Factors affecting trapping success of red fox Vulpes vulpes, stone marten Martes foina and pine marten M. martes in France

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Factors affecting trapping success of red fox *Vulpes vulpes*, stone marten *Martes foina* and pine marten *M. martes* in France

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Trapping records are often used to monitor long-term trends of small carnivore populations. However, many factors, not related to abundance, may affect capture rates. In this study, we examined whether trapper experience, trapping effort and trapping methods significantly affect capture rates of red fox *Vulpes vulpes*, stone marten *Martes foina* and pine marten *M. martes*. Data were collected from 58 trappers (35,774 trap-nights) in a 660-km^2 study area during one trapping season. The main trapping methods used for foxes and martens with different types of traps were identified by multiple correspondence analyses on 424 trap sites. Generalised linear modelling showed that trapping methods, the length of time traps were set in the same place, trapper experience and the presence of captures in neighbouring trap sites significantly affect capture rates of foxes and martens. Given the high variability of capture rates among different combinations of these factors (0-3.4 captures/100 trap-nights for fox and 0.6-7.8 captures/100 trap-nights for martens), a separate trapping index should be calculated to detect trends in small carnivore populations.

Key words: capture rate, Martes foina, Martes martes, trapping records, Vulpes vulpes

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Monitoring of small carnivores is difficult because most species have a cryptic behaviour, are rarely sighted or leave few distinctive field signs. Trapping records can be collected on a large scale and at a relatively low cost. Assuming that the number of animals caught is correlated with population density, trapping records have been used as an index of abundance to monitor long-term trends of small carnivore populations (Hewson & Kolb 1973, Debrot 1983, Hewson 1984, Danell & Hörnfeldt 1987, Tapper 1992, Schley, Krier, Baghli & Roper 1998, Smedshaug, Selås, Lund & Sonerud 1999, Helldin 2000). McDonald & Harris (1999) recently demonstrated that trapping records of stoats *Mustela erminea* and weasels *M. nivalis* could be misleading if sampling effort, defined as the number of trap sets multiplied by the number of months during which they were set, was not controlled for. For trapping records collected by different trappers, additional sources of variation are important to consider. Marked differences in culling and trapping practices may exist between regions (Ruette, Albaret, Stahl & Migot 1999, Heydon & Reynolds 2000). Trappers may use different types of traps, and significant differences in the number of captures per unit effort have been shown between traps. The way the trap is set (Barrett, Proulx, Hobson, Nelson & Nolan 1989, Naylor & Novak 1994, Kay, Gifford, Perry & Van de Ven 2000), the use of baits or odour attractants (Litvaitis, O'Donoghue, Miller & Sherburne 1984, Proulx, Pawlina, Onderka, Badry & Seidel 1994, Meek, Jenkins, Morris, Ardler & Hawksby 1995, Travaini, Laffite & Delibes 1996, Fleming, Allen, Berghout, Meek, Pavlov, Stevens, Strong, Thompson & Thompson 1998) or trapper experience (Short & Reynolds 2000) can also affect capture rates and bias long-term trends or regional comparisons of trapping records.

In this study, we attempted to define which factors or combination of factors significantly affect capture rates (number of individuals caught per 100 trap-nights) of foxes *Vulpes vulpes*, pine martens *Martes martes* and stone martens *Martes foina*. We simultaneously considered the influence of trapping effort, trapper experience and of the main trapping methods associated with different types of traps. These traps are also commonly used in other European countries (F.A.C.E. 1998). Finally we make recommendations on how to build a trapping index that could be used to detect trends in the populations of these small carnivores.

Methods

Study area

The study was carried out in central France, in a 660-km^2 region where trapping of foxes and martens was common. The landscape is a mosaic of farmland and woodland. Forests cover 12% of the study area, arable lands 72%, grassland and pasture land 11%, and roads and buildings 5%. Trapping data were collected from November 1998 to April 1999. Winter and early spring is the main period for trapping foxes and martens in this region. Spotlight night counts were carried out to get an estimation of fox density in the study area using line transect methods (Buckland, Anderson, Burnham & Laake 1993, Heydon, Reynolds & Short 2000; S. Ruette, P. Stahl & M. Albaret unpubl. data). Kilometric index was estimated at 0.19 foxes/km. Density was estimated at 0.32 foxes/km^2 (95% CL: 0.11-0.93) using the program DISTANCE 3.5 (Laake, Buckland, Anderson & Burnham 1994). Because of the lack of adequate methods, we did not attempt to estimate stone and pine marten density but these species were considered common in the study area. Both species could be caught in the same places, and they were grouped in a single 'marten' category in further analyses.

Data collection

The statistical unit was the 'trap site'. A trap site was defined as one or several traps of the same type set by a trapper in the same place (< 100 m^2) in a homogeneous type of habitat and with the purpose of trapping a specific species (fox or martens). Each trap site could be used during several periods between November and April.

Traps set in farm buildings or less than 100 m apart were excluded because these were set to catch an individual previously involved in predation on poultry. It was unlikely that trapping in such circumstances would reflect abundance.

The number of foxes and martens caught were recorded for each trap site together with seven trap-site variables: the target species (i.e. the species that the trapper intended to capture), the type of traps used, the number of traps set per trap site, the way the traps were set, the use and type of bait, the type of habitat in which the traps were set and the presence of game bird pens near the trap site (Table 1). Trap sites set near game bird pens were rare for foxes (less than 5% of trap sites) but common for martens (20% of trap sites).

Because captures on a local area may affect the probability of future captures, two additional variables were also considered for each trap site: the length of time the trap site was active, hereafter called 'trapping period', and the occurrence of captures in neighbouring trap sites. The trapping period was expressed as the number of nights the traps were set, corrected by traps sprung due to captures. Each night during which a capture occurred was assigned 0.5 rather than 1 (Beauvais & Buskirk 1999), and we defined the trapping period as:

$$\text{Trapping period} = (\text{number of trap-nights}) - (0.5 * \text{number of trap-nights with capture}).$$

For trap sites set near game pens, strong differences arose from this correction because numerous game birds were caught in the days following their release. Other events resulting in sprung traps (wind, precipitation) were not recorded. To estimate the occurrence of captures in neighbouring trap sites, all the trap sites were located on a map, and distances between them were calculated. For each trap site, it was then examined whether captures of the same target species occurred in trap sites located ≤ 500 m apart, during the same trapping period or ≤ 30 days before the onset of the trapping period. All these variables were treated as categorical variables in our analyses.

Table 1. Description of trap-site variables used in multiple correspondence analyses (MCA) to identify the main trapping methods. The abbreviations in the 'Abbreviation' column are also used in Figure1.

Variable	Categories	Abbreviation	Number of trap sites
Type of trap	Box-cage trap	TYP1	127
	Spring trap[a]	TYP2	42
	Neck snare[b]	TYP3	128
	Foot snare	TYP4	127
Trapping method	On animal paths	MET1	218
	On a manure heap	MET2	79
	'En jardinet'[c]	MET3	70
	Missing data	MET4	57
Use of baits	Never or sometimes	BAI1	220
	Always, meat bait	BAI2	141
	Always, eggs, honey, fruits or fish bait	BAI3	63
Number of traps set	1	NUM1	273
	2	NUM2	74
	≥3	NUM3	77
Target species	Red fox	TSP1	188
	Stone or pine marten	TSP2	163
	Red fox and stone or pine marten	TSP3	73
Near a game bird pen	No	PEN1	373
	Yes	PEN2	51
Type of habitat	Forest	HAB1	155
	Open fields	HAB2	109
	Forest edge	HAB3	160
Number of foxes caught[d]	0	F1	310
	1	F2	65
	≥2	F3	49
Number of martens caught[d]	0	M1	317
	1	M2	76
	≥2	M3	31

[a] Spring traps: egg trap, conibear or 'livre de messe'.
[b] Neck snares used in France have to be stopped.
[c] 'En jardinet': an artificial track created by the trapper using stones and branches. The animal is attracted to the track by a bait. The trap is set at the entrance of the track.
[d] Variables added as extra-variables in MCA.

Identification of the main trapping methods

A multiple correspondence analysis (MCA) was performed to objectively identify the main trapping methods associated with the different types of traps, i.e. the most common ways in which local trappers set each type of trap to catch foxes or martens. MCA is the appropriate method to reveal associations between categorical variables. Based on chi-square distances, MCA computes combinations of the variables and calculates their coordinates on successive factorial axes F1, F2, F3…, each axis explaining a decreasing percentage of the total variance contained in the data set (Hill 1974, Lebart, Morineau & Warwick 1984). To reveal the main trapping methods, MCA was performed with the seven trap-site variables corresponding to a total of 22 categories (see Table 1). We used correlation ratios between these variables and factorial axes to determine which variables contributed to each factorial axis. MCA was performed using the program SPAD (version 5.0.) on the dataset of 424 trap sites. Captures of foxes and captures of martens were added as extra-variables in the analysis and did not contribute to construct the factorial axes.

Trapper experience

Three factors were recorded to quantify trapper experience: 1) the total number of years the trapper had trapped, which reflects his experience of trapping in general, 2) the number of years the trapper had trapped in the study area, which reflects his experience of trapping at this particular site, and 3) the number of foxes and martens caught during the last trapping season (June 1997 - June 1998), which reflects the trapper's experience in general, e.g. his skill in trapping or his ability to set traps in places where foxes or martens are more easily caught. There was a highly significant correlation between the total number of years of trapping and the number of years of trapping in the study area (Spearman's correlation coefficient: $r_s = 0.81$, $P < 0.01$). Medians were 17 years of trapping and 8.5 years of trapping in the study area. The number of years of trapping in the study area was also related to the number of foxes and martens caught during the last trapping season (Spearman's correlation coefficient: $r_s = 0.32$, $P = 0.015$ for foxes, $r_s = 0.39$, $P = 0.004$ for martens). The median of the number of animals caught during the last trapping season was 4.5 for foxes (range: 0-80) and four for martens (range: 0-

30). As the number of foxes or martens trapped during the last season was believed to be the most integrated indicator of trapper experience and local trapping conditions, this factor was used in modelling.

Modelling capture rates

For each carnivore group (fox and martens), the capture rate was modelled as a function of four factors: trapper experience, trapping methods, occurrence of captures in neighbouring trap sites and trapping period. We verified, that the trap sites and the different combination of factors which could influence capture rates were distributed all over the study area. Possible local spatial variation in abundance could then increase the variance of the capture rate and the type II error but did not bias analysis. Generalised Linear Modelling (McCullagh & Nelder 1983) with a Poisson error term and a logarithmic link function was used to model capture rates. The logarithm of the total number of trap-nights for each combination of the factors was used as an offset (Agresti 1990). Calculations were performed with GLIM (Crawley 1993). We used a backward stepwise procedure for model selection by dropping first all non-significant 2-way interactions and then the main effects from the full model. We selected the model with the lowest Akaike Information Criterion value (AIC) with respect to the principle of parsimony (Akaike 1973, Burnham & Anderson 1992). The significance of parameter estimations was tested using Wald statistics. For each significant combination of factors, we calculated actual capture rates as the average number of captures per 100 trap-nights.

Results

A total of 424 trap sites were used by 58 trappers representing 81% of the trappers who trapped in the study area in 1998. The total number of trap-nights was 35,774 with an average of 84 trap-nights per trap site (SD = 53; range: 1-217) and 617 trap-nights per trapper (SD = 617; range: 6.5-2,964). On average, each trapper operated on 7.5 trap sites (range: 1-30).

Main trapping methods

The type of trap, the way the traps were set, the use of bait, the target species and, to a lesser extent, the type of habitat were strongly correlated and contributed most to F1 and F2 (Fig. 1). The F1 and F2 factorial axes explained 41.8% of the total variance. On the F1 axis, foot snares used with meat bait, set in open fields and on a manure heap were opposed to box-cage traps set in forest, near game bird pens, and with martens as the target species. On the F2 axis, neck snares placed on animal paths, without bait, with several traps on the site and with foxes as the target species were opposed to spring traps set on an artificial track, with eggs, honey or fruit as bait and with martens as the target species.

Because of the strong correlations between the type of trap, the target species and the other trap-site variables, three main trapping methods associated with two types of traps were identified for foxes: 'neck snares', 'foot snares set on an artificial track' and 'foot snares set on a manure heap with meat'. The way the other trap-site variables were associated with these categories is shown in Table 2. For martens, four trapping methods associated with three types of traps were defined: 'box-cage traps not set near a game bird pen', 'box-cage traps set near a game bird pen', 'spring traps' and 'foot snares' (see Table 2 for other trap-site variables associated with these categories).

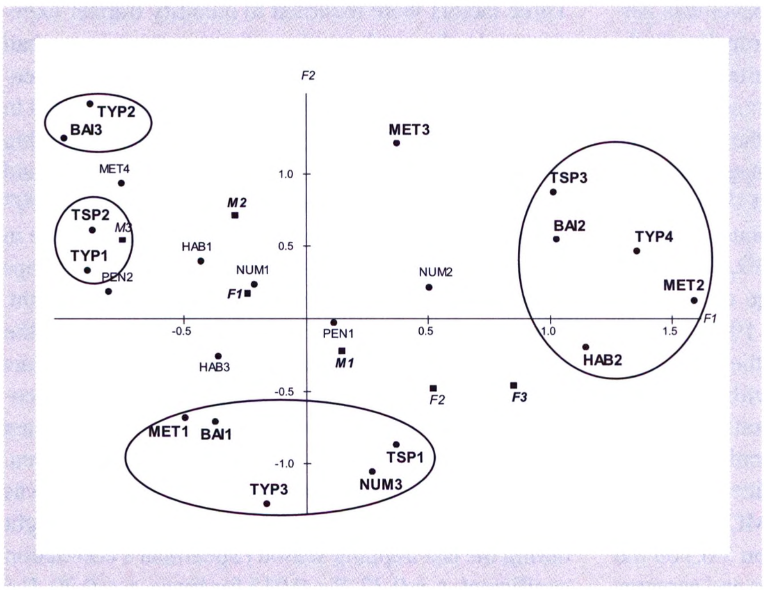

Figure 1. Results of multiple correspondence analyses (MCA; F1-F2 factorial axes) describing trapping methods. Categories contributing most to F1 or F2 are in bold. Correlations among categories of trap-site variables are indicated by the proximity of categories on the map. See Table 1 for details on abbreviations.

Capture rates of foxes

Analyses were performed on 252 trap sites. Capture of a fox occurred in

Table 2. Main trapping methods used by trappers to catch foxes and martens, and main trapping features associated with these methods. For each trapping method and associated features, the percentage of trap sites is indicated in brackets.

Trapping methods	Main trapping features	Number of trap sites
Fox		
Neck snares on animal paths	In forest or forest edge (79%), not near a game bird pen (93%), ≥3 traps set (41%), no bait (85%), fox targeted (98%)	128
Foot snares on an artificial track	Forest (55%), not near a game bird pen (98%), 1 or 2 traps set (94%), meat bait (94%), fox and martens targeted (70%)	47
Foot snares on a manure heap	Open fields (83%), not near a game bird pen (97%), 1 or 2 (80%), meat bait (83%), fox targeted (70%)	77
Marten		
Box-cage traps not set near a game bird pen	Forest or forest edge (95%), on animal path (71%), 1 trap set (87%), no bait (35%), martens targeted (96%)	94
Box-cage traps set near a game bird pen	Forest or forest edge (94%), on animal path (67%), 1 trap set (64%), no bait (67%), martens targeted (85%)	33
Spring traps	Forest or forest edge (97%), not near a game bird pen (88%), on an artificial track (56%) or not specified (34%), 1 trap set (90%), eggs, honey, fruits or fish as bait (88 %), martens targeted (90%)	41
Foot snares	Forest or forest edge (68%), not near a game bird pen (93%), on an artificial track (56%) or on a manure heap (36%), 1 or 2 traps set (82%), meat bait (94%), fox or martens targeted (88%)	66

42% of trap sites. A total of 197 foxes were caught with a maximum of nine foxes per trap site. Overall capture rate was 0.95 foxes/100 trap-nights.

Three main factors significantly affected capture rates and were included in the minimum adequate model: the trapping methods, the occurrence of captures in neighbouring trap sites and the trapping period. Two interactions also remained in the model, the first between the trapping period and trapper experience, and the second between the trapping period and the occurrence of captures in neighbouring trap sites.

Examination of the parameter estimates (Table 3) revealed that foot snares set on a manure heap and neck snares had similar capture rates ($P = 0.34$) whereas foot snares set on an artificial track had smaller capture rates than neck snares ($P < 0.01$). Capture rates were lower for long trapping periods than for short ones ($P < 0.001$). Captures in neighbouring trap sites had a small positive effect on the capture rate for short trapping periods ($P = 0.03$) but the opposite was true for long trapping periods due to an interaction between these two factors ($P < 0.01$). In a similar way, the negative effect of a long trapping period was compensated for by trapper experience due to the interaction between these two factors ($P < 0.001$).

The highest capture rate (3.17 foxes/100 trap-nights) was obtained with neck snares or foot snares set on a manure heap during a short trapping period and near trap sites with captures (Table 4). The smallest capture rates (0 foxes/100 trap-nights) were obtained with foot snares set on an artificial track during a long trapping period.

Table 3. Factors included in the minimum adequate models for fox and marten capture rates. Parameter estimates and their standard errors (SE) are given to indicate which of the categories of factors differ. For trapping methods, the reference categories are: neck snares on animal paths for fox, and box-cage traps not set near a game bird pen for martens; for trapping period: < 60 trap-nights; for captures in neighbouring trap sites: no; for trapper experience: < 5 captures of foxes or martens caught during the last season. *P < 0.05, ** P < 0.01.

Factor	Category	Parameter estimate	SE
Fox			
Trapping methods	Foot snares on an artificial track	0.15	0.16
	Foot snares on a manure heap	-0.90**	0.29
Trapping period	≥ 60 trap-nights	-1.66**	0.39
Captures in neighbouring trap sites	Yes	0.56*	0.24
Trapping period × Neighbouring captures	≥ 60 trap-nights × Yes	-0.92**	0.30
Trapping period × Trapper experience	≥ 60 trap-nights × ≥ 5 captures	1.40**	0.41
Marten			
Trapping methods	Box-cage traps near a game bird pen	0.54*	0.22
	Spring traps	0.08	0.22
	Foot snares	-0.92**	0.24
Trapping period	≥ 60 trap-nights	-1.24**	0.36
Trapping period × Trapper experience	≥ 60 trap-nights × ≥ 5 captures	-1.26**	0.47
Trapping period × Neighbouring captures	≥ 60 trap-nights × Yes	-1.35**	0.45

Table 4. Actual capture rate of fox or martens (number of captures per 100 trap-nights) for each combination of factors that significantly affects capture rates. Trapper experience is indicated by the number of foxes or martens caught during the last season.

Trapping methods	Trapping period	Captures in neighbouring sites	Trapper experience ≥ 5	Trapper experience ≥ 5
Fox				
Neck snares on animal paths or Foot snares on an artificial track	< 60 nights	No	1.75	
		Yes	3.17	
	≥ 60 nights	No	0.12	1.79
		Yes	0.28	1.03
Foot snares on a manure heap	< 60 nights	No	1.16	
		Yes	1.81	
	≥ 60 nights	No	0.27	0
		Yes	0	0.36
Marten				
Box-cage traps not near a game bird pen or Spring traps	≤ 60 nights	(No or yes)	3.20	
	≥ 60 nights	No	0.84	0.95
		Yes	0.77	0.89
Box-cage traps near a game bird pen	≤ 60 nights	(No or yes)	7.79	
	≥ 60 nights	No	0.72	0.67
		Yes	0.60	0.87
Foot snares	≤ 60 nights	(No or yes)	3.43	
	≥ 60 nights	No	0.77	0.92
		Yes	**	0.73

** No trap site

Capture rates of martens

Analyses were performed on 234 trap sites, and captures occurred in 44% of trap sites. A total of 160 captures (72 stone martens and 88 pine martens) occurred with a maximum of six martens per trap site. Overall capture rate was 0.78 martens/100 trap-nights. The minimum adequate model included only two factors: the trapping methods and the trapping period. As for foxes, two interactions also remained in the model; one between trapping period and trapper experience, and the second between trapping method and the occurrence of captures in neighbouring trap sites.

Examination of the parameter estimates (see Table 3) revealed that foot snares had lower capture rates than box-cage traps not set near game bird pens ($P < 0.001$). Box-cage traps set near a game bird pen had higher capture rates than box-cage traps not set near game bird pens ($P = 0.02$). Lower capture rates were obtained for long trapping periods than for short ones ($P < 0.001$), but this effect was not apparent with experienced trappers because of an interaction between these two factors ($P < 0.01$). As for foxes, the presence of captures in neighbouring trap sites led to lower capture rates for long trapping periods but had no effect for shorter ones because of an interaction between these factors ($P < 0.01$).

The lowest capture rates (0.60-0.89 martens/100 trap-nights) were recorded with traps set during a long trapping period and when other captures also occurred in neighbouring trap sites (see Table 4). The highest capture rates (3.20-7.79 martens/100 trap-nights) were obtained for short trapping periods irrespective of trapper experience and proximity to another trap site with captures.

Discussion

Numerous studies have shown that hunting and trapping records collected over long periods can detect changes in small carnivore populations. Hewson & Kolb (1973) showed changes in the number of foxes killed in relation to a dramatic change in rabbit populations due to myxomatosis. Similarly, bag records of foxes declined during outbreaks of sarcoptic mange or rabies (Bögel & Moegle 1980, Danell & Hörnfeldt 1987, Smedshaug et al. 1999). Bag records of specialist mustelids could also reflect the cyclicity in rodent populations (Debrot 1983). In a few studies, hunting and trapping records of small carnivores were related to another independent index of abundance (Wood 1959, Kolb & Hewson 1980, Helldin 2000, Kay et al. 2000).

At short temporal and small spatial scales, the size of a small carnivore population is often more stable, and changes in numbers could be difficult to detect with trapping records. This is especially true when data are collected from many trappers using different trapping methods, which may vary in efficiency.

Because of the large variety of components that may characterise trapping activity, e.g. the type of trap used, the number of traps set in the same place, the use and kind of bait or the habitat in which traps are set, many combinations may theoretically be encountered among trappers or sites. In our study, it was shown that trappers actually used a few 'standard' trapping procedures for each target species. These homogeneous trapping methods may have been developed locally by trappers through trial and error to reach the optimum efficiency in this landscape. In other regions where trapping is common, it is likely that a few more or less constant trapping methods may also be identified.

Different trapping methods led to different capture rates of foxes and martens. Numerous studies have shown that capture rates are influenced by trapping methods (e.g. Barrett et al. 1989, Naylor & Novak 1994, Kay et al. 2000). Three additional factors also influenced capture rates in our study: the length of time the traps were set in the same place or 'trapping period', the presence of captures in neighbouring trap sites and trapper experience. The first factor has, to our knowledge, never been studied before. It was shown that the capture rate is higher during the first weeks the traps were set. Comparisons of trapping records may then be biased if the length of the trapping periods is unequal among trap sites, and this could occur even if trapping effort (i.e. the number of trap-nights multiplied by the number of traps set in an area) is controlled for. Two interesting interactions involved the length of the trapping period. Capture rates were not influenced by the presence of captures in neighbouring trap sites for short trapping periods but were lowered for long trapping periods. For long trapping periods, capture rates decreased for inexperienced trappers but not for experienced ones. The negative effect of the presence of captures in neighbouring sites may be interpreted as a local and temporary reduction of trappable carnivores when multiple captures were made in the same place. The apparent 'compensatory effect' of trapper experience during long trapping periods is more difficult to interpret. In our study, trapper experience was expressed as the number of animals caught during the preceding season; a factor also related to the number of years the trapper had trapped in the area. However, we cannot rule out the possibility that trapper experience in part reflects spatial variation in carnivore abundance or habitat factors. But the best explanation is probably that experienced trappers chose the best places to catch carnivores, and were more careful in the way they set and controlled their traps. Then they could continue to catch animals in the same places (e.g. animals immigrating into vacant territories or shy individuals), while the trapping success of inexperienced trappers rapidly dropped once the more trappable fraction of the carnivore population was removed.

The differences in capture rates among the different combinations of trapping methods, trapper experience and trapping period were high. Given that these combinations of factors were encountered all over the study area and distributed more or less randomly, a confounding effect with the spatial variation of carnivore abundance is unlikely. The very large range of variation found in our study (0-3.17 foxes/100 trap-nights and 0.73-3.43 martens/100 trap-nights) was similar to that found when compiling data published under very different conditions of habitat and abundance of foxes. In Australia, capture rates ranged between 0.69 (Meek et al. 1995) and 2.16 foxes per 100 trap-nights (Bubela, Bartell & Müller 1998, Fleming et al. 1998) using treadle snares, which are similar to the foot snares used in our study. In Maine, Litvaitis et al. (1984) obtained an overall capture rate of 0.21 foxes/100 trap-nights with steel-jaw traps or leg snares of various sizes, in a region with relatively low densities of red fox. Capture rates reported for American marten *M. americana* varied between 0.52 and 1.22 with various conibear traps, including the spring traps used in our study, and averaged 1.72 with steel-jaw leghold traps (Barrett et al. 1989, Naylor & Novak 1994).

Given this high variability of capture rates, the major factors identified in our study should be taken into account to detect small variations in carnivore abundance between sites or over years. Standardisation is the best way to circumvent this problem (Wood 1959, Birks 1997). However, it may be difficult to change trapping practices because trapping is carried out to reduce predation on game, to remove individuals causing damage to poultry or to obtain furs but not to construct an index of abundance. As suggested by our results, it would be practicable, when using trapping data from numerous trappers, to identify the main trapping methods used in the region, and to calculate separate capture rates for the main combinations of factors influencing trapping success. Comparisons between these 'standardised' trapping indices could then be made over years, or even between various regions if the same trapping methods are used.

Most of the significant factors highlighted in our study could be recorded without much complication to build a standardised trapping index. When trapping methods are closely associated with the type of trap used, it would be possible to control only for the type of trap used, regardless of the other components of trapping practices. For year-to-year comparisons in the same region, trapper experience could be ignored provided that the same trappers are trapping each year (Helldin 2000). It would also be possible to work with a subsample of trappers or to stratify *a posteriori* among experienced or inexperienced trappers. The length of the trapping period must be recorded for each trap site, and capture rates may be calculated only for the first weeks of trapping. It seems difficult, however, to take the presence of captures in neighbouring trap sites into account. This factor cannot be studied on a large scale, and standardisation may be necessary, e.g. by defining a minimum distance between trap sites. Particular trapping conditions should also be avoided when constructing an index of abundance, especially trapping near farm buildings or following damage and, at least for martens, trapping near game bird pens. These circumstances should be recorded separately.

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