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Evaluating Track Plate Independence and Bait Type for Detecting Marten in Temagami, Ontario

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Introduction

The American marten (*Martes americana*) has become a focal species for the conservation of forested landscapes throughout North America primarily due to its association with older forests and its sensitivity to human disturbance (Thompson 1991, Watt et al. 1996, Ray 2000, Hodson et al. 2004, Carroll 2005). Field studies designed to assess species presence, population levels, and habitat conditions have employed a variety of techniques, which vary in cost, accuracy, and utility (Zielinski and Kucera 1995, Forseman and Pearson 1998). Sooted track plate boxes have become one of the more common of these techniques because of their low cost relative to their effectiveness (Zielinski and Stauffer 1996). For this report, we focus on two aspects of the Zielinski and Kucera (1995) protocol: (1) an array of 6 to 8 track boxes is treated as a single sample because individual track boxes are not considered to be independent samples, and (2) the use of chicken as bait.

If individual track boxes could be used as independent samples to detect marten, the sample size of a data set could be increased 6 to 8 fold. In fact, Hamm et al. (2003) found that track plate boxes used for fisher detection in northwestern California were spatially independent and could be used for indexing populations and assessing habitat use. Oehler and Litvaitis (1996) also used individual track plates as independent samples to assess the spatial distribution of medium-sized carnivores (no marten detected in their study area) relative to fragmentation features within the landscape. Also, if non-spoiling bait was used instead of fresh chicken, the difficulties of keeping fresh meat on hand during warm summers in wilderness settings (grocery re-supply, bears, microbial pathogens, etc.) could be avoided. Zielinsky and Kucera (1995) report that some work has addressed the issue of bait types for marten detection using track boxes, however, currently there is no consensus and none of these findings have yet been published. Thus, the purpose of this study is (1) to determine if individual track boxes used for marten detection can be treated as independent samples in our study area, and (2) to evaluate the appeal of three different bait types to marten.

Methods

To obtain the field data necessary to evaluate independence of individual track boxes visited by marten, we used the methods recommended by Zelinski and Kucera (1995) with the exception of a track box checking interval of three days instead of two days due to the logistic constraints posed by accessing a number of extremely remote track box locations. Checking interval has also been modified in other marten studies (Oehler and Litvaitis 1996, Fecske et al. 2002). We set up and observed 32 track box arrays located throughout the Rabbit Lake and Annima Nipissing Lake Watersheds in the Temagami region of central Ontario from June through August of 2003 and 2004. Each array was located in a 5 km^2 circular area that simulated the home range area of an individual marten, with no overlap into other circular home range areas. Arrays were also located to evaluate the influence of logging history, successional stage, and overstory composition on the presence of marten, however these results are not reported here. Each array was composed of six track boxes in a rectangular configuration 1 km long and .5 km wide with a .5 km distance between sides and a .5 km distance between the track boxes of an individual side. Trees surrounding each track box were smeared with "Gusto", a commercial marten lure. Track boxes were checked and re-baited with chicken every three days over a 12-day period, regardless of whether the track box had been visited by a marten. Track boxes visited by marten or other mammals were reset.

The hypothesis that track box visits by marten within an array are not independent samples assumes that the discovery of one track box in an array by a marten leads to the discovery of a second track box and so on, such that the greater the number of track boxes discovered in an array, the greater is the probability of discovering another track box in that array. Thus, there should be a greater proportion of more than one track box hit per three-day period, and the proportion should increase with each new track box visited. This was tested using the chi-squared goodness-of-fit test. Implicit in this assumption is that some feature of an undiscovered track box is attracting the marten to it. The only feature that could affect the senses of a marten over the distance of 500 m is the scent of the lure (and/or the bait) that travels through the air and dilutes as distance from the source increases. Following this logic then, the probability of a marten visiting the track box nearest to the first one discovered in an array should be higher than the probability of a marten discovering a track box further away from the first one visited in an array. Thus, because of the stronger attraction of a closer track box, the mean distance between the first and second track boxes visited should be less than the mean distance between the first track box visited and the closest unvisited track box. This was tested using the two-sample t-test. Since it was impossible to determine the order of track box visits in any three-day period for an individual array, all track boxes were treated as the first visited, meaning that for each track box visited, the distances from that track box to the nearest visited track box and to the nearest unvisited track box were recorded and used as individual observations. Only three-day periods with two and three visits within an array were used in order to exclude those arrays where the random chance of a marten detecting an unvisited track plate was greater than 50%, thus avoiding confusion between this influence and the potential effect of scent on a track plate visit.

To compare marten bait types, during September of 2003 eight arrays of track boxes were placed in forested areas of the Rabbit Lake watershed where marten had been detected within the previous three months. Arrays were separated by at least 4 km, located at least 1 km from a paved road, and marked with Gusto. Each array consisted of four track boxes with different bait types, one with chicken, one with a jam-lard-fish oil mixture, one with peanut butter, and a control with no bait. Track boxes were positioned in the four cardinal directions 5 m from a random point, checked for a maximum of seven days, and taken down on the day they were first visited by a marten or on the seventh day. The day of the marten visit was the only data recorded. The paired t-test was used to compare the means of the number of days to first detection for each bait type.

Results and Discussion

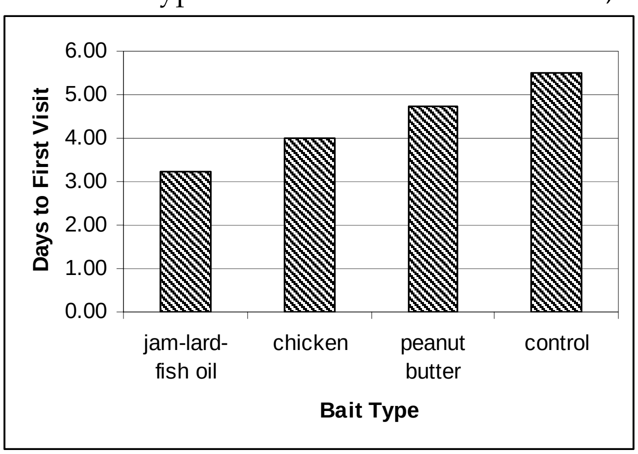
The results of the chi-squared goodness-of-fit test indicate that the observed distribution of marten visits varies significantly from the expected distribution of visits (Table 1, $X^2=19$, $p=0.002$) displaying a pattern of decreasing visit frequency (presumably by an individual marten) as visitor density within an array increases. This is contrary to the hypothesis that marten visits will increase as more track boxes are visited by marten. Thus, based on these results, we accepted the null hypothesis that track plate observations can be treated as independent samples. For the second part of the analysis, there were 9 three-day periods with 2 marten visits to an array and 16 three-day periods with 3 marten visits to an array for a total of 66 track box visits by marten. The mean of the 66 distances to the nearest visited track box was 553 m and the mean of the 66 distances to the nearest unvisited track box was 525 m. Although the mean distance to the nearest unvisited track box was 28 m closer to the starting track box than the mean distance to the nearest visited track box, the results of the t-test

TABLE 1. Frequency of the number of visits of marten to track box arrays in the Rabbit Lake and Annima Nipissing Lake watersheds, Temagami, Ontario (per array/3-day time period)		
Number of Visits	**Observed Frequency**	**Expected Frequency**
1	22	11.5
2	9	11.5
3	16	11.5
4	12	11.5
5	5	11.5
6	5	11.5

TABLE 2. Number of days until a track box was visited for arrays with three different bait types in the Rabbit Lake watershed, Temagami, Ontario				
	Number of Days Until Bait Taken			
Array	**chicken**	**jam-lard-fish oil**	**peanut butter**	**control**
1	2	1	7	7
2	4	4	4	5
3	6	4	4	6
4	4	4	4	4
6	6	6	6	6
total	22	19	25	28
mean	4.00	3.25	4.75	5.50

TABLE 3. T-test comparison of mean number of days until first visit by marten to track boxes using three different bait types in the Rabbit Lake watershed, Temagami, Ontario (t-values, p-values)			
	Bait Type		
Bait Type	**chicken**	**jam-lard-fish oil**	**peanut butter**
jam-lard-fish oil	1.50, 0.208		
peanut butter	-0.51, 0.634	-1.00, 0.374	
control	1.24, 0.284	1.62, 0.181	1.50, 0.208

Figure 1. Mean number of days until a track box was visited for arrays with three different bait types in the Rabbit Lake watershed, Temagami, Ontario



showed no significant difference between the two means (t=1.41, p=0.16). Thus, the null hypothesis of independence of track box samples was accepted, meaning that track boxes can be considered as independent samples.

Results of the bait trial analysis show that the jam-lard-fish oil mixture was 23% more effective than chicken at attracting a marten visitor and 46% more effective than peanut butter (Table 2, Fig. 1). However, three of the eight arrays were excluded from the analysis as one was frequently visited by skunk and two were destroyed by bear. Although the magnitude of the differences between effectiveness of the bait types was quite high (23% and 46%), the results of the paired t-test show that none of these differences are statistically significant (Table 3). This is most likely due to the very small sample size (n=5). The controls were likely visited by marten strictly out of curiosity after having discovered food in the other three track boxes of an array.

The results of this study and two other studies (Oehler and Litvaitis 1996, Hamm et al. 2003) support the treatment of single track plate boxes as independent samples for the detection of American marten. Using track box level analyses is particularly useful for assessing fine-scale habitat preferences operating within a marten home range. Additional evidence of their use as independent samples will be based on the number and magnitude of differences between habitat features at sites where marten are detected compared with sites where they were not detected. Lastly, although the data set is small, it appears that a jam-lard-fish oil mixture is effective bait for use on track plate boxes to detect the presence of American marten.

References

Carroll, C. 2005. Carnivore Restoration in the Northeastern U.S. and Southeastern Canada: A Regional-Scale Analysis of Habitat and Population Viability for Wolf, Lynx, and Marten (Report 2: Lynx and Marten Viability Analysis). *Wildlands Project Special Paper No. 6,* Wildlands Project, Richmond, VT. 46 pp.

Fecske, D. M., J. A. Jenks, and V. J. Smith. 2002. Field evaluation of a habitat-relation model for the American marten. *Wildlife Society Bulletin* 30:775-782.

Forseman, K.R., and Pearson, D.E. 1998. Comparison of proposed survey procedures for detection of forest carnivores. *Journal of Wildlife Management* 62:1217-1226.

Hamm, K. A., L. V. Diller and R. R. Klug. 2003. Spatial Independence of Fisher (*Martes pennanti*) Detections at Track Plates in Northwestern California. *Am. Midl. Nat.* 149:201-210.

Hodson, J., M. Henry, S. Hewitson and P. Quinby. 2004. Habitat Use by American Marten in Temagami, Ontario: Preliminary Implications for the Marten Habitat Suitability Model and Management Guidelines. *Forest Landscape Baselines Report No. 24*, Ancient Forest Exploration & Research, Toronto and Powassan, Ontario. 4 pp.

Oehler, J. D. and J. A. Litvaitis. 1996. The role of spatial scale in understanding responses of medium-sized carnivores to forest fragmentation. *Canadian Journal of Zoology* 74:2070-2079.

Ray, J. C. 2000. Mesocarnivores of northeastern North America: Status and conservation issues. Wildlife Conservation Society, *Working Paper No. 15*. 84 pp.

Thompson, I. 1991. Could marten become the spotted owl of eastern Canada? *Forestry Chronicle* 67: 136-140.

Watt, R. W., Baker, J. A., Hogg, D. M., McNicol, J. G., and Naylor, B. J. 1996. *Forest Management Guidelines for the Provision of Marten Habitat*. Ontario Ministry of Natural Resources, Queen's Printer for Ontario. 24 pp.

Zielinski, W.J. and T.E. Kucera. 1995. American Marten, Fisher, Lynx and Wolverine: Survey Methods for their detection. USDA For. Serv., *Gen. Tech. Rep. PSW-GTR-157*.

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