Lower Churchill Labrador Island Transmission Link - Newfoundland Marten Environmental Effects Monitoring Program

Field Report for Winter 2014- Newfoundland Marten Hair Snag Trapping and Off Highway Vehicle Track Densities

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Draft Interim Report

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1.0 INTRODUCTION

During the environmental assessment for the Labrador-Island Transmission Link (the Project), furbearers were identified as a Valued Environmental Component (VEC) for the Environmental Impact Statement (EIS) due to their economic, cultural, and ecological importance (Nalcor 2012). Some furbearer species are harvested by provincial residents, may serve as ecosystem indicators as they are predators or keystone species; and one species in Newfoundland, the Newfoundland population of American marten (*Martes americana atrata*) is a species at risk. Newfoundland marten are listed as threatened and are protected both federally under the *Species at Risk Act* (COSEWIC 2007) and provincially under the Newfoundland and Labrador *Endangered Species Act* (Government of Newfoundland and Labrador 2004). Newfoundland marten were recommended for this special status a result of a substantial population decline (COSEWIC 2007). Following this designation a Recovery Plan was developed by the Newfoundland Marten Recovery Team (2010), which identified threats to this insular population including habitat loss and mortality from snaring and trapping. Critical habitat (delineated by 8 km^2 blocks based on female territory sizes) within core areas for this species in Newfoundland was identified from evidence of occurrence and habitat quality data. This critical habitat presently has a gradient of partial to full protection.

Newfoundland marten are sensitive to habitat alteration and have a limited and discontinuous distribution in Newfoundland. As a result, it was included as a key indicator species for the EIS. Habitat alteration and loss during the construction phase was predicted as the greatest potential Project effect on furbearers. The Project overlaps critical Newfoundland marten habitat identified within the Main River core area. This core area has a protection rating (referred to as Group 2 Habitat) which requires development and forest harvesting to be managed through the *Environmental Protection Act* and resource planning process. All land-based traps, locking snares, and small game snares are legally prohibited under this level of protection (The Newfoundland Marten Recovery Team 2010).

Based on monitoring requirements and commitments during the Environmental Assessment, the Furbearer Environmental Effects Monitoring Program (EEMP) will examine the presence and/or distribution of marten. The scope of work for this component involves:

- assessment of the cleared RoW as a barrier to Newfoundland marten distribution;
- determining the efficacy of watercourse buffer zones, brush piles, windrows, and any applied modified vegetation management techniques as travel corridors; and
- assessment of snowmobile access provided by the cleared RoW.

This interim report describes the methods and results from the first winter hair snagging efforts conducted between mid-April to early May 2014.

2.0 STUDY OBJECTIVES

The primary objectives of the marten hair snagging program were to collect and monitor potential environmental effects during Project construction. This work is a part of the Environmental Mitigation and Management Plan associated with the Labrador-Island Transmission Link Project. These surveys will aid in the development of a program for monitoring the effectiveness of mitigation measures, and facilitate compliance with regulatory requirements and commitments made in the EIS (Nalcor 2012).

The objectives of this field program were:

- to determine the presence and distribution of marten in the core habitat areas within the proposed RoW; and
- to determine the density/access points for OHV (Off-highway Vehicle) use along the RoW.

3.0 METHODS

This wildlife research has been authorized by a permit issued by the Department of Environment and Conservation, Wildlife Division (NLWD) to Stassinu Stantec (Appendix A).

Stassinu Stantec Geographic Information System (GIS) personnel worked with the NLWD personnel to produce a map folio of the Main River valley and the Labrador-Island Transmission Link RoW indicating primary marten habitat (i.e. core marten habitat blocks) and transects to be surveyed for the OHV use during this late winter field program. Centroids from core marten block habitat were identified as locations for hair snag trap deployment. The Study Area for this program includes primary marten habitat throughout the Main River valley and the transmission line RoW.

3.1 Hair Snag Trapping

Hair snag traps were constructed and deployed using guidelines provided by the NLWD. A triangular shaped trap was constructed from three boards that were wired together. Suitable Newfoundland Marten habitat was selected using mapping provided by the Wildlife Division and by assessing suitable habitat during an aerial survey. The 17 identified trap locations were accessed via helicopter and on foot April 17, 2014. Each hair snag trap was mounted horizontally to a large living coniferous tree with screws. Four sticky pads and bait were placed as per the NLWD guidelines in each trap. A GPS waypoint and digital photo was taken at each trap location (Appendix B). Traps were checked (and re-baited if necessary) on three occasions (approximately once per week) during the survey period (Table 3.1).

3.2 Laboratory DNA Analysis

A set of 37 envelopes containing hair samples was delivered to the Genomics and Proteomics (GaP) Facility of the CREAIT Network at Memorial University of Newfoundland. One sticky pad per envelope was processed. DNA was extracted from approximately 20 roots using the Qiagen DNeasy Blood and Tissue Kit (Qiagen Inc., Toronto, Ontario, Canada) following the manufacturer's Tissue Protocol, except that DNA was re-suspended in two consecutive 75 µL elutions, for a total volume of 150 µL of DNA. Hair roots were digested overnight.

DNA from hair samples were screened twice at the following 11 microsatellite loci using standard operating protocols developed in the GaP Facility: Ma1, Ma2, Ma7, Ma9, Ma10, Ma11, Ma14, Ma18, Ma19 (Davis and Strobeck 1998); MP0085, MP0114 (Jordan et al. 2007). Alleles were called independently by two readers.

Sex determination of samples was carried out by amplifying an intron within the zinc-finger gene that is present on both sex chromosomes using primers LGL331 and LGL335 (Shaw et al. 2003) with standard operating protocols developed in the GaP Facility. Samples with two bands (zinc finger X and Y) were identified as male, and those with one band (two copies of zinc finger X) as female. Agarose gels were read independently by two readers.

Complete genotypes were run through GENECAP version 1.3, a Microsoft Excel macro that compares each individual multi-locus genotype with all other genotypes within the data set to locate matching genotypes (Wilberg and Dreher 2004) and thus identify individuals within a set of samples. (Complete report can be found in Appendix D)

3.3 OHV Survey

All OHV tracks were recorded with locational data during an aerial survey on April 17, 2014. Other parameters such as: snow depth, start and end times of each transect were also recorded. The flight track file and digital photos were stored for future reference.

Track densities were calculated for each species using the following formula:

$$\text{track density} = \frac{\text{\# tracks observed}}{\text{transect length (48.3km) x field of view (400m)}}$$

Prior to initiating the field program, all personnel reviewed the Project specific Health and Safety Plan, and attended a Lower Churchill Project orientation (March 2014). On the first day of field effort the field teams reviewed Stantec's Risk Management Strategy (RMS) 1. An RMS 2 form was reviewed daily throughout the field program to ensure safety hazards were identified and managed.

3.4 Study Team

The Study Team for the furbearer field program included Stantec personnel and pilots from Universal Helicopters Newfoundland Limited LP or Canadian Helicopters (Table 3.1).

Table 3.1 Furbearer Survey Team, April 17 – May 8, 2014

Name	Position / Role during each Visit				Organization
	April 17	April 24	May 1	May 8	
Chris Gosse	Pilot	Pilot			Universal Helicopters
Glen Piercy			Pilot	Pilot	Canadian Helicopters
Tony Parr	Field Lead	Field Lead	Field Lead	Field Lead	Stantec Consulting Ltd.
Tina Newbury	Field Biologist		Field Biologist		Stantec Consulting Ltd.
Stacey Camus		Field Biologist			Stantec Consulting Ltd.
Wayne Tucker				Field Biologist	Stantec Consulting Ltd.

4.0 RESULTS

4.1 Survey Effort and Conditions

Weather and snow conditions during surveys were ideal for winter tracking observations on all survey dates with the exception of April 24, 2014 which had recently experienced freezing rain (Table 4.1; Figure 4-1). The trapping effort captured marten hairs in the majority (59-82%) of the hair snags during each sampling period. The laboratory analyses of the hair samples were used to determine whether or not more than one Newfoundland marten had visited the trap site.

Table 4.1 Trapping Effort, Success and Weather

Date	Activities	Trap success	Flying time	Weather
April 17	Established sampling locations and set hair snag traps	17 traps activated	4.4	-4 °C, winds NE 35 Km/h, 65% cloud, no precipitation
April 24	Winter ground trap checking	10 traps positive for Marten	4.1	-2°C, winds NE 40 Km/h. 100% cloud cover, freezing rain
May 1	Winter ground trap checking	14 traps positive for Marten	3.8	-5 °C and winds 20 km/h. 0-5% cloud cover; No precipitation
May 8	Winter ground trap checking	13 traps positive for Marten	3.8	-3°C, no wind, no precipitation, 0% cloud cover, no precipitation

LOWER CHURCHILL LABRADOR ISLAND TRANSMISSION LINK - NEWFOUNDLAND MARTEN ENVIRONMENTAL EFFECTS MONITORING PROGRAM

RESULTS
February 10, 2015

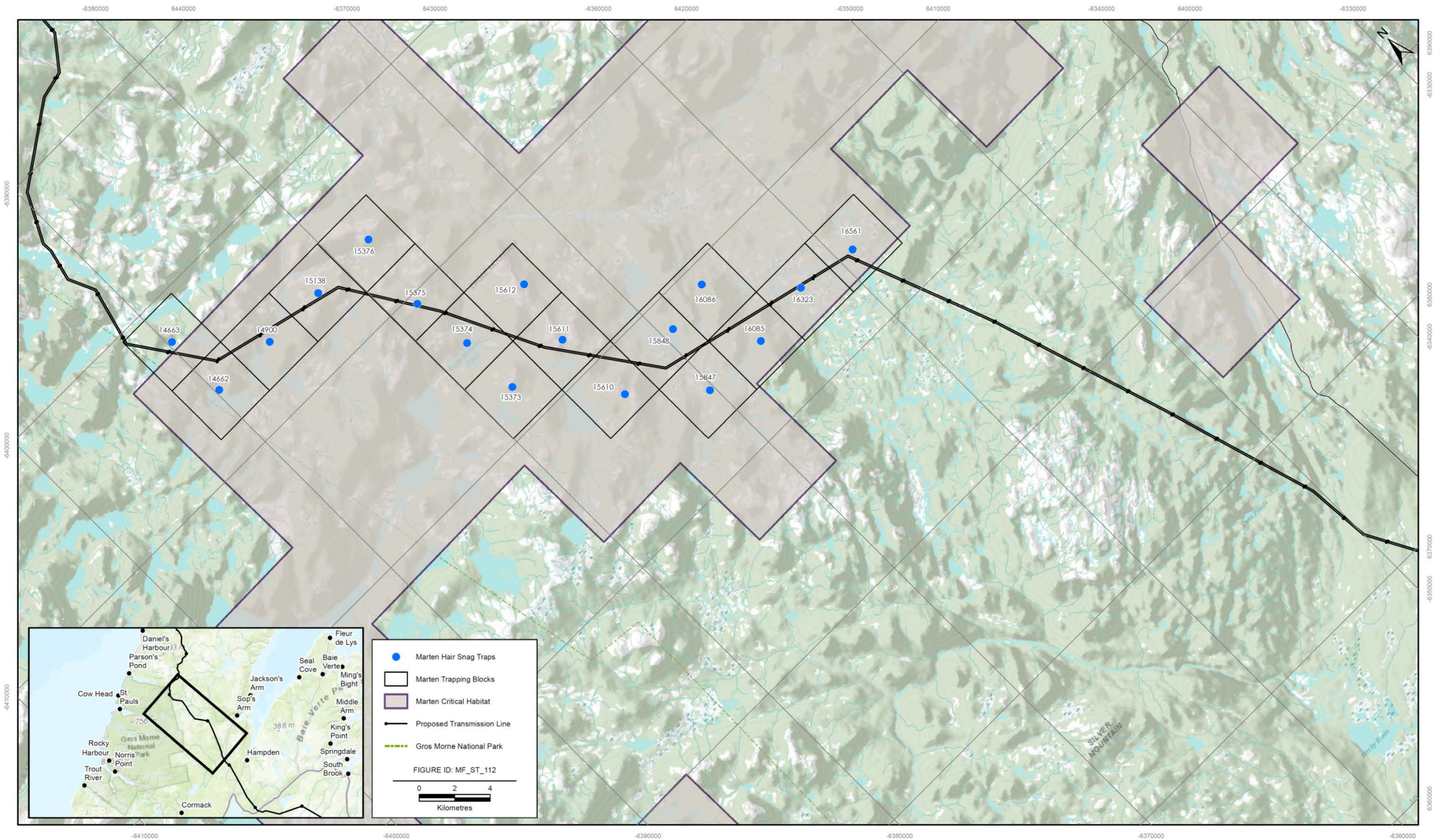

Figure 4-1 Marten Hair Snag Deployments – April 17, 2014

4.2 Winter OHV Track Survey

Snowmobile activity was quantified by developing track densities along the proposed RoW in the core area (Figure 4-2). This approach was chosen based on the landscape and technology limitations of trail cameras and counters. Snowmobile track density along the RoW would provide an index of use. A transect was identified along the RoW and surveyed by two scientists during the aerial survey. The transect start and end points were defined as the point where the RoW enters and exits the Main River core area at two other points (Appendix C). Winter 2014 survey data will serve as baseline/pre-construction data.

A total of 48.3 km of linear transect was surveyed via helicopter during the first day of hair snag trap placement. OHV tracks were recorded at 26 locations along the RoW during the survey (Figure 4-3).

4.3 Hair snag lab results

Out of the 37 submitted samples (individual envelopes containing trap samples), 32 were suitable to generate complete genotypes. From these 32 samples, 18 individual marten were identified. Ten of the individuals were captured multiple times; eight individuals were captured only once. Of the 18, sex was determined for 12 (67%). Five individuals were male, and the remaining seven were female.

From this breakdown we can see that some individuals are hitting multiple sites and are crossing the proposed ROW (See figure 4-4).

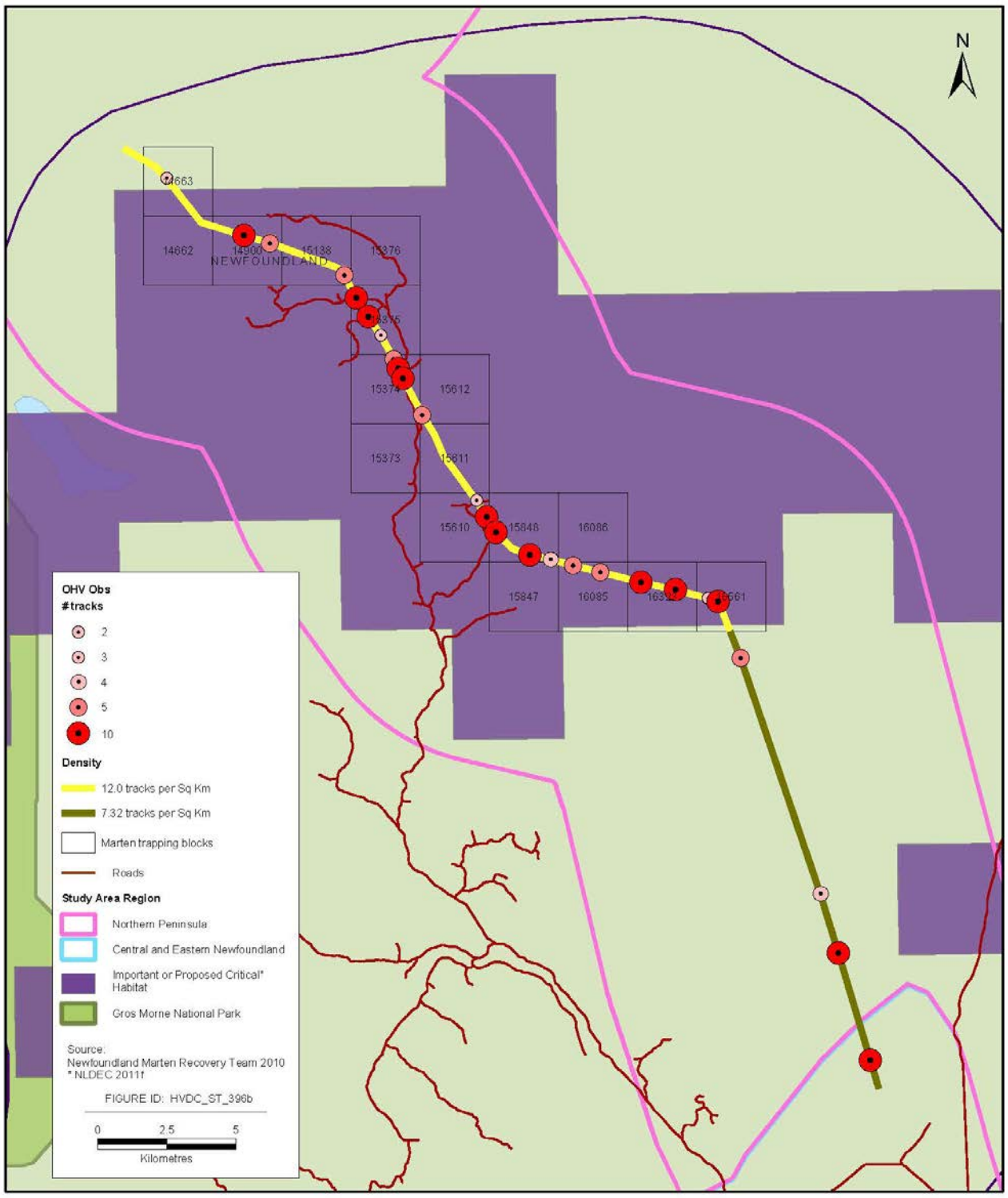

Figure 4-2 OHV Survey in the Main River Area, Northern Peninsula

LOWER CHURCHILL LABRADOR ISLAND TRANSMISSION LINK - NEWFOUNDLAND MARTEN ENVIRONMENTAL EFFECTS MONITORING PROGRAM

RESULTS
February 10, 2015

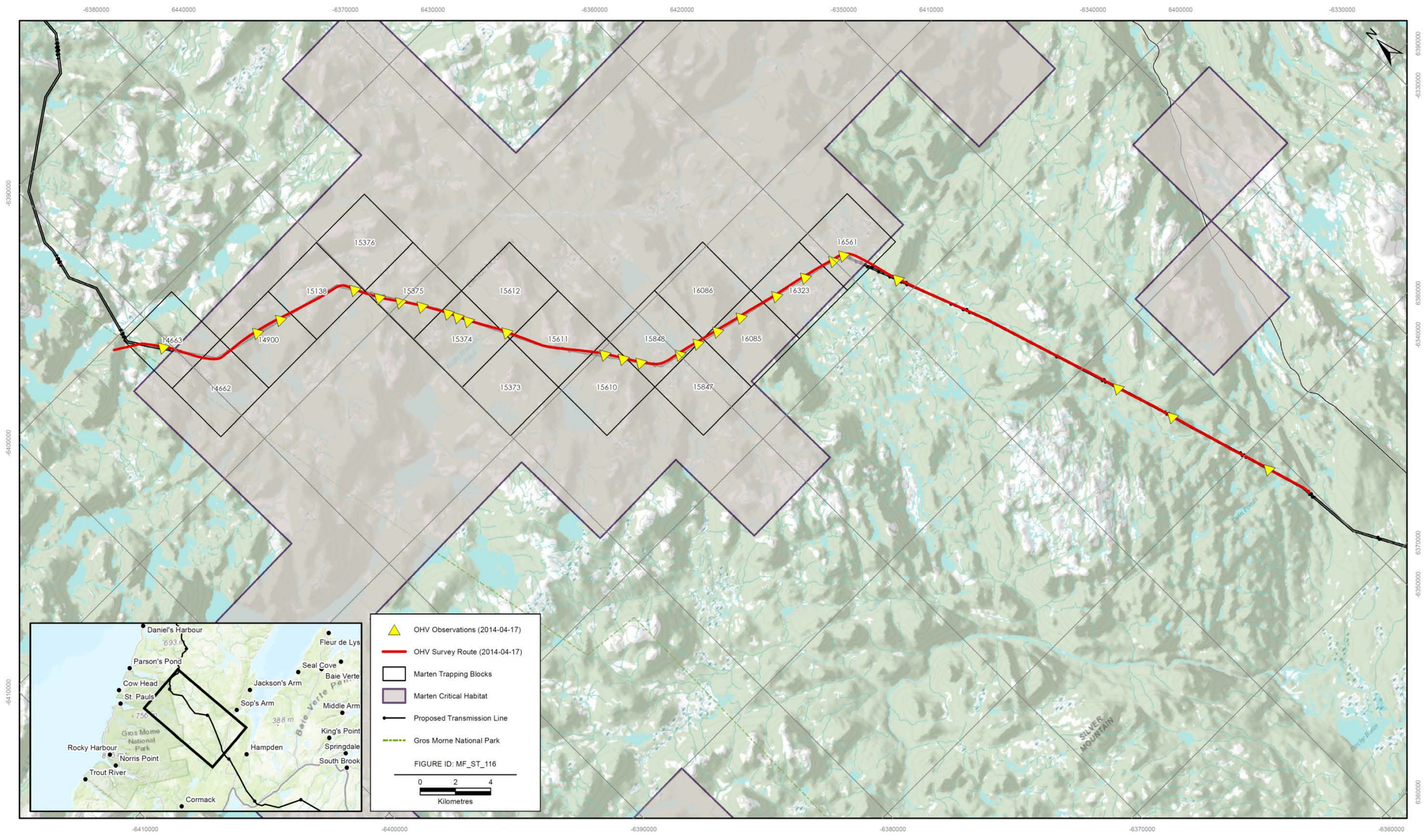

Figure 4-3 OHV Observations – April 17, 2014

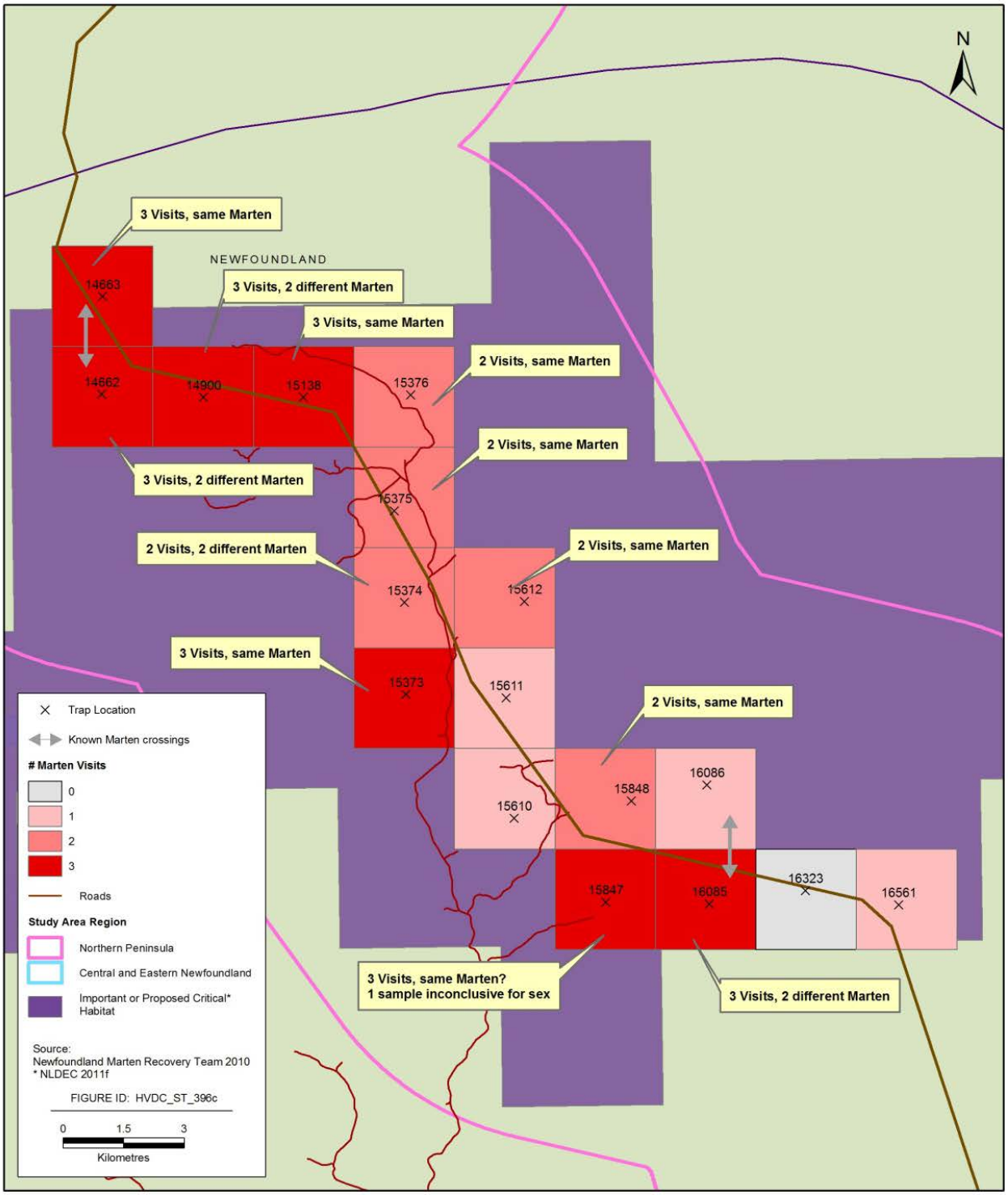

Figure 4-4 Marten Hair Snag Results

5.0 SUMMARY

Newfoundland marten presence in the Study Area was confirmed through the observation of tracks and collected hair samples. This species was expected in the Main River area based on the results of previous studies (Gosse and Hearn 2005), available habitat, and proximity to identified core and critical habitat ranges by NLWD.

Survey results provide preliminary information on the abundance, distribution, and habitat use by Newfoundland marten in the Main River watershed in the vicinity of the Project. Results from the lab analysis indicate that Marten are active in the proposed ROW survey blocks. The ability to identify and track individual Marten indicates that 18 Marten are crossing the ROW. (Figure 4-4).

This document will be used in combination with results of future surveys and other components of the EEMP to assess the movement and distribution patterns of Newfoundland marten in relation to Project activities.

6.0 REFERENCES

Davis C and Strobeck C. 1998. Isolation, variability, and cross-species amplification of polymorphic microsatellite loci in the family mustelidae. Molecular Ecology 7(12):1776-8.

Gosse, J.W and B.J. Hearn. 2005. Seasonal Diets of Newfoundland Martens, *Martes americana atrata*. The Canadian Field-Naturalist 119: 43–47.

Jordan MJ, HIGLEY J, Matthews SM, Rhodes OE, Schwartz MK, Barrett RH, Palsbøll PJ. 2007. Development of 22 new microsatellite loci for fishers (Martes pennanti) with variability results from across their range. Molecular Ecology Notes 7(5):797-801.Committee on the Status of Endangered Wildlife in Canada. (COSEWIC). 2007. COSEWIC Assessment and Update Status Report on the Status of Endangered Wildlife in Canada. vi + 26 pp. Ottawa.

Nalcor Energy (Nalcor). 2012. Labrador-Island Transmission Link Environmental Impact Statement. Volume 2B – Biophysical Assessment. 343 pp.

The Newfoundland Marten Recovery Team. 2010. Recovery Plan for the Threatened Newfoundland Population of American Marten (*Martes americana atrata*). Newfoundland and Labrador Wildlife Division, Corner Brook, NL.

Wilberg MJ and Dreher BP. 2004. Genecap: A program for analysis of multilocus genotype data for non□invasive sampling and capture□recapture population estimation. Molecular Ecology Notes 4(4):783-5.

APPENDIX A

Research Permit

Newfoundland Labrador

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of
Environment and Conservation
Wildlife Division

A PERMIT TO CONDUCT RESEARCH ON, AND POSSESS SPECIMENS OF A THREATENED SPECIES UNDER THE *ENDANGERED SPECIES ACT* OF NEWFOUNDLAND AND LABRADOR

Date: April 14, 2014

Endangered Species Permit Number: **2014/15-14**

Issued To: Perry Trimper, Stantec Consulting Ltd.
P.O. Box 482, Station C, Happy Valley-Goose Bay, NL A0P 1C0
Tel: (709) 896-5860
Facsimile: (709)896-5863

Permit To: Collect and possess hair specimens from American Marten

Expiry Date: May 31, 2014

CONDITIONS:

1. The permit holder may designate other individuals to collect and possess hair specimens on his/her behalf. The permit holder is responsible for the training of any designated individuals and must ensure designated individuals follow all regulations related to this permit.

2. Names and contact information for all individuals participating in research activities or privy to information collected on Newfoundland Marten shall be provided to the Wildlife Division, Department of Environment and Conservation prior to commencement of field work. Additional names or deletion of names can be provided to Wildlife Division on an ongoing basis. The permit holder must advise all individuals that their information will be provided to the Wildlife Division and may be further disclosed as permitted or required by law.

3. A copy of this permit shall be retained in the field at all times by at least one person on the permit personnel list and is to be provided to a Fish and Wildlife Enforcement Officer or other person of delegated authority upon request.

4. Hair collection may only take place within currently identified Newfoundland Marten critical or core habitat in the vicinity of the right of way for the Labrador-Island Transmission corridor for the Lower Churchill project.

5. Any changes to the survey design or methodology outlined in the initial permit request will require prior approval before implementation.

6. A final report must be submitted to the Wildlife Division by June 30, 2014. This report must detail the location of surveys, methods employed, number of samples/specimens taken, location of samples/specimens, individual genetic identification/information for each sample and additional relevant ecological information. The location of all hair snags and associated collection data must be submitted in digital format along with the final report. The permit holder is responsible to obtain any and all permissions which may be required to release this information to the Wildlife Division.

7. All marten samples are to be transferred to an appropriate laboratory for analysis or to the Wildlife Division, Department of Environment and Conservation. Any samples remaining after analysis must be destroyed or provided to the Wildlife Division.

8. Any unusual wildlife observations or any adverse effects observed during the Project are to be reported immediately to the Wildlife Division.

9. This permit does not absolve or relieve the permit holder from any other laws, permits, regulations or orders.

10. This permit does not relieve the permit holder from the requirement to acquire permission to access private property.

11. Under the discretion of the Director of Wildlife, this permit can be revoked without notice.

JOHN BLAKE
Director

APPENDIX B

Field Photos from Winter surveys 2014

Field Photos from Winter Surveys 2014

Photo 1 Site 14663 Habitat photo

Field Photos from Winter Surveys 2014

Photo 2 Site 14663 Tree Selection, and trap setup

Field Photos from Winter Surveys 2014

Photo 3 Site 14663 Final trap setup

Photo 4 Site 14663 positive hit for Marten hair sample

Field Photos from Winter Surveys 2014

Photo 5 Site 15612

Photo 6 Site 15612 Tree Selection, and trap setup

Field Photos from Winter Surveys 2014

Photo 7 Site 15612 positive hit for Marten hair sample

Photo 8 Site 14900

Field Photos from Winter Surveys 2014

Photo 9 Site 14900 tree selection

Photo 10 Site 14900 trap setup

Field Photos from Winter Surveys 2014

Photo 11 Site 14900 positive for Marten hair sample

Field Photos from Winter Surveys 2014

Photo 12 **Typical habitats for NL marten hair snag trap locations within the study area**

Field Photos from Winter Surveys 2014

Photo 13 **Typical habitats for NL marten hair snag trap locations within the study area**

APPENDIX C

Field Data from Winter surveys 2014

Transects

Waypoint	UTM_Zone	Easting	Northing	Track	#_Tracks	Notes	Region	Total_Tracks_Obs	Survey_Distance	Survey_Area (Km^2)	Track Density
276	21 U	470824	5526853	OHV	2		Critical	153	30	12	12.75
277	21 U	473630	5524788	OHV	10		Critical	153	30	12	12.75
278	21 U	474565	5524525	OHV	5		Critical	153	30	12	12.75
279	21 U	477258	5523362	OHV	5		Critical	153	30	12	12.75
280	21 U	477685	5522517	OHV	10	Road (Major route)	Critical	153	30	12	12.75
281	21 U	478116	5521862	OHV	10	Road (Major route)	Critical	153	30	12	12.75
282	21 U	478563	5521191	OHV	2		Critical	153	30	12	12.75
283	21 U	479052	5520331	OHV	5		Critical	153	30	12	12.75
284	21 U	479214	5519984	OHV	10	Major route	Critical	153	30	12	12.75
285	21 U	479384	5519611	OHV	10	Road (Major route)	Critical	153	30	12	12.75
286	21 U	480076	5518320	OHV	5	Road	Critical	153	30	12	12.75
287	21 U	482032	5515211	OHV	3	Road	Critical	153	30	12	12.75
288	21 U	482401	5514619	OHV	10	Major route	Critical	153	30	12	12.75
289	21 U	482752	5514068	OHV	10	Major route	Critical	153	30	12	12.75
290	21 U	483975	5513260	OHV	10	Major route	Critical	153	30	12	12.75
291	21 U	484729	5513076	OHV	4		Critical	153	30	12	12.75
292	21 U	485545	5512873	OHV	5	Road	Critical	153	30	12	12.75
293	21 U	486522	5512626	OHV	5		Critical	153	30	12	12.75
294	21 U	488002	5512257	OHV	10	Major route	Critical	153	30	12	12.75
295	21 U	489228	5511989	OHV	10	Major route	Critical	153	30	12	12.75
296	21 U	490393	5511685	OHV	2		Critical	153	30	12	12.75
297	21 U	490789	5511571	OHV	10	Major route	Critical	153	30	12	12.75
298	21 U	491582	5509538	OHV	5	along transmission line	outside	29	18.3	7.32	3.96
299	21 U	494468	5501007	OHV	4		outside	29	18.3	7.32	3.96
300	21 U	495131	5498854	OHV	10	Road (Major route)	outside	29	18.3	7.32	3.96
301	21 U	496281	5494992	OHV	10	Road (Major route)	outside	29	18.3	7.32	3.96

Survey field of view = 400 meters

Total area surveyed is 48.3 X 0.4 = 19.32 km^2

Total number tracks = 182

Over all track density is 182/19.329 = 9.42

Trap Locations

Type	Ident		Lat	Long	Altitude	Time	Ltime
WAYPOINT	259	14663	49.8925	-57.4001	462	2014-04-17T11:53:50Z	4/17/2014 7:53
WAYPOINT	260	14662	49.8706	-57.4003	496	2014-04-17T12:07:52Z	4/17/2014 8:07
WAYPOINT	261	14900	49.8700	-57.3651	465	2014-04-17T12:24:27Z	4/17/2014 8:24
WAYPOINT	262	15138	49.8701	-57.3305	509	2014-04-17T12:40:17Z	4/17/2014 8:40
WAYPOINT	263	15376	49.8708	-57.2934	467	2014-04-17T12:56:04Z	4/17/2014 8:56
WAYPOINT	264	15375	49.8448	-57.2988	519	2014-04-17T13:11:48Z	4/17/2014 9:11
WAYPOINT	265	15374	49.8243	-57.2951	410	2014-04-17T13:28:53Z	4/17/2014 9:28
WAYPOINT	266	15373	49.8037	-57.2946	519	2014-04-17T13:42:37Z	4/17/2014 9:42
WAYPOINT	267	15612	49.8246	-57.2537	484	2014-04-17T13:59:09Z	4/17/2014 9:59
WAYPOINT	268	15611	49.8031	-57.2598	487	2014-04-17T14:14:33Z	4/17/2014 10:14
WAYPOINT	269	15610	49.7761	-57.2569	509	2014-04-17T14:27:57Z	4/17/2014 10:27
WAYPOINT	270	15848	49.7801	-57.2165	338	2014-04-17T14:42:22Z	4/17/2014 10:42
WAYPOINT	271	16086	49.7837	-57.1904	407	2014-04-17T15:18:53Z	4/17/2014 11:18
WAYPOINT	272	15847	49.7574	-57.2253	361	2014-04-17T15:35:50Z	4/17/2014 11:35
WAYPOINT	273	16085	49.7571	-57.1895	414	2014-04-17T15:53:25Z	4/17/2014 11:53
WAYPOINT	274	16323	49.7601	-57.1562	318	2014-04-17T16:08:49Z	4/17/2014 12:08
WAYPOINT	275	16561	49.7570	-57.1241	318	2014-04-17T16:24:51Z	4/17/2014 12:24

APPENDIX D

Lab Report from Hair Snag Samples 2014

Revised

Microsatellite and Sex Identification of Individual Newfoundland Marten (*Martes americana atrata*)

Prepared for:

Tony Parr, B.Sc.
Environmental Technologist
Stantec Consulting

Prepared by:

Genomics and Proteomics Facility
CREAIT Network
Memorial University of Newfoundland

12 November 2014

Summary

On 11 June 2014, the Genomics and Proteomics Facility of the CREAIT Network at Memorial University of Newfoundland received a set of 37 envelopes containing hair samples. Envelopes contained 2 – 4 sticky pads; we processed one sticky pad per envelope. Samples from two envelopes were not processed due to sample quality. Thirty-five hair samples were screened with 11 microsatellite loci to identify individual Newfoundland marten, and sex of each individual was determined.

Findings

- We processed a total of 35 samples of which 32 have complete data sets (genotypes).
- Of the 32 complete genotypes, 18 individual Newfoundland marten (seven female, five male and six unknown) were identified.
- Ten individuals were recaptures; the remaining eight individuals were captured once.

The purpose of this work was to identify individual Newfoundland marten (*Martes americana atrata*) by screening DNA extracted from hair samples with a suite of microsatellite loci.

On 11 June 2014, the Genomics and Proteomics (GaP) Facility of the CREAIT Network at Memorial University of Newfoundland received a set of 37 envelopes containing hair samples delivered by Tony Parr, B.Sc., Environmental Technologist, Stantec Consulting (Table 1).

One sticky pad per envelope was processed. DNA was extracted from approximately 20 roots using the Qiagen DNeasy Blood and Tissue Kit (Qiagen Inc., Toronto, Ontario, Canada) following the manufacturer's Tissue Protocol, except that DNA was re-suspended in two consecutive 75 µL elutions, for a total volume of 150 µL of DNA. Hair roots were digested overnight. Two samples were not processed due to sample quality (only a single hair completely covered in glue was present).

DNA from hair samples were screened twice at the following 11 microsatellite loci using standard operating protocols developed in the GaP Facility: Ma1, Ma2, Ma7, Ma9, Ma10, Ma11, Ma14, Ma18, Ma19 (Davis and Strobeck 1998); MP0085, MP0114 (Jordan et al. 2007). Alleles were called independently by two readers.

Sex determination of samples was carried out by amplifying an intron within the zinc-finger gene that is present on both sex chromosomes using primers LGL331 and LGL335 (Shaw et al. 2003) with standard operating protocols developed in the GaP Facility. Samples with two bands (zinc finger X and Y) were identified as male, and those with one band (two copies of zinc finger X) as female. Agarose gels were read independently by two readers.

Complete genotypes were run through GENECAP version 1.3, a Microsoft Excel macro that compares each individual multi-locus genotype with all other genotypes within the data set to locate matching genotypes (Wilberg and Dreher 2004) and thus identify individuals within a set of samples.

We were able to generate complete genotypes for 32 samples (91%; Table 2).

From the 32 samples that had complete genotypes, we defined 18 individuals (Table 3).

The overall probability that two first order relatives will share the same genotype by chance (P_{SIB}) was $p = 0.009$, and therefore, we are confident in an analysis that screens 11 microsatellite loci.

Ten of the individuals were recaptures. The remaining eight individuals were captured only once (Table 3).

We were able to identify sex for 12 individuals (67%). Five individuals are male, and the remaining seven are female (Table 2 and 3).

Table 1. GaP Facility inventory for hair samples detailing (where available) sample ID, block ID, sample collection date, crew which collected sample, any comments about the sample provided by crew, and GaP comments about the sample during DNA extraction.

Sample ID	Block ID	Sample Collection Date	Crew	Stantec comments about sample	GaP comments about extraction
1	14662	24-Apr-14	TP & SC	None provided	25 hairs, roots visible, 4 sticky pads
2	14663	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 2 sticky pads
3	14900	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 4 sticky pads
4	15138	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 4 sticky pads
5	15373	24-Apr-14	TP & SC	None provided	30 hairs, roots visible, 2 sticky pads
6	15375	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 4 sticky pads
7	15376	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 4 sticky pads
8	15847	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 2 sticky pads
9	15848	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 4 sticky pads
10	16085	24-Apr-14	TP & SC	None provided	>50 hairs, roots visible, 4 sticky pads
11	14662	01-May-14	TN & TP	None provided	25 hairs, roots visible, 4 sticky pads
12	14663	01-May-14	TN & TP	None provided	>50 hairs, roots visible, 4 sticky pads
13	14900	01-May-14	TN & TP	None provided	>50 hairs, roots visible, 3 sticky pads
14	15138	01-May-14	TN & TP	None provided	>50 hairs, roots visible, 4 sticky pads
15	15373	01-May-14	TN & TP	None provided	20 hairs, roots visible, 4 sticky pads
16	15374	01-May-14	TN & TP	None provided	>50 hairs, roots visible, 2 sticky pads
17	15376	01-May-14	TN & TP	None provided	10 hairs, one root visible, 3 sticky pads
18	15611	01-May-14	TN & TP	None provided	20 hairs, roots visible, 4 sticky pads
19	15612	01-May-14	TN & TP	None provided	30 hairs, roots visible, 4 sticky pads
20	15847	01-May-14	TN & TP	None provided	>50 hairs, roots visible, 4 sticky pads
21	15848	01-May-14	TN & TP	None provided	>50 hairs, roots visible, 4 sticky pads
22	16085	01-May-14	TN & TP	None provided	30 hairs, roots visible, 4 sticky pads
23	16086	01-May-14	TN & TP	None provided	>50 hairs, roots visible, 4 sticky pads
24	14662	08-May-14	W. Tucker & T. Parr	#2; Snow 110 cm	20 hairs, few roots visible, 4 sticky pads
25	14663	08-May-14	W. Tucker & T. Parr	#1; Snow 80 cm	>50 hairs, roots visible, 4 sticky pads

Table 1 continued.

Sample ID	Block ID	Sample Collection Date	Crew	Stantec comments about sample	GaP comments about extraction
26	14900	08-May-14	W. Tucker & T. Parr	#3; Snow 85 cm	>50 hairs, roots visible, 4 sticky pads
27	15138	08-May-14	W. Tucker & T. Parr	#4	20 hairs, roots visible, 4 sticky pads
28	15610	08-May-14	W. Tucker & T. Parr	#11; Snow 130 cm	>50 hairs, roots visible, 4 sticky pads
29	15316	08-May-14	W. Tucker & T. Parr	#5; Snow 165 cm	20 hairs, roots visible, 4 sticky pads
30	15373	08-May-14	W. Tucker & T. Parr	#8; Snow 130 cm	10 hairs, roots visible, 4 sticky pads
31	15374	08-May-14	W. Tucker & T. Parr	#7	>50 hairs, roots visible, 4 sticky pads
32	15612	08-May-14	W. Tucker & T. Parr	#9; Snow 155 cm	30 hairs, roots visible, 4 sticky pads
33	15847	08-May-14	W. Tucker & T. Parr	#14; Snow 120 cm	>50 hairs, roots visible, 4 sticky pads
34	16085	08-May-14	W. Tucker & T. Parr	#15; Snow 165	30 hairs, roots visible, 4 sticky pads
35	16561	08-May-14	W. Tucker & T. Parr	#17	>50 hairs, roots visible, 4 sticky pads
N/A	15375	01-May-14	TN & TP	None provided	Didn't process, only one hair entirely covered in glue
N/A	15848	08-May-14	W. Tucker & T. Parr	#11; Snow 110 cm; Squirrel?	Didn't process, only one hair entirely covered in glue

NB: Crew information is as recorded on the individual envelopes.

Table 2. Microsatellite genotypes and sex identification results for all hair samples (N = 35) detailed in Table 1. '-' indicates no data available.

Sample ID	Sex	Microsatellite genotypes (in basepairs):																					
		Ma11		Ma9		Ma2		Ma19		Ma18		Ma10		Ma7		Ma1		Mp0085		Mp0114		Ma14	
1	-	108	108	146	147	175	181	212	214	167	169	181	181	204	204	225	228	134	136	162	170	209	209
2	Male	108	108	146	147	175	175	214	214	165	167	181	181	204	204	225	225	134	134	162	162	203	209
3	Female	108	108	146	147	181	181	214	214	169	169	181	181	204	206	225	225	136	136	162	162	203	209
4	-	108	108	146	147	181	181	210	214	167	169	181	181	204	206	225	228	134	136	162	162	209	209
5	Female	108	108	146	147	177	181	212	214	169	169	180	181	204	206	225	225	134	136	162	162	199	209
6	Male	108	108	146	146	175	181	210	214	167	169	181	181	206	206	225	225	134	136	162	170	199	199
7	Female	108	108	146	146	175	181	210	214	169	169	181	181	206	206	225	225	136	136	162	170	199	199
8	-	108	108	146	147	181	181	210	214	167	169	180	180	204	204	225	225	136	136	162	170	-	209
9	-	108	108	146	147	181	181	210	210	167	169	180	181	204	206	225	225	136	136	162	162	199	209
10	-	108	108	146	147	181	181	210	214	167	167	180	181	204	204	225	225	136	136	162	162	199	209
11	Male	108	108	146	147	175	181	212	214	167	169	181	181	204	204	225	228	134	136	162	170	209	209
12	Male	108	108	146	147	175	175	214	214	165	167	181	181	204	204	225	225	134	134	162	162	203	209
13	Female	108	108	146	147	175	181	214	214	-	169	181	181	204	206	225	225	136	136	162	162	203	209
14	-	108	108	146	147	181	181	210	214	167	169	181	181	204	206	225	228	134	136	162	162	209	209
15	Female	108	108	146	147	177	181	212	214	169	169	180	181	204	206	225	225	134	136	162	162	199	209
16	Male	108	108	147	147	177	177	214	214	169	169	180	181	204	206	225	225	136	136	162	170	199	209
17	-	108	108	-	-	177	177	-	214	169	169	180	181	204	206	225	225	136	136	162	170	199	-
18	Female	108	108	146	147	181	181	210	214	167	167	180	181	204	204	225	225	136	136	162	162	203	209

Table 2 continued.

Sample ID	Sex	Microsatellite genotypes (in basepairs): Ma11		Ma9		Ma2		Ma19		Ma18		Ma10		Ma7		Ma1		Mp0085		Mp0114		Ma14	
19	Female	108	108	147	147	175	181	214	214	169	169	181	181	204	204	225	225	134	136	162	162	209	209
20	-	108	108	146	147	181	181	210	214	167	169	180	180	204	204	225	225	136	136	162	162	203	209
21	Male	108	108	146	147	181	181	210	210	167	169	180	181	204	206	225	225	136	136	162	162	199	209
22	-	108	108	147	147	181	181	210	212	167	169	180	181	204	206	225	225	134	136	162	170	199	209
23	-	108	108	146	147	181	181	210	214	167	167	180	181	204	204	225	225	136	136	162	162	199	209
24	-	108	108	146	147	175	175	214	214	165	167	181	181	204	204	225	225	134	134	162	162	203	209
25	-	108	108	146	147	175	175	214	214	165	167	181	181	204	204	225	225	134	134	162	162	203	209
26	Female	108	108	146	147	175	177	214	214	167	169	181	181	204	206	225	225	134	136	162	170	199	209
27	-	108	108	146	147	181	181	210	214	167	169	181	181	204	206	225	228	134	136	162	162	209	209
28	-	108	108	147	147	175	181	212	214	167	169	180	181	204	206	225	225	134	136	170	170	209	209
29	-	108	108	146	147	181	181	210	214	169	169	180	181	206	206	225	225	136	136	162	162	199	209
30	Female	108	108	146	147	177	181	212	214	169	169	180	181	204	206	225	225	134	136	162	162	199	209
31	Male	108	108	146	146	175	181	210	214	167	169	181	181	206	206	225	225	134	136	162	170	199	199
32	-	108	108	147	147	175	181	214	214	169	169	181	181	204	204	225	225	134	136	162	162	209	209
33	-	108	108	146	147	181	181	210	214	167	169	180	180	204	204	225	225	136	136	162	162	203	209
34	Female	108	108	147	147	181	181	210	212	167	169	180	181	204	206	225	225	134	136	162	170	199	209
35	-	108	108	146	147	175	181	214	214	167	169	180	181	204	204	225	225	134	136	162	162	199	203

Table 3. Individual Newfoundland marten identified in this molecular study (including sex results) with samples having identical genotypes identified. '-' indicates no data available.

	Sex of individual	Sample IDs with matching genotypes			
1	Male	1	11		
2	Male	2	12	24	25
3	Female	3			
4	-	4	14	27	
5	Female	5	15	30	
6	Male	6	31		
7	Female	7			
8	Male	9	21		
9	-	10	23		
10	Male	16			
11	Female	18			
12	Female	19	32		
13	-	20	33		
14	Female	22	34		
15	Female	26			
16	-	28			
17	-	29			
18	-	35			

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