun for a number of days. Dry, hot conditions were quite acceptable. Occasional interruptions of rain were also not a problem, provided the cameras were sheltered with no more than a plastic bag that has an end left open for the lens. Photographs taken under conditions of combined high humidity and high temperatures, however, were often unsatisfactory using Polaroid film. The combination affected the print development process. Kodacolor 126 film, or Its equivalent, was not affected.

CONCLUSION

The phototrapllne technique could be employed as an additional method for studying snow leopards at temperatures at least as low as -29°C using the Kodak Instamatic X-15F camera (or equivalent), Kodacolor 126 film (or equivalent), and flash bar. Polaroid cameras that use a flash bar and either SX-70 film or High Speed 600 film could be used at temperatures as low as 4°C. Repeated subjection to temperatures as low as -29°C has not been shown to damage Polaroid film, flash or cameras, but does render the system Inoperative until wanned to above freezing.