Experts-conseils
Faune et Environnement

Final report

Inventory report on the presence of micromammals at the troilus mine site

Presented to :

Mathieu Michaud
Coordonnateur en environnement
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TROILUS

512 Route 167 S, Chibougamau, QC G8P 2X8 tél. : (418) 748-4441 téléc. : (418) 748-1110
www.faunenord.org

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1.Context

Troilus Gold corp., A Toronto-based mining exploration company, plans to reopen the former Troilus gold and copper mine located north of Chibougamau, approximately 60 km west of Lake Mistassini. The latter, operated by Inmet Mining Corporation from 1997 to 2010, produced more than 56,000 tonnes of gold and nearly 70,000 tonnes of copper. The Troilus Gold mining property, totaling 16,000 ha, consists of 83 claims and a mining lease. Drilling work was carried out on the site in 2018 and 2019 to validate the available mineral resources.

The reopening of the mining site involves certain alterations to the natural environment, in particular the diversion of a stream crisscrossing the mining site. In addition, the pits currently in place on the site will have to be dewatered, resulting in a discharge of water greater than the usual volumes in the adjacent hydrography

In order to determine the impact that these changes in the water regime could have on the local biota, FaunENord was commissioned to carry out an inventory of the small mammals present in the sectors potentially affected by the planned work.

2. Objectives

The objective of this study is to draw a portrait of the micromammal communities present in the sectors potentially impacted by the work planned at the Troilus mine site. The study is of particular importance, knowing that the Cooper's lemming-vole (Synaptomis cooperi), a species likely to be designated threatened or vulnerable in Quebec, was confirmed to be present in the vicinity of the mine site in 2019 and that it exploits habitats potentially impacted by this work. In addition, the rock vole (Microtus chrotorrhinus), also a species likely to be designated threatened or vulnerable in

Quebec, although not observed during the 2019 work, could nevertheless be present in the study area.

3. Methodology

3.1 Study zone

The Troilus mining project is located in the south-eastern part of the administrative region of Nord-du-Québec on the territory of Eeyou Istchee Baie-James. It is located in public land, at the northeastern tip of the Assinica wildlife reserve, about 80 km northwest of the Cree village of Mistissini and 175 km north of the city of Chibougamau (Figure 1).

It covers Category III lands in the territory governed by the James Bay and Northern Quebec Agreement and intersects with the M34, M39A and M40 traplines of members of the Cree First Nation of Mistissini.

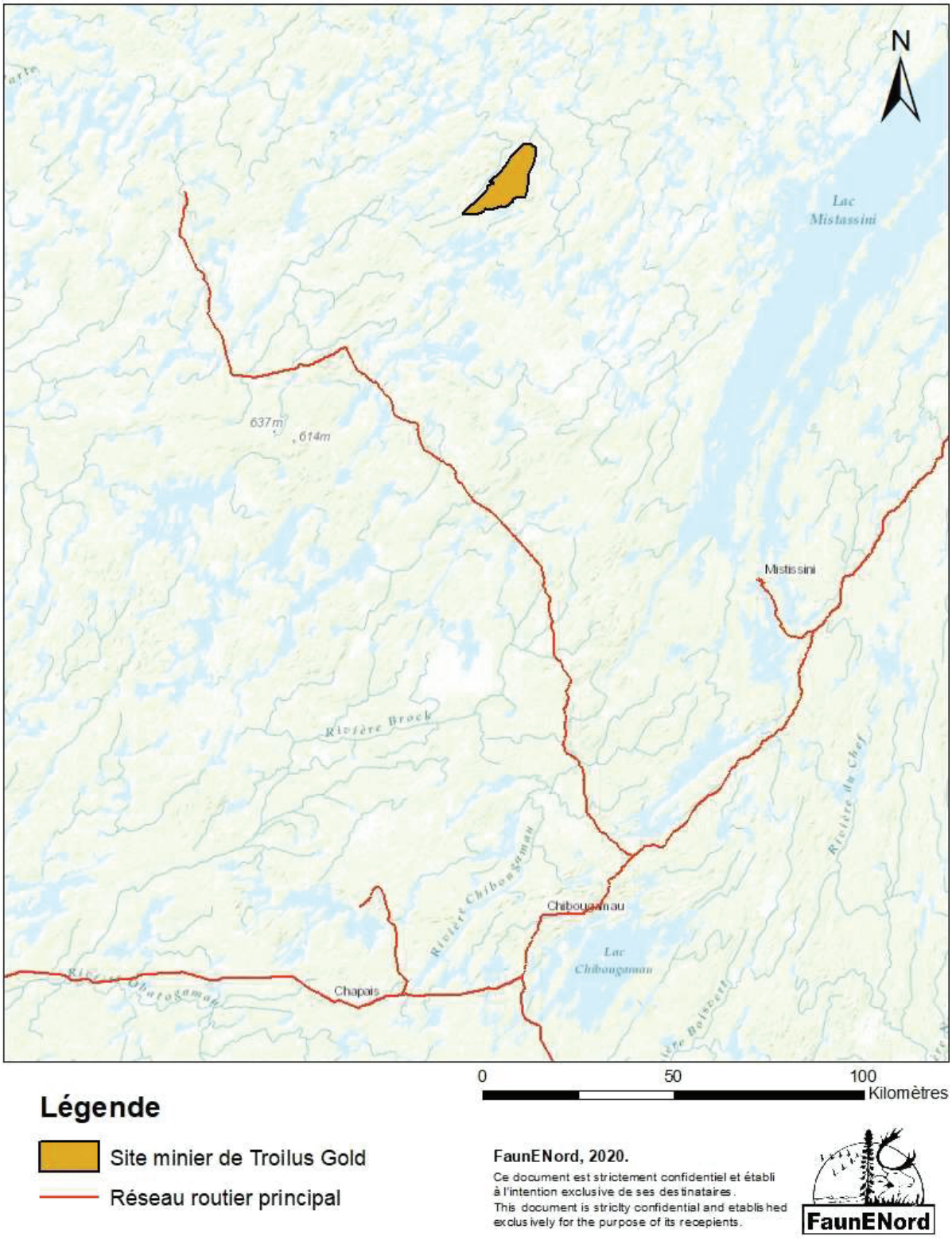

Figure 1. Map of Troilus gold site location

Access to the mining site is via the Route du Nord then by a forest path approximately 44 km in length which begins at kilometer point 108 of this road. The study area considered for the reference state of small mammals totals approximately 57 km² (Figure 2).

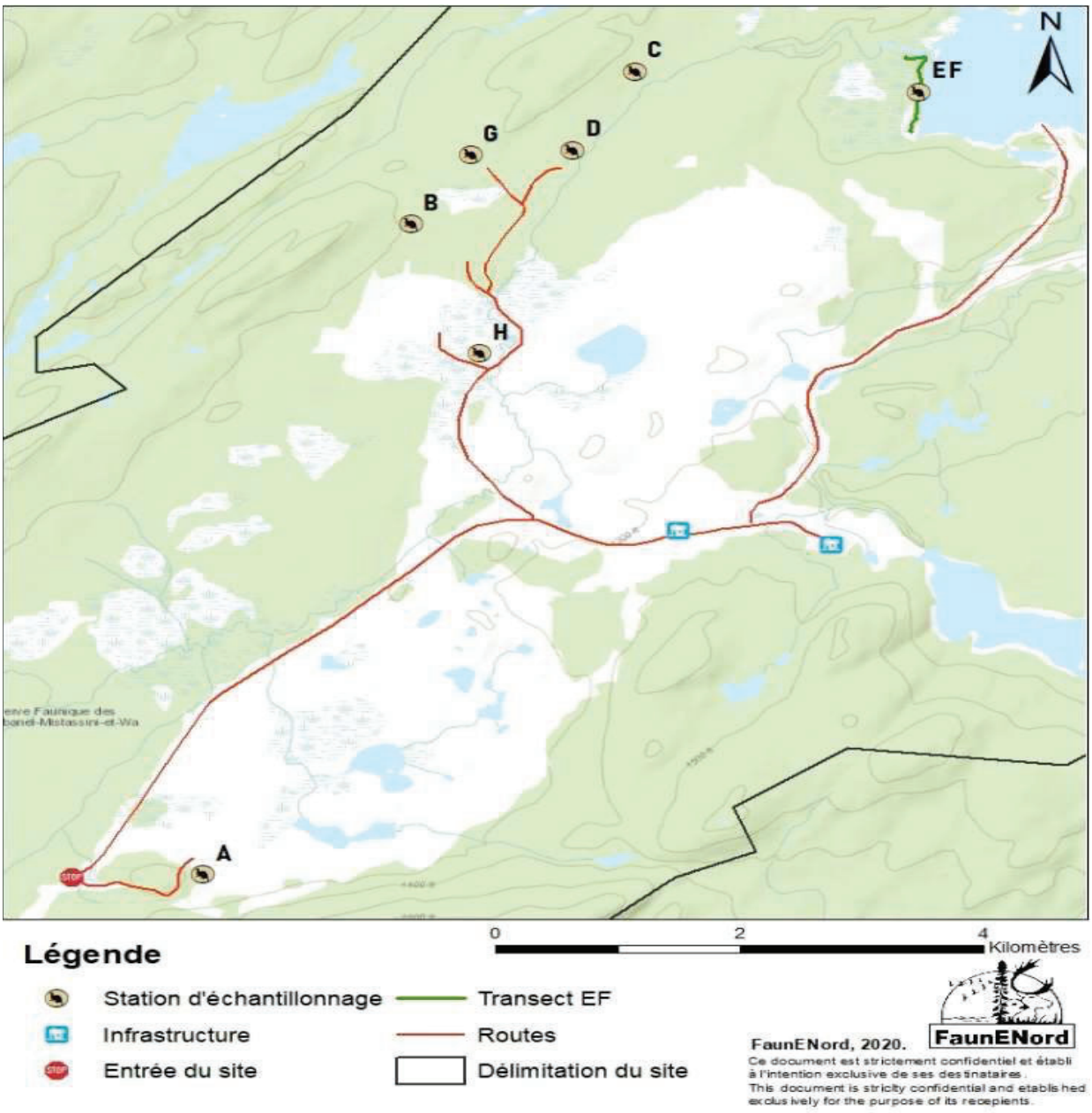

Figure 2. Map of sampling stations on the troilus gold site during the 2020 summer inventory

3.2 Sampling effort

The micromammal inventory was to be carried out at the end of the summer and on a minimum of five consecutive nights. More specifically, the choice of dates was based on the following elements:

> The end of summer is the period that offers maximum population densities due to the recruitment of the young of the year (Jutras, 2005)

> The dates of the inventory should as far as possible avoid full moon periods, which tend to decrease the activity of small mammals. This is because the increased light makes them more vulnerable to predators.

> In addition, although not predictable long in advance, the sampling work had to include at least one episode of heavy rain within a few hours of sunset, which positively influences the activity of small mammals. (Jutras, 2005).

3.3 Sampling Methodology

The technique used for this inventory was that of fatal trapping based on the method of Jutras (2005). This technique allows reliable identification of the species to which the captured specimen belongs in accordance with the recommendations of the regional directorate of the Ministry of Forests, Wildlife and Parks (MFFP). It therefore involved the capture, death and handling of micromammals under the SEG permit # 2020-08-19-134-10-G-F which was requested on August 19, 2020 to allow this inventory to be

carried out. The permit conditions were met and an activity report was sent to the wildlife management directorate (DGFa-10) of the MFFP on December 2, 2020.

The sampling plan consisted of a total of seven sampling stations. The geographic coordinates and the type of environment associated with each of them are shown in Table 1.

Table 1. Geographic coordinates and habitat type associated with sampling stations.

Sampling Station	Latitude	Longitude	Type of habitat
A	50,98329	-74,43301	Border of Sediment lac
B	51,02236	-74,47869	Spruce moss forest
C	51,03151	-74,46111	Spruce moss forest
D	51,02653	-74,46590	Jack Pine Forest
EF	51,03044	-74,44075	Ombrotrophic bog
G	51,02675	-74,47376	Peat bog and rocky outcrops
H	51,01438	-74,47277	Ombrotrophic bog

Sampling stations took two different forms, depending on their location. On the one hand, six of the seven stations included a 60m by 60m sampling grid. This grid represented a series of six parallel transects 60 m in length and 10 m apart, along which Victor-type trap-traps (model BM040-360) were placed, two in number every 10 m. . At all stations along the diagonal of the grid, a pit trap containing 10 cm of water was

placed to drown the small mammals that fell into it (Figure 3). The traps were baited with peanut butter. Each of the grid points was identified on site by forest tape and its coordinates were recorded using a GPS device (NAD 83).

TTF	TT	TT	TT	TT	TT
TT	TTF	TT	TT	TT	TT
TT	TT	TTF	TT	TT	TT
TT	TT	TT	TTF	TT	TT
TT	TT	TT	TT	TTF	TT
TT	TT	TT	TT	TT	TTF

Note: each line represents a transect parallel to the others, counting trap (T) and pit (F) type death traps every 10 m.

Figure 3. Schematization of a sampling grid based on that of Jutras (2005).

The seventh station, meanwhile, consisted of a single 500 m long transect established along the western shore of Lake A as well as a stream (unnamed) that feeds it in its northwestern part,at a distance of at most a few meters from it. This choice, consistent with the recommendations of Jutras (2005) for sampling in riparian environments, made it possible to intersect a greater number of home ranges and forced the micromammals to cross the transect to have access to water, thus maximizing the chances capture. Throughout this transect, capture gear was placed, with two traps every 10 m. Every 30 m, the trap traps were replaced with a pit trap, filled with about 10 cm of water.

This inventory by transects was carried out in conjunction with the grids; traps of the same models were baited in the same manner and the location of the traps was noted similar to that of the grids. Traps and pit traps were to be left in place for seven consecutive days and nights.

3.4 Analysis of inventory data

Any specimen captured during the inventory period was placed in an airtight bag duly identified with the date of capture, station number, trap number and type of trap. These specimens were kept in the freezer of the laboratory of the mining camp of Troilus Gold corp. until the end of the fieldwork. They were then repatriated to the laboratory to be identified with the species. The identification of the specimens collected was carried out using the keys produced by Lupien (2001 and 2002) and Fauteux et al. (2014).

When collecting and identifying specimens, wearing protective equipment (gloves and procedural masks) was required to avoid the risk of contracting zoonoses.

The relative abundances of each species caught were calculated by dividing the number of individuals captured by the sum of individuals of all species.

4. Results

4.1 Capture efforts

The inventory work took place from September 3 to 9, 2020. In general, the meteorological conditions that prevailed during the inventory period met the criteria offering an optimal catch rate (Table 2). In fact, three episodes of heavy rains occurred during the first three nights which respectively recorded rainfall of 5, 10 and 8 mm. The inventory period took place just after the full moon, which as previously mentioned is a limiting factor for the capture of small mammals. However, the percentage of cloud cover was very high

during the seven inventory nights (greater than 90% for 5 out of 7 nights). The high cloudiness appears to have ensured that the activity of small mammals was not reduced by lunar activity.

Table 2. State of abiotic factors influencing the capture of small mammals during the inventory period.

Date	Precipitation (mm)	Minimum temperature (°C)	Cloudiness (%)	Moon phase (% visible)
2020-09-03	5	12	90	99
2020-09-04	10	10	100	97
2020-09-05	8	9	90	93
2020-09-06	1	8	40	87
2020-09-07	0	10	90	80
2020-09-08	1	8	90	72
2020-09-09	0	6	70	63

A total of 553 traps were set at the seven sampling stations. Due to the conditions observed in the field, the inventory effort was reduced for some stations. In fact, the traps at stations C, D, EF and G were left in place for only 6 nights instead of the seven nights initially planned for all the traps. This modification to the protocol was motivated by the high number of captures compared to the expected specific diversity. Stations A, B and H were active during the recommended seven nights. The total capture effort was therefore 3,552 trap nights (Table 3). After only six to seven nights of inventory, a total of 167 specimens were collected from the various stations. This high number of catches made it possible to achieve the objectives set by the inventory. In addition, the minimum of five nights recommended by Jutras (2005) was respected. Finally, the capture of additional individuals would not have provided significant additional data on the specific and relative abundances of the small mammals in the area.

Table 3. Sampling effort and successful capture of small mammals in the study area.

Sampling Station	Effort (night-traps)	Effort (night-pits)	total effort (night-traps)	Number of captures	Capture rate by effort
A	504	42	546	5	0,009
B	504	42	546	45	0,082
C	432	36	468	28	0,060
D	432	36	468	32	0,068
EF	408	102	510	28	0,055
G	432	36	468	16	0,034
H	504	42	546	13	0,024
Total	**3216**	**336**	**3552**	**167**	**0,047**

During the complete capture period, 167 micromammals were collected, all stations and all types of traps combined. Considering the total trapping effort deployed, the average capture success corresponded to 0.047 micromammals per night-trap. Station B generated the most catches with 45 individuals collected (rate of 0.082 catches per night-trap). In return, station A was the least productive, with 5 captures (rate of 0.009 captures per night-trap).

Traps provided most of the specimens captured (119). Considering the effort expended, this corresponded to a capture rate of 0.037 specimens per trap night. The pit traps generated 48 captures; however, due to less sampling effort than the traps, these had a success rate more than 3 times that of the traps (0.142 catch per night-trap).

4.1 Analysis of inventory data

The September 2020 inventory campaign confirmed the presence of nine species of micromammals in the study area (Table 4).

Table 4. Species of micromammals listed in the study area

Common name	Latin name	Family	Harvested	relative Abundance(%)	Samoling Station
Vole at gapper's red back	*Myodes gapperi*	*Cricetidae*	74	44,3	B, C, D, EF, G, H
Vole- lemming from Cooper	*Synaptomys cooperi*	*Cricetidae*	12	7,2	B, C, D, EF
White legged Sylvan Mouse	*Peromyscus* sp.	*Cricetidae*	10	6,0	A, B
Field vole	*Microtus pennsylvanicus*	*Cricetidae*	9	5,4	B, H
Phénacomys	*Phenacomys ungava*	*Cricetidae*	3	1,8	D, EF, G
Total	**-**	**-**	**108**	**64,7**	**-**
Eastern Chipmunk	*Tamias striatus*	*Sciuridae*	4	2,4	D, G
Total	**-**	**-**	**4**	**2,4**	**-**
Common Shrew	*Sorex cinereus*	*Soricidae*	50	29,9	B, C, D, EF, G, H
Pigmy Shrew	*Sorex hoyi*	*Soricidae*	4	2,4	B, C, D
Water Shrew	*Sorex palustris*	*Soricidae*	1	0,6	H
Total	**-**	**-**	**55**	**32,9**	**-**

a. Individuals of the genus Peromyscus are almost impossible to differentiate by strictly morphological criteria. Therefore, the use of DNA analysis techniques is typically required (Desrosiers et al., 2002). From a geographical point of view, it seems that only one of the two species of this genus which are known in Quebec is not found in our latitudes, namely the deer mouse (Peromyscus maniculatus). However, due to the difficult identification of the species, no presumption has been made, as a precaution. Consequently, only a genus name is given for the specimens collected. In addition, given that neither of the two species has a special protection status, the use of genetic identification techniques was not considered relevant for this project.

The Cricetidae family (voles, lemmings, etc.), with 108 individuals (64.7% of catches), was the one that was most often encountered during the inventory. Soricidae (shrews) were represented by 55 individuals (32.9% of catches) and Sciuridae (squirrels) by 4

individuals (2.4% of catches). Finally, no representative of the Muridae family (mice and rats) was captured.

The gapper's red-backed vole (Myodes gapperi) and the common shrew (Sorex cinereus) were by far the most frequently captured species, with 74 (44.3%) and 50 (29.9%) respectively. harvested. Note that these two species were typically the ones most often captured in other projects from inventories carried out by FaunENord in the region. They are common and widely distributed in the province (Desrosiers et al., 2002).

Under the Endangered or Vulnerable Species Act (LEMV), Cooper's lemming vole is on the list of species likely to be designated threatened or vulnerable (MFFP, 2016-2020). This law establishes a precautionary list of species likely to be designated threatened or vulnerable due to their restricted distribution, their low numbers, or a decline in the population (MFFP, 2019). Cooper's lemming-vole is rare in Canada and occurs only sporadically in suitable habitats (MFFP 2001). A total of 12 Cooper's lemmings of this species were captured at the site at 4 different sampling stations (B, C, D, EF). The rock vole is also a status species, but no individuals of this species have been captured.

Several individuals of other species belonging to the Cricetidae family have been captured to a lesser extent such as Peromyscus sp. which were the subject of 10 captures in stations A and B, the field vole (Microtus pennsylvanicus) captured 9 times in stations B and H, or the phenacomys (Phenacomys ungava) captured 3 times in the stations D, EF and G.

The Eastern chipmunk (Tamias striatus), the only representative of the Sciuridae family caught under the project, was the subject of 4 captures at stations D and G.

Among the other captured species belonging to the Soricidae family, 4 individuals of the pygmy shrew (Sorex hoyi), a rare species (Desrosiers et al., 2002) but without particular protection status, were captured in stations B, C and D. Finally, a single water shrew (Sorex palustris) was captured in station H. This is the first mention of this species on the Troilus mining site. However, this capture is not exceptional since it occurred in the natural range of the species which does not benefit from any special protection status (Desrosiers et al., 2002).

5. Conclusion

The inventory carried out from September 3 to 9, 2020 on the site of the Troilus Gold corp mining project. made it possible to draw up a complete portrait of the micromammal communities present on the site. A total of nine different species of micromammals were captured, totaling 167 specimens. The Gapper's red-backed vole and the common shrew, accounting for 64.7% and 32.9% of catches respectively, are the two most abundant species in the territory. Cooper's lemming-vole, the main subject of this study, due to its inclusion on the list of species likely to be threatened or vulnerable, 12 individuals were captured during the inventory.

6. References

- DESROSIERS, N., R. MORIN and J. JUTRAS. 2002. Atlas of micromammals of Quebec. Quebec Wildlife and Parks Society. Department of Wildlife Development. Quebec. 92

- FAUTEUX, D., G. LUPIEN, F. FABIANEK, J. GAGNON, M. SÉGUY, L. IMBEAU. 2014. An illustration key to the mandibles of small mammals of eastern Canada. The Canadian Field-Naturalist. Flight. 128, No. 1. 37 pages.

- JUTRAS, J. 2005. Protocol for micromammal inventories. Ministry of Natural Resources and Wildlife (MRNF), 10 pages.

- LUPIEN, G. 2001. Photographic collection of morphological characteristics used for the identification of small mammals in Quebec. Volume I - insectivores. Quebec Wildlife and Parks Society, 23 pages.

- LUPIEN, G. 2002. Photographic collection of morphological characteristics used for the identification of small mammals in Quebec. Volume II - rodents. Quebec Wildlife and Parks Society, 26 pages.

- MFFP, 2001. Cooper's vole-lemming. List of threatened or vulnerable wildlife species in Quebec. Government of Quebec [Online]. https://www3.mffp.gouv.qc.ca/faune/especes/menacees/fiche.asp?noEsp=51#:~:text=The% 20campagnol% 2Dlemming% 20de% 20Cooper, de% 20l'Am% C3% A9rique% 20du% 20Nord.

- MFFP, 2019. Species conservation. Threatened or vulnerable wildlife species. Government of Quebec [Online]. https://mffp.gouv.qc.ca/faune/especes/menacees/conservation.jsp

- MFFP, 2016-2020. List of species designated as threatened or vulnerable in Quebec. Government of Quebec [Online]. https://mffp.gouv.qc.ca/la- fauna / especes / Liste-especes-vulnerables /.