Isotopic Indicators of Community Organisation and Integration at İkiztepe: Implications for Anatolian Social Development in the 4th Millennium BC

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Abstract: İkiztepe, located on the Black Sea coast, boasts a large cemetery, which has produced almost 700 burials, often containing elaborate metal weaponry. The implications of the site's remains with regard to their social and cultural importance, and the role of metal objects and weapons as symbols of social prestige, are often avoided in synthetic discussions due to uncertainties surrounding its chronological sequence. A number of scholars have suggested shifting the occupational sequence of the site earlier than originally proposed by the excavators. These reconsiderations, however, have generally not directly addressed the remains from the cemetery. The date commonly cited for the majority of the graves is in the EB III, c. 2400–2100 BC, with a few earlier burials dating to the EB II. However, the radiocarbon dates obtained suggest a period of use for the cemetery between c. 3500–3000 calBC, in the transitional Late Chalcolithic – EB I period. These dates shed new light on the significance of the cemetery. While the size of the İkiztepe cemetery was remarkable even by the standards of the Early Bronze Age, it is virtually unheard of for the Anatolian Chalcolithic. Large cemeteries with rich grave goods dating to the Chalcolithic, however, are more commonly found in the larger Pontic world. There are also links to this area visible in other forms of material culture, including ceramics, figurines and idols. Despite this, northern Anatolia is generally thought of as being largely isolated from the broader cultural processes occurring in the 4th and 3rd millennia BC. The sizeable sample of skeletal remains from İkiztepe offers an ideal means of directly testing evidence for the movement of individuals through isotopic analysis. This discussion will focus on the results of strontium and oxygen isotopic analysis of the cemetery's human remains, along with a variety of other types of data, in order to examine evidence for mobility, community organisation and integration. This includes the identification of possible examples of long-distance migration and examining the integration of these migrants into the local community, as well as discussing evidence for the practice of transhumant pastoralism and its role in the socio-economy of the site.

Keywords: Turkey, Anatolia, İkiztepe, Chalcolithic, burials, isotopic analysis, migration, mobility, social organisation

During the Late Chalcolithic period in Anatolia, a marked degree of regionalism can be observed in material culture; this is likely at least partially a result of poor coverage in archaeological investigations throughout the country. Northern Anatolia, particularly the coastal area, is generally considered to be culturally distinct from the rest of the region, and a survey of the recent literature shows that it seems to be treated as being largely isolated from the broader cultural processes that are occurring in the larger Anatolian world in the 4th and 3rd millennia BC.[2] Although a few researchers have suggested the existence of Black Sea-based interactions, or even a circum-Pontic interaction sphere during this period, that sometimes incorporates northern Anatolia, these connections are generally reconstructed in terms of trade and the transmission of ideas, rather than the movement of actual people.[3] Overall, migration and mobility are generally not considered to be major factors in the social organisation of communities during this period. This discussion will address the role of these factors in 4th millennium development in Anatolia in general, as well as reconstituting northern Anatolia as having a role in these larger developments, by focusing on the site of İkiztepe.

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2 Sagona – Zimansky 2009; Düring 2011; Schoop 2011; Yakar 2011.

3 Lichardus 1988; Chernykh 1992; Makkay 1993; Price 1993; Thissen 1993; Nikolova 1995; Bauer 2006a; Bauer 2006b.

The İkiztepe Sequence and Cemetery

İkiztepe represents one of the more contentious sites in Anatolia. Despite this, it represents one of the few excavated Black Sea coastal sites that provides us with an idea of the occupation history and material culture in the region of northern Anatolia. However, discussion of the site is often avoided or discussed separately in synthetical treatments of Anatolia and its social development, both because of the difficulty of fitting the site into larger patterns observed in the plateau and in western Anatolia, as well as because of its controversial chronology.

Excavations at the site have been conducted since 1974; the excavators have proposed a primary chronological sequence with occupation beginning in the Late Chalcolithic, and continuing until the beginning of the 2nd millennium BC, with a later secondary sequence dating to the Iron Age.[4] Many scholars have suggested that much of the primary sequence should be shifted earlier, with the earliest levels dating to the mid- to late-6th millennium, and the remainder of the sequence being shifted correspondingly earlier.[5]

Of the site's four mounds, Mound II, which has been the most extensively published, has been the focus of the most attention. Some materials on Mound I have also been addressed, but generally in a less comprehensive manner. This discussion will focus on Mound I, which has produced an occupation sequence consisting primarily of domestic architecture.[6] Following this, the mound became the site of a large extramural cemetery. This cemetery is particularly spectacular because to date it has produced the remains of almost 700 individuals.[7] The graves within this cemetery were simple earthen burials, and in the majority of cases, the individual was placed on the back with the arms straight beside the body.[8]

This cemetery has received somewhat less attention than other parts of the İkiztepe sequence in chronological discussions due to its lack of final publication, although the chronological reconsiderations of the other parts of the Mound I sequence certainly have ramifications for the dating of the cemetery, suggesting that it too should be dated earlier than the mid-late 3rd millennium, where it has been placed by its excavators.[9] Lichter and Zimmermann, for example, have both suggested that at least part of the cemetery should be dated to the 4th millennium, predominantly based on the evidence of the metal objects from the graves. Zimmermann focuses on the presence of ring-shaped idols known from the 5th and early 4th millennia in eastern Europe, while Lichter also discusses the copper weaponry found at the site, which has both typological and compositional parallels in the 4th millennium levels at Ilıpınar, as well as with sites in southeastern Europe.[10]

In order to address the chronological controversies surrounding the occupation history at the site, and specifically to deal with the dating of the cemetery itself, radiocarbon dates were conducted on three human bone samples from the cemetery. These dates confirm that the cemetery does indeed date earlier than originally suggested, likely in the late 4th millennium or during the Late Chalcolithic–EB I transitional period.[11]

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4 Alkım et al. 1988; Alkım et al. 2003.

5 Parzinger 1993; Thissen 1993; Steadman 1995; Schoop 2005.

6 Bilgi 1984; Bilgi 2001; Bilgi 2007.

7 Bilgi 2003; Bilgi 2005.

8 Bilgi 1984; Doğan 2006.

9 Bilgi 2001; Bilgi 2005.

10 See also Begemann et al. 1994; Özbal et al. 2002; Lichter 2006; Zimmermann 2007.

11 See Welton 2010. Dates in Welton 2010 were calculated using the IntCal09 calibration curve; use of the Northern Hemisphere mixed marine curve to account for potential marine reservoir effects tends to move the dates only slightly later, toward the very end of the 4th millennium. However, recent studies have indicated that the İkiztepe diet was predominantly terrestrial, and only minimally marine in nature (Özdemir 2008), suggesting that use of the IntCal09 curve is not inappropriate.

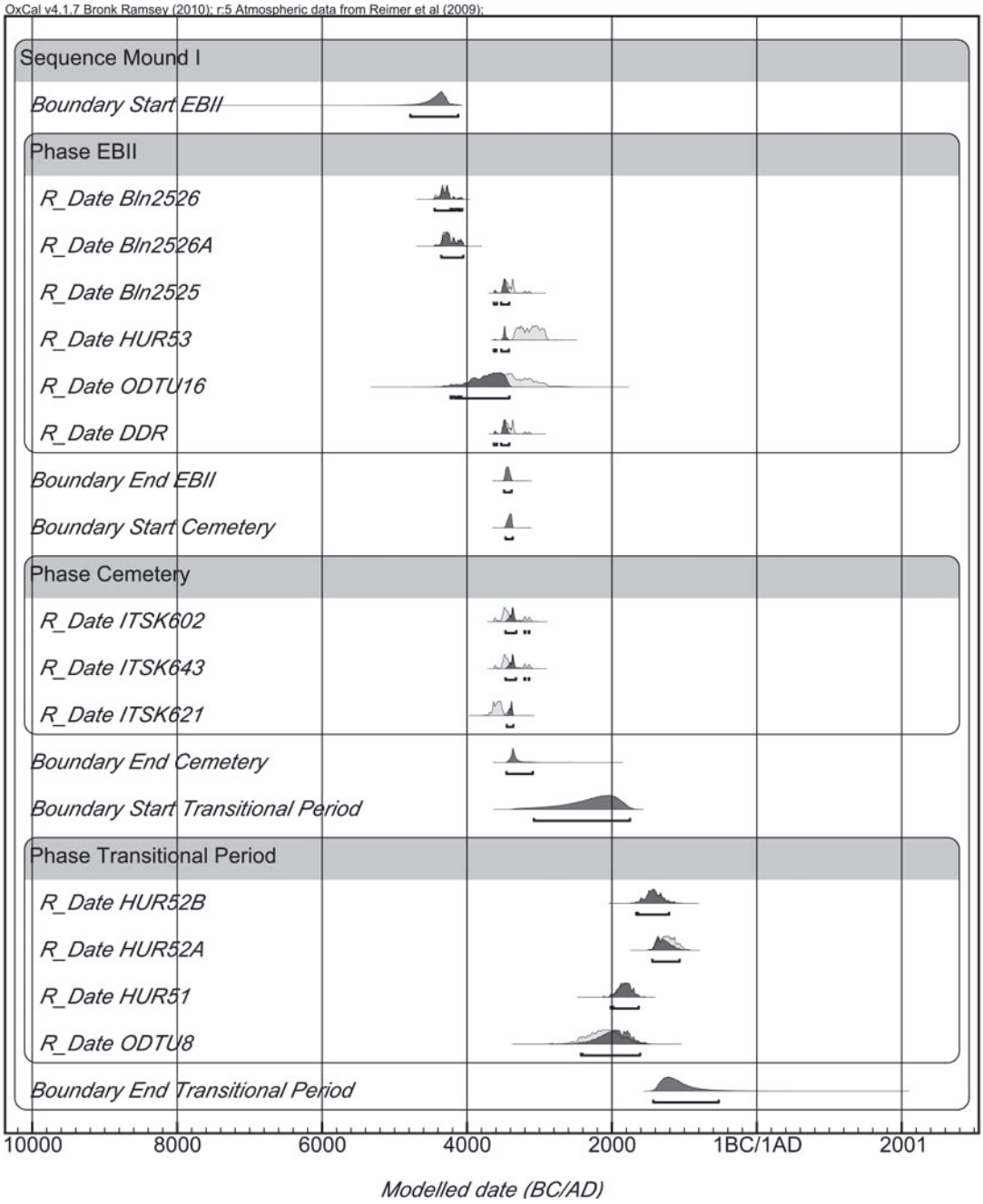

Fig. 1 Chronological reconstruction of İkiztepe Mound I.

The radiocarbon samples were selected based on the results of fluoride dating performed on a sample of human remains. Fluoride dating of bone, while not an accurate chronometric technique, has been successfully used in some cases for identifying relative sequences in cemetery contexts.[12] Such a relative dating method has the potential to provide valuable information, due to the difficulties that have been encountered attempting to create relative sequences of burials in the İkiztepe cemetery using ceramic or stratigraphic means. The fluoride dating results were used to

[12] Schurr 1989; Ezzo 1992; Johnsson 1997; Tankersley et al. 1998; Schurr – Gregory 2002.

select samples representing the proposed earliest, middle and latest parts of the burial sequence, in order to determine a possible duration for the cemetery.[13]

When these radiocarbon dates are combined with other dates that have been obtained from the preceding and following occupational levels at the site, they permit estimation of the duration of use of the cemetery. The results suggest that the cemetery was in use for less than 250–300 years (Fig. 1).[14]

The idea of a relatively short life-span for the cemetery contrasts with the reconstructions of some scholars, who have suggested that the life span of the cemetery could have been a millennium or more, a conclusion which was often based, either implicitly or explicitly, on the greater than 7m difference in depth between the burials excavated in the cemetery.[15] However, plotting the grave locations and depths in GIS demonstrates a pattern in the distribution of graves, and strongly suggests that the cemetery was located on an ancient slope.[16] This provides a reasonable and non-chronological explanation for the depth differential that has been previously commented on.

These dates shed new light on the significance of the cemetery. While the size of the İkiztepe cemetery was remarkable even by the standards of the Early Bronze Age, which boasts numerous large extramural cemeteries, it is virtually unheard of for the Anatolian Chalcolithic. The vast majority of known burials from this period are intramural, often occurring below house floors or in uninhabited areas of the settlement, and occurr in relatively small numbers at each site. Numbers generally range from a single burial to small groups of less than 10–15 individuals, although exceptions to these small numbers occur at sites such as Ilıpınar, Köşk Höyük and Kuruçay. These sites have generally produced between 30 and 60 excavated graves, comparatively large numbers in relation to other sites of the same period (Fig. 2).[17]

These numbers, however, do not compare to the known numbers of burials from Early Bronze Age cemeteries in the following period, which in many cases are in the hundreds, and which are located extramurally in much more formalized disposal areas (Fig. 3). Many of the burials known from the Chalcolithic period, and particularly from the sites containing larger numbers of burials, belong to children, who were often buried in jars and/or under the floors of houses. In some cases, burials of adults dating to the Chalcolithic period have also been found, but generally in smaller numbers. At some sites, the rarity of adult burials has been suggested to indicate the possibility of the presence of extramural cemeteries, but so far the only proposed extramural cemetery in the Chalcolithic period in Anatolia has been at Aktopraklık Höyük.[18]

As such, İkiztepe represents a thus far unique early cemetery of the late 4th millennium in Anatolia, due to its large numbers of burials, its representation of the full demographic makeup of the population, and the development of a formalized area for the placement of the dead.

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13 Many of the issues that have been identified with fluoride dating have been related to samples taken from widely varying depositional environments, while fluoride incorporation from the burial environment into bone has been suggested to be highly dependent on very localized depositional conditions (Schurr – Gregory 2002; Wrobel 2007). The İkiztepe remains originate from a physically constrained area with a consistent burial environment, and tests have suggested there to be no relationship between the observed fluoride values and the depth of the burials, which might have reflected factors such as water drainage that have been suggested to affect fluoride absorption. In addition, although admittedly based on an as yet small sample of radiocarbon dates, there appears to be a broad correlation between the results of the fluoride dating and the radiocarbon results. See Welton 2010 for further discussion of this issue.

14 Figure created using OxCal v.4.1.7. Dates for this diagram were taken from Alkım 1981; Alkım 1983; Özbakan 1988; Mellink 1992; Bilgi 2001; Alkım et al. 2003.

15 Parzinger 1993; Zimmermann 2007.

16 See Welton 2010 for more information.

17 Ilıpınar: Roodenberg 2001; Köşk Höyük: Özkan et al. 2004; Kuruçay: Duru 1996.

18 Alpaslan-Roodenberg 2011; Karul – Avcı 2011.

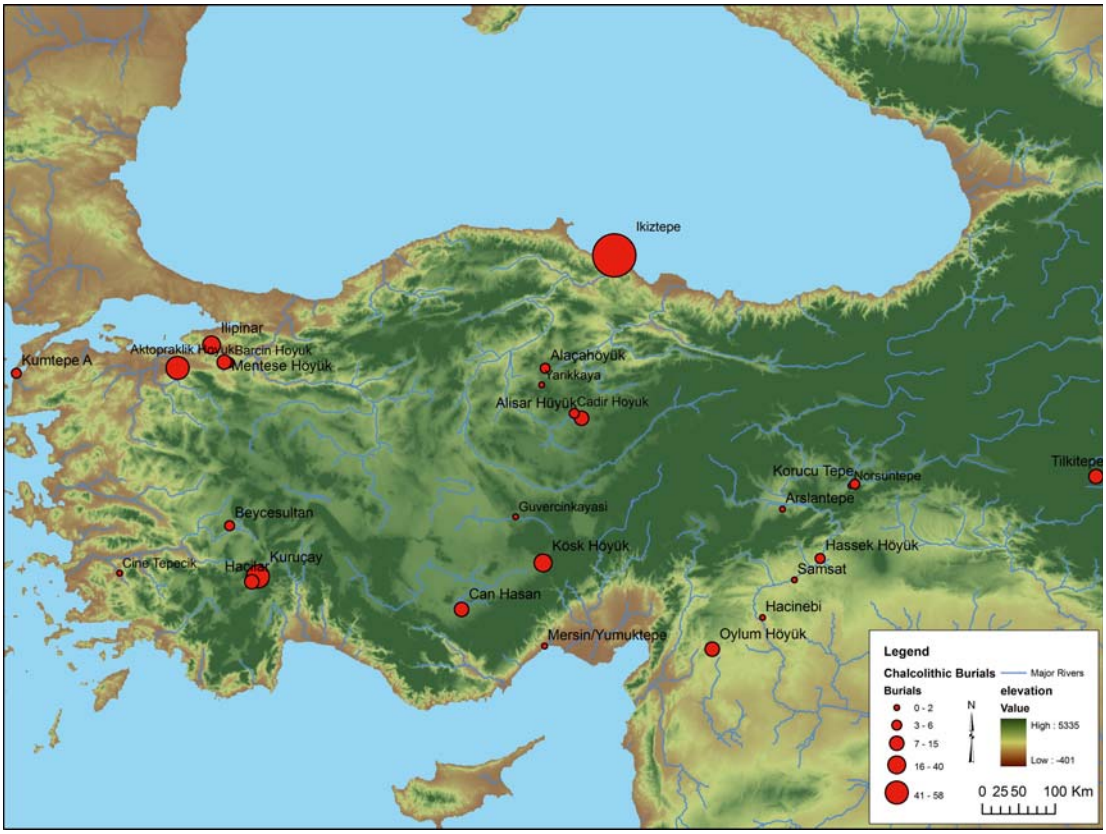

Fig. 2 Map of Chalcolithic burials in Anatolia.

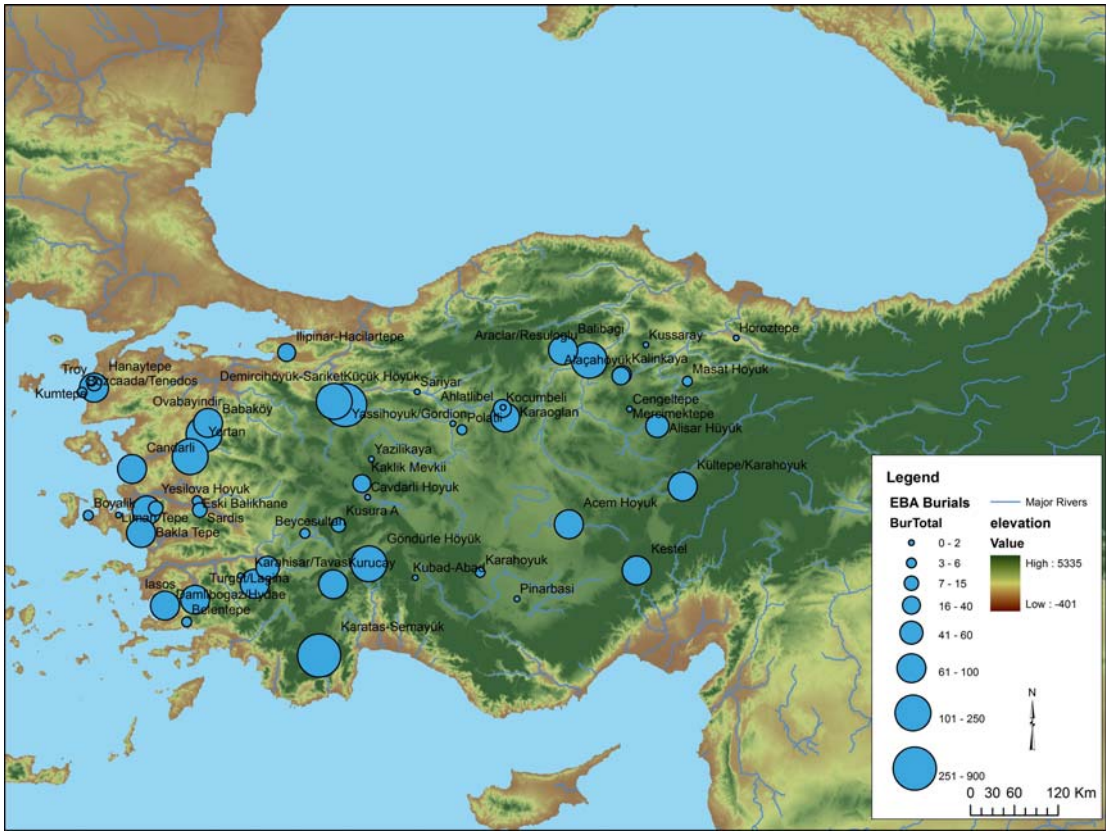

Fig. 3 Map of Early Bronze Age burials in Anatolia.

The Organisation of the Cemetery

Analysis of the cemetery's spatial organisation suggests that burial occurred preferentially within one particular area, located in the central southern part of the cemetery within a slight curve of the ancient slope. The earliest burials in the cemetery were preferentially located in this area, as were the individuals with the highest numbers of grave goods. However, it appears that there were no set rules in the placement of burials that allowed only particular groups or privileged individuals to have burials placed in this central area. Other individuals who were not members of these groups were also buried in this area of the cemetery, suggesting that burial placement in particular areas was preferential but not controlled.

Spatial analysis of the results of fluoride dating, which proposed a relative sequence for a sample of the cemetery's burials, suggests that over time the cemetery expanded out of the preferred south central area of the cemetery, filling in gaps between existing burials and expanding further to the north. The latest period of the cemetery appears to have continued to make use of the central portion of the cemetery.[19]

The occurrence of grave goods also demonstrates a temporal pattern in their distribution. In general, moderate numbers of grave goods were encountered in graves from the early period of the cemetery. Rarely do these early burials contain absolutely no grave goods. In contrast, the middle period of the cemetery's use witnesses a substantial increase in the differentiation occurring among burials based on the richness of the number of grave goods included in the graves. Graves with the highest numbers of grave goods occur almost exclusively during this period, but burials containing no grave goods also become common. Finally, during the latest period of the cemetery's use, the average numbers of grave goods appear to decrease dramatically. The highest numbers of grave goods occurring during this period are three or four objects, compared to graves with ten or more objects found during the preceding middle period.

The meaning of the distribution of grave goods included in the burials is worth discussing, since the distribution of numbers of grave goods at İkiztepe has received some attention.[20] The question is, at what point do burials begin to represent evidence for hierarchical organisation? How do we interpret a situation in which many individuals have no grave goods, with comparatively small numbers of individual burials possessing a handful of items? Does hierarchical organisation require evidence for gold or other exotic artefact types, or hundreds of objects in a few graves? And how few graves would we expect to display a rich number of burial goods in a hierarchically organized society? The graves at İkiztepe range between possessing no grave goods to possessing 14 objects; Fig. 4 visually represents the distribution of objects within the graves.

It is perhaps worth noting that there is relatively little solid evidence for the provision of grave goods that were formed with the sole intention of being provided to the dead (that is, objects that would not have been used or useable in daily life). Rather, it seems perfectly plausible that all or most of the objects included in the graves could represent the personal belongings of the individuals buried within them, or their immediate families. In the graves with the highest numbers of grave goods, the most common object type is copper weaponry. Given that the skeletal remains from the cemetery provide evidence of cranial trauma that in some cases conforms to the types of weaponry observed in the graves,[21] it seems logical to conclude that in most cases these weapons were likely actually used. Although they may not have been personally used by all of the individuals in whose graves they were included (i.e. children), it is quite likely that the inclusion of these objects could represent attempts to communicate familial status rather than individual roles.

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19 Given the comparatively short duration of the use of the İkiztepe cemetery, these patterns should be considered to represent at best very general trends in the cemetery's use.

20 Wittwer-Backofen 1985; Wittwer-Backofen 1987; Bilgi 2005; Doğan 2006.

21 Erdal 2005; Erdal 2006.

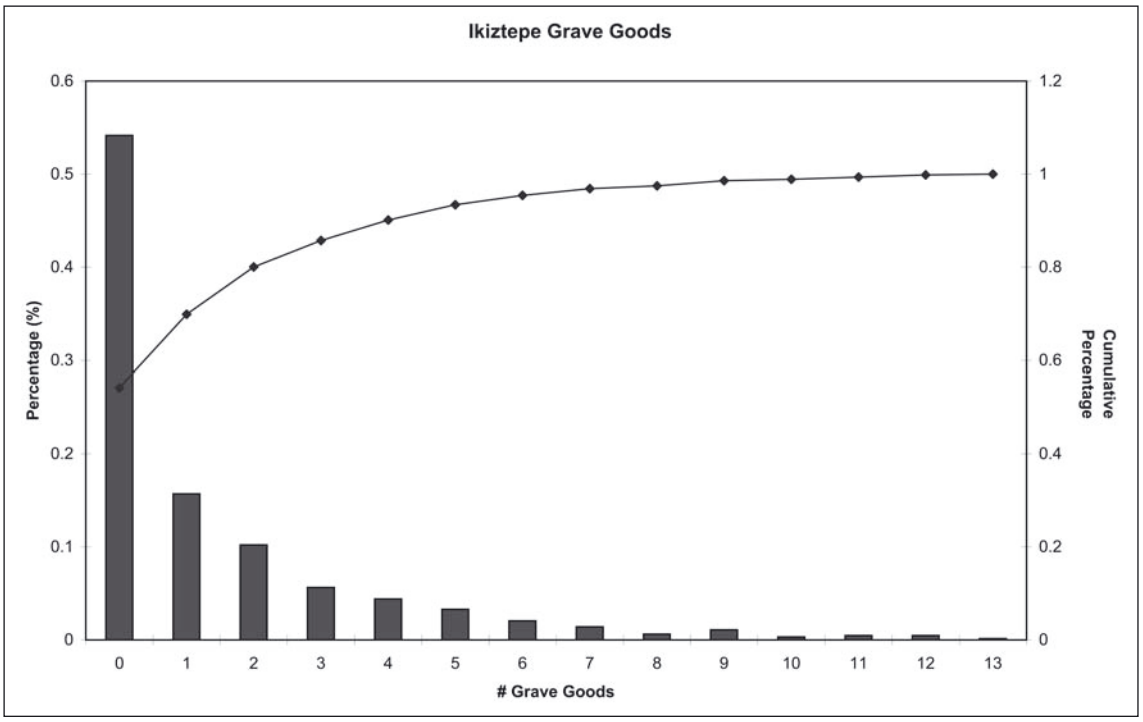

Fig. 4 Distribution of grave goods within the İkiztepe cemetery.

Furthermore, as discussed above, the provision of burial goods appears to be linked to temporal change in burial practices in the cemetery.

Bilgi, in his discussion of the cemetery at İkiztepe, selected a small number of burials containing large numbers of 'prestige' burial goods and deemed them 'distinguished' burials, which he suggested represented a single elite ruling lineage group within the community.[22] Similar to the pattern observed at İkiztepe, the cemetery at Varna displayed a small number of particularly lavish burials that could be distinguished from the remainder of the cemetery on the basis of the richness of their burial goods. Although the richness of these graves could be considered to be of an order of magnitude greater than observed in the graves at İkiztepe, in terms of the comparative distribution of grave goods amongst the population, this represents a parallel situation to Bilgi's group of 'distinguished' burials. However, Chapman suggests a completely different interpretation of these graves compared to that offered by Bilgi, providing a more heterarchical interpretation of the scenario, suggesting that these represent corporate groups within the community competing for and negotiating power relationships through conspicuous displays of wealth.[23]

Isotopic Analysis and Results

As part of this study, isotopic analysis was conducted on a sample of İkiztepe skeletal remains, with the particular aim of examining migration and mobility in the population. The isotopic composition of strontium in bone or enamel reflects the local geology of the environment in which the tissue was formed.[24] Similarly, the isotopic composition of the oxygen incorporated into bone or enamel is controlled primarily by water consumed and atmospheric oxygen. As a result, oxygen

22 Bilgi 2005.
23 Chapman et al. 2006.
24 For an overview, see Bentley 2006.

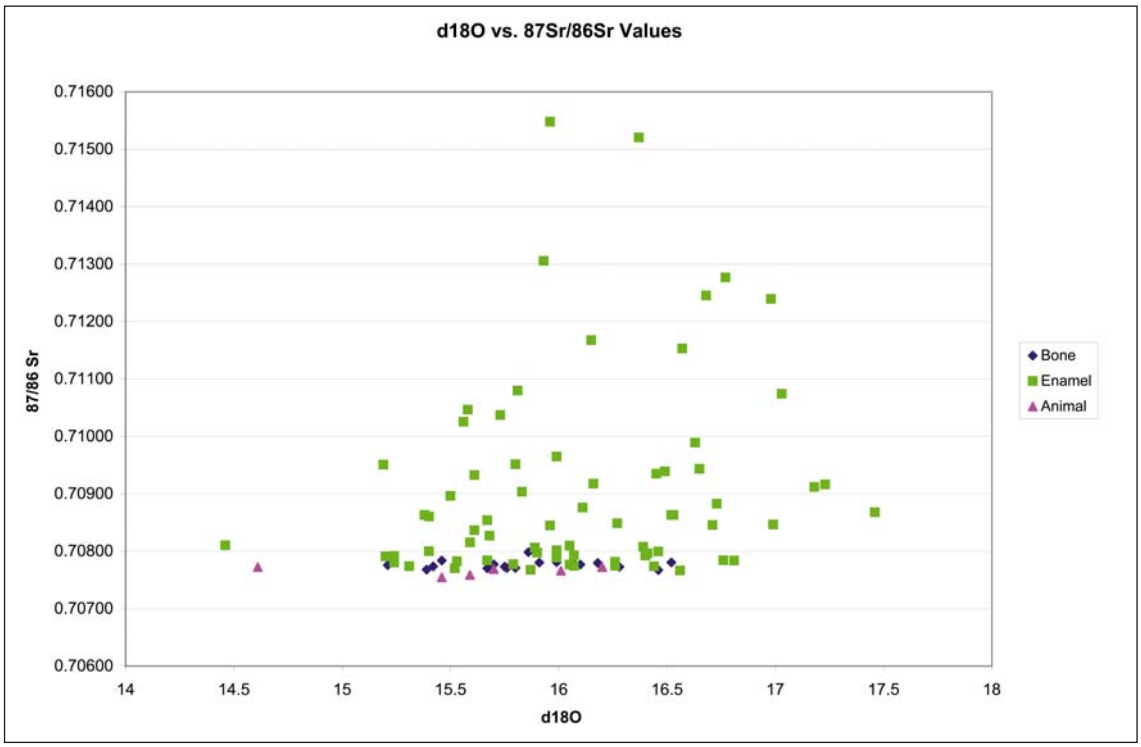

Fig. 5 Scatterplot of $\delta^{18}O$ vs. $^{87}Sr/^{86}Sr$ values for İkiztepe cemetery.

isotopic composition reflects local geography and climate.[25] These two methods are therefore complementary, each examining crucial but different aspects of the environment in which the tissues under consideration were formed.

The constant process of remodelling in bone means that the isotopic composition of human bone samples generally represents the average local conditions during the last years of life. In contrast, tooth enamel is formed during childhood and does not remodel, and thus reflects local conditions at the time of its formation during the early years of life. As a result, it is possible to use isotopic signatures in these two tissues to identify individuals who have moved between different areas during their lifetime.

For the purpose of this study, strontium and oxygen isotopic analysis was conducted on the enamel from 72 individuals. Eighteen of the examined individuals also had bone samples analysed. Finally, eight animal samples from the site's faunal collection were analysed for the purpose of providing a local baseline isotopic signature. Pigs were selected for this purpose, due to their comparatively small home range compared to other available faunal species found at the site, which are generally species herded over a large area, such as sheep, goats and cattle.[26]

The results of strontium and oxygen isotopic analysis are presented in Fig. 5. The majority of the oxygen results fall between 15 and 17‰, which is a relatively normal range of variation for a human population consuming a consistent water source.[27] Furthermore, the values themselves are within the expected range of values for the area based on local rainwater. However, despite relatively significant changes in elevation throughout northern Anatolia due to the presence of the Pontic Mountains, there does not appear to be a great deal of variation in the range of $\delta^{18}O$ values

[25] For an overview, see White et al. 1998.

[26] For more detailed discussion of sample selection procedures, see Welton 2010.

[27] See Levinson et al. 1987; Stuart-Williams et al. 1996; White et al. 1998; White et al. 2000; Budd et al. 2004; Evans et al. 2006; Bentley et al. 2007a; Bentley et al. 2007b.

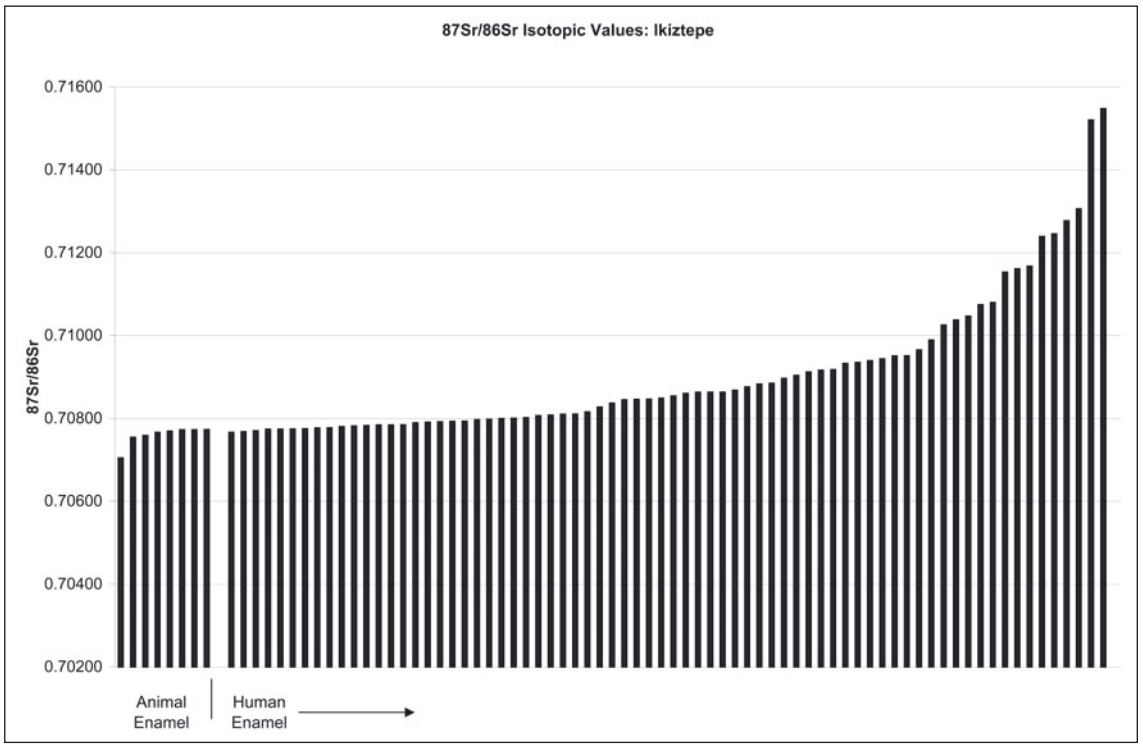

Fig. 6 $^{87}Sr/^{86}Sr$ values for İkiztepe cemetery.

for meteoric water. In fact, the range of monthly variation in $\delta^{18}O$ values in precipitation for the modern city of Bafra is greater than the variation observed between Bafra and other modern cities, including those at substantial distances and at significantly different elevations.[28] This suggests the possibility that the variation in $\delta^{18}O$ values in the Black Sea region may not be adequately sensitive for distinguishing movements of individuals between the Bafra Plain and other nearby Anatolian or Black Sea locations.

The strontium analysis, however, produced much more varied results (Fig. 6). The animal enamel and human bone samples, which are intended to provide a local baseline, demonstrate a very narrow range of variation, with similar absolute values to each other. Most of the rock types in the mountains directly to the south of İkiztepe have quite low strontium isotopic signatures, consisting primarily of carbonates and island arc magmatics. The highest available local values are those of Black Sea water, which reach as high as 0.7093, the values associated with modern ocean water.[29] The observed values in the animal and human bone samples, clustering around 0.7075, represent a reasonable value for the mixing of these sources. Many of the human enamel samples cluster in this region as well; the values of the majority of the İkiztepe population can likely be explained by the consumption of a terrestrial diet with rather low strontium isotopic signatures, perhaps supplemented by a marine dietary component with a high proportion of fish, with a higher strontium isotopic signature. However, many of the enamel samples display higher results, and in some cases, significantly higher results; samples with values higher than the sea-water values are more difficult to explain, and would require dietary inputs from areas with higher strontium signatures. This problem is further compounded by the fact that trace element analysis

[28] As calculated by the Water Isotope System for Data Analysis, Visualisation and Electronic Retrieval (WISER) application (IAEA 2006) and the Online Isotopes in Precipitation Calculator (OIPC) application (Bowen 2009).

[29] Faure – Powell 1972; Ryan et al. 2003.

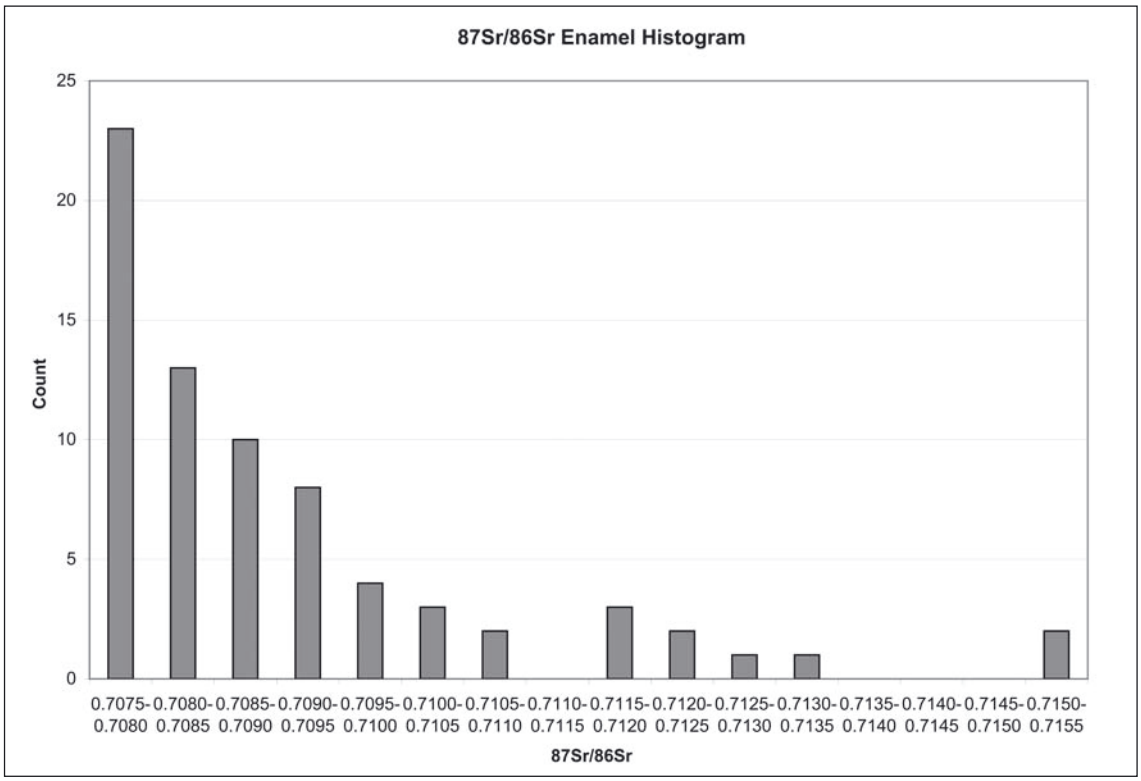

Fig. 7 Histogram of $^{87}Sr/^{86}Sr$ values for İkiztepe cemetery.

of human remains from the İkiztepe cemetery has suggested lower levels of consumption of marine resources than might be expected for a coastal site.[30]

Based on the variety of strontium isotopic signatures, it is likely that the population contains a number of individuals who were born non-locally. A histogram of the strontium results (Fig. 7) demonstrates that the distribution of the values in the sample is actually tri-modal; with the majority of the population displaying values less than 0.710, and with secondary peaks occurring around 0.712 and 0.715. The second peak around 0.712 includes 7 individuals, while the third peak around 0.715 includes two individuals. This suggests that 9 out of 72, or 12.5%, of the individuals analysed demonstrate enamel signatures that are likely to be non-local. This is actually a rather conservative estimate, as conventional methods of estimating local variation within the population would generally use a range of 2 standard deviations from the mean of the animal enamel samples or of the human bone samples,[31] both of which would result in an estimate of 65–75% of the population being born non-locally.[32] This would be a remarkably high percentage of non-local individuals. Indeed, the standard deviation in the human enamel strontium isotope values observed for the İkiztepe population is extremely high compared to most estimates for populations where this type of study has been previously completed.[33] This suggests a greater amount of mobility than is often observed.

30 Özdemir 2008.

31 Price et al. 2000; Price et al. 2002.

32 2SD range for human bone = 0.70762–0.70791; 2SD range for animal enamel = 0.70752–0.70781.

33 İkiztepe: 0.7091 ± 0.00172; Early Neolithic Vaihingen (LBK): 0.709591 ± 0.000224 (Bentley et al. 2003); New Kingdom Tombos, Nile Valley: 0.70743 ± 0.000055 (Buzon et al. 2007); Early Medieval West Heslerton, Britain: 0.7095 ± 0.0007 (Budd et al. 2004); LMIII Sellopoulo, Crete: 0.708947 ± 0.000147 (Nafplioti 2008); Harris Creek, Middle Archaic Florida: 0.708314 ± 0.000413 (Quinn et al. 2008); Wari Empire, Conchopata, Peru: 0.70584 ± 0.00074 (Tung – Knudson 2008).

There is no evidence for any form of distinction of non-local individuals by means of burial practices (Fig. 8). For non-local individuals whose burial position could be determined at the time of excavation, the majority was buried in the standard burial position for the site, that is, they were buried dorsally. Furthermore, there is no clear pattern with regard to which sex seems to be migratory over long distances. There also appears to be no identifiable pattern with regard to the numbers or types of grave furnishings included with these individuals. The number of items included in these graves varies from none (samples ITSK306, ITSK642, ITSK268) to six (sample ITSK573), including items of weaponry. In fact, the latter burial is one of the richer burials found at the site.[34]

Identifying where these individuals might originate from is particularly difficult given the lack of comparative data for this area. There have been few studies of strontium isotopic values in animals or humans in most of Anatolia, particularly in the central and northern portions of the country.[35] It is possible to compare geological maps to identify potential broad places of origin, and to use measured values of geological formations as a guide, but the correspondence of geological formations to the biologically available isotopic values displayed by local populations is not always direct.[36]

The primary issue, of course, is where to begin looking. Do we look inland, within Anatolia itself, or do we look to the coastal region of the larger Pontic world? A number of scholars have suggested the existence of a larger circum-Pontic region of interaction, where coastal sites share more characteristics in ceramic production, metallurgical production and architecture with each other than they do with inland sites that are closer in terms of absolute distance.[37] This interaction is long-lived, and continues into the early 3rd millennium BC. However, in the following periods, the ceramics found at İkiztepe suggest an increased connection to the south, toward the Anatolian Plateau.[38] This may be a larger pattern, as it seems that regional integration in the circum-Pontic

Sk No.	Sex	Age	Head Direction	Body Position	Grave Goods	Tooth
Group 1 (0.7115–0.7135)						
ITSK306	Female	Middle Adult	Unknown	Unknown	None	LLM1
ITSK553	Male	Middle /Young Adult	Southeast	Dorsal	1 spearhead	LLM2
ITSK567	Female	Middle Adult	East	Dorsal	1 harpoon	LRM3
ITSK602	Male	Middle Adult	South	Dorsal	3 total: 1 spearhead, 1 dagger, 1 earring	URP1
ITSK621	Female	Young/Middle Adult	Unknown	Unknown	1 earring	LLM1
ITSK642	Female	Unknown/Young Adult	Unknown	Unknown	None	URM3
ITSK643	Male	Middle Adult	West	Left	1 needle	LRC
Group 2 (0.715+)						
ITSK268	Female	Young/Middle Adult	North	Unknown	None	ULC
ITSK573	Male	Older/Middle Adult	Southeast	Dorsal	6 total: 2 spearheads, 1 dagger, 1 knife, 1 harpoon, 1 whetstone	ULP2

Fig. 8 Characteristics of likely long-distance migrants.

34 Data from Doğan 2006.
35 Dufour et al. 2007; but see, for example, Meiggs 2009.
36 Sillen et al. 1998; Price et al. 2002.
37 Particularly Price 1993; Bauer 2006b.
38 Particularly in the 'Transitional Period'; Alkım et al. 1988; 2003; Thissen 1993.

zone decreases after the mid-3rd millennium, particularly as Mediterranean/Aegean trade routes begin to increase in prominence.

After removing the nine likely non-local individuals from consideration, and looking at the rest of the population, whose strontium isotopic values exist within the primary peak of the histogram, a small group of individuals still remains with values higher than those of Black Sea water. In order to explain these values, it is necessary to look for other possible explanations that may have contributed to the population's isotopic variation.

There is little textual information about this region available, even in later periods. This is generally recognized as the area inhabited by the Kaska tribes during the Hittite Empire period.[39] The Kaska are often viewed as transhumant populations with few or no cities, and seem to have a dispersed and flexible social organisation with little evidence for domination by a single leader. Their pattern of settlement seems equally flexible; overall, the Kaska may be seen as a mobile highland people, with a combined subsistence pattern of animal herding (both mobile and non-mobile) and small-scale crop growing, with a series of small somewhat impermanent settlements and seasonal patterns of movement.[40]

Traditional practices in the mountainous regions of Turkey, which still persist today to varying degrees, involve seasonal movements of groups or portions of the society into highland areas in association with the herding of animals. These practices are often known as *yayla*. Modern and recent historical Black Sea populations commonly exploit two or more vertically differentiated environments for subsistence, through a combination of small-scale agriculture and horticulture for individual consumption and intensive animal husbandry.[41] Winter months are spent in the coastal plain engaged in agricultural production, while summer months are spent in high altitude mountain pastures, grazing sheep and goats. Generally, only a portion of the coastal plain communities engage in seasonal transhumance, however; another segment of the population remains in the settlement year-round, tending to agricultural crops. Although the modern system was likely introduced by semi-nomadic Turkic tribes that entered Turkey from central Asia around the 10th century AD,[42] there is reason to believe that these practices are well-adapted to mountainous coastal environments[43] and that ancient populations may have practiced similar patterns of transhumance. In fact, these incoming 10th century populations may have adapted their customs to transhumant traditions already in place in the region.

Such practices could potentially have added to the variability of the İkiztepe population's isotopic signatures, as individuals or groups moved between areas with slightly different strontium isotopic signatures. Given the local geology, these movements are not likely to have produced extremely 'non-local' signatures (i.e. like the outliers in the secondary and tertiary peaks in Fig. 7), but may have contributed to increased variability in a subset of the population.

Conclusions

Significantly, the İkiztepe community chose to bury their dead in a single coherent cemetery. Although the lack of evidence is likely partially a result of poor excavation coverage during this period, it certainly seems that this was a much rarer decision during the late 4th millennium than it was later, during the 3rd millennium. The presence within this cemetery of both probable long-distance migrants and mobile communities or sub-communities that may have practiced transhumance, alongside more sedentary village populations is important in itself, because it sug-

39 Glatz – Matthews 2005; Matthews – Glatz 2009.
40 Matthews – Glatz 2009.
41 Yakar 2000.
42 Geray – Özden 2003.
43 Yakar 2000.

gests a strong degree of integration of these individuals into the larger community. The apparent lack of differentiation in burial practices between these groups further underlines this integration. The İkiztepe cemetery seems to reflect the existence of a commonly accepted pattern of burial activity that represented a coherent means of ritual and mortuary expression in the community, where preferential locations and styles of burial were shared amongst the different individuals and groups within the community, suggesting a system of shared values.

The İkiztepe cemetery seems to present less evidence for the existence of an elite than is often suggested. Rather, perhaps, it suggests the formation of symbols of prestige in the form of imagery based on war and conflict, but this development seems to have translated into comparatively little in the way of economic or political stratification. At the same time, there appears to be an expansion in the broader sense of shared social identity beyond the immediate or extended family, incorporating the larger community, who shared a common formalized area for the disposal of the dead. This may be related to inter-community warfare or conflict and the need to formulate a cohesive community identity as a response to conflict. The social processes that we see reflected at İkiztepe likely represent the nascent stages of processes that continue in the 3rd millennium.

Despite the marked regionalism that is visible in Anatolia in the Chalcolithic period, it would be overly simplistic to assume that communities or regions were isolated from each other, or that social development during this time was dominated by insularity. In fact, the evidence from İkıztepe suggests there was a great deal of mobility, and even long distance migration, suggesting that inter-regional interaction was not a rare occurrence. In particular, northern Anatolia appears to have played an important part in this inter-regional interaction, and displays important developments in social complexity during this period. Finally, these results suggest that methods such as isotopic analysis have the potential to provide valuable information about social organisation, even in circumstances where the knowledge of material culture remains comparatively limited.

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