

C3b Y Chromosome DNA Test Results Point to Native American Deep Ancestry, Relatedness, among United States and Canadian Study Participants

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Introduction:

A study of Amerindian ancestry by way of DNA testing involves the comparison of participant test results with genetic sequences established for indigenous, Native American populations. The primary objective of a Y chromosome DNA study of Amerindian ancestry is to confirm, by way of DNA testing, the likelihood that a male project participant descends directly from a Native American paternal-line ancestor. A secondary objective, important to a study of genealogy, is to establish that project participants of the same surname have shared a common, paternal-line, ancestor within recent generations.

Surname studies benefit from Y chromosome DNA tests as the male chromosome passes from a father to a son, by way of inheritance, virtually unchanged except for mutations, and matching genetic sequences, discovered among surname study participants, can determine the probability of a most recent common ancestor -- a family patriarch - within a genealogically significant period of time.

Within DNA surname studies that trace the paternal line, short tandem repeats (STRs) are particularly useful; a close, Y chromosome DNA match, calculated at 67 (STR) markers, points to a high probability that a common, male, paternal line ancestor exists within recent generations of a family genealogy. DNA tests may also be used to uncover deepest ancestral origins. The C3b Y DNA haplogroup, at the center of the study, is characterized by the P39 single nucleotide polymorphism (SNP), a genetic indicator of deep, Native American ancestry.

Study Scope:

Established in 2006, the Amerindian Ancestry Out of Acadia DNA Project mission is to research and publish the mtDNA and Y chromosome genetic test results of site participants who descend from persons living in Nova Scotia and surrounding environs in the 17th and 18th centuries, focusing specifically upon the region known historically as Acadia, in Nova Scotia Canada. As part of the mission, the Project develops a database of published mtDNA and Y chromosome test results and encourages the sharing of this information among other similarly focused studies for the purposes of comparison and the advancement of science and research. The Amerindian Ancestry out of Acadia project, whose membership is based in the United States, Canada, and Europe, is voluntary and self-funded. Participation in the C3b Y chromosome DNA study is voluntary; the kit numbers and information referenced in analysis are published on public Internet websites; individual project participant names and personal information remain confidential.

Study participants from the United States and Canada include existing and new participants, whose paternal line of descent from person of interest, Germain Doucet, born in Port Royal, Nova Scotia in approximately 1641, qualified them for full test sponsorship, with all costs absorbed by the project. The costs of additional

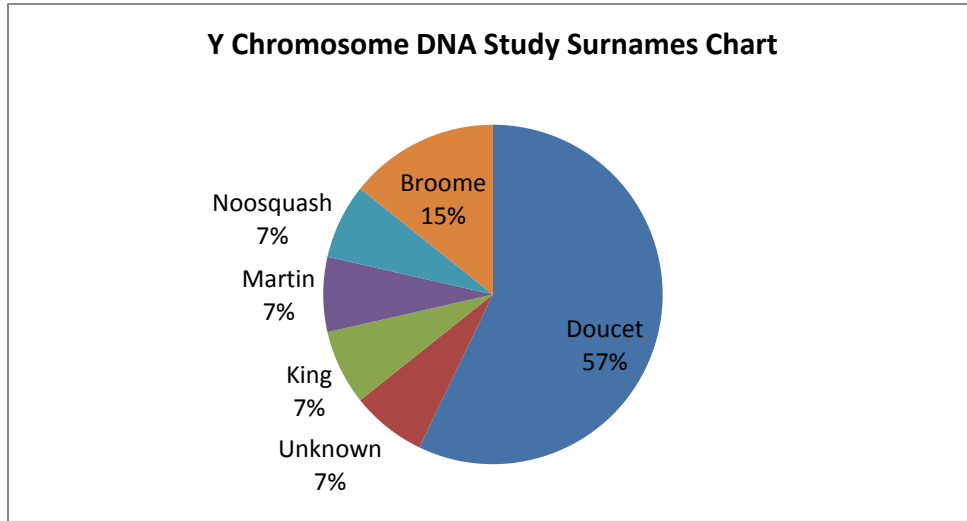
P39 SNP subclade and extended marker tests were also covered by the project to ensure a consistent base of information to be used in comparison.

The following table describes study scope, including published surnames, the locations where test kits were mailed; participants' published ancestors and countries of origins; Y chromosome test parameters, and Y DNA haplogroup and subclade results:

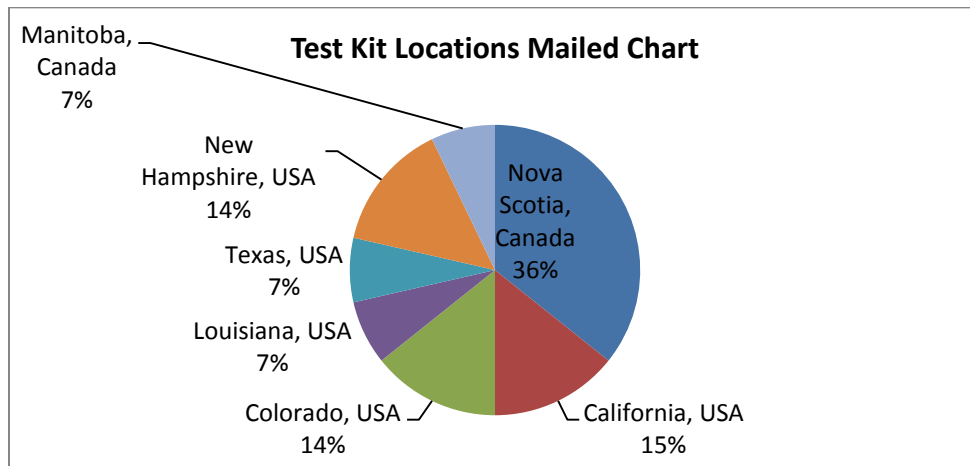
C3b Y Chromosome DNA Kit Information and Study Scope

Test Kit Surname	Test Kit Location Mailed	Most Distant Ancestor/ Country of Origin	Markers Tested	SNPs Tested	Y DNA Haplogroup Result
218934 Doucet	Nova Scotia, Canada	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
219648 Doucet	California, USA	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
219335 Doucet	Nova Scotia, Canada	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
194117 Doucet	Nova Scotia, Canada	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
219075 Doucet	Nova Scotia, Canada	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
N30448 Unknown	Nova Scotia, Canada	Unknown	67	P39	C3b
223915 Doucet	Colorado, USA	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
171928 Doucet	Louisiana, USA	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
140590 Doucet	Texas, USA	Germain Doucet b. ca 1641, Nova Scotia, Canada	67	P39	C3b
101730 King	California, USA	George King, Abt. 1800, Ontario, Canada	67	P39	C3b
156054 Martin	Colorado, USA	Richard Martin, USA	67	P39	C3b
151129 Noosquash	Manitoba, Canada	Noosquash, born about 1840 and died. 1895, Manitoba, Canada	67	P39	C3b
144262 Broome	New Hampshire, USA	Guillaume "William" Broom, Perce, Gaspé County, Quebec, Canada	67	P39	C3b
160180 Broome	New Hampshire USA	Guillaume "William" Broom, Perce, Gaspé County, Quebec, Canada	67	P39	C3b

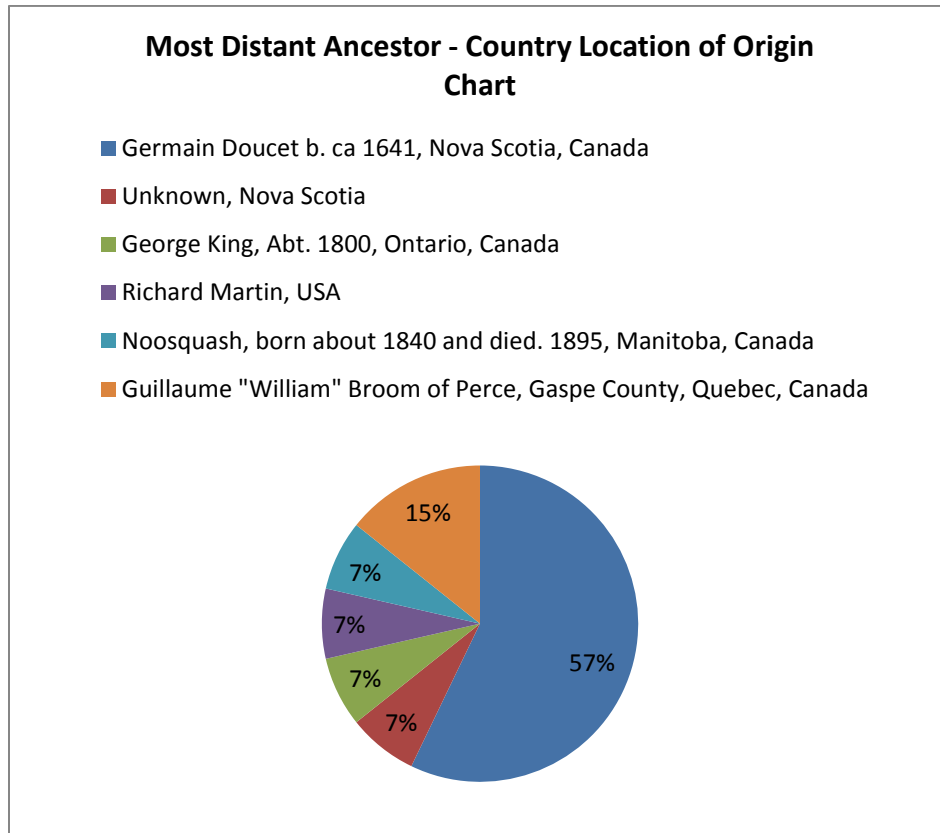
The following charts summarize study surnames represented, geographic locations for test kits mailed and most distant paternal-line ancestors, and Y chromosome DNA test results:



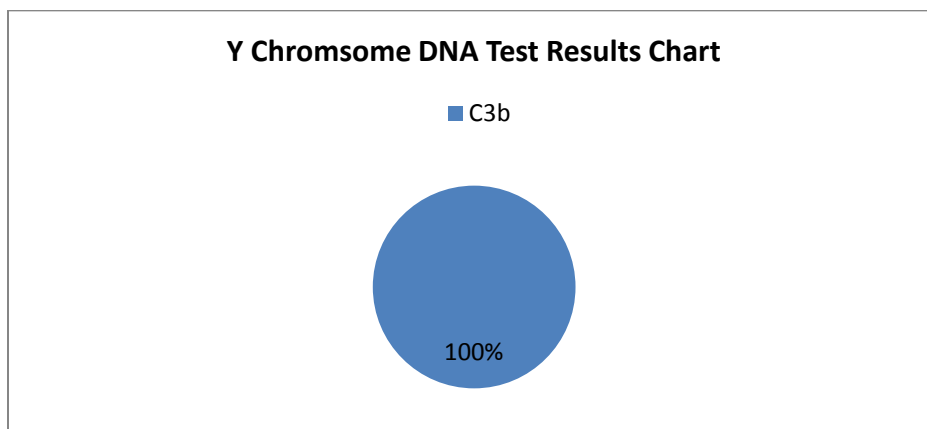
The Y Chromosome DNA Study Surnames Chart illustrates that the 57% of study participants published “Doucet” as their surname; the Broomes ranked second highest at 15% of test participants; the remainder were of unknown biological surname or single surname representatives.



The Test Kit Locations Mailed Chart reflects that the greatest percentage of kits were shipped to locations in Nova Scotia, Canada; the balance were shipped to Manitoba, Canada, and locations in the United States.



The Most Distant Ancestor – Country Location of Origin Chart illustrates that 57% of study participants trace paternal line ancestry to person of interest Germain Doucet, a member of an early Acadian settlement in Port Royal, now Annapolis Royal, Nova Scotia. The next highest ranking ancestor is William Broom, born in Perce, in Gaspé, Québec; study participants descending from William Broom are First Nations Mi'kmaq. Others trace individual ancestries to King, Martin, Noosquash ancestors, and one participant is of unknown paternal-line ancestry.



Each of the tests included in the study returned a C3b Native American Y haplogroup result, illustrated in the Y Chromosome DNA Test Results Chart, significant to the deep, Native American ancestry of Germain Doucet,

born 1641, his descendants, the Broomes, and the several other paternal lines represented.¹ That there were no diversions from this finding among participant results, that not one participant whose surname line traced to Germain Doucet of Nova Scotia experienced a Y chromosome DNA test result other than C3b is significant, and highlights the existence of unbroken, Native American paternal lines of descent for participants living in the United States and Nova Scotia, Canada, that have sustained for the past four centuries.

Methodology:

To investigate Native American ancestry and surname relatedness within the Amerindian Ancestry out of Acadia C3b Y DNA project, the study conducted three tests: the first, a twelve-marker Y chromosome STR DNA test was performed, resulting in the C3 Y DNA haplogroup assignment; a second P39 single nucleotide polymorphism (SNP) Y chromosome DNA test was performed to ascertain the C3b subclade, confirming participant Native American ancestry; last, DNA test results were extended to 67-markers to provide a uniform baseline for comparison.

In order to prove a line of descent, and a Native American ancestry of one of the study's primary patriarch of interest, paternal ancestor Germain Doucet, born approximately 1641,² the test results of qualified descendants of Germain Doucet were needed; and so, the study advertised and sponsored the Y chromosome DNA tests of several candidates from various locations in the United States and Nova Scotia, who in their applications reported diverse paternal lines of descent from Germain Doucet through his several sons. To establish relationships of Germain Doucet's descendants, as compared with others in the study, the results of all study participants would need to be examined. Therefore, the test plan included the paternal-line descendants of Germain Doucet of Nova Scotia and several others of North American – Canadian ancestry, whose Y chromosome DNA tests had returned a C3b Y DNA result.

Test kits comprised of two swabs, used for scraping cells from the inside of the cheek, two test tubes, and consent forms were ordered from the Family Tree DNA Genetics by Genealogy, LTD., company of Houston, Texas and mailed to volunteer test participants. On return, test results were initially posted to the Amerindian Ancestry project and subsequently published on the project website.

Y chromosome STR and the P39 SNP tests, including those of several, paternal-line descendants of Germain Doucet of Nova Scotia, born approximately 1641, yielded confirmed, C3b Y DNA subclade results. Following the verification of a C3b Y chromosome haplogroup and the completion of 67-marker tests for all study participants, the following analyses were conducted: First, genetic distance was derived by comparing mismatches among study participants' Y chromosome DNA test results. Next, most recent common ancestor (MRCA)³ percentage probabilities were calculated at twelve generations, and then, at twenty-four. Last, genetic distance, MRCA percentage probabilities were compared among study participants and charted.

¹ Hammer et al "High-resolution SNPs and microsatellite haplotypes point to a single, recent entry of Native American Y chromosomes into the Americas." *Mol. Biol. Evol.* 21(1):164–175. 2004

² Germain Doucet b. ca 1641, and his offspring, are referenced in several Acadian census reports (e.g., 1671, 1678, 1686)

³ "How Many to Test? 12, 37, 67 Markers?" Family Tree DNA. <http://www.familytreedna.com/faq-markers.aspx>

Genetic Distance:

Within a DNA surname project, genetic distance refers to the number of mismatches that arise when Y chromosome marker test results are compared; the lower the genetic distance recorded when two sets of DNA test results are compared, the closer the genetic relationship. Conversely, the greater the genetic distance recorded when two sets of DNA results are compared, the more distant is the genetic relationship. The genetic distances recorded among Doucet descendants, when 67 marker test results are compared, are well within range (0 to 5 mismatches) for a common paternal ancestor having lived approximately 12-13 generations ago, significant to genealogy study, and cluster predictably.⁴ Results for Kit 171928 (Doucet) and kit 144262 (Broome), when compared, show 11 mismatches – too great a separation for a common ancestor to have occurred within a genealogically meaningful timeframe. Kits 140590 and 171928 (Doucet surname), show a genetic distance of “0” at 67 markers; these participants are related within two generations. Kits 144262 and 160180 (Broome surname), compare at “0” mismatches at 67 markers, these participants are related within one generation. “N/A” (not applicable) is assigned when test kits are self-compared. The following table describes genetic distance among study participants when 67 marker test results were compared.

Participant Genetic Distance Comparisons at 67 Markers Table

Kit/ Surname	218934 Doucet	219648 Doucet	219335 Doucet	194117 Doucet	219075 Doucet	N30448 Unknown	223915 Doucet	171928 Doucet	140590 Doucet	101730 King	156054 Martin	151129 Noosquash	144262 Broome	160180 Broome
218934 Doucet	N/A	5	4	3	3	4	4	4	4	8	11	12	12	12
219648 Doucet	5	N/A	1	3	2	3	3	3	3	8	9	12	12	12
219335 Doucet	4	1	N/A	2	1	2	2	2	2	7	10	11	11	11
194117 Doucet	3	3	2	N/A	1	2	2	2	2	7	10	10	11	11
219075 Doucet	3	2	1	1	N/A	1	1	1	1	6	9	10	10	10
N30448 Unknown	4	3	2	2	1	N/A	2	2	2	7	10	11	9	9
223915 Doucet	4	3	2	2	1	2	N/A	2	2	7	10	11	11	11
171928 Doucet	4	3	2	2	1	2	2	N/A	0	7	10	11	11	11
140590 Doucet	4	3	2	2	1	2	2	0	N/A	7	10	11	11	11
101730 King	8	8	7	7	6	7	7	7	7	N/A	7	4	12	12
156054 Martin	11	9	10	10	9	10	9	10	10	7	N/A	9	10	10
151129 Noosquash	12	12	11	10	10	11	11	11	11	4	11	N/A	16	16
144262 Broome	12	12	11	11	10	9	11	11	11	12	11	16	N/A	0
160180 Broome	12	12	11	11	10	9	11	11	11	12	11	16	0	N/A

⁴ “Interpreting Genetic Distance within Surname Projects (67 markers)” Family Tree DNA. <http://www.familytreedna.com/genetic-distance-markers.aspx?testtype=67>

Most Recent Common Ancestor (MRCA):

A genealogy surname study has as its primary goal the determination of a most recent common ancestor (MRCA) and relationships among study participants who share the same last name. The percentage probability of a most recent common, paternal-line ancestor having occurred within twelve generations, relevant to a genealogy study, is high among Doucet surname descendants when their respective Y chromosome DNA tests results are compared; a similarly high probability is found among related Broome surname descendants. By contrast, the probability of unrelated participants of different surnames having a common ancestor within twelve generations is low. "N/A" (not applicable) is assigned when test kits are self-compared.

MRCA % Probability within 12 Generations Table

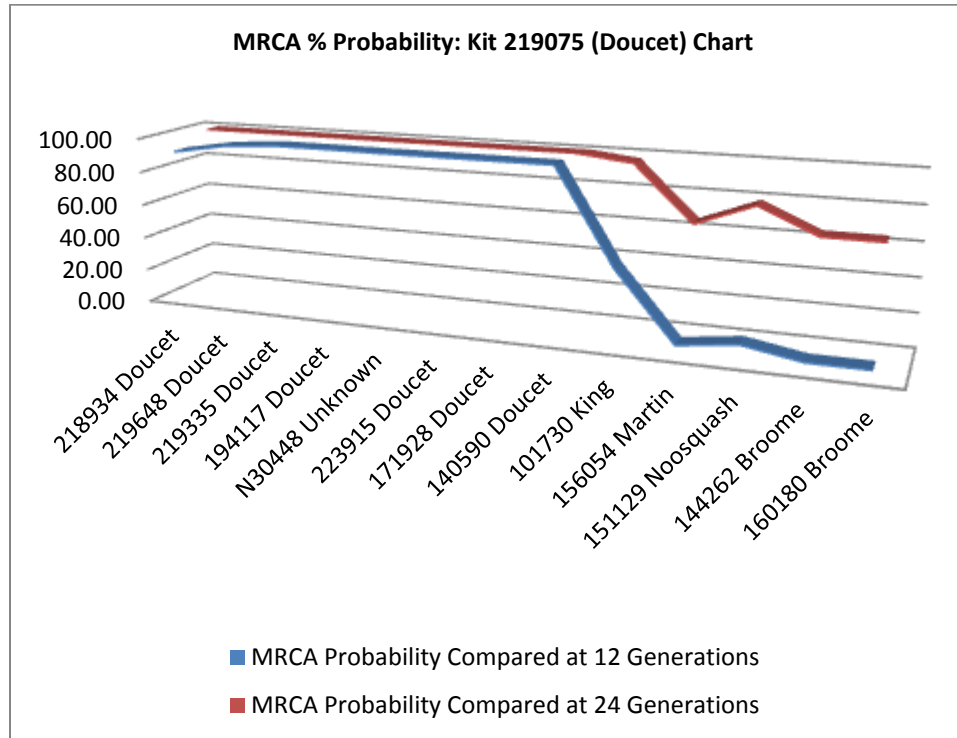
Kit/ Surname	218934 Doucet	219648 Doucet	219335 Doucet	194117 Doucet	219075 Doucet	N30448 Unknown	223915 Doucet	171928 Doucet	140590 Doucet	101730 King	156054 Martin	151129 Noosquash	144262 Broome	160180 Broome
218934 Doucet	N/A	66.99	81.66	91.55	91.55	78.91	80.47	81.25	81.25	17.82	1.06	5.03	0.82	0.82
219648 Doucet	66.99	N/A	99.27	91.54	96.98	89.77	90.69	91.13	91.13	17.03	6.18	2.17	0.75	0.75
219335 Doucet	81.66	99.27	N/A	97.16	99.30	96.45	96.82	97.00	97.00	29.57	2.59	5.09	1.99	1.99
194117 Doucet	91.55	91.54	97.16	N/A	99.32	96.53	96.89	97.07	97.07	30.03	2.69	5.25	2.06	2.06
219075 Doucet	91.55	96.98	99.30	99.32	N/A	99.12	99.23	99.28	99.28	44.90	5.87	10.24	4.50	4.50
N30448 Unknown	78.91	89.77	96.45	96.53	99.12	N/A	96.11	96.33	96.33	25.60	5.87	3.86	11.49	11.49
223915 Doucet	80.47	90.69	96.82	96.89	99.23	96.11	N/A	96.71	96.71	44.90	5.87	10.24	1.72	1.72
171928 Doucet	81.25	91.13	97.00	97.07	99.28	96.33	96.71	N/A	99.89	28.94	2.46	4.89	1.89	1.89
140590 Doucet	81.25	91.13	97.00	97.07	99.28	96.33	96.71	99.89	N/A	28.94	2.46	4.89	1.89	1.89
101730 King	17.82	17.03	29.57	30.03	44.90	25.60	44.90	28.94	28.94	N/A	28.96	92.15	1.03	1.03
156054 Martin	1.06	6.18	2.59	2.69	5.87	5.87	5.87	2.46	2.46	28.96	N/A	9.66	4.31	4.31
151129 Noosquash	5.03	2.17	5.09	5.25	10.24	3.86	10.24	4.89	4.89	92.15	9.66	N/A	0.15	0.15
144262 Broome	0.82	0.75	1.99	2.06	4.50	11.49	1.72	1.89	1.89	1.03	4.31	0.15	N/A	99.89
160180 Broome	0.82	0.75	1.99	2.06	4.50	11.49	1.72	1.89	1.89	1.03	4.31	0.15	99.89	N/A

The percentage probability of a most recent common ancestor (MRCA) increases among all project participants, within a historic (24 generation) timeframe, as illustrated in the table and chart that follows.

MRCA % Probability within 24 Generations Table

Kit/ Surname	218934 Doucet	219648 Doucet	219335 Doucet	194117 Doucet	219075 Doucet	N30448 Unknown	223915 Doucet	171928 Doucet	140590 Doucet	101730 King	156054 Martin	151129 Noosquash	144262 Broome	160180 Broome
218934 Doucet	N/A	99.10	99.74	99.94	99.94	99.61	99.69	99.72	99.72	85.71	37.94	66.05	37.91	37.91
219648 Doucet	99.10	N/A	100.00	99.94	99.99	99.89	99.92	99.93	99.93	84.80	65.88	52.33	36.24	36.24
219335 Doucet	99.74	100.00	N/A	99.99	100.00	99.98	99.99	99.99	99.99	92.19	51.00	66.33	50.33	50.33
194117 Doucet	99.94	99.94	99.99	N/A	100.00	99.98	99.99	99.99	99.99	92.44	51.79	67.00	51.09	51.09
219075 Doucet	99.94	99.99	100.00	100.00	N/A	100.00	100.00	100.00	100.00	96.34	64.68	77.67	63.40	63.40
N30448 Unknown	99.61	99.89	99.98	99.98	100.00	N/A	99.98	99.98	99.98	89.64	64.68	59.90	80.14	80.14
223915 Doucet	99.69	99.92	99.99	99.99	100.00	99.98	N/A	99.98	99.98	96.34	64.68	77.67	47.28	47.28
171928 Doucet	99.72	99.93	99.99	99.99	100.00	99.98	99.98	N/A	100.00	91.84	49.88	65.40	49.27	49.27
140590 Doucet	99.72	99.93	99.99	99.99	100.00	99.98	99.98	100.00	N/A	91.84	49.88	65.40	49.27	49.27
101730 King	85.71	84.80	92.19	92.44	96.34	89.64	96.34	91.84	91.84	N/A	91.84	99.95	42.16	42.16
156054 Martin	37.94	65.88	51.00	51.79	64.68	64.68	64.68	49.88	49.88	91.84	N/A	76.36	62.48	62.48
151129 Noosquash	66.05	52.33	66.33	67.00	77.67	59.90	77.67	65.40	65.40	99.95	76.36	N/A	21.56	21.56
144262 Broome	37.91	36.24	50.33	51.09	63.40	80.14	47.28	49.27	49.27	42.16	62.48	21.56	N/A	100.00
160180 Broome	37.91	36.24	50.33	51.09	63.40	80.14	47.28	49.27	49.27	42.16	62.48	21.56	100.00	N/A

The participants who descend from Germain Doucet of Nova Scotia cluster predictably, showing a high probability for having shared a common ancestor within twelve generations. This finding is significant for genealogical studies of this family, which span a timeframe of nearly four hundred years and provides a proof of ancestry, by way of genetic genealogy, for paternal-line descendants of Germain Doucet participating in the study. Within a historically significant timeframe of twenty-four generations, the MRCA probability increases dramatically for all study participants.



Results of representative test kit 219075 (Doucet) were analyzed against thirteen others in the study. As illustrated in the MRCA % Probability Chart for kit 219075, when one Doucet descendant's results are compared against thirteen other study participants, the highest probability for sharing a common ancestor at twelve generations -- a genealogically relevant timeframe - is greatest among Doucet surname descendants. Included in the Doucet surname cluster are the test results for a participant whose biological paternal ancestry is unknown. As shown in the data, the same Doucet descendant is unlikely to have shared a common ancestor with any of the other study members, and the percentage probability is predictably low when results are compared.

Conclusion and Summary:

For the descendants of person of interest Germain Doucet who participated in the study, the evidence is clear: Germain Doucet, born approximately 1641 in Nova Scotia, was of Native American, paternal-line ancestry, and his father, therefore, would have been a Native American. For all study participants, a C3b haplogroup subclade has been confirmed by way of DNA testing, such that each would have a Native American paternal-line ancestry as well. Further analysis has shown that descendants of Germain Doucet are highly likely to have shared a common, paternal line ancestor in the past twelve generations, as would be the case for descendants of an ancestor who was born in the mid seventeenth century; it is unlikely that these same descendants, who cluster with another participant of an unknown paternal line, would share a close relationship with the other study participants.

DNA results compiled during the course of the study have served the project well. In fact, study objectives have been perfectly supported by the data: the relationship between Germain Doucet and participants who trace a paternal line of descent from Germain is self-evident, as is the deep Native American paternal-line

ancestry assessed for all participants. However perfect the data, published history is now in question: how does Germain Doucet relate to his alleged siblings? A time-honored assumption of French ancestry cannot be supported; for based on the results obtained by the study, there would be no genetic relationship between Germain Doucet dit Laverdure of France, and the Germain who came from Canada. How does the theme of the Acadian deportation fare when study results for participants living in post-expulsion Acadian communities in Louisiana and Texas clearly demonstrate that Native Americans were among the numbers forcibly removed from Nova Scotia in 1755? From a cultural perspective, the study is cross-cutting and inclusive, encompassing a participant base with strong, genealogical ties to Acadian strongholds in the United States and Nova Scotia, a First Nations community in Gaspé, Quebec, and other regions in Canada. Perhaps the most significant finding is that all of these participants, their families, and inter-related communities, are now linked by a shared, Native American ancestry that is deeply rooted in the founding genealogies and history of North America.