

# N1c1-phylogeny

*Jaakko Häkkinen (updated 19<sup>th</sup> January 2012)*

The reconstructed founder haplotype of the haplogroup N1c1:

393	390	19	391	385a	385b	426	388	439	389I
<b>13</b>	<b>23</b>	<b>14</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>11</b>	<b>12</b>	<b>10</b>	<b>14</b>
392	389b (II)	458	459a	459b	455	454	447	437	448
<b>14</b>	<b>16 (29)</b>	<b>17</b>	<b>09</b>	<b>09</b>	<b>11</b>	<b>12</b>	<b>24</b>	<b>14</b>	<b>19</b>
449	464a	464b	464c	464d	460	Y-gata 4H	YCAIIa	YCAIIb	456
<b>28</b>	<b>14</b>	<b>14</b>	<b>15</b>	<b>15</b>	<b>11</b>	<b>11</b>	<b>18</b>	<b>20</b>	<b>14</b>
607	576	570	CDYa	CDYb	442	438	531	578	395S1a
<b>15</b>	<b>16</b>	<b>19</b>	<b>35</b>	<b>35</b>	<b>12</b>	<b>10</b>	<b>11</b>	<b>8</b>	<b>15</b>
395S1b	590	537	641	472	406S1	511	425*	413a	413b
<b>17</b>	<b>8</b>	<b>8</b>	<b>10</b>	<b>8</b>	<b>11</b>	<b>10</b>	<b>12</b>	<b>21</b>	<b>22</b>
557	594	436	490	534	450	444**	481	520	446***
<b>14</b>	<b>10</b>	<b>12</b>	<b>12</b>	<b>17</b>	<b>7</b>	<b>13</b>	<b>20</b>	<b>21</b>	<b>15</b>
617	568	487	572	640	492	565			
<b>12</b>	<b>11</b>	<b>10</b>	<b>11</b>	<b>11</b>	<b>12</b>	<b>11</b>			

Start in the beginning of the tree: group 0. Look first the next **bold** “trunk mutation”, and if you have the mutated value Z ( $X > Z$ ), go on to the next bolded group. When you stop in the non-mutated value (you haven’t undergone that mutation), look the subgroup mutations immediately preceding that group. Proceed as far to the “twig mutations” as you can, and when you again stop in the non-mutated value, your group is the determined by the last mutation which you have undergone. Sometimes your value can be greater or lesser than the mutated value; in that case go on, because you will face a follow-up mutation in the same marker in some later subgroup. If you have for instance the value 31 in DYS449, just go on from the group 4 (DYS449 = 28 > 29), until you reach the mutations DYS449 = 29 > 30 and DYS449 = 30 > 31. In this marker there have occurred several parallel mutations, so similar values can be found in different subgroups.

After every subgroup there is either an example haplotype in *italics* (Family-TreeDNA kit number), which has undergone only few individual mutations, or a reconstructed founder haplotype. You can find the concerned group by opening the N1c1 Excel-table in <http://www.sukujutut.fi/dna/index.htm> and inserting the

number of the example haplotype in the Find-command box. Your own haplotype should be located close to the example haplotype. At this point only the groups **5, 6, 7** and **8** are somewhat ready. The five mutations the latter two share are preliminary included in the group **7\*8**. Also the SNP mutations – data of which is quickly increasing – are taken into consideration at some extent, but later changes may still occur. In the haplotype the mutations defining the group are in red, and they as well as the older mutations from the ancestral groups are underlined and bold.

**11<sup>th</sup> Jan 2012:** SNP-mutation L550+ is found in the Spanish group in addition to the North European group. Therefore these both groups now have been derived from the Central European group **2a**. The other European group is now the East European group **4**. Two of the four Spanish mutations are back-mutations returning the original/ancestral value; for this reason it seemed in the STR-level to have been split off very early after the European founder haplotype.

**19<sup>th</sup> Jan 2012:** Subgroups from Viena Karelia, Northern Dvina and England added.

## 0. N1c1 FHT

13 23 14 11 12 13 11 12 10 14 14 16=30 17 09 09 11 12 24 14 19 28 14 14 15 15 11 11 18 20 14 15 16 19 35 35 12 10 11 08 15 17 08 11 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

1. Asian FHT (DYS439 = 10 > 11 || **DYS458 = 17 > 18** || **DYS448 = 19 > 20** || **DYS449 = 28 > 29** || Y-GATA 4H = 11 > 10)

13 23 14 11 12 13 11 12 11 14 14 16=30 18 09 09 11 12 24 14 20 29 14 14 15 15 11 10 18 20 14 15 16 19 35 35 12 10 11 08 15 17 08 11 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

1a. Altaian (DYS19 = 14 > 15 || **DYS385b = 13 > 12** || **DYS460 = 11 > 12** || **DYS576 = 16 > 17** || **DYF395S1a = 15 > 14** || **DYS537 = 11 > 10** ||

DYS413a,b = 21 22 > 24 24 || **DYS450 = 7 > 8** || **DYS520 = 21 > 22** || **DYS446 = 15 > 16** || **DYS572 = 11 > 10**)

13 23 15 11 12 12 11 12 11 14 14 16=30 18 09 09 11 12 24 14 20 29 14 14 15 15 12 10 18 20 14 15 17 19 35 35 12 10 11 08 14 17 08 10 10 08 11 10 12 24 24 14 10 12 12 17 08 13 20 22 16 12 11 10 10 11 12 11

1b. Siberian FHT (DYS391 = 11 > 10 || **DYS385a = 12 > 11** || **DYS385b = 13 > 14** || **DYS447 = 24 > 25** || **DYS449 = 29 > 30** || **DYS464a,b = 14 14 > 16 16** ||

DYS464c,d = 15 15 > 16 16 || **DYS570 = 19 > 20** || **DYF406S1 = 11 > 12** || **DYS413b = 22 > 21** || **DYS534 = 17 > 15**)

13 23 14 10 11 14 11 12 11 14 14 16=30 18 09 09 11 12 25 14 20 30 16 16 16 16 11 10 18 20 14 15 16 20 35 35 12 10 11 08 15 17 08 11 10 08 12 10 12 21 21 14 10 12 12 15 07 13 20 21 15 12 11 10 11 11 12 11

1b1. East Asian (DYS458 = 18 > 19 || **DYS570 = 20 > 21** || **DYS557 = 14 > 15** || **DYS568 = 11 > 12**) *I7678I*

13 23 14 10 11 14 11 12 11 14 14 16=30 19 09 09 11 12 25 14 20 30 16 16 16 16 11 10 18 20 14 15 16 21 35 35 12 10 11 08 15 17 08 11 10 08 12 10 12 21 21 15 10 12 12 15 07 13 20 21 15 12 12 12 10 11 11 12 11

1b2. Volgan (DYS439 = 11 > 10 || **DYS459 = 9 9 > 10 10**) *I7678I*

13 23 14 10 11 14 11 12 10 14 14 16=30 18 10 10 11 12 25 14 20 30 16 16 16 16 11 10 18 20 14 15 16 20 35 35 12 10 11 08 15 17 08 11 10 08 12 10 12 21 21 14 10 12 12 15 07 13 20 21 15 12 11 10 11 11 12 11

2. European FHT (DYS393 = 13 > 14 || **DYS385a = 12 > 11** || **DYS447 = 24 > 25** || **DYS537 = 11 > 8**)

14 23 14 11 11 13 11 12 10 14 14 16=30 17 09 09 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 16 19 35 35 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

2a. Central European FHT (CDY = 35 35 > 36 36 || **DYS442 = 12 > 14**) (*L550+*)

14 23 14 11 11 13 11 12 10 14 14 16=30 17 09 09 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 16 19 36 36 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

2a1. Southwest European [Spanish] (DYS393 = 14 > 13 || **DYS19 = 14 > 12** || **DYS447 = 25 > 24** || **DYS570 = 19 > 17**) *50530*

13 23 12 11 11 13 11 12 10 14 14 16=30 17 09 09 11 12 24 14 19 28 14 14 15 15 11 11 18 20 14 15 16 17 36 36 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

3. North European FHT (DYS446 = 15 > 16)

14 23 14 11 11 13 11 12 10 14 14 16=30 17 09 09 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 16 19 36 36 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 16 12 11 10 11 11 12 11

3a. Scandinavian *I2067I*

14 23 14 10 11 13 11 12 09 14 14 16=30 16 09 09 11 12 25 14 19 28 14 14 15 15 11 10 18 20 14 15 16 19 38 38 14 10 11 08 15 17 08 08 10 08 10 10 12 21 22 14 10 12 12 19 07 13 21 22 16 12 11 10 11 11 12 11

3b. Balto-Polish *I56293*

14 23 15 11 11 14 11 12 10 13 14 16=30 17 09 09 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 17 19 36 36 13 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 16 07 13 20 21 16 12 11 10 11 11 12 11

4. East European FHT (DYS459 = 9 9 > 10 10 || **DYS449 = 28 > 29** || **DYS570 = 19 > 18**) (*L132+*)

14 23 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 18 35 35 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

4a. Turkic *I76969*

14 23 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 29 15 15 15 11 11 18 20 14 16 16 18 35 35 12 10 11 08 15 17 08 08 11 08 12 09 12 21 22 14 10 12 12 18 07 14 21 21 15 12 11 10 11 12 13 11

5. Finlandian FHT (DYS389I = 14 > 13 || **DYS442 = 12 > 14**)

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 18 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

5a. Gulf of Bothnia FHT (DYS391 = 11 > 10 || **DYS449 = 29 > 28** || **DYS576 = 16 > 15** || **DYS531 = 11 > 12**)

14 23 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 15 18 35 35 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

5a1. Satakunta (DYS390 = 23 > 24) *I37845*

14 24 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 15 18 35 35 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

5a1a. (DYF406S1 = 11 > 12 || **DYS520 = 21 > 22**) *216264*

14 24 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 15 18 35 35 14 10 12 08 15 17 08 08 10 08 12 10 12 21 22 14 10 12 12 17 07 13 20 22 15 12 11 10 11 11 12 11

5a2. Satakunta-Ostrobothnian (DYS446 = 15 > 14)

14 23 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 15 18 35 35 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 14 12 11 10 11 11 12 11

5a2a. Ostrobothnian (DYS449 = 28 > 27 || DYS464a,b = 14 14 > 13 13) 207634

14 23 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 27 13 13 15 15 11 11 18 20 14 15 15 18 35 35 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 14 12 11 10 11 11 12 11

5a2b. South Ostrobothnian (DYS464a,b = 14 14 > 15 15 || CDY 35 35 > 34 34 || DYS444 = 13 > 14) 210956

14 23 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 15 15 15 15 11 11 18 20 14 15 15 18 34 34 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 14 12 11 10 11 11 12 11

5a2b1. North American (DYS572 = 11 > 10) 103964

14 23 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 15 15 15 15 11 11 18 20 14 15 15 18 34 34 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 14 12 11 10 10 11 12 11

5a2c. North Ostrobothnian (Y-GATA 4H = 11 > 10) N55552

14 23 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 14 14 15 15 11 10 18 20 14 15 15 18 35 35 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 14 12 11 10 11 11 12 11

5a2d. Pori (DYS454 = 12 > 13 || DYS534 = 17 > 16) 131520

14 23 14 10 11 13 11 12 10 13 14 16=29 17 10 10 11 13 25 14 19 28 14 14 15 15 11 11 18 20 14 15 15 18 35 35 14 10 12 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 16 07 13 20 21 14 12 11 10 11 11 12 11

|||5b. Austrvegr-Tavastian FHT (DYS393 = 14 > 15) NEW!

15 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 18 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

5b1. South Tavastian (DYF406S1 = 11 > 12) NI0231

15 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 18 35 35 14 10 11 08 15 17 08 08 10 08 12 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

5b2. English (DYS570 = 18 > 19 || DYS481 = 20 > 21) 73958 NEW!

15 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 21 21 15 12 11 10 11 11 12 11

5c. Inland Finnish FHT (DYS570 = 18 > 19)

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

|||5c1. Bothnian-North-Savonian (DYS393 = 14 > 13 || DYS458 = 17 > 18 || DYS576 = 16 > 17) 131535

13 23 14 11 11 13 11 12 10 13 14 16=29 18 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 17 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

5c2. Tavastian FHT (DYS390 = 23 > 24 || DYS459 = 10 10 > 9 9) N61541

14 24 14 11 11 13 11 12 10 13 14 16=29 17 09 09 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

5c3. Mid Finnish (CDY = 35 35 > 36 36 || DYS444 = 13 > 14)

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 19 36 36 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 14 20 21 15 12 11 10 11 11 12 11

|||5c3a. East Tavastian (DYS607 = 15 > 14 || DYS576 = 16 > 17) 172700

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 14 17 19 36 36 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 14 20 21 15 12 11 10 11 11 12 11

5c3b. Savo-Kainuu (DYS413a = 21 > 22) 143875

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 29 14 14 15 15 11 11 18 20 14 15 16 19 36 36 14 10 11 08 15 17 08 08 10 08 11 10 12 22 22 14 10 12 12 17 07 14 20 21 15 12 11 10 11 11 12 11

|||6. South Finnish (DYS449 = 29 > 30)

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 30 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

|||6a. Southcoast Finnish (DYS19 = 14 > 15) 200344

14 23 15 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 30 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

6b. Old Satakunta FHT (DYS534 = 17 > 18)

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 30 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 18 07 13 20 21 15 12 11 10 11 11 12 11

|||6b1. Birkaland-Bothnian (DYS444 = 13 > 12) 122906

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 30 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 18 07 12 20 21 15 12 11 10 11 11 12 11

6b2. Far Bothnian (DYS449 = 30 > 28) N24550

14 23 14 11 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 28 14 14 15 15 11 11 18 20 14 15 16 19 35 35 14 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 18 07 13 20 21 15 12 11 10 11 11 12 11



7b1b. (DYS391 = 11 > 10 || DYS449 = 31 > 29) *200364*

14 24 14 10 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 29 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 21 21 16 12 11 10 11 11 12 11

||7c. Karelian (DYS537 = 8 > 9) *N65153*

14 24 14 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

||7c1. (CDYa,b = 37 37 > 36 36 || DYS572 = 11 > 10) *I25338*

14 24 14 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 36 36 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 10 11 12 11

7c1a. (DYS393 = 14 > 15 || CDYa,b = 36 36 > 35 35) *I75081*

15 24 14 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 35 35 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 10 11 12 11

7c1a1. (DYS389b = 16 > 15 || DYS576 = 18 > 17) *N49535*

15 24 14 11 13 11 12 10 14 14 15=29 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 17 19 35 35 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 10 11 12 11

7c1a2. (DYS389I = 14 > 13) *I37750*

15 24 14 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 35 35 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 10 11 12 11

7c2. (DYS413a = 21 > 22) *I49773*

14 24 14 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 22 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c2a. (DYS459 = 10 10 > 9 9 || DYS576 = 18 > 19 || DYS446 = 15 > 16) *I57569*

14 24 14 11 13 11 12 10 14 14 16=30 17 09 09 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 19 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 22 22 14 10 12 12 17 07 13 20 21 16 12 11 10 11 11 12 11

7c3. (DYS449 = 30 > 31) *I78355*

14 24 14 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3a. (DYS391 = 11 > 10 || DYS444 = 13 > 12) *I30904*

14 24 14 10 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 12 20 21 15 12 11 10 11 11 12 11

7c3b. (DYS458 = 17 > 16) *I65992*

14 24 14 11 13 11 12 10 14 14 16=30 16 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3b1. (DYS439 = 10 > 11)

14 24 14 11 13 11 12 11 14 14 16=30 16 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3b1a. (DYS438 = 10 > 9) *I31525*

14 24 14 11 13 11 12 11 14 14 16=30 16 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 09 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3b1b. (DYS444 = 13 > 12 || DYS520 = 21 > 22) *I16962*

14 24 14 11 13 11 12 11 14 14 16=30 16 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 12 20 22 15 12 11 10 11 11 12 11

7c3c. (DYS389I = 14 > 16 || DYS458 = 17 > 19 || DYS459a,b = 10 10 > 9 9 || DYS442 = 12 > 13) *I01480*

14 24 14 11 13 11 12 10 16 14 16=32 19 09 09 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 13 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3d. (DYS385a = 11 > 12) *N64579*

14 24 14 11 12 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3e. South Karelian (DYS390 = 24 > 25)

14 25 14 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3e1. (DYS449 = 31 > 32) *I30654*

14 25 14 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 32 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3e2. (DYS439 = 10 > 11 [ $> 12$ ]) *I84573*

14 25 14 11 13 11 12 11 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3f. Northern Dvina (DYS389I = 14 > 13 || CDYa,b = 37 37 > 35 35) *N86125 NEW!*

14 24 14 11 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 35 35 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c3f1. (DYS391 = 11 > 10 || DYS385a = 11 > 12 || DYS607 = 15 > 16) *N86125 NEW!*

14 24 14 10 12 13 11 12 10 13 14 16=29 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 16 18 19 35 35 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c4. (DYS390 = 24 > 23) *174729*

14 23 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c4a. (DYS449 = 30 > 31)

14 23 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c5. (YCAIIb = 20 > 19 || DYS576 = 18 > 17) *N36698*

14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 19 14 15 17 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c6. (DYS594 = 10 > 8) *199400*

14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 08 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c7. (DYS19 = 14 > 15)

14 24 15 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

7c7a. (DYS444 = 13 > 12) *167356*

14 24 15 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 12 20 21 15 12 11 10 11 11 12 11

7c7a1. (DYS389I = 14 > 15)

14 24 15 11 11 13 11 12 10 15 14 16=31 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 12 20 21 15 12 11 10 11 11 12 11

7c7b. (DYS531 = 11 > 12 || DYS413a = 21 > 22 || DYS490 = 12 > 13 || DYS617 = 12 > 14) *N8612*

14 24 15 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 12 08 15 17 08 09 10 08 11 10 12 22 22 14 10 12 13 17 07 13 20 21 15 14 11 10 11 11 12 11

7c8. (DYS392 = 14 > 15 || DYS520 = 21 > 22) *N32035*

14 24 14 11 11 13 11 12 10 14 15 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 20 14 15 18 19 37 37 12 10 11 08 15 17 08 09 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

## 8. Savonian FHT (YCAIIb = 20 > 18) *159419*

14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 15 15 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a. (DYS447 = 25 > 26) *130942*

14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 13 13 15 15 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a1. (DYS449 = 30 > 31) *102190*

14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 31 13 13 15 15 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a1a. (DYS464a,b = 13 13 > 15 15) *N25997*

14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 31 15 15 15 15 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a2. (DYS464a,b = 13 13 > 14 14 || DYS464c,d = 15 15 > 14 14) *169150*

14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 14 14 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a2a. (DYS391 = 11 > 12)

14 24 14 12 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 14 14 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a3. (DYS442 = 12 > 13 || DYS576 = 18 > 19 || DYS439 = 10 > 11) *N52096*

14 24 14 11 11 13 11 12 11 14 14 16=30 17 10 10 11 12 26 14 19 30 13 13 15 15 11 11 18 18 14 15 19 18 37 37 13 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a4. (Y-GATA 4H = 11 > 12) *147212*

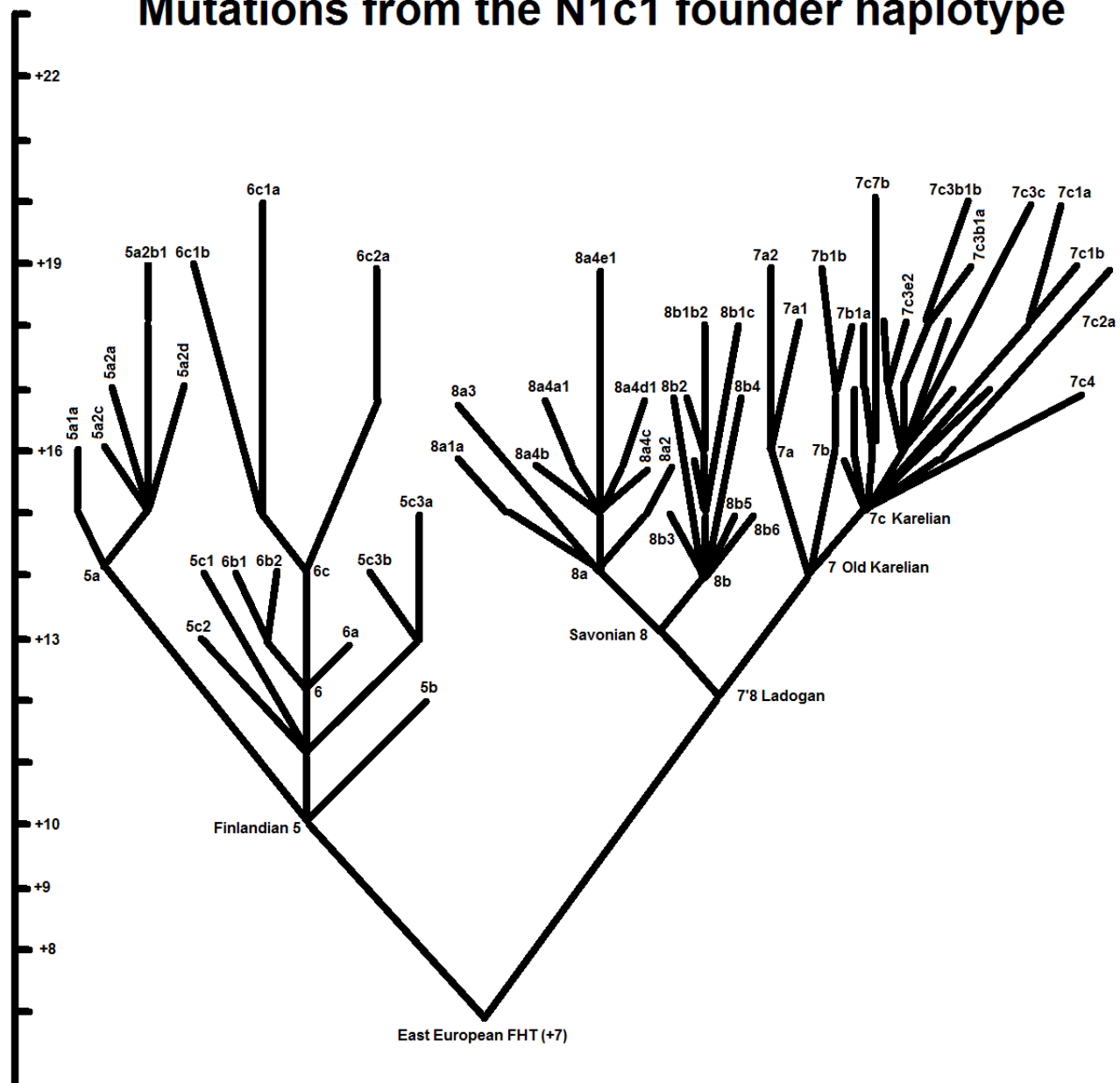
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

8a4a. (DYS19 = 14 > 15) *109267*

14 24 15 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

|      |      |      |      |      |      |      | 8a4a1. (DYS389b = 16 > 17) *165696*  
14 24 15 11 11 13 11 12 10 14 14 17=31 17 10 10 11 12 26 14 19 30 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8a4b. (DYS391 = 11 > 10) *165725*  
14 24 14 10 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8a4c. (DYS454 = 12 > 11) *N49344*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 11 26 14 19 30 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8a4d. (DYF406S = 11 > 12) *99533*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 12 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8a4d1. (DYS385b = 13 > 11) *200355*  
14 24 14 11 11 11 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 30 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 12 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8a4e. (DYS390 = 24 > 25 || DYS449 = 30 > 31) *102979*  
14 25 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 26 14 19 31 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8a4e1 (DYS389b = 16 > 15 || DYS481 = 20 > 21) *192874*  
14 25 14 11 11 13 11 12 10 14 14 15=29 17 10 10 11 12 26 14 19 31 13 13 15 15 11 12 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 21 21 15 12 11 10 11 11 12 11  
     |      |      |      |      |      |      |      | 8b. (DYS464c,d = 15 15 > 14 14) *102785*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
     |      |      |      |      |      |      |      | 8b1. (DYS449 = 30 > 31) *183409*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
     |      |      |      |      |      |      |      | 8b1a. (DYS413 = 21 22 > 20 21) *2841*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 20 21 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
     |      |      |      |      |      |      |      | 8b1a1. Viena Karelian (CDY 38 38 > 39 39) *18294 NEW!*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 18 14 15 18 18 39 39 12 10 11 08 15 17 08 08 10 08 11 10 12 20 21 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8b1b. (DYS511 = 10 > 11) *174009*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 11 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8b1b1. (DYS442 = 12 > 11) *166099*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 18 14 15 18 18 37 37 11 10 11 08 15 17 08 08 10 08 11 11 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8b1b2. (DYS459a,b = 10 > 9 || DYS450 = 7 > 8) *102558*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 09 09 11 12 25 14 19 31 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 11 12 21 22 14 10 12 12 17 08 13 20 21 15 12 11 10 11 11 12 11  
8b1c. (DYS458 = 17 > 16 || CDY = 37 37 > 36 36 || DYS442 = 12 > 13)  
14 24 14 11 11 13 11 12 10 14 14 16=30 16 10 10 11 12 25 14 19 31 13 13 14 14 11 11 18 18 14 15 18 18 36 36 13 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8b2. Bothnian Bay (DYS392 = 14 > 15 || DYS456 = 14 > 15 || DYS444 = 13 > 12) *104348*  
14 24 14 11 11 13 11 12 10 14 15 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 18 15 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 12 20 21 15 12 11 10 11 11 12 11  
8b3. Birkaland-Tavastian (DYS389b = 16 > 17) *147920*  
14 24 14 11 11 13 11 12 10 14 14 17=31 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8b4. (DYS385a = 11 > 12 || CDYa,b = 37 > 34 || DYF406S1 = 11 > 10) *169819*  
14 24 14 11 12 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 18 14 15 18 18 34 34 12 10 11 08 15 17 08 08 10 08 10 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8b5. (DYS391 = 11 > 10) *185486*  
14 24 14 10 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 11 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11  
8b6. (DYF406S1 = 11 > 12) *175648*  
14 24 14 11 11 13 11 12 10 14 14 16=30 17 10 10 11 12 25 14 19 30 13 13 14 14 11 11 18 18 14 15 18 18 37 37 12 10 11 08 15 17 08 08 10 08 12 10 12 21 22 14 10 12 12 17 07 13 20 21 15 12 11 10 11 11 12 11

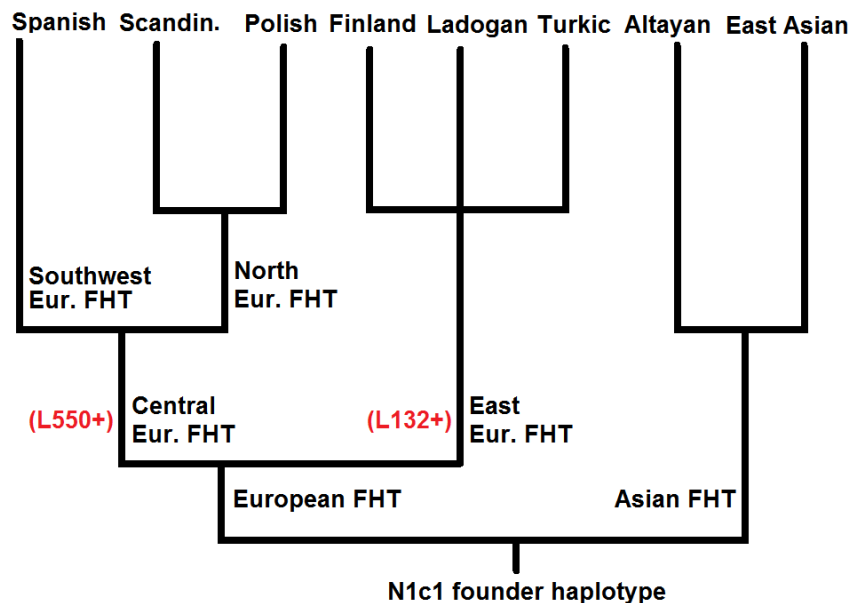
# Mutations from the N1c1 founder haplotype





## N1c1 phylogeny

This stratification differs from the earlier tree at two levels: firstly the founder haplotype of the whole haplogroup N1c1 has become more accurate, and secondly I have concentrated on the clusters consisting of closely related haplotypes, not the individual haplotypes. This way I was able to utilize the modal haplotypes (ignoring the individual mutations). When even between the young subgroups it is not always possible to find the missing links, it is not necessary to find a living person for every mutation step. Various population genetic bottlenecks are so common that some of the intermediary stages are lost forever, and some are yet to be found.



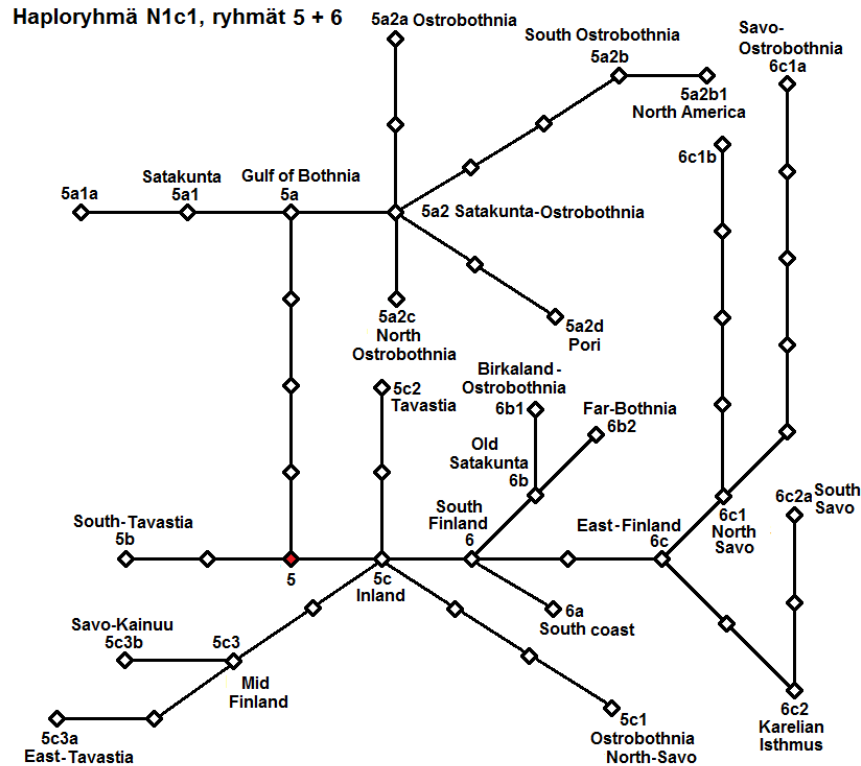
Groups **5** and **6** represent the Finlandian group, and groups **7** (Old Karelian) and **8** (Savonian) represent the Ladogan group. The third East European main group is the Turkic **4a**, but so far it has only few

haplotypes. Where **7** and **8** are parallel brother groups, **6** is the descendent of **5** (**6** ~ "5c4"). I have nevertheless distinguished it as an independent group to avoid too long numeral labels for groups.

	<b>greatest group-GD</b>	<b>Greatest</b>	<b>ht-</b>
<b>GD</b>			
5.–6. Finlandian	15	19	
7. Old Karelian	10	21	
8. Savonian	11	14	

Inter-subgroup genetic distance (group-GD) is greatest in the Finlandian group and clearly lesser in the Old Karelian and Savonian groups. On this basis the diversity of the Finlandian group could be temporally the deepest, while the Old Karelian and Savonian founder haplotypes would have been reproduced somewhat later. When we look at the actual genetic distance between the haplotypes (ht-GD), the Old Karelian group rises slightly past the Finlandian group (GD 21/67 vs. GD 19/67). The diversity of the Karelian group is by the great measure horizontal, due to population growth, and therefore probably younger than the diversity of the Finlandian group, which may be seen by rooting the three Finnish-related groups into the East European founder haplotype.

As can be seen, the Finlandian group has begun to disperse relatively earlier than the Ladogan group. The subgroups of the Finlandian group are more often separated from their ancestor by long, even five mutation branches without intermediary haplotypes. Such bottlenecks testify of the stable, small population; similarly hints also the fact that there seldom splits off more than three branches simultaneously in the Finlandian group. It is interesting that the internal diversity of **5a** Gulf of Bothnia is just as great as is the diversity of the whole group **5**.



## Groups 5 and 6 (Finlandian and South Finnish)

Group 5 began to branch out in the Western Finland: from the trunk (which from this stage on is **5c** Inland Finnish) first split off **5a** Gulf of Bothnia and **5b** South Tavastian. On the basis of the genetic distance ( $GD = 19/67$ ) this happened most probably around 60 generations ago, that is 1500–1800 years ago, which means Younger Roman Iron Age or Early Migration Period.

The Inland Finnish group **5c** has rapidly split off to northern (**5c1** North Savonian-Ostrobothnian), central (**5c2** Tavastian), eastern

(**5c3** Mid Finnish) and southern group (**6** South Finnish). **5c3** Mid Finnish split off onwards into **5c3a** East Tavastian and **5c3b** Savo-Kainuu.

Group **6** South Finnish split off into three subgroups: **6a** South coast, **6b** Old Satakunta and **6c** East Finnish. Old Satakunta split off into **6b1** Birkaland-Ostrobothnian and **6b2** Far Bothnian. East Finnish split off into **6c1** North Savonian and **6c2** Karelian Isthmus.

## Group 7'8 (Ladogan)

The Ladogan groups **7** Old Karelian and **8** Savonian have separated at the relatively late stage, sharing five additional mutations after the East European founder haplotype. The common ancestor I have labeled **7'8**. The greatest GD between actual Ladogan haplotypes is ca.  $GD 21/67$ , which means a time-depth of ca. 67 generations, or 1675–2010 years. The great population growth may still distort the result, because the more there are people, the more occur also mutations. In the earlier figure we can see that at least in the mutational steps the Ladogan group began to branch out later than the Finnish group.

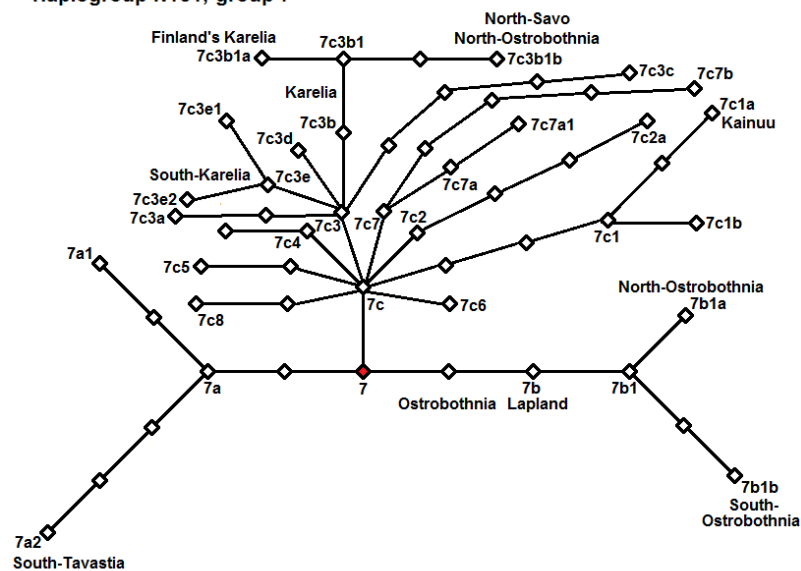
## Group 7 (Old Karelian)

Old Karelian group splits into three groups, two of which are very small: **7a** concentrates in Tavastia, while **7b** is found in Northern Finland, Lapland and Norway. These both can be connected to the Old Karelians, who spread to the west from the 12<sup>th</sup> century onwards: in the south, up to Lake Päijänne, in the north up to the river valleys of Far Bothnia. The greatest subgroup **7c** is Karelian proper,

and it is very common in East-Finland, because it participated in the Savonian expansion from the late 15<sup>th</sup> century onwards. Distribution of many subgroups reaches up to the northern parts of Ostrobothnia, and naturally they are met also in the Russian Karelia. Few subgroups have more narrow distribution: **7c1a** in Kainuu, **7c3e** in Finland's South Karelia, **7c3b1a** in Finland's Karelia (South and North Karelia) and 7c3b1b in North Savo and North Ostrobothnia.

The greatest genetic distance in the group 7 is ca. GD 21/67, which means 67 generations, or 1675–2010 years; about the Roman Iron Age.

Haplogroup N1c1, group 7



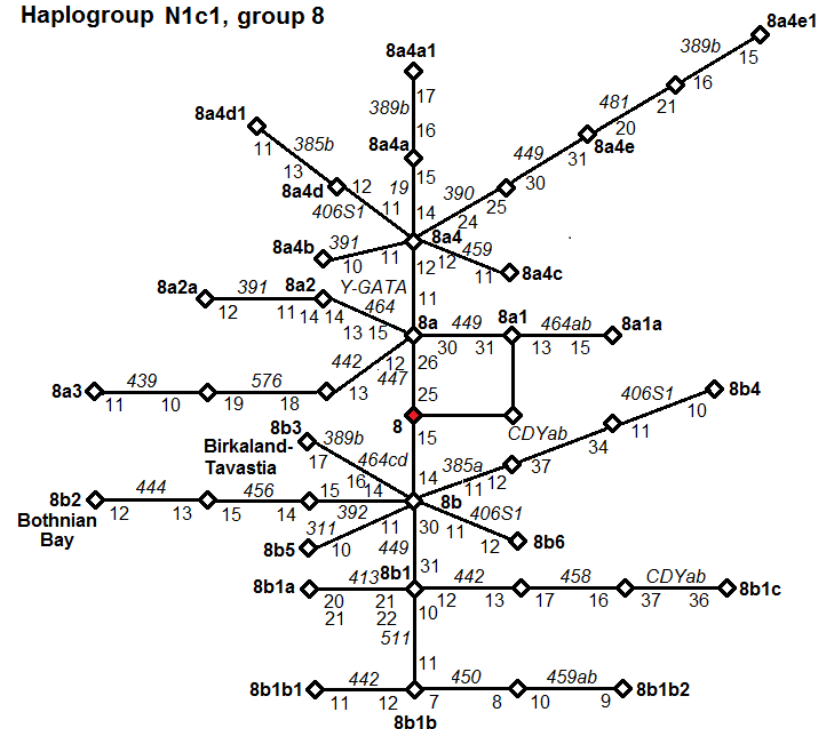
### Group 8 (Savonian)

Surprisingly, the diversity within the Savonian group is deeper of the two Ladogan groups, at least measuring from the mutations after the N1c1 founder haplotype: split into two main groups, **8a** and **8b**, has

happened rather soon. The distribution of these groups is mainly East-Finland, although often reaching Ostrobothnia or Karelian Isthmus. In the group **8b** (which thus seems to be the more western of these) there are some Western Finland subgroups like **8b2** Bothnian Bay and **8b3** Birkaland-Tavastia. Also in some subgroups of **8a** the distribution reaches West-Finland, but it is not restricted into it in any subgroup. Subgroups are named only when they clearly deviate from the normal Eastern Finland distribution.

The greatest genetic distance within the group 8 is ca. 14/67, which means 42 generations or 1050–1260 years. Its diversity seems to be considerably younger than that of the Old Karelian group.

Haplogroup N1c1, group 8



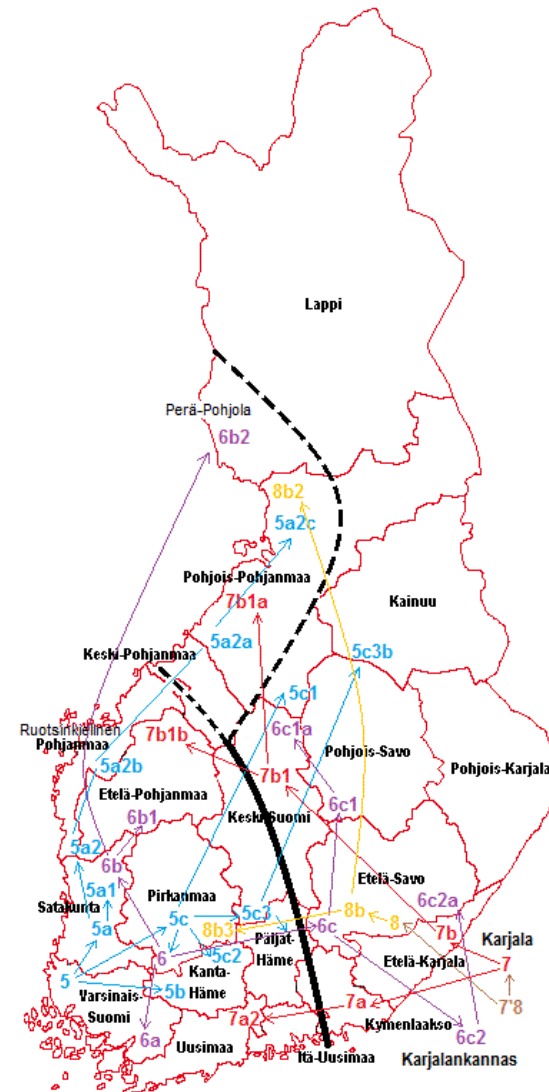
## N1c1 and the settlement history of Finland

It is remarkable that the West and East Finnish men seem to be so clearly of different origin, at least considering the haplogroup N1c1: groups **5** and **6** concentrate in the West-Finland, groups **7** and **8** in the East-Finland. Both western and eastern groups have subgroups which cross the west–east border, but only few western subgroups concentrate in East-Finland (**5c1**, **5c3b** and **6c**) or eastern subgroups in West-Finland (**7a**, **7b**, **8b2** and **8b3**). Mainly the difference between the western and eastern N1c1-Finns seems to derive from very remote past: already the East European founder haplotype **4** has given birth to three groups: **4a** Turkic, **5** Finlandian and **7/8** Ladogan. This must have happened somewhere to the southeast from Finland, probably in the Volga basin (<http://www.mv.helsinki.fi/home/jphakkin/N1c1.xps> or .pdf). Therefore it seems probable that the western and eastern N1c1-Finns have arrived in Finland through different routes. These routes hopefully become more accurate in the future when we get more samples from Estonia and Russia.

It is known of old that the culture has been different in West- and East-Finland since the late Stone Age. Recent years the genome-wide studies have also shown that the western and eastern Finns are clearly different populations, their genetic distance being comparable to that between the Swedes and Russians, and there can be distinguished no less than seven Finnish populations in different parts of the country (see <http://www.mv.helsinki.fi/home/jphakkin/SevenFinnish.xps>).

In the map the black line indicates the border between the western and eastern Finns, and the dotted line marks the area having great number of both western and eastern groups. Almost all subgroups of **5** Finlandian (blue) and **6** South Finnish (violet) have been marked,

but of **7** Old Karelian (red) and **8** Savonian (gold) only those subgroups have been marked which cross the border to West-Finland, because most of the subgroups have a wide distribution in East-Finland.



It is interesting that many subgroups of different groups have undergone a population increase approximately at the same stage, +14 mutations from the N1c1 founder haplotype: **5a** Gulf of Bothnia, **6c** East Finnish, **8a** and **8b** Savonians and Old Karelian **7**. Could these events be simultaneous even in reality?

The dating of the groups can be approached from two different directions: onwards from the N1c1 founder haplotype (counting the mutations up to the founder haplotype of a group), and backwards from the present (counting the internal diversity, the genetic distance [GD] between haplotypes).

	<b>GD to FHT</b>	<b>greatest ht-GD</b>	<b>age</b>
5. Finlandian	+10	19	1500–1800
6. South Finnish	+12	17	1300–1560
6c. East Finnish	+14	13	975–1170
7'8. Ladogan	+12	21	1675–2010
7. Old Karelian	+14	21	1675–2010
7c. Karelian	+15	19	1500–1800
8. Savonian	+13	14	1050–1260

There seems to be a contradiction in the results: beginning from the N1c1 founder haplotype the age of the Finlandian group seems older, but beginning from the present the age of the Ladogan group or even the Old Karelian group seems to be older. However, it must be noted that these two methods do not necessarily catch the same moment: distance from the N1c1 founder haplotype tells the time of birth of the group, while the genetic distance between the present haplotypes tells the time of birth of the descendent subgroups. There may be a long temporal gap between these two incidents.

Within the Finlandia group the order is the same with both methods: the oldest group is **5** Finlandian, then 6 South Finnish and the youngest is **6c** East Finnish. Within the Ladogan group the birth of **8**

Savonian looks earlier (+13 mutations) than the birth of **7** Old Karelian (+14 mutations). Yet the rise of the Savonian subgroups looks later than Old Karelian and even **7c** Karelian.

Interestingly, **6c** East Finnish and **8** Savonian look very similar, so we can suppose them both being present in South-Savo at the time of the Savonian expansion. Also their ages fit: rise of their subgroups happened most probably a bit more than a millennium ago. Approximately this is also the dating for the birth of Old Savo: the Old Karelian language and culture spread from the northwestern side of Lake Ladoga to originally Tavastian South-Savo, and on the basis of material culture this area joined in the Old Karelian sphere of influence. The slash-and-burn agriculture inherited from the Karelians was the main factor behind the population increase in East-Finland. Yet the large-scale Savonian expansion only began at the late 15<sup>th</sup> century when the king opened the wilderness for the settlers.

The datings of the other groups are probably in the right scale: the increase and the rise of the subgroups of both the Finlandian group and the Ladogan group would be slightly younger than two millennia. This matches well with the new datings for the dispersal of Late Proto-Finnic: it seems to have occurred right in the beginning of the Common Era. It is thus possible to connect the Finlandian group to the spread of Proto-Finnic speakers from Estonia to Southwest-Finland. To reassure this we will nevertheless need more haplotypes from the Estonians.

The Ladogan group **7'8** is somewhat less clear: both Karelian and Vepsian can be derived from the northern dialect of Late Proto-Finnic, so the Ladogan group is too old for them. Considering the time and place it could be connected to Proto-Saami, which is seen to have spread from the Ladoga region via Finland to the north early in the 1<sup>st</sup> millennium AD. The Proto-Saami connection would also

explain the occurrence of the early subgroup **7b** in Lapland, although the Old Karelian explanation would be satisfactory. On the other hand, the precise location for the birth of the Ladogan group cannot be solved until we have the total distribution of the early subgroups in Russia; the Ladogan group could also come from further in the southeast.

## Problems of dating

A temporal problem is caused by the fact that the East European founder haplotype, laying behind the Finlandian and Ladogan groups, does not seem to be considerably farther in the past than the mentioned groups: so far I have found the greatest genetic distance between the haplotypes of the Finlandian and Ladogan group to be 23/67, which would give the most probable time-depth 75 generations or 1875–2250 years. Even the Turkic group does not affect the situation. Far more peculiar is that even if some Asian haplotypes are included in the comparison, the genetic distance is only ca. 25/67. Could the whole haplogroup N1c1 be so young – only slightly older than 2 000 years – or is there something wrong with the datings?

One distorting factor is, that when we compare random haplotypes, we can only see part of the actual mutations – we cannot see those mutations which have occurred in both haplotypes separately (parallel mutations), nor those mutations which have later returned the original value (back-mutations). Thus, even if there is differences only in 25 markers between the East Asian example haplotype and the subgroup **8a4e1** (GD 25/67), the number of actual mutations is much higher. From the N1c1 founder haplotype through the Asian group to the East Asian example haplotype there have occurred 21

mutations, and from the FHT to the subgroup **8a4e1** there have occurred 19 mutations. The true genetic distance (TGD) is now 40/67, which gives the most probable time-depth of the haplogroup N1c1 163 generations or 4075–4890 years.

True genetic distance (TGD) can thus be almost twice bigger than the apparent genetic distance (GD). The only credible way to find out TGD and the real age of a group is to solve the relationship and descending of all the groups. Only when we count the mutations by lineage, beginning from the common reconstructed ancestor (FHT), we can reach also the parallel mutations and back-mutations.

From the East European FHT to the subgroup **6c1a** there have occurred 13 mutations, and to the subgroup **7c7b** similarly 13 mutations, so TGD is 26/67, although GD is only 20/67. Here the difference between the calculations is not so great than in the case of the whole haplogroup (because of shallower time-depth), but it is still moderate: increase is over 25 %. This means that the above calculated GD 23/67 for the East European founder haplotype would be 29/67 when corrected, which would give the time-depth of 101 generations or 2525–3030 years. The East European FHT becomes 700 years older.

## Finnish Vikings and Bjarmians?

There are not many subgroups which would have been born in Finland and then spread farther. One of this kind is the subgroup **5b**, which I have named Austrvegr-Tavastian (*Austrvegr*, ‘Eastway’, was a Viking route from Scandinavia through the south coast of Finland to Ladoga and further). In Finland its descendant, the subgroup **5b1** is only found in the southern area of the Tavastians, but its brother

group **5b2** is found surprisingly only in the British Isles (N-project: 51215, N26900 and 73958). When we remember that the great Tavastian port, Portus Tavastorum mentioned in the chronicle of Erik Olai, was most probably located in the Halikko Bay area near the ancient market village of Rikala (nowadays part of Salo municipality), the South Tavastians had a direct contact to the Austrvegr. Probably from here some South Tavastians departed to their long journey to England, possibly among the Scandinavian Vikings – either in cooperation or as captive slaves after a lost battle.

The greatest genetic diversity of the English subgroup **5b2** is only 5, but because we can only compare 37 markers, is the most probably time-depth for this subgroup about 22 generations, 550–660 years. Such a dating is clearly younger than the Viking Age, so this group could also descend from some South Tavastian who ended up in England at Late Medieval times. However, the greatest genetic distance of the group **5b** (51215 vs. N10231) is 13/67, which makes 39 generations, giving the time-depth of ca. 975–1170 years, so the Austrvegr-Tavastian group **5b** itself was born already in the Viking Age.

Another interesting finding from British Isles is the subgroup **6c1b2b** (N-projekti: 174807, 172817 ja 172435). Its brother group 6c1b2a is only found in Viena Karelia, and I have named their com-

mon ancestor group **6c1b2** Bjarmian. This Bjarmian group descend from North-Savo, where we can find its ancestral groups **6c1b**, **6c1** and **6c**.

The greatest genetic distance between the haplotypes of the English subgroup **6c1b2b** is 6/37, which gives the most probable time-depth 27 generations, 675–810 years. Nevertheless, the genetic distance between the haplotypes of the Bjarmian group **6c1b2** is 12/37, which would give time-depth of 60 generations, 1500–1800 years.

Bjarmia or Bjarmaland was located south of the White Sea, and a Norwegian Ottar (Old English form: Ohthere) visited there at the end of 9<sup>th</sup> century AD, taking his story to England where it was included in the history book edited by king Alfred the Great. It is possible that already then some Bjarmian ended up in England, because the route between England and the White Sea only opened again much later.

It is remarkable that both the Austrvegr-Tavastian and the Bjarmian groups have not been found elsewhere, only in England, which hints to direct contacts. In both cases the English haplotypes form distinguished clusters on their own, without any close matches in the area of departure. Therefore it seems probable that it is a matter of old, even Viking Age connections.