Haplogroup E3b1a2 as a Possible Indicator of Settlement in Roman Britain by Soldiers of Balkan Origin

Steven C. Bird

Abstract

The invasion of Britain by the Roman military in CE 43, and the subsequent occupation of Britain for nearly four centuries, brought thousands of soldiers from the Balkan peninsula to Britain as part of auxiliary units and as regular legionnaires. The presence of Haplogroup E3b1a-M78 among the male populations of present-day Wales, England and Scotland, and its nearly complete absence among the modern male population of Ireland, provide a potential genetic indicator of settlement during the 1st through 4th Centuries CE by Roman soldiers from the Balkan peninsula and their male Romano-British descendants. Haplotype data from several major genetic surveys of Britain and Ireland are examined, analyzed and correlated with historical, epigraphic and archaeological information, with the goal of identifying any significant phylogeographic associations between E3b1a-M78 and those known Romano-British settlements and military posts that were associated specifically with Roman soldiers of Balkan origin. Studies by Cruciani et al. (2007), Perečić et al. (2005), and Marjanovic et al. (2005), examining the distribution of E3b1a-M78 and E3b1a2-V13 in the Balkans, are analyzed further to provide evidence of phylogeographic associations between the E3b1a2 haplotypes identified within the Balkans by these studies and those regions of the Balkans occupied first by the Roman army in antiquity. E3b1a2 is found to be at its highest frequency worldwide in the geographic region corresponding closely to the ancient Roman province of *Moesia Superior*, a region that today encompasses Kosovo, southern Serbia, northern Macedonia and extreme northwestern Bulgaria. The Balkan studies also provide evidence to support the use of E3b1a-M78 (in the present study) as a close proxy for the presence of E3b1a2-V13 (representing 85% of the parent E3b1a-M78 clade) in both the Balkans and in Britain.

Address for correspondence: stevenbird1000@hotmail.com

Received: July 1, 2007; accepted: Sept. 15, 2007.

Introduction

The origins, arrival times and possible routes of migration of the E3b haplogroup[1] to Britain have been the subject of debate among population geneticists for several years. In his book, *The Origins of the British,* Stephen Oppenheimer (2006) advanced a theory of a Neolithic time period for the arrival of E3b (and a companion haplogroup, J2) in Britain,[2] corresponding to the period from 6.5-5.5 kya (thousands of years ago) and originating from the Balkan peninsula.[3] The data upon which his conclusions concerning E3b and J2 were based[4] were derived from two surveys of British haplotypes, published by Weale et al. (2002) and Capelli et al. (2003). Oppenheimer based his hypothesis, in part, upon a study by Semino et al. (2004) that addressed the spread of haplogroups E3b and J in western Europe during the Neolithic era, but did not include any data from the island of Britain specifically, and upon the earlier work of Ammerman and Cavalli-Sforza (1984) concerning the "demic diffusion" model, in which the *Linearbandkeramik* or LBK culture arose after the Neolithic transition (with the Starčevo-Körös-Çris cultures) about 6000 BCE or 8 kya.

At about the same time as the release of Oppenheimer's book, Bryan Sykes (2006) published his book *Blood of the Isles* (entitled *Saxons, Vikings, and Celts* in the U.S. release). Simultaneously, Sykes also published the data from the Oxford Genetic Atlas Project (OGAP) online.[5] While the studies of Weale and Capelli were limited geographically either to a specific transect of Britain or to a grid pattern containing large gaps of unsampled and potentially significant geographic regions within Britain, the Sykes OGAP study covered every region of the island of Britain.[6]

Very shortly after the publication of these two books, Cruciani et al. (2007) published a new study defining ten subclades of haplogroup E3b1a-M78 through several newly identified unique event polymorphisms (UEP's).[7] The subclade E3b1a2 (identified by the presence of the V13 and V36 UEPs) was found by Cruciani et al. (2007) to have a strong phylogeographic association with the southern Balkan peninsula; this subclade also was found by the same study to correspond very closely to the α ("alpha") cluster of E3b1a-M78, first identified by Cruciani et al., (2004) using microsatellite (STR) data. Cruciani (2007) also stated that the subclade defined by the V13 UEP (phylogenetically equivalent to E3b1a2 and E3b1α) was found in 85% of western European males who also were positive for E-M78.

Semino et al. (2004) viewed E3b1a-M78, of which E3b1a2 is, by far, the most common subclade in Europe, as an indicator of the diffusion of people from the Balkans (along with a "companion" clade, J2b1-M12/M102) and therefore a candidate for a residual genetic signature of the Neolithic demic diffusion model. Cruciani et al. (2007) have brought the Neolithic dating assumption into question, however, by their revised dating of the expansion of E-V13 and J-M12, from the Balkans to the remainder of Europe, to a period no earlier than the Early Bronze Age ("EBA").[8]

Two dating methods were employed by Cruciani (2007) to calculate the "time to most recent common ancestor" ("TMRCA"): that of Zhivotovsky et al. (2006) based on his "evolutionary effective" mutation rate for an average square distance ("ASD") calculation, and the second based on Forster et al. (1996) and Saillard et al. (2000) utilizing ρ ("rho") statistics, employed to "assay how robust the time obtained is to choice of method." Cruciani et al. (2007) found that Forster's method produced time estimates that were slightly younger than the ASD-based method but that the difference was significant only for the root of the entire haplogroup.

An important finding of this study was that E-V13 and J-M12 had essentially identical population coalescence times. They concluded that the E-V13 and J-M12 subclades expanded in Europe outside of the Balkans as the result of "a single evolutionary event at the basis of the distribution of haplogroups E-V13 and J-M12 within Europe, a finding never appreciated before." Further, Cruciani, et al. (2007) wrote that

> *Our estimated coalescence age of about 4.5 ky for haplogroups E-V13 and J-M12 in Europe (and their C.I.s) would also exclude a demographic expansion associated with the introduction of agriculture from Anatolia and would place this event at the beginning of the Balkan Bronze Age, a period that saw strong demographic changes as clearly testified from archeological records.*

These expansion times were calculated by Cruciani (2007) to have occurred between 4.0-4.7 kya for E-V13 and 4.1-4.7 kya for J2-M12, with the upper limit of the expansion time for E-V13 at 5.3 kya and for J2-M12 at 6.4 kya. Both expansion times therefore are centered at approximately 4.3-4.35 kya, a period of time corresponding to the EBA in the southern Balkans (Hoddinott, 1981).

Cruciani et al.'s E-V13 and J2-M12 coalescence times bear a striking similarity to carbon-14-based date calculations for certain archaeological sites in the Maritsa river valley and its tributaries, near the city of Nova Zagora, Bulgaria (Nilolova, 2002). These sites are associated directly with the proto-Thracian culture of the southern Balkans that came to dominate the region during the first millennium BCE. Sites surveyed included Ezero, Yunatsite, Dubene-Sarovka and Plovdiv-Nebet Tepe, all of which had deep associations with the developing EBA proto-Thracian culture of the region. It is evident that if Cruciani et al. (2007) are approximately correct in their dating of the expansion of E-V13 from the Balkans, then Oppenheimer's theory of the role of E3b in Neolithic Britain is flawed fundamentally. E3b1a2 could not have arrived in Britain during the Neolithic era (6.5-5.5 kya) if it had not yet expanded from the southern Balkans.

Another difficulty for the acceptance of Oppenheimer's "Neolithic" arrival time for E3b and J2 in Britain is the virtual absence of these haplogroups in Ireland, according to two recent large-scale population studies (McEvoy, 2006a; Moore, 2006). The data, compiled by the Smurfit Institute of Genetics at Trinity College, University of Dublin, demonstrated that E3b appeared in Ireland at an extremely low level of just eight examples out of a total of 1921 haplotypes tested, or 0.42% (less than 1/2 of one percent) when combined.[9] Remarkably, no samples of Y-haplogroup J (*any* subclade) were found by either study. In a surname study, also from the Smurfit Institute, McEvoy et al. (2006b) found a 5-6% E3b presence (n=3) within a very small sample (N=47) among males in Ireland who had "Norse" surnames. Two of the resulting three E3b samples, however, may have resulted from a single founder (surname Arthur). McEvoy (2006b) stated, "In the Arthur [surname] both samples . . . were identical suggesting a single origin or introduction to Ireland." Therefore the apparently higher percentage of E3b haplotypes found in this study may be due to a founder effect and to the very small sample size. Capelli et al. (2003) also had found the "Neolithic" haplogroups of E3b and J entirely absent in Ireland, based on two sample locations, one taken from "a site in central Ireland that has had no known history of contact with Anglo-Saxon or Viking invaders," (Castlerea) and the other near Dublin (Rush).

If E3b1a-M78 had in fact arrived during the Neolithic era by water routes from Iberia and the Mediterranean, there would not appear to be any obvious reason for it to be distributed so unevenly between Britain and Ireland. Oppenheimer acknowledged this problem indirectly in Chapter 5 of his book ("Invasion of the Farmers") and stated in so many words that he had no explanation for the avoidance of Ireland in favor of Britain by E3b (and J2), a problem that apparently did not affect other Neolithic haplogroups identified by Oppenheimer (2006, pp. 193-194, 206-207), namely I1b* and I1b2, allegedly following the same route along the Iberian coast and from the Mediterranean.

While a Neolithic arrival date for E3b in Britain, as suggested by Oppenheimer, is evidently rendered impossible by Cruciani et al. (2007), a Bronze Age arrival date is not necessarily excluded. The British Bronze Age lasted from approximately 2400 to 600 BCE and involved a succession of closely related cultures arriving from the continent. Norman Davies (1999, pp. 21-25) has identified several groups associated with the British Bronze Age. The first to arrive were the "Beaker Folk," followed by the "Flanged-axe Warriors" and, three centuries later, the "Urnfield People." The Beaker Folk (also referred to as the "Beaker Culture") are believed to have come mainly from Northwest Europe (Cockburn, 1969, pp. 36-41), and also may have been associated with the spread of the Celtic language (Cunliffe, 2004). An excavation of the so-called "Amesbury Archer" grave, near Stonehenge, has provided an example of a Beaker Culture high status burial, probably an elite ruler (as evidenced by the valuable grave goods found with the skeleton), whose origins have been traced to an area in the Alps using oxygen isotope analysis of tooth enamel (Fitzpatrick, 2003). He is dated to approximately 2,300 BCE, and may have spoken an early form of Celtic. The place of origin is significant because it locates the "Archer's" birthplace in a region of Europe other than the Balkan peninsula at approximately the same time that E-V13 only was beginning to expand from the Balkans to the rest of Europe. Therefore, it is improbable that the "Archer" (and his associated Beaker culture peers) originated from a region closely associated with E3b1a2 during the EBA.

Bronze Age and Iron Age Celtic-style cultures have been identified by both Oppenheimer and Sykes as being associated with the so-called "Western Atlantic Modal Haplotype" (R1b1c). Alcock (1972, pp. 99-112) has examined the model of a Celtic Irish-Sea culture-province in the pre-Roman Iron Age ("IA"), in particular connections across the Irish Sea, including a dominant Irish cultural component, as well as related settlement in Wales, Strathclyde, Argyll, and southwestern Britain. The problems encountered by the Neolithic theory of Oppenheimer, i.e., the virtual absence of E3b and the complete absence of J in Ireland, also are inherent in any BA or IA scenario. A BA or IA culture that extended across the Irish Sea probably would not have caused a significant difference in the Y genetic admixture of Britain and Ireland. Barring any later discovery of significant levels of E3b or J in Ireland, it would appear that whatever historic or prehistoric migratory movements were responsible for these haplogroups' presence in Britain had little or no impact on the male genetic component of Ireland.

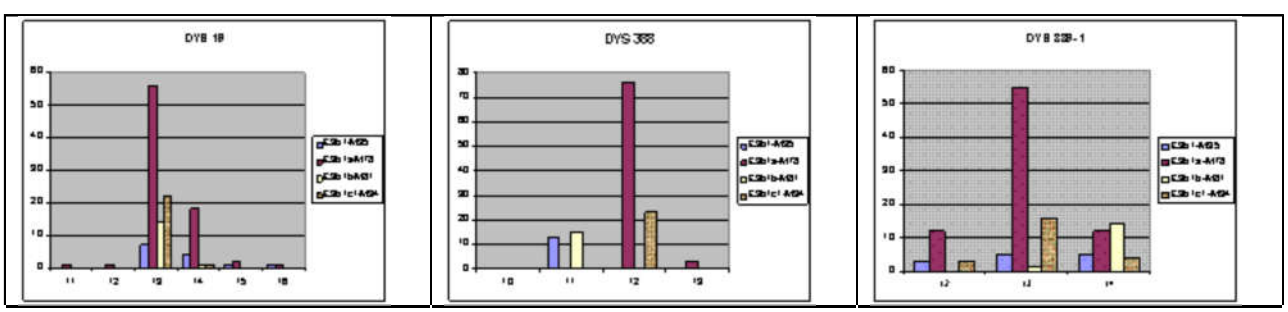
Difficulties with Neolithic, BA, and IA models for the migration of E3b and J2 to Britain raise a question: If these haplogroups did not arrive during these eras, then when might they have migrated? To assist in developing a meaningful hypothesis concerning possible migratory routes for E3b1a2 from the Balkan peninsula to Britain, a comparison of the published haplotypes from the three aforementioned population surveys was made, with the goal of identifying any residual patterns of settlement among British E3b haplotypes.

Methodology

The three data sets of Capelli, Weale, and Sykes used six to ten STR markers to determine the haplotype of each sample; this necessarily limited the resolution of the data. Both Weale and Capelli reported the haplogroup results for each of their haplotypes, classifying E3b haplotypes as "M35" (Capelli) or "Haplogroup 21," using the older nomenclature for the haplogroup defined by YAP/SRY4064 (Weale). Sykes reported a greater number of Y-STR values for each haplotype tested, up to ten, but did not provide any individual haplogroup identifications in the OGAP. In the case of the first two studies, samples were selected for inclusion if the donor and the donor's paternal grandfather had been born within 20 km (Weale) or 20 miles (32 km) (Capelli) of the location being surveyed. In the third study (Sykes) the geographic origin of the haplotype was assigned according to the paternal grandfather's birthplace.[10] In effect, the haplotypes gathered were a sample of Britain's male population distribution patterns largely before World War I.

A factor preventing direct comparison (by percentage) of these three data sets was a substantial difference in the format used for reporting the geographic origins of individual haplotypes. Weale (2002) and Capelli (2003) each specified geographic locations (towns or villages) in their reports of haplotype frequencies; Sykes (2006), however, reported his findings by combining locations into larger geographic regions that, in most cases, joined several British counties into a single data set (such as "Central England," or "Borders").[11] A map of the approximate locations for all "Eshu" haplotypes was provided in the Appendix of the book, but the precise geographic location of individual haplotypes was not provided.[12]

Even with these limitations, however, it was possible to identify some trends in the three data sets when combined. Using Whit Athey's Y-Haplogroup Predictor, version 5 (Athey, 2006), nearly all of the haplotypes in Sykes's OGAP study could be classified into their respective broader haplogroup categories, (such as E3b-M35 or I1b1-P37.2), based on their reported allele values. The haplotypes estimated to be E3b were then further analyzed and refined using histograms (**Figure 1**) developed in the present study, based on the allele frequencies found in E3b1-M35 and three of its subclades, and a public Y-DNA database compiled by the "E3b Y-DNA Project" from those haplotypes whose subclades have been confirmed as M35+.[13]



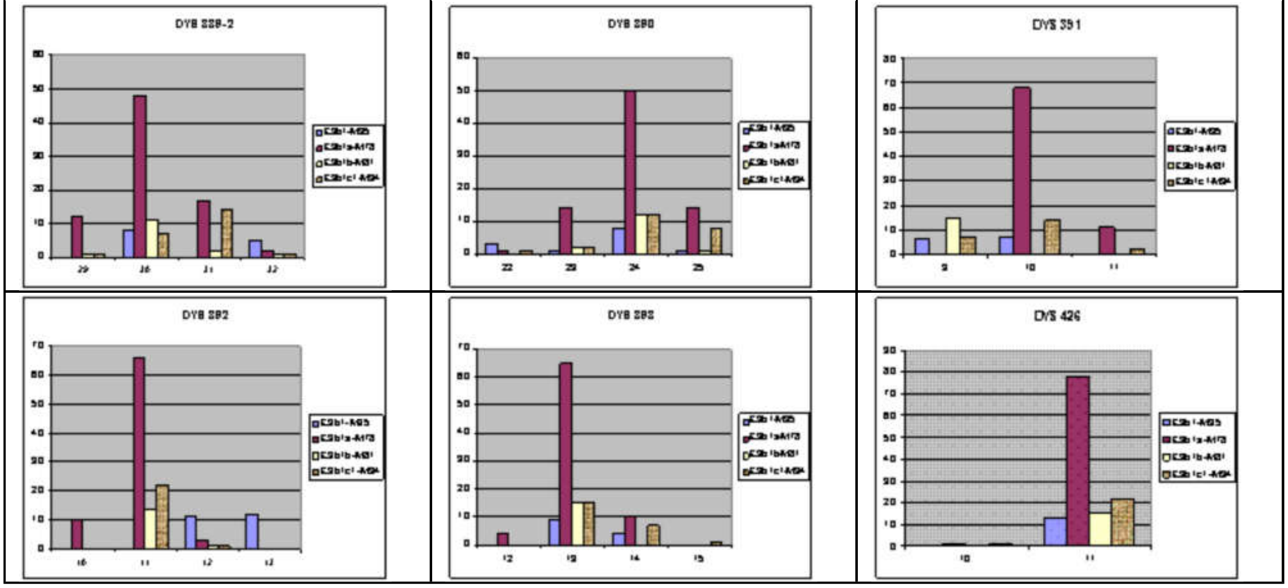
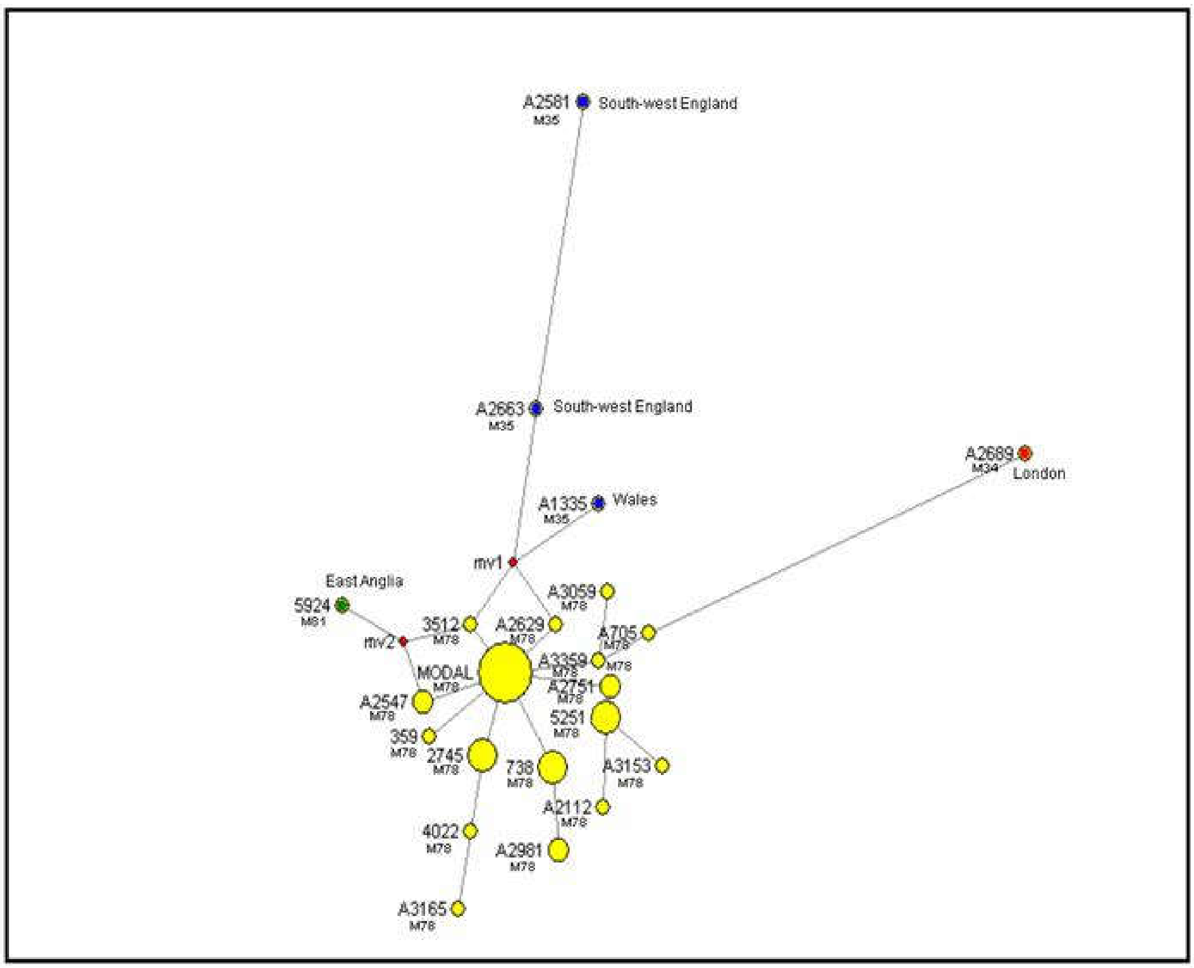


Figure 1. Histograms of E3b-M35, Allele Frequencies by Subclade

As a third method of estimation (and to provide a check of the robustness of the derived subclade assignments), a median-joining network was constructed in NETWORK 4.2.0.1,[14] using the allele data from the OGAP predicted as E3b by Athey's Y-Haplogroup Predictor, as shown in **Figure 2.**[15] The E3b (estimated) data from the OGAP is presented in **Table 1**, along with the subclade assignments determined using the methodology outlined above. These assignments are also presented in **Table 2**, grouped according to the OGAP's geographic regions and the overall percentages for each E3b subclade.



Key to multiple taxa nodes:

Modal: A2960, 5371, 4018, A3040, A3097, A3174, A2923, A2833 A3429, A2967,A3029, A9065 (E-M78)

2745: 2745, A2243, A2950, A1201 (E-M78)
738: 738, A2090, A2109, A3093 (E-M78)
5251: 5251, A8115, A8135, A8584 (E-M78)
A2981: A2981, 503 (E-M78)
A2751: A2751, A2211 (E-M78)
A2547: A2547, A231 (E-M78)
(All other nodes have one taxon each. Geographic descriptions apply only to the adjacent taxon).

Figure 2. Median-Joining Network, OGAP Data, E3b

Table 1. OGAP E3b Data Grouped by Region and Classified by Subclade

OGAP Haplotype Number	OGAP Regional Identification	393	390	19	391	426	388	389 / 1	392	389 / 2	425	Estimated Subclade
738	Argyll	13	23	13	10			13	11	17	0	E3b1a-M78
A2547	Borders	13	24	13	10	11	12	14	11	17	0	E3b1a-M78
A2960	East Anglia	13	24	13	10	11	12	13	11	17	12	E3b1a-M78
5251	East Anglia	13	24	14	10			13	11	18		E3b1a-M78
5371	East Anglia	13	24	13	10			13	11	17		E3b1a-M78
5924	East Anglia	13	24	13	9			14	11	16		E3b1b-M81
3512	Grampian	13	24	13	10			13	11	16		E3b1a-M78
4018	Grampian	13	24	13	10			13	11	17		E3b1a-M78
4022	Grampian	13	24	13	10			13	11	19		E3b1a-M78
2745	Highland	13	24	13	10			13	11	18		E3b1a-M78
A2243	London	13	24	13	10	11	12	13	11	18	0	E3b1a-M78
A3040	London	13	24	13	10	11	12	13	11	17	10	E3b1a-M78
A3097	London	13	24	13	10	11	12	13	11	17	12	E3b1a-M78
A3359	London	13	24	13	10	11	12	12	11	17	0	E3b1a-M78
A2689	London	15	25	13	11	11	12	11	11	19	12	E3b1c1-M34
A2090	North England	13	23	13	10	11	12	13	11	17	12	E3b1a-M78
A2109	North England	13	23	13	10	11	12	13	11	17	0	E3b1a-M78
A3093	North England	13	23	13	10	11	12	13	11	17	12	E3b1a-M78
A2112	North England	13	24	15	10	11	12	13	11	18	12	E3b1a-M78
A3174	North England	13	24	13	10	11	12	13	11	17	12	E3b1a-M78
A705	North England	13	24	13	11	11	12	12	11	17	12	E3b1a-M78
A2923	Northumbria	13	24	13	10	11	12	13	11	17	0	E3b1a-M78
A8115	Shetland	13	24	14	10			13	11	18		E3b1a-M78
A8135	Shetland	13	24	14	10			13	11	18	0	E3b1a-M78
A8584	Shetland	13	24	14	10			13	11	18	0	E3b1a-M78
A2981	South England	13	23	13	10	11	12	13	11	18	0	E3b1a-M78
A2629	South England	14	24	13	10	11	12	13	11	17	0	E3b1a-M78
A2751	South England	13	24	14	10	11	12	13	11	17	0	E3b1a-M78
A2833	South England	13	24	13	10	11	12	13	11	17	10	E3b1a-M78
A2950	South England	13	24	13	10	11	12	13	11	18	10	E3b1a-M78
A3429	South England	13	24	13	10	11	12	13	11	17	13	E3b1a-M78
A3059	South England	13	24	13	10	11	12	11	11	17	10	E3b1a-M78
A2581	South-west England	13	23	13	10	11	12	15	13	16	12	E3b1-M35
A2663	South-west England	14	24	13	10	11	12	13	13	16	12	E3b1-M35
A2967	South-west England	13	24	13	10	11	12	13	11	17	13	E3b1a-M78
A3029	South-west England	13	24	13	10	11	12	13	11	17	10	E3b1a-M78
A3153	South-west England	13	25	14	10	11	12	13	11	18	0	E3b1a-M78
A3165	South-west England	13	24	13	10	11	12	14	11	19	12	E3b1a-M78
503	Strathclyde	13	23	13	10			13	11	18		E3b1a-M78
359	Strathclyde	13	25	13	10			13	11	17		E3b1a-M78
A9065	Tayside & Fife	13	24	13	10			13	11	17		E3b1a-M78
A1201	Wales	13	24	13	10	11	12	13	11	18	0	E3b1a-M78
A231	Wales	13	24	13	10	11	12	14	11	17	12	E3b1a-M78
A2211	Wales	13	24	14	10	11	12	13	11	17	0	E3b1a-M78
A1335	Wales	14	24	13	10	11	12	13	11	15	0	E3b1-M35

Table 2. E3b Subclades by OGAP Region and Percentage

Subclade	Region	N=(total)	n=	%
M-78	Argyll	19	1	5.3%
M-78	South England	163	7	4.3%
M-78	London	151	4	2.6%
M-78	East Anglia	125	3	2.4%
M-78	Grampian	126	3	2.4%
M-78	Tayside & Fife	56	1	1.8%
M-78	South-west England	237	4	1.7%
M-78	Wales	178	3	1.7%
M-78	Strathclyde	120	2	1.7%
M-78	North England	365	6	1.6%
M-78	Borders	64	1	1.6%
M-78	Northumbria	82	1	1.2%
M-78	Northern Isles	202	1	0.5%
	Total	1888	37	2.0%
M-81	East Anglia	125	1	0.8%
	Total	125	1	0.8%
M-34	London	151	1	0.7%
	Total	151	1	0.7%
M-35	South-west England	237	2	0.8%
M-35	Wales	178	1	0.6%
	Total	415	3	0.7%
n/a	Central England	193	0	0.0%
	Total	193	0	0.0%

The locations of individual E3b haplotypes identified on the main island of Britain were plotted together using *Map Viewer 7* (Golden Software),[16] appearing in **Figures 3-6**. **Figure 3** presents the combined data from the three surveys, grouped according to the county into which they fell. **Figure 4** shows the exact (Weale and Capelli) or estimated (Sykes) geographic location of each data point from all three surveys. **Figure 5** presents these same points according to the number of E3b haplotypes found at each location. **Figure 6** presents the data from **Figure 3**, analyzed using the Kriging method, to produce a contour map of the geographic distribution and frequency of Haplogroup E3b (Cressie, 1990).

Forty haplotypes from the OGAP were classified as E3b1-M78 (88.8%). Of the other three subclades predicted, two E3b*-M35 haplotypes were found in "Southwest England" (Cornwall and Devon, approximately) and one occurred in Wales. One E-M81 haplotype was located in East Anglia and one E-M34 haplotype was found in London. Capelli (2003) reported three haplotypes estimated in the present study to be E3b1b-M81 (all in the Channel Islands) and two estimated to be E3b1c1-M34 haplotypes (one in Norfolk and the other again in the Channel Islands). All E3b haplotypes reported in the Weale (2002) study were estimated to be E3b1a-M78 with the exception of a singleton from Llangefni, Wales with DYS391=12, which could not be classified based on the limited allele information available.

Haplogroups were named according to ISOGG (2007).

E3b Patterns of Settlement in Britain

The frequency of E3b in Britain was observed to be most prevalent in two regions; a geographic cluster of haplotypes extending from Wales eastward to the vicinity of Nottingham, encompassing the region surrounding Chester, and a second (NNE to SSW) cluster extending from Fakenham, Norfolk to Midhurst, Sussex. Other E3b data points were scattered widely throughout Britain. According to the OGAP, the overall estimated percentages of haplogroup E3b ("Eshu") in Britain were: England-2.1%, Wales-3.1%, Scotland-1.5% (Sykes, 2006, p. 290). **Figures 3-6** demonstrate clearly, however, that these data are not distributed evenly across the island of Britain. When the E3b data locations from Wales to Nottinghamshire are considered, the "Welsh" cluster is underestimated by an arbitrary division by Sykes into two geographic regions ("Wales" and "Northern England"). This division creates an impression of a large number of "Eshu" haplotypes located throughout Northern England, when in fact the Northern English cluster is linked to the Welsh cluster geographically.

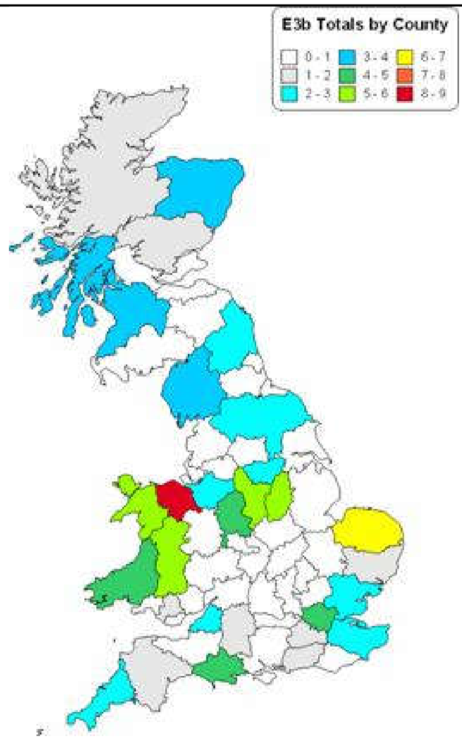


Figure 3. Frequency of E3b Grouped by County

Figure 4. E3b Distribution by Geographic Location

Figure 5. E3b Distribution

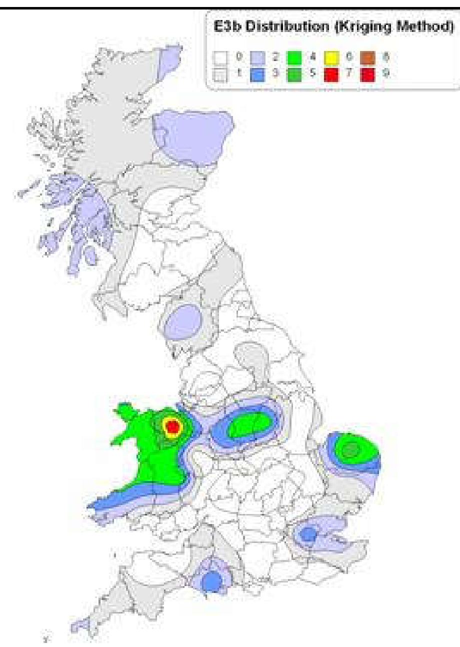


Figure 6. E3b Distribution–

by Frequency and Location	Kriging Method

Of special interest is a void appearing in the geographic distribution of E3b, found largely in the part of England designated by Sykes (2006, p. xvi) as "Central England." This region, containing the populous cities of Gloucester, Birmingham and Coventry, was reported to be devoid of any E3b haplotypes. The "hole" in the distribution of E3b also extends south from this region within an area defined approximately by the narrowing of the Severn estuary (immediately southwest of Gloucester) to the west, the Isle of Wight to the south, and east to the Thames river, immediately west of Greater London.

The major E3b1a-M78 (Wales-to-Nottingham) cluster extended across lands formerly occupied by the Ordovices, the Deceangi, the Cornovii, the Brigantes and the Coritani tribes.[17] It did not appear therefore to conform to the tribal divisions extant in Britain prior to the Roman invasion of CE 43. The indicated E3b "hole" also did not appear to conform to any of the better-known medieval political divisions, such as the Danelaw, whose western border (along Watling Street) bisects the Central England E3b void. Weale (2002) stated that the historical and archaeological records "argue for some degree of Viking settlement in both East Anglia and the Midlands in the ninth century A.D. but against a substantial displacement of the existing people during this period." The same conclusion was applied by Weale to the Norman invasion of 1066. An important conclusion of the Weale study was that a strong genetic barrier exists, however, between Central England and Wales:

> *The Central English-North Welsh barrier cannot be explained purely as a simple isolation-by-distance phenomenon because it contrasts strongly with the lack of evidence for a cline among the five widely separated English towns. Our findings are particularly striking, given the high resolution and rapid mutation rate of the Y chromosome haplotypes on which they are based. These allow genetic barriers, if they exist, to be clearly defined.*
>
> *The best explanation for our findings is that the Anglo-Saxon cultural transition in Central England coincided with a mass immigration from the con-tinent. Such an event would simultaneously explain both the high Central English-Frisian affinity and the low Central English-North Welsh affinity.*

The data reported by the OGAP concerning the "Eshu" void, when combined with Capelli and Weale, provides some additional evidence that appears to support Weale's hypothesis. The distinct clustering of E3b1a-M78 from Wales to Nottinghamshire may be an indication of a mass displacement of one group (the Romano-British) in favor of another (the Anglo-Saxons) within the Central England region.[18]

An alternative interpretation of the Weale and Capelli findings, hypothesized by Thomas et al. (2006), was that the genetic admixture of Central England resulted from an elite dominance ("apartheid") social structure imposed by the invading Anglo-Saxons on the existing Romano-British population. Thomas concluded that "the genetic contribution of an immigrant population can rise from less than 10% to more than 50% in as little as five generations, and certainly less than 15 generations." Under this scenario, the Y genetic component of the Romano-British population was replaced partially (or entirely) over a few generations (from the middle of the fifth century CE to the issuance of the laws of Alfred the Great in about 890) by Anglo-Saxon elite males who outbred the Romano-British males, due to social and economic advantages. In effect, either model (Weale or Thomas) would lead quickly to the substantial replacement (or displacement) of Romano-British males by Anglo-Saxon males in the affected area (Central England). If a majority of the E3b haplotypes found among the "native" British at the time of the Anglo-Saxon migration had arrived during the Romano-British period (CE 43-410) and were introduced into the general population by soldiers (and their descendants) who remained in the province upon their retirement, then these E3b haplotypes would have been replaced within Central England's genetic admixture during the Anglo-Saxon cultural transition.[19]

Balkan Ethnogenesis

The hypothesis that members of the E3b1a2 haplogroup migrated to Britain from the Balkans with the Roman military during the first through third centuries, CE, as members of auxiliary military units or as members of the regular Roman legions, is supported by genetic, archaeological and historical evidence.

In *Saxons, Vikings and Celts*, Sykes (2006, p. 224) queried:

> *But who were the soldiers of the Roman army? Not all from Rome, that's for sure. After the initial campaigns, when there would have been a substantial Italian contingent in the legions, the occupation itself was left in the hands of the auxiliaries. In Wales these troops, who would be granted citizenship when they retired, were drawn largely from the valleys of the Rhine and the Danube. It is for Y-chromosomes from that part of Europe that we should keep an eye out as a sign of the genetic influence of the Roman occupation.*

Thracian and Dacian soldiers originating from the geographic regions near the Danube, where E-V13 has been shown to have its highest frequencies worldwide, were attested historically and epigraphically in the same regions of Britain where E3b1a-M78 has appeared most commonly in the three population surveys of Weale, Capelli and Sykes. Cruciani's finding that E-V13 was present in 85% of western European males who also were tested positive for E-M78 suggested that E3b1a-M78 could be used as a proxy for E-V13 in most cases, with the caveat that approximately 15% of E3b1a-M78 haplotypes would be from subclades other than E3b1a2-V13. The geographic distribution of E-V13 could therefore be assumed, to a first approximation, to be very similar to that of E-M78.

With the six main subclades of E-M78 separated into their component parts, according to Cruciani (2007) it appeared that the frequency distribution of E-V13 was centered in the region of Albania. The distribution, based upon data of Cruciani (2007, Fig. 2D), is presented in **Figure 7**. Peričić et al. (2005) also examined the distribution of haplogroups in the same region of southeastern Europe with some differences in populations sampled.

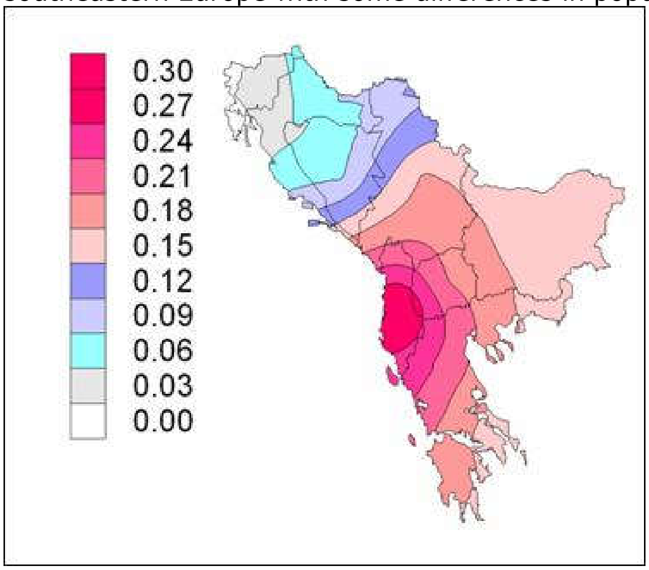


Figure 7. E-V13 Frequency, Balkan Region, after Cruciani et al. 2007, Fig. 2D.

The E-M78α cluster of E3b1 was found to be identified closely with the southern Balkans, in particular the regions of the former Yugoslav Republics of Macedonia, Kosovo, and Serbia.[20] Frequencies of E3b1α were highest in Kosovo, Macedonia, and Greece, with variance peaking in Macedonia and Greece. A higher frequency of E3b1α in the Vardar-Morava-Danube river system (Serbia, Kosovo, and Macedonia) was noted when compared to the neighboring Adriatic-Dinaric complex (Croatia, Bosnia and Herzegovinia). Because Cruciani did not include any haplotypes from Kosovo, the resulting E-V13 frequency contour may not have reflected the actual location of the region's peak frequency of E3b1α accurately.[21]

Figure 8 shows the distribution of E-V13 in the Balkans with the two data sets combined and averaged, and with Kosovo treated as a distinct region from Serbia and Albania. When the E3b1a-M78 data from the two studies (**Figure 9**) were combined, averaged and compared with the combined and averaged E-V13 data, the resulting (Kriging-based) contour maps were nearly identical. This phylogeographic coherence tended to confirm that, for European populations, E3b1a-M78 could be treated as a close proxy for E-V13. The inclusion of the Kosovo data from Peričić (2005) was significant because it relocated the geographic center of E3b1a2's frequency distribution from Albania (**Figure 9**) to a point between Peć and Priština, approximately 170 km to the northeast, in the center of the former Roman province of *Moesia Superior* (Upper Moesia); see **Figure 10**.

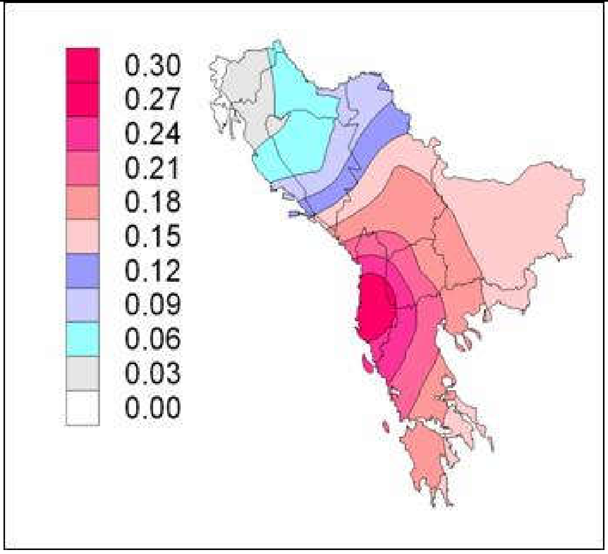


Figure 7. E-V13 Frequency, Balkan Region, after Cruciani et al. 2007, Fig. 2D.

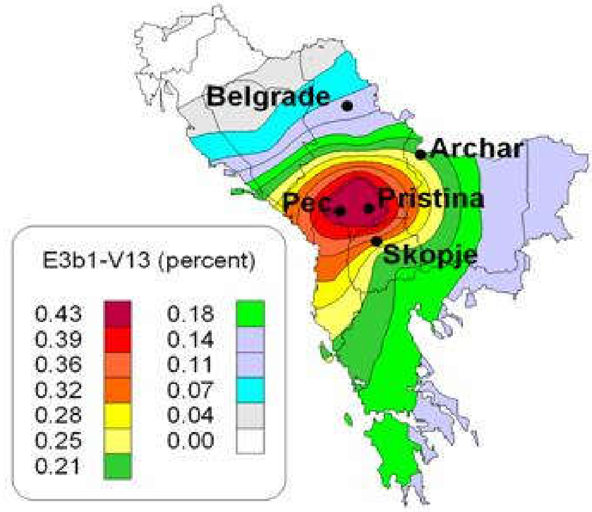


Figure 8. E-V13 Frequency Contour (Kriging Method), Southern Balkans.

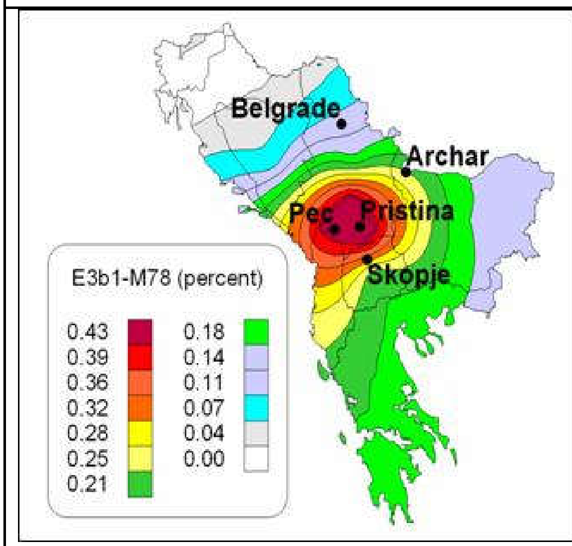


Figure 9. E-M78 Frequency Contour (Kriging Method), Southern Balkans.

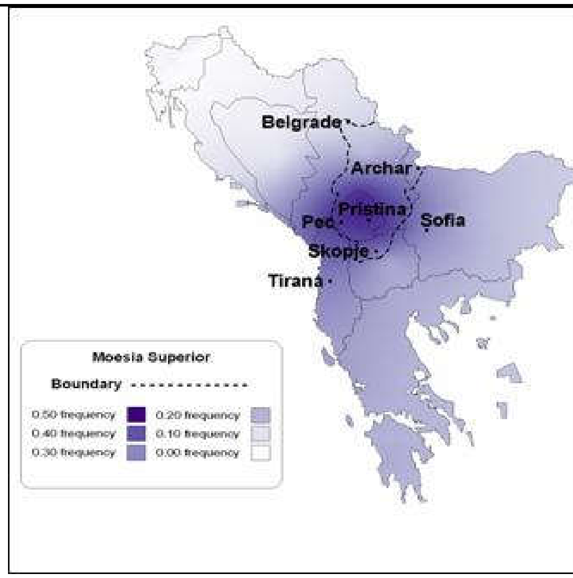


Figure 10. Boundary of Upper Moesia (after Mócsy, 1974) with E-V13 Frequency Gradient.

Moesia Superior was roughly rectangular in shape, with the Danube River forming a northern border between it and the ancient kingdom (and later, Roman Province) of *Dacia* (Mócsy, 1974, Fig. 60). The *Moesi*, a tribe for whom the province of *Moesia* was named, were conquered by Marcus Licinius Crassus in 29 BCE (Cary, 1917). The neighboring region of *Dardania* was subsequently conquered in 28 (Mócsy, 1974, p. 24). This Thracian-speaking region included the cities of *Scupi* (Skopje) and the Roman colonia of *Ulpianum* (immediately south of the modern city of Priština). The Roman province of Moesia was created out of these combined areas in CE 6 by Augustus. Domitian reorganized the province in CE 86 into M*oesia Superior* and *Moesia Inferior* (known also as *Ripa Thracia*).[22] With regard to the tribal identity of the natives of Upper Moesia, Mócsy (1974) has stated, based largely on archaeological evidence:

> *. . . a general conclusion may be permitted, that the original inhabitants of Moesia Superior were in the main Thracian, but had been exposed to Illyrian influence from the west, with the result that the Dardanian area in particular emerges as the contact zone between the Illyrian and Thracian languages. The inhabitants of Scupi probably spoke Thracian, as a Roman soldier born there in the third century considered himself a Bessus. In late antiquity Bessus was the normal term applied to Thracian-speaking inhabitants of the empire; the lingua Bessica was Thracian.*

The Dacian kingdom, immediately north of the Danube and Moesia Superior, was conquered partially by Trajan in CE 106, with the region conquered becoming the Roman province of *Dacia Traiana*. "Dacian" was a Roman ethnic label; previously known to the Greeks as the *Getae,* Wilcox (1982), Hoddinott (1981), and Webber (2001) have all identified the Geto-Dacians as people of proto-Thracian descent and relationship. Because of later difficulties with the Goths, Rome was forced to abandon *Dacia Traiana* and withdraw south of the Danube after CE 270, relocating many Romanized Geto-Dacians in the process. The region (within Upper Moesia) that was settled by these expatriate Dacians became known as *Dacia Aureliani*. Upper Moesia was reorganized further by Diocletian (after 284) into smaller provinces, being further divided into *Dardania, Moesia Prima, Dacia Ripensis* and *Dacia Mediterranea*. The administrative capital of Dacia Mediterranea was *Serdica* (Sofia, Bulgaria) (Mócsy, 1974, p. 275), and Dardania´s capital was *Naissus* (Niš, Serbia). "Dacians" (as a Roman-identified ethnic group) therefore presented special problems of identification, since the location of their homeland shifted over time.

The Russian linguist Georgiev (1960) stated that the modern Albanian people were descended from Daco-Mysian ancestors, who had occupied ancient homelands in western Dacia (north of the Danube) and Moesia Superior (south of the Danube). This conclusion, based on linguistic evidence and analysis, was in good agreement with the Y-DNA genetic evidence published by Perečić (2005) and Cruciani (2007) for the relevant regions of Southeastern Europe.[23] Georgiev (1960) also stated that the modern Albanian language was most closely related to modern Romanian, and that both were linguistic descendants of Daco-Mysian.[24] According to Georgiev, "Romanian represents a completely Romanised Daco-Mysian and Albanian a semi-Romanised Daco-Mysian [language]." These archaeological, historical and linguistic findings support the view that Thracians, Getae, Dacians, and Moesians (Mysians) were derived from a common, earlier proto-Thracian culture.

Thracian soldiers in Roman Britain

Epigraphic evidence for the presence of individual Thracian soldiers, as well as for Thracian military units of the Roman army, is found in several locations in Britain. Jarrett (1969) traced the probable careers and locations of thirty-seven separate Thracian units in the Roman military, ranging from the provinces of Syria to Britannia. He noted the difficulty of determining exactly how many Thracian units were formed in total, because of the Roman military's unmethodical habit of naming many of the newly raised units the *cohors I Thracum* (First Thracian Cohort), regardless of how many of these units with the same name had existed previously. These Thracian cohorts initially were raised for service (probably) in Germany; some later were assigned to service in Britain. The *cohors I Thracum eq.* (mounted cohort of Thracian cavalry), is recorded on a tombstone in Cologne from the first century; this unit had moved to Britain by 122 and was still there under Severus (r. 193-211). The *cohors II Thracum* moved from Germany to Britain between the mid-first century and CE 103, perhaps as a result of the Bouddican revolt. Only one seventh cohort is known, the *cohors VII Thracum.* It was attested in Britain in 122 and 135 and in *Brittania Inferior* (corresponding to northern England, with its capital at York) in the third century. Among the *alae* ("wings" of cavalry), the *ala I Thracum* was attested in Britain in 103 and 124; tombstones from Colchester (about CE 45) and Cirencester (CE 62) attest to the unit's presence in Britain in the mid-first century and an engraved *trulla* (washbasin or ladle), possibly Flavian, places the unit in *Isca Silurum* (Caerleon, Gwent) in the late 1st century.[25] The unit was moved to lower Germany (*Germania inferior*) by the mid-second century and was still there in 219 (Jarrett, 1969, p 218).

Sources for these attestations include bronze military *diplomata* (documents issued to retiring soldiers) and epigraphic inscriptions, typically tombstones or dedications. The *diplomata*, which functioned as retirement papers, also granted Roman citizenship to retiring soldiers after twenty-five years of service. An example, found in 1812 near Malpas, Cheshire and now in the British Museum,[26] is typical. The diploma was issued to Reburrus, son of Severus, the Spaniard. It mentions Balkan units specifically, serving in Britain at the time of the diploma's issuance on 19 January 103.

The inscription is translated (Collingwood, 1990) as follows:

> *The Emperor Caesar Nerva Traianus Augustus, conqueror of Germany, conqueror of Dacia, son of the deified Nerva, pontifex maximus, in his seventh year of tribunician power, four times acclaimed Imperator, five times consul, father of his country, has granted to the cavalrymen and infantrymen who are serving in four alae and eleven cohorts called: (1)* ***{ala} I Thracum*** *and (2)* ***I Pannoniorum Tampiana*** *and (3) Gallorum Sebosiana and (4) Hispanorum Vettonum, Roman citizens; and (I) {cohor} I Hispanorum and (2) I Vangionum, a thousand strong, and (3) I Alpinorum and (4) I Morinorum and (5) I Cugernorum and (6) I Baetasiorum and (7) I Tungrorum, a thousand strong, and (8)* ***II Thracum*** *and (9) III Bracaraugustanorum and (10) III Lingonum and (11)* ***IIII Delmatarum****, and are stationed in Britain under Lucius Neratius Marcellus, who have served twenty-five or more years, whose names are written below, citizenship for themselves, their children and descendants, and the right of legal marriage with the wives they had when citizenship was granted to them, or, if any were unmarried, with those they later marry, but only a single one each. {Dated} 19 January, in the consulships of Manius Laberius Maximus and Quintus Glitius Atilius Agricola, both for the second time [CE 103]. To Reburrus, son of Severus, from Spain, decurion of ala I Pannoniorum Tampiana, commanded by Gaius Valerius Celsus. Copied and checked from the bronze tablet set up at Rome on the wall behind the temple of the deified Augustus, near [the statue of] Minerva. [Witnessed by]: Quintus Pompeius Homerus; Gaius Papius Eusebes; Titus Flavius Secundus; Publius Caulius Vitalis; Gaius Vettienus Modestus; Publius Atinius Hedonicus; Tiberius Claudius Menander.* [N.B. Boldface mine, for emphasis—SCB]

Among the units listed in this document, several can be identified with regions found to be high in frequency for E3b1a2. The *ala I Thracum* (First Wing of Thracian Cavalry) and the *cohors II Thracum* (Second Thracian Infantry) would have had members from the regions containing Thracian tribes, including the Roman provinces of Thracia and Moesia. The Pannonian and Dalmatian units, *ala I Pannoniorum Tampiana,* and the *cohors IIII Delmatarum* (Fourth Dalmatian Infantry) may have had some E3b1a2 members from the Balkan peninsula also, although clearly Reburrus himself (for whom this particular diploma was issued) or his father was “from Spain.”

Cheshire and Northern Wales

Frere et al., have stated that “less than 20% of diploma recipients moved out of the province in which they had served upon retirement.”[27] It is evident from the wording of the Malpas diploma that many of the soldiers must have had wives and children, who stood to gain rights as citizens upon the soldiers’ retirement. The fact that this bronze plaque was found barely twenty miles (32 km) from the major fortress at *Deva* (now Chester, Cheshire), not far from the Roman Road and very close to the minor Roman settlement of *Bovium* (now Tilston, Cheshire) would tend to suggest that Reburrus settled in the immediate vicinity following his retirement. Presumably, soldiers from retiring Thracian, Dalmatian or Pannonian units, all of which were likely to have had members whose haplotype was E3b1a2, would have done the same.

Another diploma, which was discovered in Middlewich, Cheshire in 1939, was dated to approximately CE 105. It had been issued to a member of the *ala Gallorum et Thracum Classiana civium Romanorum* ("Classian [cavalry] wing of Gauls and Thracians [who are] Roman Citizens") Because of the wording, which differed somewhat from the standard diploma formula, the editors of the RIB suggested that the diploma was issued to a serving soldier, rather than a retiring one. The diploma provides only a fragment of the soldier’s name, viz. “…us, son of Rammio from…” and it is also unusual in naming his wife, “Amabilis, daughter of Firmus.”[28] The identification of the Thracian members of this particular cavalry unit as Roman citizens is significant (Collingwood, 1965, p. 174).

Aside from the Malpas and Middlewich diplomas, a considerable amount of epigraphic evidence has been identified linking Roman soldiers who were buried in Deva specifically to the Roman provinces of Thracia and Moesia, including in some cases place names of origin within these provinces for these soldiers (Carrington, 2006). Four individuals from the *Legio II Adiutrix* were identified by Carrington (2006) from burial markers as having originated in *Aprus* (now Apri, in Turkish Thrace) and were associated with the Roman fortress at Deva in the period from CE 71 to circa 86. There is also evidence of soldiers of Thracian origin who were members of the *XX Legio VV* (“Twentieth Legion Valeria Victrix”) settling in or near the Roman fortress of Deva (now Chester, Cheshire), presumably upon retirement (Carrington, 2006). A third century grave marker depicts a soldier from the XX Legio VV and his spouse, identifying him as being “Bessus” (of the tribe of the Bessi).[29] This stone is depicted in *The Roman Inscriptions of Britain* ("RIB") entry no. 523 (Collingwood, 1965, p. 174). The find is significant because it provides direct epigraphic proof of a married Thracian soldier who lived (and died) in Deva during the third century.[30] The description from the RIB is as follows:

> *523. Tombstone, 25 X 46 in., broken across the stool and also above the inscription. Donatus reclines on a couch, and holds in his left hand a scroll, probably his will, and in his right a cup. On the left his wife reclines behind him. Found in 1887 in the North Wall (east part). Now in the Grosvenor Museum. Drawn by R. P. W., 1947.*
>
> *[Inscription]: D(is) M(anibus) | C(a)ecilius Donatus B | essus na | tione mili | tauit ann | os XXVI uix | it annos XXXX.*
>
> *To the spirits of the departed, Caecilius Donatus, a Bessian tribesman, served 26 years and lived 40 years.*
>
> *The Bessi were a Thracian tribe. Since Donatus given no praenomen, tribe, or father’s names and uses the spelling Cecilius (for Caecilius), and as a legionary was recruited from a tribal area and not from a town, a third-century date seems certain.*

Mócsy (viz., quotation above) identified a third century tombstone in which a soldier from Scupi (Skopje, Macedonia) called himself a "Bessus."[31] Another marker from Deva, naming "M. Ulpius Ianuarius" from “Ulpia Traiana,” may possibly be that of a Dacian soldier and is dated by Carrington to the period from 117 to 193. Some ambiguity necessarily must be present in this case because of the existence of two Roman *colonia* with the same name, the first at the site of the ancient Dacian capital of *Sarmizegetusa*, and the second on the Rhine river at the site of the modern city of Xanten, Germany. Considering the period of identification, which coincides with the posting of the *cohors Primae Dacorum* (First Dacian Cohort) to Birdoswald, on Hadrian’s Wall (a site also associated with the XX Legio VV, Chester’s main military unit), a Dacian attribution is possible but not certain.

Carrington (2006, p. 12) also addressed the evidence for the Chester *canabae* (civilian settlements), including marriages between Roman soldiers and local women, the legal positions of the soldier, his wife and their offspring with regard to Roman citizenship and inheritance, and the most probable period of settlement:

> *The first half of the third century is the period when one would expect family-formation at Chester to have been at its strongest, given that the [XX] legion was fairly static in its home base, local recruitment was supposedly increasing and the legal impediments to soldiers’ marriage seen to have been removed . . . . Hadrian eventually allowed the illegitimate children of soldiers into the ranks of intestate heirs. Soldiers could legitimize their marriages on discharge, although any*

children born during service remained illegitimate. Nevertheless, if their mothers were Roman citizens, these children would still be citizens.

Archaeological evidence for Roman settlement in northern Wales is also compelling. A. H. A. Hogg (1965, p. 28) identified over a hundred examples of homesteads of "distinctive character" preserved in northwest Wales:[32]

They are associated, also, with terraced fields which have resisted destruction even more strongly than the homesteads themselves. Further, sufficient sites have been excavated to justify the presumption that the majority, if not all, are of the Roman period.

Hogg (1965, p. 33) hypothesized that these homesteads associated with the terraced fields were, in all likelihood, of early third century Roman origin and stated that:

. . . some proportion of the enclosed homesteads represent officially encouraged new settlement superimposed on relatively sparse occupation which had persisted from before the Roman conquest, possibly enfeebled by punitive measures.

He estimated the Romano-British population of the region at 4000, plus another 500 soldiers stationed at *Segontium* (Caernarfon, Gwynedd). In northeast Wales, the settlement of *Dinorben* (1.8 miles [2.9 km] southeast of Abergele, Clwyd), which was established by the Romans at the site of an earlier, abandoned Iron Age fortress, was seen as significant by Hogg. Dinorben appeared to have been a villa-styled settlement, dated soon after the middle of the 3^{rd} century, with the main part of the work being done by a force of laborers (Hogg, 1965, p. 31). The third century date coincidence is striking, corresponding to the period of greatest family growth in Deva, as identified by Carrington (2006). Dinorben was identified by J. L. Davies (1977, p. 257) as "the only Welsh hillfort to produce items of undoubted Roman military equipment."

Abergele was discovered by Weale (2002) to have the highest percentage of E3b in Britain, at nearly 39% of a very small sample of 18 haplotypes. Oppenheimer (2006, p. 232) seized upon this evidence to advance a theory of a "Bronze age Spanish mining colony in north Wales" at Abergele, based upon the discovery (in 1997) of a BA copper mine at Pentwyrn (Great Ormes Head),[33] twelve miles (19 km) distant from Abergele. The area around the Pentwyrn site was believed to have been occupied during the upper Paleolithic, Mesolithic, Neolithic, Bronze Age and Iron Age periods. There is archaeological evidence, however, to indicate that the individuals who worked the mine in the pre-Roman eras actually may have lived nearby at the Lloches yr Afr rock shelter, within 200 meters of the mine site itself.

Southeastern Britain

In addition to the tight clustering of E3b1a-M78 haplotypes in Wales and Northern England (Chester to Nottingham), another significant cluster of E3b1a-M78 appears to follow the coastline of the North Sea and the English Channel from Fakenham, Norfolk to Midhurst, Sussex (see **Figure 6**). It could be argued reasonably that the substantial presence of E3b1a-M78 in a region contained entirely within the early medieval kingdom of East Anglia (corresponding today to the modern counties of Norfolk and Suffolk) might provide evidence for the introduction of this subclade by the incursion of the Anglo-Saxon population itself from mainland Europe. The absence of E3b1a-M78 in the "Central England" region, however (also controlled by the Anglians) would appear to refute this proposition.[34]

More significant may be the close geographic proximity of some of these E3b1a-M78 haplotypes to the Roman fortresses and settlements known collectively as the "Forts of the Saxon Shore," especially in Norfolk. The origins, purposes, and functions of the Saxon Shore forts remain a matter of intense debate among archaeologists, but all competing theories acknowledge that the shore forts were associated directly with the late Roman military in Britain.

In *Rome's Saxon Shore* Fields (2006, p. 38) stated that under Severus Alexander (r. 222-235) it was thought advisable to withdraw troops from the northern frontier (i.e., Hadrian's Wall) and place them in new forts built at *Branoduno* (Brancaster), Caister-on-Sea, and *Regulbium* (Reculver). Epigraphic evidence of the Saxon Shore is essentially nonexistent, with Wilkes (1977, pp. 76-80) referring to the problem as an "argumentum ex silentio." Thracian and Dacian cohorts stationed at Birdoswald on Hadrian's Wall were well-attested epigraphically, however, from 205[35] to at least 276.[36] This period overlaps with the reign of Severus and the decision to relocate Roman troops from the Wall to the Shore Forts.

Through aerial photography, it has been determined that most of these forts had small, non-military settlements (*vici)* adjacent to them, with the most extensive being at *Branodunum* (Brancaster) (Fields, 2006, p. 51). From the third century onward soldiers were permitted to have their families stationed with them (Fields, 2006, p. 48). Moreover, the presence of Roman soldiers, originating from the Balkans, in the forts of the Saxon Shore, provides a robust explanation for the presence of E3b1-M78 in East Anglia and Essex.

Branodunum was the permanent base of the *Equites Dalmatae Branodunenses* (Dalmatian Horsemen of Branodunum). Likewise, the *cuneus equitum Dal-matarum Fortensium* (Formation of Brave Dalmatian Horsemen) were stationed at

Bradwell, Essex (*Othona*) (Fields, 2006). The Roman province of *Dalmatia* corresponds geographically with the southwestern part of modern Croatia and Bosnia-Herzegovina, a region found by Peričić (2005) and Marjanovic (2005) to have significant levels of E3b1α present, ranging from 5.6% among mainland Croatians up to 19% among ethnic Serbs. Therefore it is possible, even probable, that these units recruited from Dalmatia would have had substantial numbers of members who were E3b1a2. See **Figure 11**.

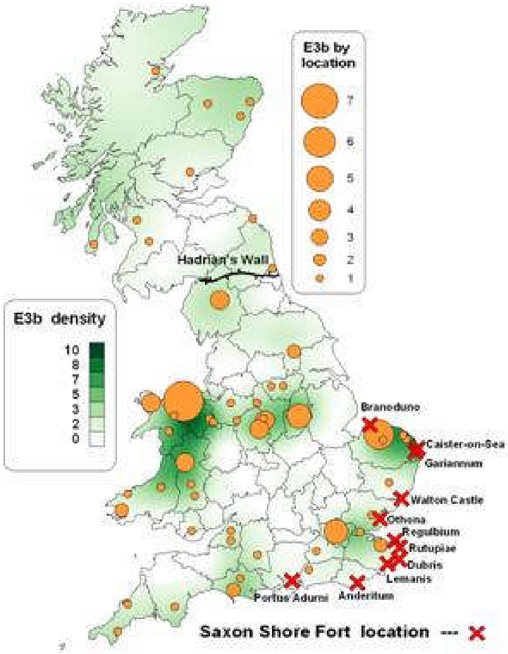


Figure 11. "Saxon Shore" Fort Locations, E3b Haplotype Locations (from Figure 4) and E3b (Kriging Method) Gradient.

There also is substantial archaeological evidence for dense settlement by the Romano-British in the region known today as Essex County. An unequivocal Thracian identification for an individual from first-century Essex can be made for the subject of the very well-preserved Roman burial tombstone of *Longinus Sdapeze* of *Serdica,* held presently in the Colchester Museum.[37] The stone is Bath oolite and the workmanship is of very high quality. Its outstanding condition is attributable to its burial, face-down for nearly 1900 years, from sometime after CE 45 until 1928.[38] The find site was located in Colchester, "on the south side of a Roman road running from north-west to south-east to cross the south-westward Roman road from the Balkerne Gate. The site is 800 yds. south-west of the Gate, 80 yds. south of Lexden Road, and 30 yds. west of Beverly Road."[39] The inscription reads:

Longinus Sdapeze | *matygi f(ilius) duplicarius* |
ala prima Tracum pago |
Sardi(ca) anno(rum) XL aeror(um) XV |
heredes exs testam(ento) [f(aciendum)] c(urauerunt |
h(ic) s(itus) e(st)

The translation in the RIB has some difficulties with the last name of Longinus, identifying it (probably in error) as "Sdapezematygus," but also acknowledging that Die Thrakische Sprachreste (Vienna, 1957) made Sdape a name separate from Zematygus. A more recent interpretation offers the division of the name as "Longinus Sdapeze, son of Matygus," a reading that follows the original inscription's division.[40]

Following this, the translation becomes:

Longinus Sdapeze, son of Matygus, duplicaris from the First Cavalry Regiment of Thracians, from the district of Sardica [Serdica], age 40, of 15 years' service. His heirs under his will had this set up. He lies here.

Notwithstanding the apparent difficulties of the father's and son's names, there is a considerable amount of information to be gleaned from this stone. Longinus was from the region ("pago") surrounding Serdica (now Sofia, Bulgaria). He was an officer ("duplicaris," that is, one who received double pay, presumably for some administrative duty), he had served fifteen years and he died at about age 40. Although he had heirs, it is not clear from the evidence if the heirs were his offspring or simply his comrades in arms.

The figure depicted on the stone is interesting, with obvious similarities to the Thracian "Hero" religious icon described at length by R. F. Hoddinott (1981, pp. 179-185) in his landmark archaeological treatise, The Thracians. The RIB described the stone figure as follows:

> *The cavalryman . . . is in scale-armour, with oval shield on left arm, and is riding to the right on a richly caparisoned horse, beneath whose belly crouches a naked barbarian with his left hand holding his shield under him. In the right hand of the cavalryman there is a dowel-hole, presumably once filled by a metal weapon* [N.B., probably a lance; see the description for the stone of Rufus Sita, below].

The mounted Thracian "Hero" figure was a common theme for tombstones from Thracian units, though not always associated exclusively with ethnic Thracian soldiers.

Dark (2002, pp. 97-100) has theorized that sub-Roman Essex may have survived intact until the sixth century and that the civilian authority may have transitioned smoothly from sub-Roman to Saxon authority without any evidence of struggle or the displacement of the local Romano-British population. Drury and Rodwell (1980, p. 71) have provided similar evidence for the survival of sub-Roman Essex well into the Anglo-Saxon period. At Rivenhall, two large domestic buildings and an aisled barn were modified during the 4th, 5th and 6th centuries, "to suit the needs of the agriculturally-based estate . . . there is good reason at least to ask whether Roman estates did not gradually transmute into Domesday *vills*."

The authors also stated (Drury, 1980, pp. 71-74):

> *With the exception of a small number of early Saxon settlements founded in the coastal areas of Essex, of which Mucking is the best known, it has become clear that there cannot have been any great influxes of Germanic immigrants in the 5th and 6th centuries, comparable to those of East Anglia or east Kent. This is not to say that folk of Germanic origin were not present in the hinterland of Essex: . . . . artifact finds suggest that they were, but in limited numbers, living in controlled circumstances on 'Roman' settlements. How such controlled settlement was instituted and maintained is perhaps beyond the reach of archaeology, but the clues to its initial phases should doubtless be sought in the Saxon short fort at Bradwell-on-Sea and the walled towns of Colchester and Great Chesterford… it can hardly be coincidence that every 5th century Anglo-Saxon site—settlement or cemetery—is directly associated with one of late Roman date . . . .*

This position was echoed by Bassett (1989, p. 25), who stated:

> *Elsewhere there may have been a takeover (by new immigrants or by a settled community nearby) of a former Romano-British town and its immediate hinterland... A good example is provided by the small walled Roman town at Great Chesterford on the north-western border of the county of Essex. Its cemeteries appear to show a peaceful fusion of the town's latest Roman population and a group of Germanic newcomers, many of them perhaps mercenaries.*

Peterson (2004, Fig. 3, p. 66) has described evidence of several Roman *cadastres* or "centuriations" in southeastern Britain. A cadastre was a system of land administration often based on a square survey grid. The known area of the cadastre identified, primarily in Essex County, extended from the northern bank of the Thames to the Essex-Cambridgeshire border, west to east from the Colne river in Middlesex to an area east of Wickford, Essex. The Roman city of *Caesaromagus* (Chelmsford) was in the eastern part of this grid, Saffron Walden and Bishop's Stortford are to the north, and Great Wymondley is to the northwest.

The area north of Saffron Walden and east of the Roman fort at Great Chesterford included several villas and the largest group of Roman burial tumuli in western Europe, located at Bartlow, just over the Cambridgeshire border from Essex (Bassett, 1982, pp. 2-12). These barrows originally numbered nine, and are the largest group of such burial mounds west of the Alps. Liversidge (1968, pp. 495-499) identified several Roman objects taken from these burial tumuli and noted, among other objects, a coin of Hadrian (r. CE 117-138) lying on top of the remains of one cremation that was placed in a glass jug.

An illustration from 1845 by Knight (1845, Fig. 21, No. 18) provided an interior view of the largest of the tumuli, a sketch of the burial gallery of tumulus no. 3, accessed from the exterior originally by a hallway-like passage. In *The Thracians*, Hoddinott (1981, pp. 119-121, 124-126) described earthen burial tumuli very similar in appearance to the Bartlow tumuli, complete with hallways and burial galleries, throughout ancient Thracia. The Bartlow tumuli are also similar in appearance to a line of Roman barrows found in Belgium lying along a section of the main road from Cologne to Boulogne which was built for the invasion of Britain, between Bavai and Tongres (Liversidge, 1968, p. 498). Some of the artifacts found in the Bartlow mounds were believed to have been imported from the Rhineland.

The tumuli (originally in County Essex) may have been associated with a large villa about one mile (1.6 km) away, near Linton, Cambridgeshire (Liversidge, 1968, p. 498). This Roman corridor villa located on the south bank of the Greta river, in the extreme northern end of Hadstock parish and on the Essex/Cambridgeshire border, was first discovered in 1826. Coin finds extend from Hadrian to Constantine III, suggesting that the villa was occupied continuously from the late first century until at least the end of the Romano-British period in 410 (SEAX Index).

Southwestern Britain

Charles Thomas (1966, pp. 74-98) has commented on the difficulty of archaeological research in *Dumnonia* (Cornwall and Devon) and that due to the material poverty of the region, both in the pre-Roman and Roman eras, few artifacts have been recovered. He identified the Roman fort of *Durocornavis* at the (modern) location called "The Rump," fifteen miles (24 km) southwest from Tintagel, near Polzeath, Cornwall; additional Roman settlements were identified at Exeter, Seaton, Topsham and Plymouth.

The tombstone of Rufus Sita, very similar to that of Longinus Sdapeze, is described in RIB 121. It was found in 1824 in Wotton, about 0.75 miles (1.2 km) ENE of the north gate of the Colonia Nervia Glevensium, and is now in the Gloucester City Museum. The inscription reads:

> *Rufus Sita eques c(o)ho(rtis) VI*
> *Tracum ann(orum) XL stip(endiorum) XXII*
> *heredes exs test(amento) f(aciendum) curaue(runt)*
> *h(ic) s(itus) e(st)*

Translated:

> *Rufus Sita, trooper of the Sixth Cohort of Thracians, aged 40, of 22 years' service. His heirs had this erected according to the terms of his will. He lies here.* **[41]**

The editors of the RIB speculated that the last name *Sita* may have derived from *Sitas*, a king of "Thrace" in 29 BCE, who was of the Denethali tribe. This identification is tenuous at best, however. The stone features the Thracian "Hero" theme, complete with a lance in the right hand of the figure, who is striking down a prostrate enemy, carrying a short sword in his right hand. The similarities to the tombstone of Longinus Sdapeze of Colchester, and to the Thracian "Hero" iconography, are obvious.

Durnovaria (Dorchester) was a major Roman settlement featuring a high level of cultural sophistication. A Roman town house there was excavated in 2000; evidence of continuous construction from the first to the fourth centuries was evident. Coin finds indicated continuous occupation of the site until at least the fifth century.[42] The location of Durnovaria corresponds geographically to the higher E3b frequency, shown in **Figures 5 and 6**, at Dorchester.

Scotland

It may be seen from **Tables 1 and 2**, and from **Figures 3-6**, that E3b1a-M78 is present in Scotland, but at a less concentrated level than found in England or Wales. It is possibly significant that Capelli did not find any E3b present in Scotland; all data samples appearing north of Hadrian's Wall were from the OGAP study[43] (See **Figure 11**). The sample sizes for certain regions of Scotland, however, especially Argyll, Tayside & Fife, Borders, and Highland are probably too small to allow any generalizations for such a large geographic area. The appearance of one E3b haplotype, from a sample of only nineteen haplotypes gathered in Argyll, is especially problematic and is very similar to the difficulty with Abergele's small data set.

Nevertheless, the Romans were not absent from Scotland. It is perhaps significant that all of the haplotypes located north of Hadrian's Wall were estimated to be E3b1a-M78. Curle (1911, pp. 341-342) has identified and discussed Roman artifacts associated with the Roman fort in Newstead. Coin finds totaling 260 from that site indicated occupation from approximately the reign of Vespasian to that of Commodus, or from around CE 80 to 180. The latest date to which occupation of Newstead could be assigned was CE 210 (Dark, 2002, pp. 209-11).

Dark (2002, pp. 202-207) has identified a Romano-British style settlement associated with the kingdom of Strathclyde, very near the location of the western Scottish haplotypes, appearing in Fig. 4. Some evidence of Roman-style settlement also exists in the regions surrounding modern Edinburgh. There simply is not yet enough data concerning E3b's presence in Scotland to permit any definite conclusions to be drawn, other than to say generally that E3b appears to be rarer north of Hadrian's Wall than south.

Summary

The coalescence age (TMRCA) of E-V13, as calculated by Cruciani, et al. (2007), has placed the expansion of this haplogroup from the Balkan peninsula into the remainder of Europe no earlier than 5.3 kya. If correct, E3b1a2 could not have been involved in the Neolithic settlement of Britain. Another difficulty with the Neolithic, Bronze Age and Iron Age scenarios for E3b (and J) is the almost complete absence of those haplogroups from Ireland, suggesting that they arrived as part of a migration that did not itself have any significant impact on Ireland's Y-DNA admixture. One such large-scale migration is known from history; the Roman occupation, which never reached Ireland in the form of permanent settlements.

The E-M78 cluster E3b1α (phylogenetically equivalent to E-V13) was found by Peričić (2005) to be at its highest frequency worldwide in the geographic region corresponding to the Roman province of *Moesia Superior*, a region that encompasses Kosovo, southern Serbia, northern Macedonia and extreme northwestern Bulgaria today. The Roman invasion of CE 43, and the subsequent occupation and settlement of Britain for nearly four centuries by the Roman military, brought thousands of soldiers from the Balkan peninsula to Britain as part of auxiliary units and, at least in some cases, as regular legionnaires. By no later than the mid-third century, retired Thracian soldiers and their families were living in Deva (Chester); archaeological evidence indicates also that the Northern Wales/Cheshire region was heavily settled by the Romano-British during the same period (third century), a region containing the highest frequency of E3b1a-M78 haplotypes found in Britain today.

With E-M78 treated as a close approximation (85%) for the presence of E-V13, the geographic association between the locations of E3b1a-M78 haplotypes and the "Saxon Shore Forts" in southeastern Britain (especially in Norfolk) may be significant, suggesting a possible link between the *vicus* populations of these forts and the current distribution of these haplotypes. Similarly, the dense settlement and long survival of sub-Roman Essex may be linked to the present distribution of E3b1-M78 in southeastern Britain. Additional genetic surveys of this important region of Roman Britain, an area not sampled by Capelli et al. in the 2003 study, may help to clarify the situation.

The lower density of E3b haplotypes north of Hadrian's Wall may be explained by the more limited Roman presence in that region, encompassing a period of approximately 100 years, rather than the 400+ years of Romano-British and sub-Roman society south of the Wall. There is some indication of substantial Roman- and sub-Roman-style settlement in Strathclyde and near Edinburgh. Limitations in the size of the data sets for large portions of Scotland (both Capelli and Sykes) prevent any firm conclusions from being made at this time. A more thorough survey of Scotland (especially those regions underserved by the two existing large-scale studies) may help to clarify the extent to which E3b is present in Scotland.

There appears to be less doubt, after three published genetic surveys (Weale, 2002; Capelli, 2003; Sykes, 2006), that the "Central England" E3b void is not an accidental artifact of population sampling bias, but rather reflects a genuine population replacement. The "E3b hole" suggests that either (a) a massive displacement of the native Romano-British population by invasion or, (b) the substantial genetic replacement of Romano-British Y-DNA through an elite dominance ("apartheid") model (Thomas, 2006), has occurred in Central England. Regardless of the mechanism, the Central England region of Britain, with its lack of E3b haplotypes, is the area having the most "striking similarity in the distribution of Y-chromosomes" with Friesland (Thomas, 2006). North Wales, where E3b1-M78 is found at its highest frequency, is identified specifically by the same study as having the highest genetic dissimilarity with "Central England" (Thomas, 2006). For these reasons, it is hypothesized that the early Anglo-Saxon ruling elite in this region may have been responsible for the replacement of the Romano-British male genetic admixture in central England by a process or processes that led to the almost complete removal of E3b (any subclade) from this geographic region.

Some relevant questions that must await better and more complete genetic sampling of E3b1a2 haplotypes in Britain and western Europe include: (a) whether E-M78 (putatively E-V13) haplotypes from the Northern Wales/Cheshire geographic cluster and from the southeastern England cluster are in fact from the same population, originating in the Balkan peninsula, or whether their arrival times and migration routes are substantially different; (b) what role (if any) J2-M12 has had in the Roman occupation and settlement of Britain; and, (c) could any E3b haplotypes located in the Rhine river region also have been the result of settlement and military occupation of *Germania Inferior* by soldiers of Balkan origin?

It is hoped that a large-scale genetic survey of all of Britain may be undertaken in the near future, perhaps following the excellent model of the Smurfit Institute's studies of Ireland, especially in their use of more extended haplotypes. The availability and use of the newly identified "V series" SNP tests (based on the UEPs identified by Cruciani et al., 2007) also may help to clarify greatly the role that E3b1a2 has played in the formation of the modern British people.

Acknowledgement

I wish to thank Mr. Larry Jones, Esq., for his very helpful insights and commentary while this manuscript was in preparation. Any content, opinions or conclusions expressed, when not attributed directly to the relevant source, are my own.

Electronic-Database Information

https://home.comcast.net/~hapest5/index.html
Haplogroup Predictor Program

http://www.familytreedna.com/public/E3b/
Haplogroup E3b Project

http://www.goldensoftware.com
MapViewer 7, Golden Software

http://www.bloodoftheisles.net/results.html
Oxford Genetic Atlas Project (OGAP) Database

http://www.roman-britain.org/main.htm
On-line Roman Britain Resource

http://www.isogg.org/tree/index.html
ISOGG Y Haplogroup Tree

References

Alcock L (1972) The Irish Sea Zone in the Pre-Roman Iron Age, in *CBA Research Report 9.* Council for British Archaeology, London, pp. 99-112.

Ammerman AJ, Cavalli-Sforza LL (1984) *The Neolithic Transition and the Genetics of Human Populations in Europe*, Princeton University Press, Princeton, NJ.

Ammerman AJ (2006) Comment on 'Ancient DNA from the First European Farmers in 7500-year-old Neolithic Sites.' *Science*, 312:1875a.

Athey TW (2006) Haplogroup Prediction from Y-STR Values Using a Bayesian-Allele-Frequency Approach. *J Genetic Genealogy*, 2:34-39.

Bandelt H-J, Forster P, Röhl A (1999) Median-joining networks for inferring intraspecific phylogenies. *Molecular Biology and Evolution*, 16:37-48

Bassett SR, Drury PJ (1982) Saffron Walden: excavations and research 1972-80, in *CBA Research Report 45*, Chelmsford Archaeological Trust and the Council for British Archaeology, York, pp. 2-12.

Bassett S, ed (1989) *The Origins of Anglo-Saxon Kingdoms.* Leicester University Press, London.

Capelli C, et al. (2003) A Y Chromosome Census of the British Isles. *Current Biology*, 13:979–984.

Carrington P (2006) Towards a model of Roman society in Cheshire: First to third centuries AD, *Chester City Council*. http://www.chesterarchaeolsoc.org.uk/R_cheshire_model.html, http://www.chesterarchaeolsoc.org.uk/R_cheshire_bibl.html

Cary E, Foster HB, transl (1917) *Dio Cassius, Roman History, Book 51.* Harvard University Press, Boston.

Cockburn JS, King HPF, McDonnell KGT (1969). "Archaeology: The Beaker Period," in *The Victoria History of the County of Middlesex, V. 1*. London.

Collingwood RG, Wright RP (1965) *The Roman Inscriptions of Britain.* Clarendon Press, Oxford.

Collingwood RG, Frere S, Roxan MM, Tomlin R, Wright RP (1990) *The Roman Inscriptions of Britain*, *Vol. II.* Alan Sutton, Gloucester.

Cressie NAC (1990) The Origins of Kriging. *Mathematical Geology*, 22:239-252.

Cruciani F, et al (2004) Phylogeographic Analysis of Haplogroup E3b (E-M215) Y Chromosomes Reveals Multiple Migratory Events Within and Out Of Africa. *Am J Hum Genet*, 74:1014–1022.

Cruciani F, et al (2007) Tracing past human male movements in northern/eastern Africa and western Eurasia: new clues from Y-chromosomal haplogroups E-M78 and J-M12, *Molecular Biology and Evolution*, 24:1300-1311.

Cunliffe B (2004) *Facing the Ocean: The Atlantic and Its Peoples*. Oxford University Press, Oxford.

Curle J (1911) *A Roman Frontier Post and Its People: The Fort of Newstead in the Parish of Melrose.* James MacLehose and Sons, Glasgow.

Dark K (2002) *Britain and the End of the Roman Empire.* Tempus Publishing, Stroud, UK.

Davies JL (1977) Roman Arrowheads from Dinorben and the *Sagittarii* of the Roman Army. *Britannia*, v. 8, p. 257.

Davies N (1999) *The Isles.* Oxford University Press, Oxford.

de la Bédoyère G (2006) *Roman Britain.* Thames & Hudson, New York.

Drury PJ, Rodwell W (1980) “Settlement in the Late Iron Age and Roman Periods” in Buckley DG ed, *Archaeology In Essex to AD 1500, CBA Research Report No. 34.* Council for British Archaeology, York.

Encyclopedia Britannica, (1911). Moesia. V. 18, p. 644.

Fields N (2006). *Rome’s Saxon Shore: Coastal Defenses of Roman Britain, AD 250-500*. Osprey Publishing, Oxford.

Fitzpatrick AP (2003) The Amesbury Archer. *Current Archaeology*, 184:146-152.

Forster P, Harding R, Torroni A, Bandelt H-J (1996) Origin and evolution of Native American mtDNA variation: a reappraisal. *Am J Hum Genet*, 59:935-945.

Georgiev V (1960) The genesis of the Balkan Peoples. *The Slavonic and East European Review,* 44:285-297.

Hassall MWC (1977) “The historical background and military units of the Saxon Shore,” in Johnston DE, ed., *The Saxon Shore, CBA Research report No. 18*. Council for British Archaeology, York.

Hoddinott RF (1981) *The Thracians.* Thames and Hudson, New York.

Hogg AHA (1965) Native settlement in Wales, in Thomas C ed., *Rural Settlement in Roman Britain*, *CBA Research Report 7.* Council for British Archaeology, York.

ISOGG [International Society of Genetic Genealogy] (2007) Y-DNA Haplogroup Tree 2007, Version 2.06, 25 July 2007 (Accessed 30 September 2007).

Jarrett MG (1969) Thracian Units in the Roman Army. *Israel Exploration Journal*, 19:215-224.

Knight C (1845) *Old England: A Pictoral Museum*. Charles Knight and Co, London.

Liversidge Joan (1968) *Britain in the Roman Empire.* Frederick A. Praeger, New York.

Marjanovic D. et al. (2005) The peopling of modern Bosnia-Herzegovina: Y-chromosome haplogroups in the three main ethnic groups. *Ann Hum Genet*, 69:757-763.

McEvoy B, Bradley DG (2006a) Y-Chromosomes and the extent of patrilineal ancestry in Irish surnames. *Human Genetics*, 119:212-219.

McEvoy B, et al. (2006b) The scale and nature of Viking settlement in Ireland from Y-chromosome admixture analysis. *Eur J Hum Genet,* 14:1288-1294.

Mócsy, A. (1974) *Pannonia and Upper Moesia.* Routledge & Kegan Paul, London and Boston.

Moore LT, et al. (2006) A Y-chromosome signature of hegemony in Gaelic Ireland. *Am J Hum Genet*, 78:334-338.

Nilolova L, Görsdorf J (2002) New radiocarbon dates from the Balkans (Dubene-Sarovka): approach to the Early Bronze absolute chronology in Upper Thrace. *Radiocarbon*, 44:531-540.

Oppenheimer Stephen (2006) *The Origins of the British.* Carroll and Graf, New York.

Perečić M, et al. (2005) High-resolution phylogenetic analysis of Southeastern Europe traces major episodes of paternal gene flow among Slavic populations. *Molecular Biology and Evolution*, 22: 1964–1975.

Peterson J (2004) Co-axial landscapes in South Norfolk and beyond: another view, *The Annual: The Bulletin of the Norfolk Archaeological and Historical Research Group*, *No. 13.* Norfolk Archaeological & Historical Research Group, Norfolk.

Saillard J, Forster P, Lynnerup N, Bandelt H-J, Nørby S. (2000) mtDNA variation among Greenland Eskimos: the edge of the Beringian expansion. *Am J Hum Genet*, 67:718-726.

SEAX Archaeology Index, "Red Field," SMR no. 4747, Essex Record Office, Chelmsford, UK.

Semino O, et al. (2004) Origin, diffusion, and differentiation of Y-chromosome Haplogroups E and J: Inferences on the Neolithization of Europe and later migratory events in the Mediterranean area. *Am J Hum Genet*, 74:1023–1034.

Sykes BG (2006) *Blood of the Isles.* Bantam Press, London.

Thomas C (1966) The character and origins of Roman Dumnonia, in *CBA Research Report 7.* Council for British Archaeology, York, pp. 74-98.

Thomas MG, et al. (2006) Evidence for an apartheid-like social structure in early Anglo-Saxon England. *Proceedings of the Royal Society B*, 273:2651-2657.

Weale ME, et al. (2002) Y chromosome evidence for Anglo-Saxon mass migration. *Molecular Biology and Evolution,* 19:1008–1021.

Webber, C (2001) *The Thracians: 700 BC – AD 46.* Osprey Press, Wellingborough, UK.

Wilcox P (1982) *Rome's Enemies: Germanics and Dacians.* Osprey Press, Wellingborough, UK.

Wilkes JJ (1977) The Saxon Shore—British anonymity in the Roman Empire, in Johnston DE, ed *The Saxon Shore, CBA Research report No. 18*. Council for British Archaeology, York, pp.76-80.

Zhivotovsky LA, et al. (2006) Difference between evolutionarily effective and germ-line mutation rate due to stochastically varying haplogroup size. *Molecular Biology and Evolution*, 23:2268-2270.

---

[1] E3b in this and similar contexts refers to the E3b1-M35 clade and its component subclades, collectively, unless otherwise speci ed.

[2] Oppenheimer (2006), pp. 206-207.

[3] Ibid.

[4] Haplogroups corresponding to E3b-M35 and J2-M172 in the Capelli study.

Address for correspondence: stevenbird1000@hotmail.com

Received: July 1, 2007; accepted: Sept. 15, 2007.

[5] Oxford Genetic Atlas Project (OGAP) data is published online at: http://www.bloodoftheisles.net/results.html

[6] Irish data for *Blood of the Isles* was taken from studies performed by the University of Dublin, discussed below in detail. The OGAP did not survey any portion of Ireland.

[7] A current diagram of the ten E3b1a-M78 subclades may be found at: http://www.isogg.org/tree/

[8] Semino et al. (2004) treated J-M12 and J-M102 as phylogenetically equivalent, as did Peričić et al. (2005). Later work has shown that J-M102 is a subgroup of J-M12 (ISOGG, 2007).

[9] The full data set from both studies is available online at: http://www.gen.tcd.ie/molpopgen/resources.php

[10] These measures undoubtedly were used as a control to assure that the population sample gathered did not unintentionally reflect more recent, individual migration to (or within) Britain.

[11] An excellent map and discussion of Sykes' OGAP regions may be found in K Campbell (JoGG, Spring 2007, Fig. 1).

[12] The E3b1-M35 haplogroup is identified by Sykes as "Eshu."

[13] http://www.familytreedna.com/public/E3b/

[14] http://www.fluxus-engineering.com

[15] For all but a few haplotypes, the Fluxus MJ network simply clarified and confirmed the haplogroup estimate derived from the histograms and from a comparison with proved (SNP-tested) E3b haplotypes. OGAP numbers 4022, A3059 and A3165 were confirmed as E-M78 by their clustering within the MJ network. Haplotype 2745, which was estimated at first (using the histograms) as a possible E-M34, was revised to M-78 based upon its obvious clustering with three other M-78 haplotypes (A2243, A2950, A1201); it was the only initial estimate that required revision.

[16] http://www.goldensoftware.com

[17] http://www.roman-britain.org/maps/british_tribes.htm.

18 Under this scenario, members of other haplogroups besides E3b1-M78 would also have been displaced, including, for example, R1b1-P25 and its subclades, but these haplotypes might not be as easily distinguishable as Romano-British, within the populations surveyed, as would be those that are E3b1-M78.

19 Although the same hypothesis may in fact apply to J2b-M12, the remainder of this study will focus exclusively on E3b1-M35 and its component subclades, in particular E3b1a-M78 and E3b1a2-V13. More study of J2b-M12 and its phylogeography is required before any rm conclusions may be made concerning this clade. Such study, although perhaps relevant, is beyond the scope of the present article.

[20] On the basis of the positive identi cation of the α cluster of E-M78 with E-V13 by Cruciani, it may be seen that E3b1a2, E-M78α and E-V13 are phylogenetically equivalent to each other.

[21] This omission is puzzling considering that Cruciani et al. (2007) acknowledged the ndings of Perečić et al. (2005) directly.

[22] See Moesia, *Encyclopedia Britannica*, v. 18, p. 644 (1911).

[23] The military action that led to the conquest of Upper Moesia was later called the Thraco-Getic War by Roman historians, another indication of the common origins of these Thracian- and Daco-Mysian-speaking tribes.

[24] Georgiev apparently treated "Mysian" as a synonym for Moesian; this ethnonym should not be confused with the Mysian people of Asia Minor, identi ed by Herodotus, who had lived in northwest Anatolia.

[25] RIB 2415.39.

[26] Item no. 1813.12-11.1-2, Department of Prehistory and Early Europe, British Museum.

[27] RIB, v. II, 2401.5, p. 12.

[28] RIB, v. II, 2401.3, p. 8.

[29] The Bessi were a Thracian tribe who lived in the Rhodope mountains.

[30] For the purposes of this discussion, "Thracian," "Dacian" and "Bessus" (plural - "Bessi") are treated as equivalent ethnonyms. The term "Thracian" could have been applied to any of these groups, since the descriptions "Bessus," "Dacian," and "Thracian" were used by the Romans themselves rather indiscriminately.

[31] It is not clear from Mócsy's description if he may be, in fact, referring to the same tombstone as Carrington.

[32] Hogg was Secretary, Royal Commission on Ancient and Historical Monuments in Wales and Monmouthshire.

[33] An interim excavation report is available online at:
http://www.ancient-arts.org/Pentrwyn%20Bronze%20Age
%20Metalworking%20Site.htm#sitelo

[34] Sykes' region of "Central England," in which E3b was found to be entirely absent by the OGAP, corresponds closely to the geographic extent of the central Anglian kingdom of Mercia in CE 700.

[35] RIB 1909.

[36] RIB 1929b.

[37] Although the cavalry unit is identified as Thracian, Serdica actually was located in the Roman province of Moesia in CE 45. This distinction was evidently of no importance to the Roman military.

[38] It is often speculated that the marker was thrown over during the Bouddican sack of Colchester in CE 60, but this is not certain.

[39] RIB, no. 201. p. 66.

[40] http://www.roman-britain.org/places/camulodunum.htm#rib201

[41] RIB, 121.

[42] An excavation report from Wessex Archaeology is available at:
http://www.wessexarch.co.uk/projects/dorset/dorchester_hospital

[43] The OGAP identified a small cluster of three E3b samples found in the Shetland Islands, but since the haplotypes in this one location were identical for the markers tested, they may well have been all descended from a single ancestor, a "founder's effect."