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Porcupine Project

Standards
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 **McGill**

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Urgence: cellulaire gardiens = 725-8216

1. Introduction

The porcupine project began in may 2000 with two objectives. First we are building a study population of North American porcupines with known individuals that we follow throughout their life. Second we test specific hypotheses about this population, and use our tests to advance scientific knowledge in animal ecology.

Porcupines have rarely been studied in the wild, and nobody has ever tried to follow marked individuals over the years, to find the juveniles born in the population, to measure the reproductive successes and failures of mothers, to patiently record what food individuals eat and how this affects their survival or body mass changes over time, etc. Therefore many surprises are waiting for us.

Your enthusiasm, hard work, good cooperation, willingness to learn, and determination when faced with adversity are all major conditions for the success of this project. Another condition is good organization. This document will help you organizing your work. Bring it in the field, read it in your tent, use it in the computer room, refer to it as often as you can.

2. Study Site and Camp Life

The Parc du Bic is small but you will quickly discover that it is a very complex mosaic of habitats. Here mountains, water, and forests are playing with each other. The Parc du Bic is one of the most beautiful places in this province. Many people come here to relax and enjoy spectacular sceneries. You have to respect them. Remember that you are wildlife specialists whereas most tourists are not. Although you have lots of work to do in any given day, you must answer their questions if they are interested in your work. In the end, it is the public who pays to protect this park and to do this research.

About camp life: Our field camp will first remember you of past holidays. After a few weeks, however, you will see the camp and the Maison Gagnon as a place to exchange information, plan future work, and rest. We have a few rules in this camp (see field crew information document) and new ones can be added if needed as the field season goes on. They help us living and working in a good atmosphere.

To some field workers you will become very close friends. With others you will perhaps not have much affinity. Learn to respect each other's differences. This is the only way to work together for months and be happy at the same time.

3. Data Collection

Your work consists in collecting data using standardized methods, recording this information in your field book or datasheets, and entering it in computer files. When collecting data on porcupines, it is very important to AVOID ALL SOURCES OF STRESS TO INDIVIDUALS. This especially applies when capturing porcupines. You must never speak loudly nor run. This also applies when porcupines are anaesthetized. An anaesthetized porcupine is actually only immobilized and remains conscious of everything you are doing. The following is a short description of the main techniques of data collection. Only experience, however, can really teach you how to collect data.

Catching porcupines: We catch porcupines on the ground using fishing nets. This is a very simple and efficient technique that you will quickly learn in the field. Occasionally we also use traps in trees for individuals that are seldom found on the ground. In order to reduce stress, we try to keep the number of times an animal is caught to a minimum. We sometimes inject drugs to immobilize animals. Since there is always a risk of mortality associated to anesthesia (even in humans!), again we minimize the number of times a given individual is anesthetized during a field season. ONLY FIELD ASSISTANTS AUTHORIZED TO INJECT DRUGS CAN DO SO.

Marking porcupines: Biological studies gain a lot when individuals are identified. We mark porcupines with small and medium metal ear tags. Numbers on these tags can only be read if the porcupine is caught. We thus attach to these tags other, larger plastic tags that are coloured and can be seen from a distance (see Appendix 3). This enables us to also identify individuals when they are high in a tree or only seen from a distance. Colour tags have a symbol written on them. These symbols are always the same for both ears. Sometimes we use radiocollars. You will learn how to put a radiocollar with

someone experienced. One important note however is that a radiocollar must always be loose around the porcupine neck, to prevent infection. As a simple rule, there should always be enough space between the collar and the neck for a xylazine bottle to find its way.

Finding young porcupines: One important question we want to solve is “What factors affect the reproductive success of mothers?” To do so we need to find their young and follow the growth and survival of juveniles through time. Mothers give birth in May-June and only have one baby. We try to find them as soon as possible after birth by being vigilant in the vicinity of a lactating female and, sometimes, by searching carefully the area where mothers rest during the day.

Tagging dens and trees: We identify dens and trees used by porcupines in order to answer questions such as: does the same porcupine often reuse a given tree or den? Can several porcupines use the same den in a given season? We want to identify dens and trees in a way that is clear and does not damage the environment. Dens are identified by small plastic tags attached to surrounding trees (later on, these tags are changed by Julie for larger ones fixed in the rock). Trees are identified with small aluminium forestry tags attached with aluminium nails. Tags must be attached at breast height, in a way that makes them difficult to see by tourists (for example, when a tree is close to a trail, put the tag on the tree side that is opposite to the trail). Note that when we scare a porcupine and it climbs in a tree, we don't identify that tree, because it does not reflect a real choice by the porcupine).

Monitoring of the vertebrate community:

Porcupines interact with other species in the forest and we try to keep track of a few other vertebrates of the community. Hare numbers are followed through counts of hare turds on permanent plots. The presence of fishers is also monitored through track counts during snow transects performed in winter.

Scientific equipment: You have access to sophisticated equipment to help you performing state-of-the-art ecological research. Unfortunately sophisticated equipment is very costly and is lost or breaks too easily. Please be extremely careful at

all times. Losing or breaking a given piece of equipment will prevent us from collecting important data. Often we will not be able to replace the equipment during the field season. Telemetry receivers, antennas, GPS, and radios are especially vulnerable. It is important that you know exactly how the equipment works. In addition, different pieces of equipment sometimes work with different types of rechargeable batteries, and it is very important to use the right battery in the right equipment. Similarly, each kind of rechargeable battery must be recharged in the appropriate charger. User manuals will always be available at camp. Take some time to look at them at the beginning of the season. Always ask when in doubt... At the beginning of the field season, every field assistant is assigned some equipment (e.g. Nancy gets GPS # 3 and telemetry receiver # 2). You are responsible for the care of the equipment that is given to you.

Biological samples: You will collect different types of biological samples, such as hairs, turds, skulls, parasites, or vegetation. Always identify bags or tubes immediately. Do not wait until you are back to camp. This is the best way to mis-identify samples. Then store samples in an appropriate place as soon as possible. Often this will be in the freezer. Failing to do so always results in important samples being lost or deteriorated.

Communication in the field: We use VHF radios to communicate in the field. This allows us to work more efficiently and to increase safety in difficult terrain. We can use up to 6 radios at the same time. When you talk to someone, everyone else can hear you. Please keep conversations to a minimum to save batteries and to avoid annoying field workers you are not talking to. After a few weeks, it is not very pleasant to be alone in the woods and always hear the same guy talking in the radio for no reason.

4. Data recording and data entering

You will record all the information you collect in your field book or in specific datasheets. Make sure your field book is properly identified, with your name and the current year. Always write the date when you start your day of work. You will also need to write and keep track of the identity of all

known individuals of the population in your field book. At the end of the field season, all the field books and datasheets are stored in the conservation biology laboratory at UQAR so we can check information when needed. Write legibly.

We follow a few simple rules that help us keeping the information we record very clear. Please try to follow them. In the following are important indications related to the contact datasheet (see Appendix 5):

-Porcupines trapped for the first time are denoted as new by putting a box around the tag numbers, and writing NEW.

-Check porcupines for ripped ears. If the ear is ripped or you have to replace a tag, the new tag has a box placed around it and RETAG is written above it.

In some cases the porcupine will have a radio collar put on.

On the day the collar is put on record the radio frequency and write NEW COLLAR.

If you exchange the collar by another one, write COLLAR CHANGE.

-If you remove a collar write COLLAR REMOVED.

-Finally, if the porcupine is captured and released with the same collar, write COLLAR ON.

One common problem in long-term field projects is data management. Many different observers collect lots of information over the years, and this information has to be very well organized or it gets lost. All of your observations will be managed in an Access database with your initials next to it. This database consists of several files that will receive different types of information. It is your responsibility to make sure that the data you collect are:

1/ properly recorded in your field book or datasheet, and
2/ then properly entered to the appropriate files.

This part of the document will help you doing a good work.

Read it carefully and always refer to it when in doubt. When you are not sure about something, always ask. Never guess.

The following gives information on how to record data in the field and how to enter them in computer files. As a rule, we

never use codes when recording data in the field, but always use codes when entering data in the files. This is the best way to prevent mistakes and ease data management.

4.1. Contact – Information recorded each time an individual is observed or captured. Note 1: if the individual is a juvenile captured for the first time, the information must be

entered in the Juvenile file AND in the contact file. Note 2: if type=CAR, there is no need to enter information in the observation section of the contact datasheet. Note 3: if type=LOS, the information in the observation section must be entered in the contact datasheet.

Date: Date of capture or observation. Example: 10-Jun-2000.

Time: Time of capture or observation. Example: 13:43:00.

Obs: Initials of observer.

Type: Type of contact. Use the following codes:

SCA= simple capture (ex. animal captured in a trap)

COB= capture-observation

VOB= visual observation

TOB= telemetry observation (when you only get a strong signal and know where the porcupine is, but can't see the porcupine)

CAR= tagged carcass

LOS= tag or radiocollar found

Colour: Plastic tag colour and code.

TagLft: Number on metal tag (left ear).

TagRt: Number on metal tag (right ear).

MiniTagLft: Number on metal minitag (left ear).

MiniTagRt: Number on metal minitag (right ear).

Sex: Enter M for male, F for female.

Area: Area in which the contact was made.

LatNorth: Northern Latitude coordinate (5 min. average GPS).

LongWest: Western Longitude coordinate (5 min. average GPS).

UTMEast: Eastern UTM coordinate (5 min. average GPS).

UTMNorth: Northern UTM coordinate (5 min. average GPS).

Found: Indicate method used to find the individual:

1= Found by chance (no searching of porcupines)

2= Found from systematic search of porcupines, but not this one in particular

3= Found from systematic search of this porcupine, individual not radio collared

4= Found from systematic search of this porcupine, individual radio collared

Behaviour: Indicate what the behaviour of the individual was when first seen:

T= Walking or running (travelling)

R= Immobile (resting)

F= Feeding

O= Other (specify in Notes)

Feeding: If the individual was feeding, indicate what it was feeding on:

1= Plants on the ground

2= Tree leaves

3= Tree bark

4= Tree buds

5= Tree flowers

6= Other (specify in Notes)

7= Unknown

Disturbed: Indicate if the behaviour ***you recorded*** was likely affected by your presence. Note that if you disturbed the porcupine when you arrived, but the individual had resumed its normal activities when you recorded its behaviour, then the code should be N.

Y= I'm sure the behaviour was affected by my presence ***when it was recorded***

N= I'm sure the behaviour was not affected by my presence ***when it was recorded***

U= I don't know exactly

Location: Indicate where the individual was located when you first saw it:

1= On the ground, not hidden

2= On the ground, hidden in vegetation (herbs and/or shrubs)

3= On the ground, under a log or rock

4= On the ground, in a tree cavity

5= On the ground, at the base of a tree

6= On top of a log, rock, or low branch (less than 1 m from the ground)

7= In a tree or shrub (more than 1 m from the ground)

8= Unknown

Den: Indicate den number if porcupine is in a den.

Tree: Indicate, if Location = 7, the tree species in which the porcupine was located when ***you first saw it***.

Tree tag: Indicate the number of the tree aluminium tag.

Tree tag fate: Indicate if the tag was already present on the tree (fate = 1), is new (fate = 2), or if there is no tag on the tree and you have been unable to put a tag (fate = 3). Note that when we scare a porcupine and it climbs in a tree, we don't identify that tree, because it does not reflect a real choice by the porcupine).

Circum: Circumference at breast height (in cm).

Pair: Indicate here if the individual was with another porcupine (Yes/No). We define a pair as 2 individuals in the same tree or 2 individuals on the ground within 3 m. Note that if you scare a porcupine and it climbs a tree where there is already another porcupine, this is not considered as a pair. If Pair = Yes, indicate in "Notes" the Colour, TagLft, TagRt, MiniTagLft, and MiniTagRt of the pair individual.

TreeCover: Indicate the tree cover, as evaluated within a circle of 15 m radius around the individual's location when you first found it:

1 = absent (< 5%)

2 = scattered (5-25%)

3 = open (25-50%)

4 = dense (50-75%)

5 = closed (> 75%)

Tree1: Indicate the dominant tree species within a circle of 15 m radius around the porcupine's location when you first found

it (example: trembling aspen = Po tr). Use tree codes (see Appendix 4).

Tree2: Indicate the second dominant tree species within a circle of 15 m radius around the porcupine's location when you first found it (example: balsam fir = Ab ba). Use tree codes (see Appendix 4).

ShrubCover: Indicate the shrub cover, as evaluated within a circle of 15 m radius around the individual's location when you first found it. Shrubs are defined here as any woody vegetation 50-150 cm tall (shrubs taller than 150 cm are considered as trees):

- 1 = absent (< 5%)
- 2 = scattered (5-25%)
- 3 = open (25-50%)
- 4 = dense (50-75%)
- 5 = closed (> 75%)

HerbCover: Indicate the herb cover, as evaluated within a circle of 15 m radius around the individual's location when you first found it. Herbs are defined here as any non-woody vegetation (for example old dry herbs in early spring or newly growth herbs in late spring and summer):

- 1 = absent (< 5%)
- 2 = scattered (5-25%)
- 3 = open (25-50%)
- 4 = dense (50-75%)
- 5 = closed (> 75%)

Temp: Indicate the approximate temperature (°C).

Cloud: Indicate the cloudiness of the sky:

- 1= clouds occupy < 5% of the sky
- 2= clouds occupy 5-25% of the sky
- 3= clouds occupy 25-50% of the sky
- 4= clouds occupy 50-75% of the sky
- 5= clouds occupy 75-100% of the sky

Wind: Indicate how windy it was in the area where the observation was performed:

- 1= none
- 2= leaves agitated

- 3= outermost twigs move
- 4= branches move
- 5 = branches bend
- 6 = whole trees move

Rain: Indicate if it was rainy:

- 1= You can leave you book open, no fog
- 2 = You can leave you book open, but there is some fog
- 3= You can't leave your book open but don't need to find a shelter for yourself
- 4= You need to find a shelter
- 5= Snow
- 6= Other (specify in Notes)

Insect1: Biting insect harassment (mosquitoes and black flies combined) as noticed in the study area during the last couple of days. This is a general measure of the abundance of biting insects in the study area at this time of the year.

- 1=No biting insect noticed.
- 2=A few biting insects noticed. They are not annoying.
- 3=Quite many biting insects noticed. They are moderately annoying. No need to use insect repellents.
- 4= Many biting insects noticed. They are annoying. It is useful to use insect repellents in the woods or around camp.
- 5=Very many biting insects. They are very annoying. It is necessary to use insect repellents in the woods or at camp.

Insect2: Biting insect harassment (mosquitoes and black flies combined) as noticed during the capture or observation. This is an instantaneous measure of the abundance of biting insects in a specific location at a specific time.

- 1=No biting insect noticed.
- 2=A few biting insects noticed. They are not annoying.
- 3=Quite many biting insects noticed. They are moderately annoying. No need to use insect repellents.
- 4= Many biting insects noticed. They are annoying. It is useful to use insect repellents.
- 5=Very many biting insects. They are very annoying. It is necessary to use insect repellents.

Fate: Fate of the capture (leave blank if no capture performed, e.g. visual observation or telemetry observation). Use the following codes:

1= recapture

2= new animal never tagged before

3= retagged. One of both ears is ripped. Identity of the animal known

4= retagged. Both ears are ripped. Identity of animal unknown.

5= unnatural death (trapping or handling)

6= recapture found dead (not roadkill)

7= roadkill

MetCap: Method of capture:

N= Net

H= Hand

T= Trap (not vertical trap)

VT= Vertical trap

P= Pole (restraint pole)

JS= Jabstick (immobilizing jabstick)

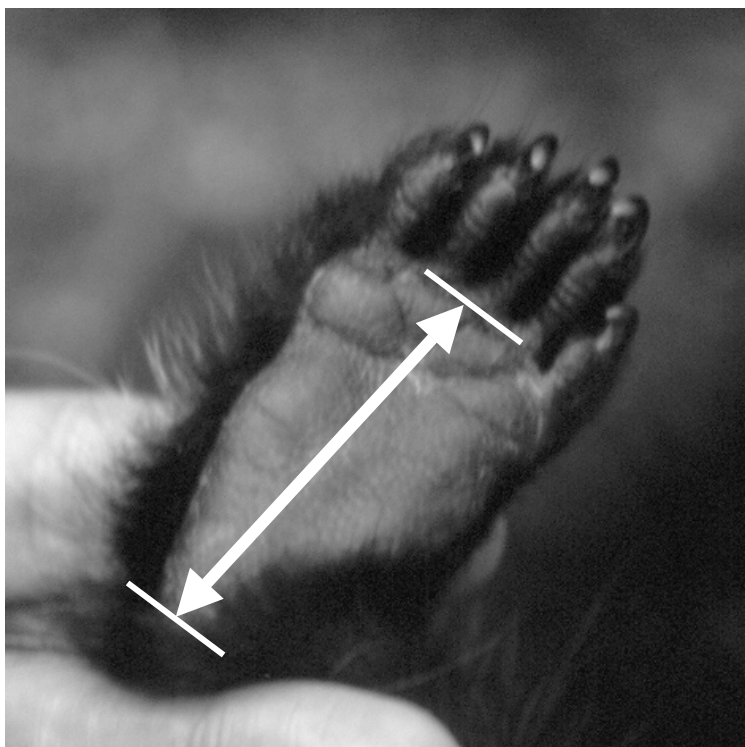
TS= Tree stick (stick used to drive porcupine down the tree)

DS= Den stick (stick used to drive porcupine out of the den)

O= Other (specify in Notes)

Mass: Body mass (don't forget to subtract the mass of the radio, if applicable). Note: 10kg scale precision= 0.05kg and 20kg scale precision= 0.1kg.

Foot: Right hind foot length (in cm). Measurement from the heel to the longest part of the foot pad, claws not included.



Chest: Mid-sternal circumference of chest (in cm).

Measurement towards the upper teats, not too tight or too

loose, just enough to squeeze the fur and quills.

Length: Mid-dorsal length of body (in cm). Measurement from tip of nose to end of tail (last vertebrae), keeping the porcupine well elongated. Note that these 3 measurements are only performed during anaesthesia. They are done again each time an animal is anaesthetised in order to obtain data on body growth.

Ticks: Number of ticks seen on porcupine.

Flies: Total number of black fly bites seen on porcupine. When the number is large, you can indicate an approximation (example: 30-35). When the number is very large, you can give a minimum number (example: >80).

Status: Reproductive condition.

NC = Not checked (because you forgot, or the porcupine was too nervous, etc.)

If checked and porcupine = male, enter:

S = Scrotal

A = Abdominal

U = Unclear

If checked and porcupine = female, enter:

P = Pregnant

L = Lactating

NR = Non reproducing (not pregnant, not lactating)

U = Unclear

Note → If you know that the female is reproductive but this is not visible in the field, indicate Status = L and indicate in Notes that no milk was seen.

Milk: If Status = L, indicate here the characteristics of the milk. The first symbol indicates colour, the second one indicates consistence.

NN = Milk of “normal” colour and “normal” consistence (as 3.25 % milk you buy in a store)

+N = Milk more beige, yellow, or grey than normal milk, but of normal consistence.

-N = Milk more translucent, clear than normal milk, but of normal consistence.

N+ = Milk of normal colour, but more creamy than normal milk.

N- = Milk of normal colour, but more liquid than normal milk.
Use the codes --, -+, ++, +- if needed.

Radio: Enter the fate of the radio collar:

1= No collar on porcupine

2= New collar

3= Collar on

4= Change of collar – Indicate the frequency of the collar that was removed

5= Collar removed

6= Collar found

Freq: Frequency of the radio collar. Must be entered each time the animal is captured. The frequency entered is the frequency given by the manufacturer, not the best frequency. The frequency must also be entered on the day you put on or take off the collar. Leave blank if not applicable.

Hair: Indicate if ca. 10 hair roots have been collected in an envelope for later genetic analyses (Yes/No). You must indicate on the envelope the date, colour code, and ear tag numbers (TagLft/TagRt and MiniTagLft/MiniTagRt).

Turd: Indicate if turds have been collected (Yes/No). You must indicate on a piece of rain paper inserted in the Ziploc bag the date, colour code, and ear tag numbers (TagLft/TagRt and MiniTagLft/MiniTagRt).

Sleep: Indicate if the porcupine has been anaesthetized (Yes/No).

OldTagLft: Enter the old tag number (left ear) if FATE = 3. Must be entered each time a tag or minitag has been changed, even if it is not this one. If tags have been changed several times, indicate the last tag number.

OldTagRt: Enter the old tag number (right ear) if FATE = 3. Must be entered each time a tag or minitag has been changed, even if it is not this one. If tags have been changed several times, indicate the last tag number.

OldMiniTagLft: Enter the old minitag number (left ear) if Fate = 3. Must be entered each time a tag or minitag has been

changed, even if it is not this one. If tags have been changed several times, indicate the last tag number.

OldMiniTagRt: Enter the old minitag number (right ear) if Fate = 3. Must be entered each time a tag or minitag has been changed, even if it is not this one. If tags have been changed several times, indicate the last tag number.

Note about retag: a porcupine is anaesthetized for a retag only if a plastic coloured tag is lost. Please check the condition of each ear. When an ear is in very bad shape due to a couple of previous retags, you may choose not to retag the animal, and let it go with only one coloured tag. Indicate that the ear is in bad shape in Notes and also in your field book, so the animal is not anaesthetized a second time.

OldColour: Enter the old colour and code if fate = 3 (even if colour code has not changed)

TagHist: Give here as many comments as possible about the tag change (why you changed the tag, condition of the ear, etc.).

Notes: Enter here any observation relevant to the ecology, the capture methods, the conditions of capture, the health, etc. of the porcupine. For example, it is useful to indicate here if the porcupine has a broken nail or tooth, scars, exceptional number of nipples, strange behaviour, neck abrasion due to radiocollar, other parasites, etc.

4.2. Juvenile – Information recorded each time a juvenile (i.e. individual born this year) is captured for the first time. Please note that when a juvenile is captured for the first time, some data must also be entered in *Contact* (see appendix 2).

Date: Date of capture. Example: 10-Jun-2000.

Time: Time of capture. Example: 13:43:00.

Obs: Initials of observer.

MiniTagLft: number on metal minitag (left ear).

MiniTagRt: number on metal minitag (right ear).

Colour: Wires colours.

MTagLft: number on metal tag (left ear) of the mother. If she is untagged, write “Untagged”. If you are unsure about who the mother is, write “Unknown”. You can give suggestions in “Notes”.

MTagRt: number on metal tag (right ear) of the mother. If she is untagged, write “Untagged”. If you are unsure about who the mother is, write “Unknown”. You can give suggestions in “Notes”.

MColour: Colour code of the mother. If she is untagged, write “Untagged”. If you are unsure about who the mother is, write “Unknown”. You can give suggestions in “Notes”.

Mass: Body mass.

Foot: Right hind foot length (in cm).

Chest: Mid-sternal circumference of chest (in cm).

Length: Mid-dorsal length of body from tip of nose to end of tail (last vertebrae) (in cm).

Sex: enter M for male, F for female.

Area: Area in which the juvenile was captured.

LatNorth: Northern Latitude coordinate (5 min. average GPS).

LongWest: Western Longitude coordinate (5 min. average GPS).

UTMEast: Eastern UTM coordinate (5 min. average GPS).

UTMNorth: Northern UTM coordinate (5 min. average GPS).

Found: Indicate method used to find the juvenile:
1= Found by chance (you were not looking for porcupines)

2= Found from systematic search of porcupines, but not this one in particular

3= Found from systematic search around the mother

Behaviour: Indicate what the behaviour of the juvenile was when first seen:

T= Walking or running (traveling)

R= Immobile (resting)

F= Feeding

O= Other (specify in Notes)

Feeding: If the juvenile was feeding, indicate what it was feeding on:

1= Plants on the ground

2= Tree leaves

3= Tree bark

4= Tree buds

5= Tree flowers

6= Suckling

7= Other (specify in Observations)

8= Unknown

MotherBehav: If possible, indicate what the behaviour of the mother was when first seen:

1= Walking or running

2= Resting on ground

3= Resting in tree

4= Feeding on ground

5= Feeding on tree

6= Other (specify in Observations)

Disturbed: Indicate if you think your presence had disturbed the behaviour of the juvenile **that you recorded** (Yes/No).

Location: Indicate where the juvenile was found:

1= On the ground, not hidden

2= On the ground, hidden in vegetation

3= On the ground, under a log or rock

4= On the ground, in a tree cavity

5= On the ground, base of a tree

6= On top of a log, rock, or low branch (less than 1 m from the ground)

7= In a tree or shrub (more than 1 m from the ground)

8= Unknown

Sleep: indicated if the juvenile has been anaesthetized (Yes/No).

Hair: Indicate if ca. 10 hair roots have been collected in an envelope for later genetic analyses (Yes/No). The identification number of the envelope must be the ear tag numbers (MiniTagLft/MiniTagrt).

Turd: Indicate if turds have been collected (Yes/No).

Erect: Indicate if the juvenile was seen erecting the quills of its back (Yes/No).

Notes: Enter here any observation relevant to the ecology, behaviour, capture method, etc. of juveniles. Also note colour of teeth and state of umbilical cord (wet, dry, lost?).

4.3. Search – Information recorded each time a systematic search is performed to find a juvenile around the location of a mother.

Date: Date. Example: 10-Jun-2000.

Time: Indicate the time at which the search started (2:35 p.m. must be entered as 14:35).

Obs: Initials of observer

NumPer: Number of persons participating in the search (including the principal observer)

Duration: Time spent searching

MTagLft: number on metal tag of the mother (left ear)

MTagRt: number on metal tag of the mother (right ear)

MMiniTagLft: number on metal minitag of the mother (left ear)

MMiniTagRt: number on metal minitag of the mother (right ear)

MColour: Plastic tag colour and code of the mother.

Lactation: Indicate the lactating status of the mother (as recorded during the last capture).

1 = Lactating

2 = Not lactating

3 = Unknown

4 = Unclear

Freq: Frequency of the radio collar **of the mother**. If the mother has no collar, leave blank.

LatNorth: Northern Latitude coordinate (5 min. average GPS).

LongWest: Western Longitude coordinate (5 min. average GPS).

UTMEast: Eastern UTM coordinate (5 min. average GPS)

UTMNorth: Northern UTM coordinate (5 min. average GPS)

TreeCover: Indicate the tree cover, as evaluated within a circle of 15 m radius around the mother's initial location (when you first found her).

1 = absent (< 5%)

2 = scattered (5-25%)

3 = open (25-50%)

4 = dense (50-75%)

5 = closed (> 75%)

Tree1: Indicate the dominant tree species (example: trembling aspen = Po tr). Use tree codes.

Tree2: Indicate the second dominant tree species (example: balsam fir = Ab ba). Use tree codes.

Standage: Relative age of stand

1 = Mature (> 50% of the trees are old)

2 = Immature (> 50% of the trees are young)

ShrubCover: Indicate the shrub cover (all woody vegetation between 50 and 150 cm), as evaluated within a circle of 15 m radius around the mother's initial location (when you first

found her).

- 1 = absent (< 5%)
- 2 = scattered (5-25%)
- 3 = open (25-50%)
- 4 = dense (50-75%)
- 5 = closed (> 75%)

HerbCover: Indicate the herb cover (herbs are defined here as any non-woody vegetation, for example old dry herbs in early spring or newly growth herbs in late spring and summer), as evaluated within a circle of 15 m radius around the mother's initial location (when you first found her).

- 1 = absent (< 5%)
- 2 = scattered (5-25%)
- 3 = open (25-50%)
- 4 = dense (50-75%)
- 5 = closed (> 75%)

Caverns: Number of places under rocks where the juvenile could potentially hide (within a circle of 15 m radius around the mother's initial location --- when you first found her).

- 1 = 0
- 2 = 1-5
- 3 = 6-10
- 4 = 11-20
- 5 = >20

DeadWood: Number of places under dead trees or branches where the juvenile could potentially hide (within a circle of 15 m radius around the mother's initial location --- when you first found her).

- 1 = 0
- 2 = 1-5
- 3 = 6-10
- 4 = 11-20
- 5 = >20

Slope: Indicate the average slope amount within a circle of 15 m radius around the mother's initial location (when you first found her).

- 1 = negligible (virtually flat)
- 2 = moderate (there is an obvious slope, you feel it when you walk)

3 = steep (it is a real effort to “climb” the slope)

4 = very steep (you have to hold branches to climb the slope)

Aspect: Indicate the average slope direction.

N = North

NE = North-East

E = East

SE = South-East

S = South

SW = South-West

W = West

NW = North-West

Temp: Indicate the approximate temperature (in the shadow) during the search (°C)

Cloud: Indicate the cloudiness of the sky

1= clouds occupy < 5% of the sky

2= clouds occupy 5-25% of the sky

3= clouds occupy 25-50% of the sky

4= clouds occupy 50-75% of the sky

5= clouds occupy 75-100% of the sky

Wind: Indicate how windy it was

1= none

2= leaves agitated

3= outermost twigs move

4= branches move

5 = branches bend

6 = whole trees move

Rain: Indicate if it was rainy

1= You can leave you book open, no fog

2 = You can leave you book open, but there is some fog

3= You can't leave your book open but don't need to find a shelter for yourself

4= You need to find a shelter

5= Snow

6= Other (specify in Notes)

Ground: Indicate the ground conditions

1= Very wet (recent rain)

2= Not recent rain but too wet to sit down

3= You can sit on the ground (dry)

4= Frozen

Success: Indicate the success of your search

1= No juvenile found

2= Juvenile found but not tagged (indicate why in “observations”)

3= Juvenile tagged

Distance: Estimated horizontal distance between mother and young when you arrived

MiniTagLft: If “Success” = 3, number on metal minitag of the juvenile (left ear)

MiniTagRt: If “Success” = 3, number on metal minitag of the juvenile (right ear)

Notes: Enter here any observation relevant to the ecology, the search methods, etc. of the juvenile porcupines.

4.4. Carcass – Information recorded each time a porcupine is found dead (in the study area or anywhere else). Note that if the porcupine is tagged, the information has to also be entered in the Contact file.

Date: Date at which the carcass was found. Example: 10-Jun-2000.

Obs: Initials of observer

Colour: Plastic tag colour and code.

TagLft: Number on metal tag (left ear).

TagRt: Number on metal tag (right ear).

MiniTagLft: Number on metal minitag (left ear).

MiniTagRt: Number on metal minitag (right ear).

Fate: Indicate the fate of the carcass

1= Roadkill

- 2= Predation
- 3= Treefall
- 4= Other (specify in Observations)
- 5= Unknown

Shape: Use the following codes:

- 1= Carcass in a very bad shape. You can only recognize that it is a porcupine because there are some quills around
- 2= Carcass in a bad shape. You can recognize that it is a porcupine (feet or head still characteristic) but it has seriously been damaged
- 3 = Carcass in good shape. You see some injuries but the body is not very damaged
- 4 = Carcass in very good shape (as if the porcupine was asleep).

CarcassAge: Indicate your estimate as to when the porcupine died

- 1= A few minutes or a few hours ago (still warm)
- 2 = Today or yesterday
- 3 = 2-4 days ago
- 4 = Most probably more than 4 days ago
- 5= Several weeks or months ago

Mass: body mass

Foot: Right hind foot length (in cm)

Chest: Mid-sternal circumference of chest (in cm).

Length: Mid-dorsal length of body from tip of nose to end of tail (last vertebrae) (in cm).

Sex: enter M for male, F for female

Status: Reproductive condition.

NC = Not checked (because you forgot, observation not possible, etc.)

If checked and porcupine = male, enter:

S = Scrotal

A = Abdominal

U = Unclear

If checked and porcupine = female, enter:

P = Pregnant

L = Lactating

NR = Non reproducing (not pregnant, not lactating)

U = Unclear

CollectionSite: Area in which the porcupine was found.

Examples: Gagnon, 10 km North of Rimouski, etc.

LatNorth: Northern Latitude coordinate (5 min. average GPS).

If you don't have any GPS, describe the location (road number, distance and direction from major city, sector in the park, etc.) in "Notes"

LongWest: Western Longitude coordinate (5 min. average GPS).

UTMEast: Eastern UTM coordinate (5-min. average GPS)

UTMNorth: Northern UTM coordinate (5-min. average GPS)

Hab: Indicate what type of habitat you found the carcass in.

1= Conifer forest

2 = Deciduous forest

3 = Mixed forest

4 = Field

5 = City, village, farm

6 = Lake or river

7= Road or road side

8= Other (specify in Observations)

Skull: Indicate if you have kept the skull (Yes/No)

SkullID: Indicate skull identification number (see skull file)

FemurCol: Note the colour of the marrow from the femur of one of the hind legs.

W= White or beige

LP= Light pink

P= Pink

R= Red (like blood)

FemurCon: Note the consistence of the marrow from the femur of one of the hind legs.

H= Rather hard
S= Soft
G= Gelatinous
L= Nearly liquid

Stomach: Indicate if stomach content has been collected (Yes/No).

Notes: Enter here any observation that you may find relevant (it is useful to indicate as many comments as possible about potential cause of death, position of the carcass, etc.).

4.5. Skull – Information recorded each time a porcupine skull is added to our collection.

Skull ID: Skull identification number.

Date: Date of skull collection. Example: 10-Jun-2000.

CollectionSite: Area in which the porcupine was found. Examples: Gagnon, 10 km North of Rimouski, etc.

Colour: Plastic tag colour and code.

TagLft: Number on metal tag (left ear).

TagRt: Number on metal tag (right ear).

MiniTagLft: Number on metal minitag (left ear).

MiniTagRt: Number on metal minitag (right ear).

Sex: enter M for male, F for female

Fate: Indicate the fate of the carcass

1= Roadkill
2= Predation
3= Treefall
4= Other (specify in Observations)
5= Unknown

Notes: Enter here any observation relevant to the condition of the skull.

4.6. Den – Information recorded each time a new den is found or a known den is visited. We identify a new den when it is occupied by a porcupine or when there are fresh or old signs of porcupine occupation. We consider as a sign of occupation the presence of a porcupine trail, the presence of a strong porcupine odour, or the accumulation of > 20 pellets (fresh or old).

Date: Date at which the den is found or visited. Example: 10-Jun-2000.

Time: Time at which the den is found or visited. Example: 13:43:00.

Obs: Initials of observer

Den tag: Number on plastic tag used to identify the den.

Area: Area in which the den was located.

LatNorth: Northern Latitude coordinate (5 min. average GPS).

LongWest: Western Longitude coordinate (5 min. average GPS).

UTMEast: Eastern UTM coordinate of the den (5 min. average GPS)

UTMNorth: Northern UTM coordinate of the den (5 min. average GPS)

Fate: Fate of the den. Use the following codes:

1= visit of a previously identified den

2= new den

3= retagged (only if new tag number is different from previous number)

4= destroyed (den no more usable by a porcupine)

5= not found (after an intensive search of this identified den)

Dentaghist: In the case of a den tag loss, indicate old den tag number (if known).

Found: Indicate method used to find the den. Use the following codes:

- 1= by following a porcupine or some porcupine tracks
- 2= after finding a porcupine by telemetry
- 3= by chance (observed while not going to this specific den)
- 4= visit of this specific den was planned

Active: Indicate if den is active. Leave blank if unknown.

Y= the den is used now or has been used in the last couple of days (porcupine is in, fresh pellets, fresh tracks)

N= the den is not used now and has not been used in the last couple of days

Colour: Plastic tag colour and code of resident porcupine, if known.

TagLft: Number on metal tag (left ear).

TagRt: Number on metal tag (right ear).

MiniTagLft: Number on metal minitag (left ear).

MiniTagRt: Number on metal minitag (right ear).

Type: Type of den. Use the following codes:

- 1=rock
- 2=stump or log
- 3="calvette"
- 4=building
- 5=other (specify in Notes)

Depth: Indicate depth of den. Use the following codes:

- 1=porcupine can be reached
- 2=porcupine visible but unreachable
- 3=porcupine too far to be visible
- 4=other (specify in Notes)

Snow depth: Indicate snow depth (in cm) as averaged within a circle of 10-15 m around the den. An approximate measurement (within 10 cm) is good enough.

Environment: Indicate useful comments to help other observers to find the den back. Any description of surrounding

landmarks will be useful.

Tag check: Indicate if the tag is a Maxi Allflex and has been secured in rock or in tree in a way it is clearly visible for observers (Yes or No)

GPS diff check: Indicate if an accurate location has been taken with a differential GPS (Yes or No).

Fisher checks: We must know whether some fisher signs could have been observed during your visit. Indicate if snow allows recent (last 2-3 days) fisher tracks to be seen AND some time (>2-3 minutes) have been spent looking for signs 10-15 m around den (Yes or No).

Fisher signs: fresh signs of fisher presence seen within 10-15 m of the den (e.g. tracks in snow, fresh scats) (Yes, No, Uncertain). If “Yes”, please specify the nature of observed signs in notes.

Notes: Enter here any observation relevant to the characteristics of the den, the tag change, the resident identity and behaviour, predation signs, etc.

4.7. Effort – Information recorded each time a capture session is performed. Effort datasheets are usually completed by the capture team. The information will be used to estimate the amount of effort invested each year in capturing porcupines, which is critical to get a good index of porcupine densities.

Obs: Initials of observer (the observer is the person responsible for the data collected and entered in the file).

Date start: Date at which observers started field work. Format must be like "12-May-01".

Time start: Time at which observers started field work. Format must be like "04:45" or "23:14" (preparation time in the office must not be counted).

Date end: Date at which observers ended field work. Format

must be like "12-May-01".

Time end: Time at which observers ended field work. Format must be like "04:45" or "23:14" (time spent in the office to take care of equipment must not be counted).

Nbr observers: Number of observers participating in the capture session.

Area: Area(s) visited during the capture session. For example: once the study area, twice the study area, fields only, Amour + fields, etc.

Transportation: Mode of locomotion used during the capture session. For example: walk, bike, bike + walk in the fields, etc.

ID Observers: Initials of observers and contribution of each of them. For example DB (1), CT (1), JR (0.5)

Temp: Indicate the approximate temperature (°C).

Cloud: Indicate the cloudiness of the sky:

- 1= clouds occupy < 5% of the sky
- 2= clouds occupy 5-25% of the sky
- 3= clouds occupy 25-50% of the sky
- 4= clouds occupy 50-75% of the sky
- 5= clouds occupy 75-100% of the sky

Wind: Indicate how windy it was in the area where the observation was performed:

- 1= none
- 2= leaves agitated
- 3= outermost twigs move
- 4= branches move
- 5 = branches bend
- 6 = whole trees move

Rain: Indicate if it was rainy:

- 1= You can leave you book open, no fog
- 2 = You can leave you book open, but there is some fog
- 3= You can't leave your book open but don't need to find a shelter for yourself
- 4= You need to find a shelter

5= Snow

6= Other (specify in Notes)

Ground: Ground wetness (1=very wet--recent rain, 2=no recent rain but too wet to sit down, 3=dry--you can sit down, 4=frozen, 5=snow). Try to indicate average conditions for the capture period. Leave blank if unknown!

Insect1: Biting insect harassment (mosquitoes and black flies combined) as noticed during the capture session. This is a general measure of the abundance of biting insects in the areas covered during captures.

1=No biting insect noticed.

2=A few biting insects noticed. They are not annoying.

3=Quite many biting insects noticed. They are moderately annoying. No need to use insect repellents.

4= Many biting insects noticed. They are annoying. It is useful to use insect repellents in the woods or around camp.

5=Very many biting insects. They are very annoying. It is necessary to use insect repellents in the woods or at camp.

Rain last night: General conditions during the last night.

Wind last night: General conditions during the last night.

COB: Number of capture-observation performed.

VOB: Number of visual-observation performed.

SCA: Number of simple captures performed.

Juvenile (New): Number of new juveniles captured.

Heard: Number of individuals heard but not identified.

Seen: Number of individuals seen but not identified.

Total: Total of 6 previous fields.

Notes: Indicate here any observation relevant to the capture success.

4.8. Radiolog – Information recorded each time a radiocollar is put on a porcupine, removed from a porcupine, or found in the field after being lost by a porcupine. This data is very important as it is needed to keep track of which radios are used, and how much battery life remains on each of them.

Serial: Serial number of radio.

Freq: Radio frequency as given by the manufacturer. Note: the real frequency used in an initial test or in the field can differ from the frequency given by the manufacturer, depending on the receiver that is used, the temperature, etc.

Purchase: Date of purchase. Example: 10-Jun-2000.

Company: Name of company.

Radio type: A = Adult, Y = Young.

Collar design: Number of the design that was used to attach transmitter.

Battery new: Date of last battery change.

Put on: Date the radio was put on a porcupine. Example: 10-Jun-2000.

Person put on: Initials of person who took the collar out of the camp and put it on porcupine.

Colour: Plastic tag colour and code.

TagLft: Number on metal tag (left ear).

TagRt: Number on metal tag (right ear).

MiniTagLft: Number on metal minitag (left ear).

MiniTagRt: Number on metal minitag (right ear).

Sex: Sex of individual (M = male, F = female). Leave blank if unknown.

Took off: Date the radio was removed from the porcupine.

Example: 10-Jun-2000.

Days on: The number of days the collar was on the porcupine.

Person took off: Initials of person who removed the collar and returned the collar to the camp.

Person entered: Initials of person who entered the data in Access.

Notes: Enter here relevant observations (e.g., radio damaged, signal very weak, works very well, emitted a mortality signal for a very long time, produced an infection on porcupine's neck, etc.).

4.9. Phenology – Information recorded on several plant species and about snow cover to get a quantified estimate of seasonal changes in vegetation.

Date: Date of data recording. Format must be like "12-May-00".

Obs: Initials of observer (the observer is the person who collects the information).

Species: Plant species (indicate "Snow" if record dedicated to snow cover).

Length: Length (cm) from base of bud or leaf petiole to extremity of bud or leaf (Note: extremity of longest leaf if composed leaf).

Plant part: Plant part considered (bud, leaf, or fruit).

Fruit colour: Fruit colour.

Fruit cons: Fruit consistence.

Fruit quant : Fruit quantity.

% Cover : Proportion of ground covered by snow in woody

slope located 100 m South of Maison Gagnon.

Notes: Indicate here any observation relevant to plant phenology.

5.0. Snowshoe hare turd plots – Information recorded each time a snowshoe hare turd plot is visited to count hare turds. Note that there are 6 grids in the study area, and each grid contains 16 circular plots (1 m diameter each).

Date: Date of turd count. Example: 10-Jun-2000.

Obs: Initials of observer.

Grid ID: Name used to identify the grid to which the plot belongs.

Plot ID: Letter/number used to identify the plot. Example: B12.

Fate: Fate of the plot. Use the following codes:

1= first count on the plot

2= the plot was already counted in a preceding year

3= the plot is not counted this year (indicate why in notes)

Turd: Number of hare pellets counted on the plot.

Notes: Enter here any observation relevant to the characteristics of the plot, or anything that could have led to a bias in the turd count. Indicate UTM coordinates when the grid is installed or the first time the grid is counted.

5. At the computer

Entering data into the appropriate computer files is the last step of your work. You have to do it very carefully and avoid mistakes: please check everything, and then double-check. I repeat: please check everything, and then double-check! If you enter information in the wrong way, your efforts in the field will have been a waste of time and will result in lots of frustration when data are analyzed. Remember that your initials are your signature on each record. Do not be surprised if we sometimes have a look to the data you have entered.

The best way to be on top of things is to make sure that you never keep any data in your field book for more than a couple of days without entering it. When you have entered a piece of information, write “Entered” in datasheet or in your field book.

Steps:

1. Double-click “porcupine”
2. Double-click the name of the file where you wish to enter data
3. Click on the New Record button at the bottom of the datasheet window
4. The first field is an AutoNumber type. Simply press Tab and begin typing in the second field. Don’t panic if the AutoNumber field skips one or two numbers when it creates an entry for your new record. This happens and it is not a problem.
5. At the end of a line, simply press Tab and a new record is generated.
6. When you have finished entering your data in this table, save it (File, Save).
7. Then close the table (File, Close)
8. Finally exit Access (File, Exit) or open another table if you have more data to enter.

Tips:

1. Ctrl + ‘ (Ctrl + apostrophe) inserts the same field value as in the last record (using that saves lots of time)
2. Ctrl + ; (Ctrl + semicolon) inserts the current date.
3. Ctrl + s saves the table without closing it. It is a very good idea to often save the table while you are working.

Common Errors

This is a list of common mistakes done by field workers involved in long-term studies of this kind. Please pay special attention to these potential errors and do your best to avoid them.

Field book and datasheets

- Only one tag recorded (capture or observation)
- Only colours recorded, no tag numbers (capture)
- Observer forgot to collect or record a specific information (e.g., time, rain, wind, etc.)
- Notes were not legible

- Inconsistent coding (e.g. RC OK, NO RC, etc. for information on radio collars)

HOW TO AVOID THESE ERRORS: Always take your time when recording data in the field. Refer to your standards, especially at the beginning. Make your own checklist of materials needed to perform captures, observations, juvenile searches, etc. This will prevent you from leaving the camp without, e.g. a GPS, a flashlight, or spare batteries.

Data entry

- Duplicate entry
- Data from field book or datasheet not entered
- Errors in tag numbers
- Errors in radio frequencies

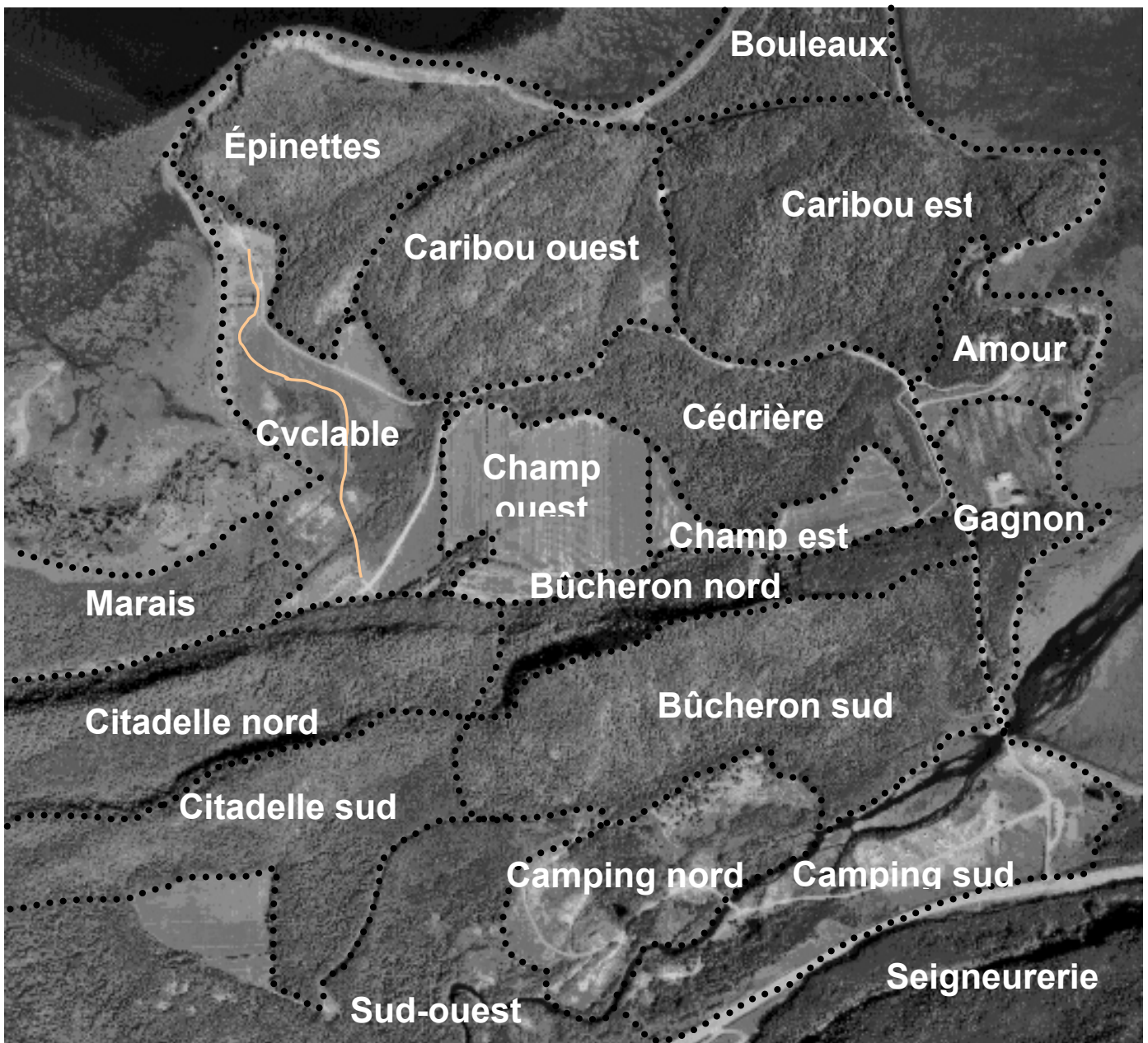
HOW TO AVOID THESE ERRORS: Always note immediately in your field book whether a given piece of information has been entered or not. Always check what you entered in the file, and then double-check.

Other

- Data inconsistently collected (e.g. on the same day, one person indicated the porcupine had a collar whereas another observer didn't note the presence of a collar)
- Pieces of data about a given capture episode recorded in several field books

HOW TO AVOID THESE ERRORS: When you are working in groups, always make it clear who is the principal observer. This person takes responsibility for the recording of data in his/her field book.

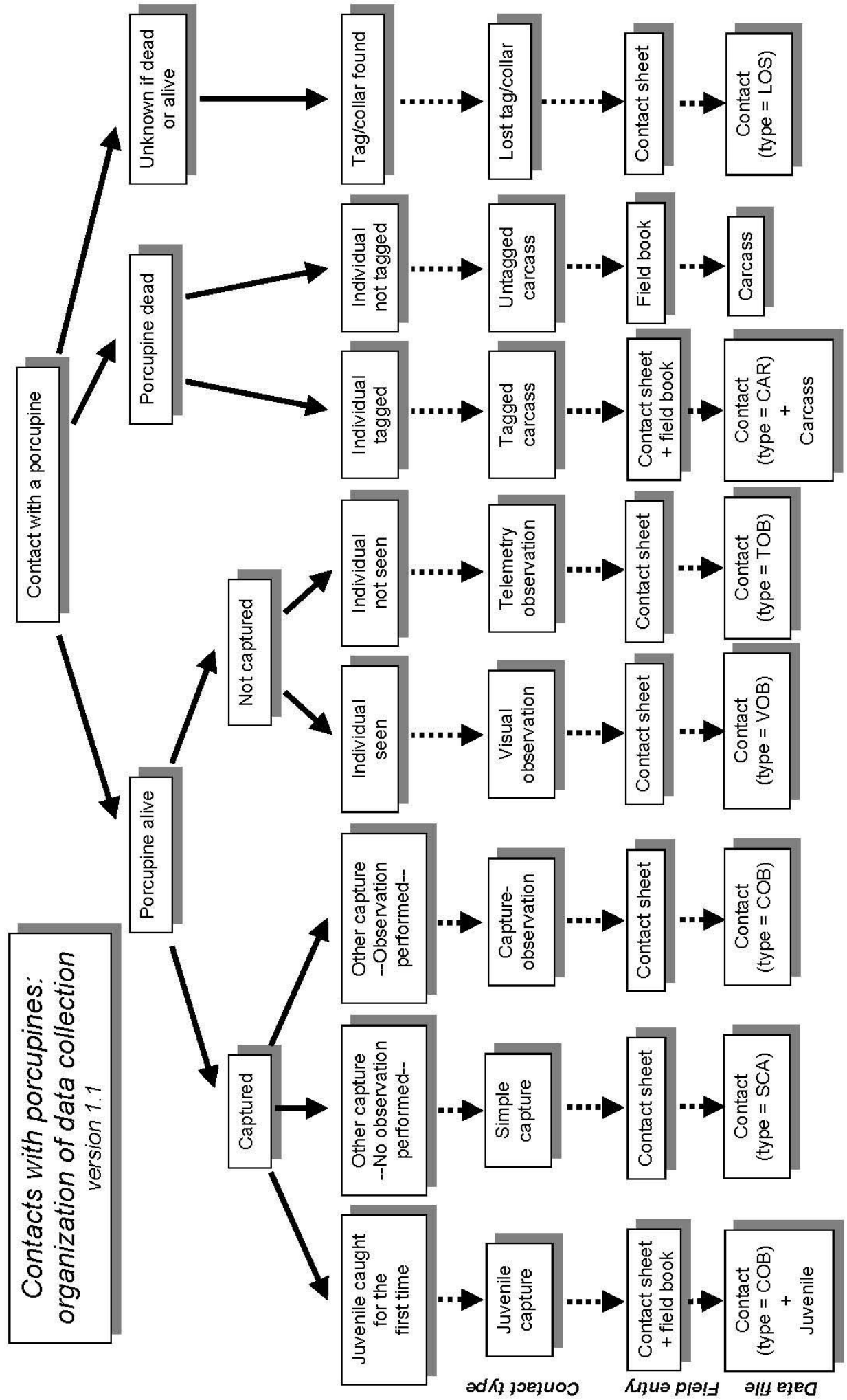
Appendix 1: Study area



Abbreviations of areas for data entry (Area field in Contact file):

Amour:	Amour	Sud-ouest :	Sudouest
Bouleaux:	Bouleaux		
Bûcheron nord :	Buchnord		
Bûcheron sud :	Buchsud		
Camping nord :	Campnord		
Camping sud :	Campsud		
Caribou est:	Caribest		
Caribou ouest:	Caribouest		
Cédrière :	Cedriere		
Champ est :	Champest		
Champ ouest :	Champouest		
Chocolat :	Choco		
Citadelle nord :	Citanord		
Citadelle sud :	Citasud		
Cyclable:	Cyclable		
Épinettes:	Épinettes		
Gagnon :	Gagnon		
Marais :	Marais		
Seigneurerie:	Seigneur		

Appendix 2: Organization of data collection (v. 1.1)



Appendix 3: Tag colours and symbols

Each porcupine can be identified at a distance using its unique combination of plastic tags. The two tags can be of different colours but they always have the same symbol.

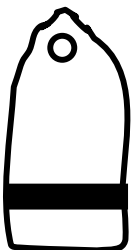
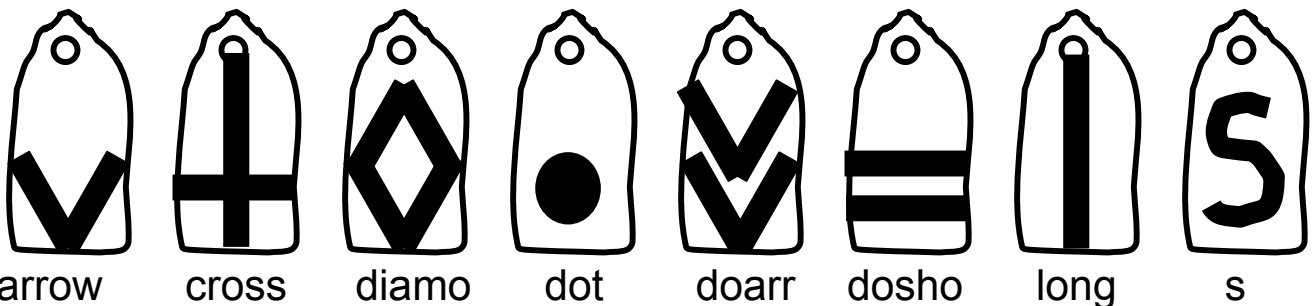
We use the following colours :

Blue = B
 Orange = O
 White = W
 Yellow = Y
 Dark = D

We use the following symbols:

Arrow = arrow
 Cross = cross
 Diamond = diamo
 Disk = disk (not used anymore)
 Dot = dot
 Double arrow = doarr
 Double short = dosho
 Long = long
 S = s
 Short = short
 Wire = wire (used only for juveniles)

A given porcupine is called according to its tag combination. For example, if the left tag is orange, the right tag is blue, and the symbol is a double arrow, then the porcupine is called Orange Blue Double Arrow (OBdoarr). The “left tag” is the tag on the left ear of the porcupine.



short

Appendix 4: Tree Codes

This is a list of the most common tree species we find in the park, with codes that must be used when data are entered into files. More species will perhaps have to be added to the list. If you are unsure about the identity of a tree, flag it and come back with someone who is more experienced.

Code	Latin name (French name - English name)
Ab ba	<i>Abies balsamea</i> (Sapin baumier - Balsam fir)
Ac pe	<i>Acer pennsylvanicum</i> (Érable de pennsylvanie - Striped mapple)
Ac ru	<i>Acer rubrum</i> (Érable rouge - Red maple)
Ac sa	<i>Acer saccharum</i> (Érable à sucre - Sugar mapple)
Ac sp	<i>Acer spicatum</i> (Érable à épis - Mountain mapple)
Al cr	<i>Alnus crispa</i> (Aulne crispé - Green alder)
Al mo	<i>Alnus molis</i> (Aulne soyeux - Silky alder)
Al ru	<i>Alnus rugosa</i> (Aulne rugueux - Speckled alder)
Am ar	<i>Amelanchier arborea</i> (Amélanchier arborescent - Downy serviceberry)
Am ba	<i>Amelanchier bartramiana</i> (Amélanchier de Bartram - Mountain serviceberry)
Am la	<i>Amelanchier laevis</i> (Amélanchier glabre - Smooth serviceberry)
Am sa	<i>Amelanchier sanguinea</i> (Amélanchier sanguinea - Roundleaf serviceberry)
Be al	<i>Betula alleghaniensis</i> (Bouleau jaune - Yellow birch)
Be pa	<i>Betula papyrifera</i> (Bouleau à papier - White birch)
Co ca	<i>Cornus Canadensis</i> (Cornouiller du Canada – Bunchberry)
Co ru	<i>Cornus rugosa</i> (Cornouiller rugueux - Round-leaved dogwood)
Co st	<i>Cornus stolonifera</i> (Cornouiller stolonifère - Red-Twig dogwood)
Co co	<i>Corylus cornuta</i> (Noisetier à long bec - Beaked hazel)
Fr ni	<i>Fraxinus nigra</i> (Frêne noir - Black ash)
Fr pe	<i>Fraxinus pennsylvanica</i> (Frêne rouge - Red ash)
Ju co	<i>Juniperus communis</i> (Genévrier commun - Common juniper)
Ju ho	<i>Juniperus horizontalis</i> (Genévrier horizontal - Creeping juniper)
La la	<i>Larix laricina</i> (Mélèze laricin – Tamarack)

Ma pu	<i>Malus pumila</i> (Pommier nain - Common apple-tree)
Pi gl	<i>Picea glauca</i> (Épinette blanche - White spruce)
Pi ma	<i>Picea mariana</i> (Épinette noire - Black spruce)
Pi ba	<i>Pinus banksiana</i> (Pin gris - Jack pine)
Pi re	<i>Pinus resinosa</i> (Pin rouge - Red pine)
Pi st	<i>Pinus strobes</i> (Pin blanc - Eastern white pine)
Po ba	<i>Populus balsamifera</i> (Peuplier baumier - Balsam poplar)
Po gr	<i>Populus grandidentata</i> (Peuplier à grandes dents - Largetooth aspen)
Po ni	<i>Populus nigra</i> (Peuplier noir d'Italie - Lombardy poplar)
Po tr	<i>Populus tremuloides</i> (Peuplier faux-tremble - Trembling aspen)
Pr pe	<i>Prunus pensylvanica</i> (Cerisier de Pennsylvanie - Pin cherry)
Pr vi	<i>Prunus virginiana</i> (Cerisier de Virginie - Choke cherry)
Rh ty	<i>Rhus typhina</i> (Sumac vinaigrier - Staghorn sumac)
Sa be	<i>Salix bebbiana</i> (Saule de Bebb - Bebb willow)
Sa di	<i>Salix discolor</i> (Saule discolore - Pussy willow)
Sa lu	<i>Salix lucida</i> (Saule brillant - Shinning willow)
Sa pu	<i>Sambucus pubens</i> (Sureau rouge - Eastern red elderberry)
So am	<i>Sorbus Americana</i> (Sorbier d'Amérique - American mountain-ash)
So de	<i>Sorbus decora</i> (Sorbier decoratif - Showy mountain-ash)
Sy vu	<i>Syringa vulgaris</i> (Lilas commun - Common lilac)
Ta ca	<i>Taxus Canadensis</i> (If du Canada - Canada yew)
Th oc	<i>Thuja occidentalis</i> (Thuja occidental - Eastern white-cedar)
Ul am	<i>Ulmus Americana</i> (Orme d'Amérique - White elm)
Vi ed	<i>Viburnum edule</i> (Viorne comestible - Squashberry viburnum)

Appendix 5: Contact datasheet (version 1.2)

Year:	Obs:	Obs:	Obs:	Contact version 1.2
Basics	Date / Time			
	Type ¹			
	Colour Code			
	Tags			
	Minitags			
	Old Tags/Minitags			
	Sex / Area			
	Lat / Long			
	UTM East / North			
Observation	Found ²			
	Behaviour ³			
	Feeding ⁴			
	Disturbed			
	Location ⁵ / Den			
	Tree/Tag/Fate/Circum.			
	Pair			
	Tree Cover ⁶			
	Tree 1 / Tree 2			
	Shrub Cover ⁶			
	Herb Cover ⁶			
	Temp / Cloud ⁶			
	Wind ⁷ / Rain ⁸			
Insect1 / Insect2 ⁹				
Capture	Fate ¹⁰ / MetCap ¹¹			
	Mass			
	Foot/Chest/Length			
	Ticks / Black flies			
	Status ¹² / Milk ¹³			
	Radio ¹⁴ / Freq.			
	Hair / Turd / Sleep			
Notes	Comments about ear condition, tags, neck abrasion, other parasites, number of teats, molt, special behaviour, white spots, injuries, etc.	Use verso if needed	Use verso if needed	Use verso if needed

1-Type of contact: simple capture, capture-observation, visual observation, telemetry observation, tagged carcass.
 2-Method used to find the individual: no searching of porcupines, search of porcupines (but not this one in particular), search of this porcupine without telemetry, search of this porcupine with telemetry.
 3-Behaviour WHEN FIRST SEEN: traveling, resting, feeding, other (specify).
 4-Food eaten: plants on the ground, tree leaves, tree bark, tree buds, tree flowers, other (specify), unknown.
 5-Location: ground not hidden, ground hidden in vegetation, ground under log/rock, ground in tree cavity, ground base of tree, top of log/rock/branch <1m, tree or shrub >1m, unknown. If under rock, indicate den number.
 6- Indicate: <5%, 5-25%, 25-50%, 50-75%, >75%.
 7-Wind: none, leaves agitated, twigs move, branches move, whole trees bend.
 8-Rain: no rain, no rain (but fog), light rain (most people stay outside), heavy rain (most people don't stay outside), snow, other (specify).
 9-Insect1=general, Insect2=instantaneous; None, few not annoying, quite many moderately annoying, many annoying, very many very annoying.
 10-Fate: recapture, new animal, retag (identity known), retag (identity unknown), unnatural death, found dead, road kill.
 11-Capture method: Net, Hand, Trap, Vertical Trap, Pole, Jab Stick, Tree Stick, Other (specify).
 12-Reproductive condition: Not checked or MALES: scrotal, abdominal, unclear, FEMALES: pregnant, lactating, non reproducing, unclear.
 13-Colour and consistence of milk, as compared with 2.5% cow milk.
 14-Fate of the collar: no collar, new collar, collar on, change of collar, collar removed.
Never use codes to record data on this datasheet. Using words instead of codes limits risks of errors when recording data in the field.

Appendix 6: Effort datasheet (version 1.1)

Year:		Obs:	Obs:	Obs:	Effort version 1.1
Basics	Date start ¹				
	Time start ¹				
	Date end ¹				
	Time end ¹				
	Nbr observers ²				
	Area ³				
	Transportation ⁴				
	Id observers ⁵				
Conditions	Temp ⁶				
	Cloud ^{6,7}				
	Wind ^{6,8}				
	Rain ^{6,9}				
	Ground ^{6,10}				
	Insect1 ^{6,11}				
	Rain last night ¹²				
	Wind last night ¹²				
Success	COB				
	VOB				
	SCA				
	Juvenile (new)				
	Heard ¹³				
	Seen ¹³				
	Total				
Notes	Comments about potential factors that might have affected capture success (e.g. conditions during the last days, time lost during the capture session, etc.)	<i>Use space below table if needed</i>	<i>Use space below table if needed</i>	<i>Use space below table if needed</i>	

1-Dates and times at which observers started and ended field work (preparation time in the office must not be counted here).
 2-Number of observers participating in the capture session. Use decimals if needed. E.g., if an observer worked for half of the session, indicate 2.5.
 3-Area(s) visited during the night. For example: once the study area, twice the study area, fields only, Amour + fields, etc.
 4-Mode of locomotion. For example: walk, bike, bike + walk in the fields, etc.
 5-Observer initials and contribution of each observer. For example BD (1), CT (1), JR (0.5)
 6-Average conditions during the capture session.
 7-Indicate: <5%, 5-25%, 25-50%, 50-75%, >75%.
 8-Wind: none, leaves agitated, twigs move, branches move, branches bend, whole trees bend.
 9-Rain: no rain, no rain (but fog), light rain (most people stay outside), heavy rain (most people don't stay outside), snow, other (specify).
 10- Ground: Very wet (recent rain or heavy dew), Wet (no recent rain but too wet to sit down); Dry (you can sit on the ground); Frozen
 11-Insect1=general; None, few not annoying, quite many moderately annoying, many annoying, very many very annoying.
 12-Genal conditions during the last night
 13-Number of individuals detected (with certainty) by sound or vision but not identified (therefore not entered in the contact datasheet).
Never use codes to record data on this datasheet. Using words instead of codes limits risks of errors when recording data in the field.

Appendix 7: Den datasheet (version 1.1)

Year:	Obs:	Obs:	Obs:	Den version 1.1
Basics	Date / Time			
	Den tag ¹			
	Area	X New den only	X New den only	X New den only
	Lat / Long	X	X	X
	UTM East / North	X	X	X
Description	Fate ²			
	Dentaghist ³			
	Found ⁴			
	Active ⁵			
	Resident identity			
	Colour Code ⁶			
	Tags ⁶			
	Minitags ⁶			
	Type ⁷	X	X	X
	Depth ⁸	X	X	X
	Snow depth			
	Environment ⁹	X	X	X
	Tag check ¹⁰			
GPS diff check ¹¹				
Fisher check ¹²				
Fisher signs ¹³				
Notes	Comments about characteristics of the den, tag change, resident identity and behaviour, predation signs, or any other observation that you find relevant	Use verso if needed	Use verso if needed	Use verso if needed

1-Number on plastic tag used to identify the den.
 2-Fate: visit, new den, retagged (only if new tag number is different from previous number), destroyed (den no more usable by a porcupine).
 3-Dentaghist: when fate = retagged, indicate the old den tag number (if known).
 4-Method used to find the den: by following a porcupine or some porcupine tracks, after finding a porcupine by telemetry, by chance (den observed while not going to this specific den), visit of this specific den was planned.
 5-Active: Yes=the den is used now or has been used in the last couple of days (porcupine in, fresh pellets, fresh tracks) – Indicate which signs allow you to write "Yes"; No=the den is not used now and has not been used in the last couple of days; leave blank if unknown.
 6-Identity of the resident porcupine, if known (when more than one porcupine inhabits the den, specify the identity of other porcupines, if known).
 7-Type: rock, stump or fallen log, "calvette", building, other (specify).
 8-Depth: porcupine could be reached with hand, porcupine visible but unreachable, porcupine too far to be visible, other (specify).
 9-Environment: useful comments to help other observers to find the den back (any obvious landmark around?).
 10-Tag check: the tag is a Maxi Allflex and has been secured in rock or in tree so that it is clearly visible to observers (Yes or No).
 11-GPS diff check: an accurate location has been taken with a differential GPS (Yes or No).
 12-Fisher check: snow allows recent (last 2-3 days) fisher tracks to be seen AND 2-3 minutes have been spent looking for signs (Yes or No).
 13-Fisher signs: fresh signs of fisher presence seen within 10-15 m of the den (e.g. tracks in snow, fresh scats) (Yes, No). If "Yes", please specify the nature of observed signs in notes.

Never use codes to record data on this datasheet. Using words instead of codes limits risks of errors when recording data in the field.

Appendix 8: Snowshoe hare turd plots



Appendix 9: Doses for anaesthetics

Full dose (Ketamine - 0.1 ml/kg, Xylazine – 0.2 ml/kg)

Mass (kg)	Ketamine	Xylazine	Total
1	0.1	0.2	0.3
2	0.2	0.4	0.6
3	0.3	0.6	0.9
4	0.4	0.8	1.2
5	0.5	1.0	1.5
6	0.6	1.2	1.8
7	0.7	1.4	2.1
8	0.8	1.6	2.4
9	0.9	1.8	2.7
10	1.0	2.0	3.0

$\frac{3}{4}$ dose (Ketamine - 0.075 ml/kg, Xylazine – 0.15 ml/kg)

Mass (kg)	Ketamine	Xylazine	Total
1	0.075	0.15	0.225
2	0.15	0.3	0.45
3	0.225	0.45	0.675
4	0.3	0.6	0.9
5	0.375	0.75	1.125
6	0.45	0.9	1.35
7	0.525	1.05	1.575
8	0.6	1.2	1.8
9	0.675	1.35	2.025
10	0.75	1.5	2.25

$\frac{1}{2}$ dose (Ketamine - 0.05 ml/kg, Xylazine – 0.1 ml/kg)

Mass (kg)	Ketamine	Xylazine	Total
1	0.05	0.1	0.15
2	0.1	0.2	0.3
3	0.15	0.3	0.45
4	0.2	0.4	0.6
5	0.25	0.5	0.75
6	0.3	0.6	0.9
7	0.35	0.7	1.05
8	0.4	0.8	1.2
9	0.45	0.9	1.35
10	0.5	1.0	1.5

Appendix 10: Important phone numbers

These are important phone numbers that should help you in case of emergency as well as in case of minor problems.

----En cas d'urgence contacter d'abord les gardiens----
---In case of emergency first contact wardens---

Gardiens (cellulaire)	725-8216
Urgence ambulance ou autre problème très grave	911
Dominique (bureau UQAR)	723-1986 (poste 1910)
Marlène (paget)	721-9230
Herven (cellulaire)	732-8623
Numéros à la maison:	
Dominique et Julie	869-3397
Marlène	736-4109
Herven (directeur)	724-3807
Camil (gardien)	736-5079
André (gardien)	736-4913
Alain (ressources collectives)	736-5144