ARCHAEOLOGICAL AND DATING EVIDENCE FOR THE 8.2 KA BP CLIMATE EVENT ON THE ISLAND OF GÖKÇEADA, NORTHEAST AEGEAN

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Abstract: *The 8.2 ka BP event is one of the most proeminent and abrupt climatic events of the Holocene, showing generally drier and colder conditions for ca. 160 years, but there are also variations in climatic impacts by region. Dating and archaeological evidence indicates that the impact of the climate event varies by region, from large-scale site abandonment to continued occupation and local adaptation. The dating evidence from Uğurlu on the Island of Gökçeada, Northeast Aegean, shows that there is a clear hiatus in ^{14}C dates between ca. 8220 and 8000 cal BP, corresponding to the 8.2 ka BP climate event. This paper presents dating and archaeological evidence from Uğurlu and discusses the consequences of evidence in terms of the 8.2 ka BP climate event.*

Cuvinte-cheie: *evenimentul climatic de la 8,2 ka BC, insula Gökçeada, zona egeeană de nord-est, Anatolia*
Rezumat: *Evenimentul climatic de la 8,2 ka BP este unul dintre cele mai importante și mai dramatice evenimente climatice ale Holocenului, caracterizat în general de condiții mai aride și climat mai rece, dar cu variații regionale climatice notabile. Atât cronologia, cât și cercetările arheologice indică un impact variabil al acestui eveniment climatic de la o regiune la alta, caracterizat prin părăsirea siturilor în unele cazuri sau prin continuarea locuirii și diverse adaptări locale în altele. La Uğurlu, pe insula Gökçeada din nord-estul Mării Egee, se observă un hiatus clar în seria datelor ^{14}C, între cca 8220 și 8000 cal BP, interval care corespunde evenimentului climatic de la 8.2 ka BP. Articolul de față prezintă rezultatele datărilor ^{14}C și ale cercetării arheologice, discutând impactul evenimentului climatic de la 8.2 ka BP asupra locuirii de la Uğurlu.*

INTRODUCTION

The effects of the 8.2 ka BP climate event on societies in the Near East and South East Europe have been discussed by many researchers (Weninger *et alii* 2006 and 2014; Clare, Weninger 2010; van der Plicht *et alii* 2011; Biehl, Nieuwenhuyse 2016; Flohr *et alii* 2016; Berger *et alii* 2016; Chapman 2018). The early Holocene cooling event of the 8.2 ka BP was caused by a flood of fresh water and glacial ice into the North Atlantic Ocean and is recorded in multiple climatic archives across the globe (Alley *et alii* 1997). The first evidence for the 8.2 ka BP cooling period of ca. 3 to 6 ±2 °C was found in ice cores of Greenland, starting at ca. 8250 cal BP and lasted around 160 years (Kobashi *et alii* 2007; Thomas *et alii* 2007; van der Plicht *et alii* 2011). It is emphasized that the impact of the 8.2 ka BP climate event varies by region, from large-scale site abandonment to continued occupation and local adaptation (Flohr *et alii* 2016). Many researchers agree that dating and archaeological evidence should be considered together, as neither alone provides a complete answer.

Dating and archaeological evidence from different Neolithic settlements of Anatolia indicate that the impact of the 8.2 ka BP climate event also varies by region. In addition, geochemical, isotopic, and pollen records from several lakes in Anatolia registered this change in climate, for example Nar Lake and Sofular Cave (Göktürk *et alii* 2011; Dean *et alii* 2015). Çatalhöyük in Central Anatolia is the best dated site with a series of radiocarbon dates. Although archaeological evidence shows that East Çatalhöyük was abandoned around 6200/6300 cal BC and settlement shifted to West Çatalhöyük around 6000 cal BC, new excavations show that occupation on the south summit (TP Area) continued until ca. 5950 cal BC (7925–7815 cal BP) (Marciniak *et alii* 2015; Orton *et alii* 2018; Roffet-Salque *et alii* 2018). Both Çatalhöyük East and West settlements coexisted for a short period of time before the East Mound was abandoned. Changes in architecture and food supply strategies have been observed in this period (Roffet-Salque *et alii* 2018). Although some researchers disagree (see Roffet-Salque *et alii* 2018), the settlement abandonment and shifts in the material culture at Çatalhöyük may be linked to the 8.2 ka BP climate event (Clare, Weninger 2010; Willett *et alii* 2016). At Yumuktepe, Southern Anatolia, around 6200 cal BC (between 8266 and 8170 cal BP) a gap is also seen, which overlaps the transition from the Early to the Middle Neolithic phase at the site (Weninger *et alii* 2006).

Evidence suggests that at Ulucak and Barcın in Western Anatolia, no changes contemporaneous with the 8.2 ka BP climate event appear to be present (Flohr *et alii* 2016). Weninger and Clare (2011) explain the lack of archaeological break at Ulucak by the milder coastal climate. Ulucak Va–b is dated by 12 AMS dates, with the

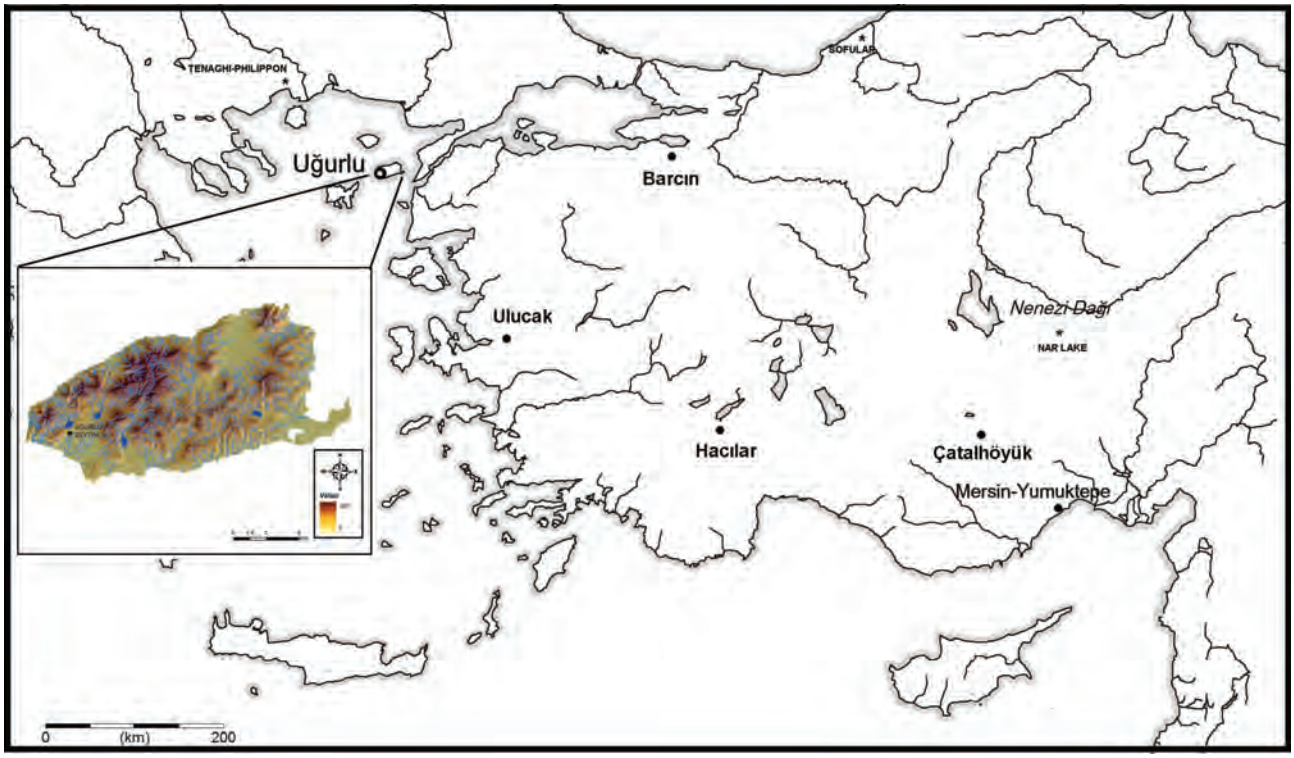

Figure 1. *Map showing Uğurlu and the settlements mentioned in the text.*

Start Boundary around 8221 cal BP (68.3%), and the End Boundary around 7905 cal BP (68.3%) based on Bayesian calibration (Bronk Ramsey 2009). Despite strong continuity with previous phases in the building plans, the capacity of the storage units in each building increased, including the use of circular bins and rectangular clay boxes (Çevik, Erdoğu 2020). There is an increasing focus on the individual household in storage and production. Although domestic animals were dominant in the faunal assemblage, the amounts of wild species increased significantly. These factors may indicate that there were economic adaptations associated with the 8.2. ka BP climate event. Although there is not enough dating evidence, archaeological evidence shows that the impact of the 8.2 ka BP climate event may have been minimal in the Lake District Region (Thissen 2010). Although the destruction of Hacılar VI settlement by fire may be associated with this period, occupation continued across the 8.2 ka BP line.

The dates and archaeological evidence from Uğurlu on the island of Gökçeada, Northeast Aegean, show that the occupation of the site covers the 8.2 ka BP climate event (Fig. 1). This paper presents archaeological evidence from this period with discussion focusing on its relation to the 8.2 ka BP climate event.

UĞURLU ON THE ISLAND OF GÖKÇEADA

Uğurlu is a low mound about 1 km north of the village of Uğurlu, on the western part of the island of Gökçeada. The site is located at 40°13’23.64’’ N and 25°71’ 56.08’’ E, at an elevation of 16 metres above sea level. The site covers an area of approximately 250 × 200 m. on a gentle slope at the eastern foot of Mount Doğanlı (Isa). The Pilon stream lies on the eastern part of the site; and there is also a nearby spring. The site has been damaged by the main Uğurlu-Dereköy road, which cuts through it. It has also been damaged by a long trench dug for the opening of an irrigation system. The site was first discovered in 1998, and a long-term excavation project was started in the summer of 2009 (Erdoğu 2011; 2014; Erdoğu *et alii* 2021).

Gökçeada (the older name in Turkish was İmroz and in Greek, Imvros) is the largest island of Turkey in the northern part of the Aegean Sea. It is about 17 km from the Gelibolu Peninsula and covers an area of 289.5 sq km. Gökçeda is a mountains island with Mount Doruk (Elias), at an altitude of 673 m, being the highest point on the island. The solid geology is composed mainly of volcanic rocks. The sea level and the shoreline of the Aegean were different during prehistory. During the Neolithic period, around 7000–6500 cal BC, the sea level was ca. 20 m lower than today (for discussion see Özbek, Erdoğu 2014), with the island of Gökçeada close to the Gelibolu Peninsula, ca. 10 km. Today, the seashore is about 2 km from the site of Uğurlu. The site therefore was located far from the shoreline during the Neolithic period. Archaeobotanical research demonstrates that the first settlement was located in an area where small lakes and swamps occurred, and the Neolithic inhabitants of Uğurlu lived near a spring in this well-watered fertile area.

Present-day Gökçeada has a warm and mild climate. According to “tr.climate-data.org” data, the

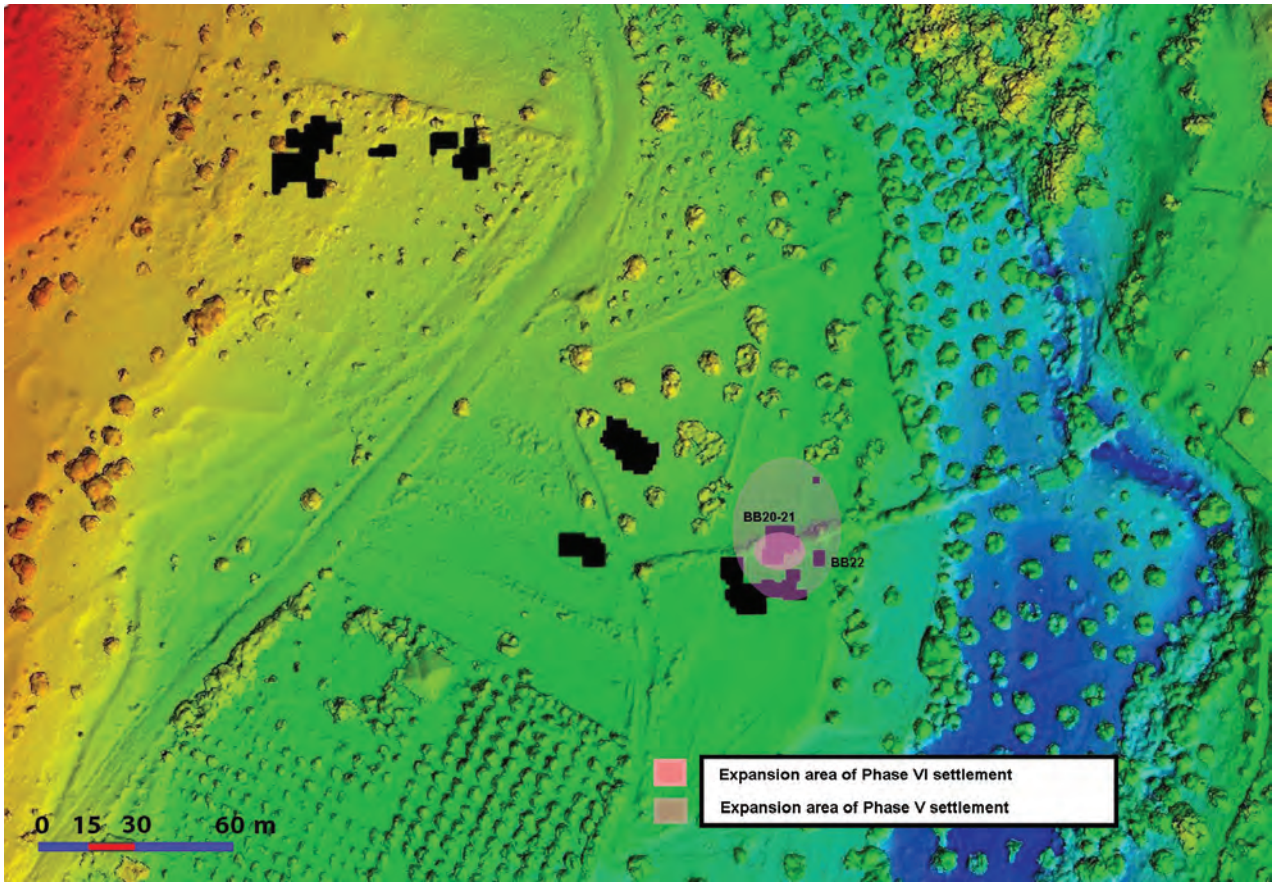

Figure 2. *Map showing the expansion area of Phase VI and V settlements on the topographic plan.*

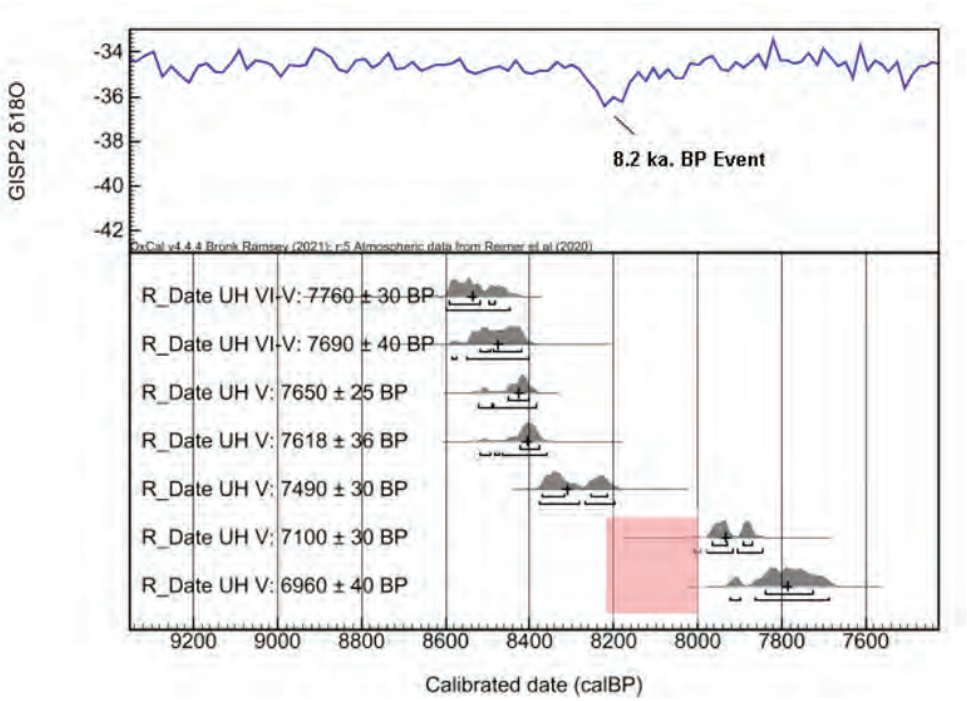

Figure 3. *Uğurlu Phase VI–V and V ^{14}C dates on animal bones are shown in comparison to Greenland GISP2 ice-core δ18O record. There is a hiatus between ca. 8220 and 8000 cal BP, corresponding to the 8.2 ka BP climate event. Graph produced by OxCal.*

Figure 4. *Remains of "Building 10" and Anatolian type of figurines.*

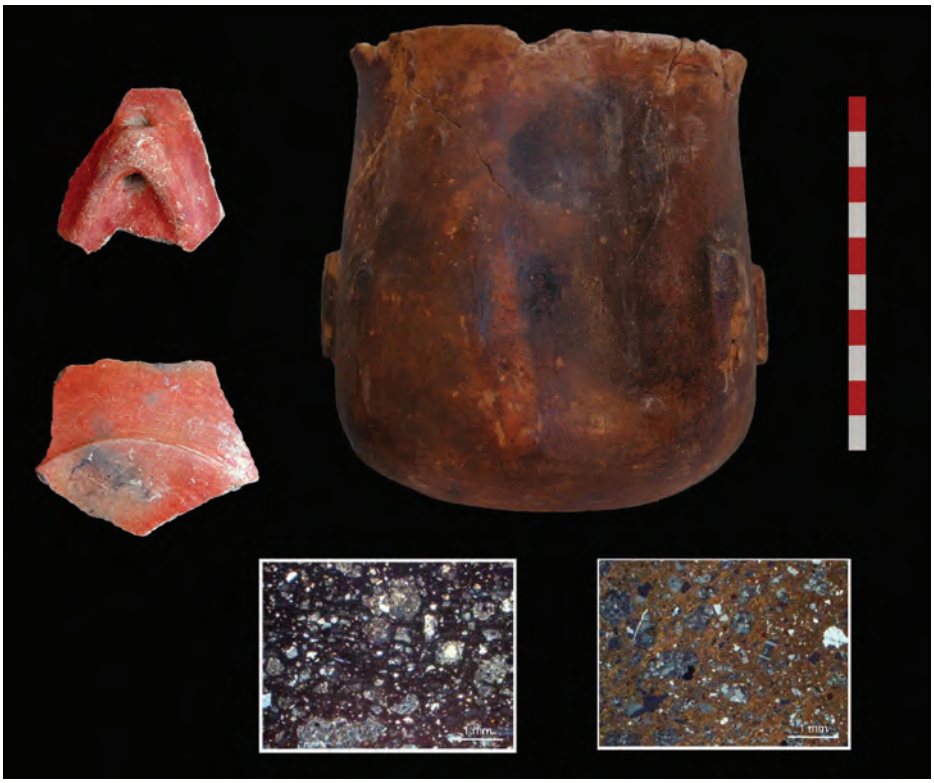

Figure 5. *Phase V pottery samples and thin-section photomicrographs of diorite porphyry fabric.*

annual average temperature is 17.1°C. The amount of precipitation between the driest and wettest months of the year is 107 mm. August is the driest month with 3 mm of precipitation. With an average of 110 mm, maximum rainfall occurs in December. The hottest month is August, with an average temperature of 25.3°C, and the lowest average temperatures are in January with an average temperature of 6.4°C. On the other hand, no pollen records or other such direct past climate proxies are available for the island of Gökçeada.

During excavations at the site of Uğurlu, six main cultural phases, designated as I–VI (beginning with Phase I at the top) have been recognized. The 31 conventional and AMS radiocarbon dates from Uğurlu clearly indicate a long history of occupation at the site, from 6760 to 4350 cal BC (Erdoğu *et alii* 2021).

THE ARCHAEOLOGICAL AND DATING EVIDENCE

The earliest occupation (Phase VI) at Uğurlu is located in the eastern part of the settlement, and is characterised by the absence of pottery. The thickness of the pre-pottery deposit is about 1 m. It is understood that the first settlement was rather small consisting of a few households spread over an area of 200 m^2. In the excavated 7 × 4 m trench BB20-21, semi-subterranean oval hut-like structures of ca. 3 × 1.50 m, comprising either reed or rammed earth-lined walls were discovered (Erdoğu *et alii* 2021). The earliest pottery found at the site appeared around 6600 cal BC (Phase VI–V), and its quantity is quite limited. Architecturally, only a shallow oval depression with sharp edges and partially traceable white-coloured floor was found. An oval sunken mud-plastered basin (ca. 60 × 50 cm), and a hearth, ca. 35 cm in diameter, were associated with the floor. A terrazzo platform, or surrounded area, made with burnt lime and pebbles was also discovered. It was red coloured and polished. Two AMS radiocarbon dates from bone samples originating in Phase VI–V (7760 ± 30 BP and 7690 ± 40 BP), calibrate respectively to 8591–8482 cal BP (6642–6533 cal BC) and 8519–8419 cal BP (6570–6470 cal BC) (68.3%). Charcoal dates are excluded as they potentially have an 'old wood effect'.

It is seen that starting from ca. 6500 cal BC, during Phase V, the settlement enlarged, and the Neolithic settlement covered an area of 2000 m^2 (Fig. 2). Remains of this period were unearthed in trench BB20-21 and two sounding trenches. Stone-based architecture appeared for the first time, and the pottery amount had increased. The vast majority of Phase V pottery is red slipped and burnished. All Phase V pottery is handmade and thin walled. Black and brown burnished sherds were found in small quantities. Deep bowls with "S" profile, hole-mouth vessels and straight-sided shallow dishes are common shapes. Bases are either flat or have a low pedestal. Vertically placed tube-like and knob-like perforated tubular lugs, as well as small crescent shaped lugs, are characteristic. Architecturally, stone-base walls and floor fragments not indicating a definite plan were found.

A single AMS radiocarbon date on a bone sample comes from trench BB20-21 and other two from sounding trench BB22. The radiocarbon date from trench BB20-21 is 7650 ± 25 BP (8450–8400 cal BP: 6501–6451 cal BC). The date from the lowest level of the sounding trench BB22 is 7618 ± 36 BP (8424–8379 cal BP: 6475–6439 cal BC), and the date from the fill just above it is 7490 ± 30 BP (8369–8215 cal BP: 6420–6266 cal BC). In Trench BB20-21, the remains of Building 10, which was dated to 7100 ± 30 BP (7964–7872 cal BP: 6015–5923 cal BC), lie in the upper part of the trench (Tab. 1). Thus, according to the radiocarbon dates, a gap of approximately 250 years is observed, which corresponds to more or less the 8.2 ka BP climate event (Fig. 3).

During this period, the settlement surface decreased again. Building 10 is a rectangular building with damaged mud walls on a stone foundation (Fig. 4). There was oriented northwest-southeast; only the northern and western walls have survived (Erdoğu 2017). The walls are ca. 50 cm wide, and the remaining northern wall section extends for about 3 m. An 80 × 50 m platform and a hearth, ca. 60 cm in diameter were associated with the building. Faunal remains show the presence of numerous new born caprine bones.

There is no fundamental change in the manufacturing of pottery. Petrographic analyses indicate that the clay sources and the pottery production method have not changed at all starting from the beginning (Fig. 5). In this respect, the samples contain abundant diorite porphyry. The minerals consist of quartz, alkali and plagioclase feldspars, amphiboles, pyroxene and titaniferous minerals, especially magnetite (Erdoğu 2014). This composition is compatible with the local geology of Gökçeada. Red-slipped burnished ware was still dominant, comprising 60% of the

Lab. No.	Material	Phase	14^C BP	1ð cal BC	2ð cal BC	δ13C ‰	Pre-treatment
AA106098	Bone Collagen	Phase VI/V	7760 ± 30 BP	6641–6570	6645–6505	-20,5	collagen ext. with alkali
AA106099	Bone Collagen	Phase VI/V	7690 ± 40 BP	6533–6584	6603–6455	-20,5	collagen ext. with alkali
UGAMS-42350	Bone Collagen	Phase V	7650 ± 25 BP	6501–6456	6532–6442	-21,21	collagen ext. with alkali
Wk-29173	Bone Collagen	Phase V	7618 ± 36 BP	6479–6436	6530–6417	-20,1	collagen ext. with alkali
UGAMS 25377	Bone Collagen	Phase V	7490 ± 30 BP	6424–6360	6315–6255	-19,19	collagen ext. with alkali
UGAMS 25379	Bone Collagen	Phase V	7100 ± 30 BP	5943–5927	5956–5905	-20,12	collagen ext. with alkali
AA106100	Bone Collagen	Phase V	6960 ± 40 BP	5891–5783	5917–5741	-20,5	collagen ext. with alkali

Table 1. *Conventional and calibrated radiocarbon dates from Uğurlu Phase VI/V and Phase V.*

total assemblage. Black burnished ware was still noted, but different tones of red slip applied on the exterior surfaces resulting in mottled surfaces. Red on white and white on red painted pottery also appear for the first time (Derici, Erdoğu 2019). Around 6000 cal BC, the 'Anatolian Type' of figurines that we know from the Lake District Region appeared. A Hacılar type of 'coffee-bean eyed' figurine head was found near the hearth of the Building 10. The life-span of Building 10 was limited, and subsequently a monumental building was built on the area, possibly for ritual purposes (see Erdoğu *et alii* 2021).

DISCUSSION AND CONCLUDING REMARKS

Dating and archaeological evidence from Neolithic settlements of Anatolia indicate that the impact of the 8.2 ka BP climate event varies by region. On one hand, although it is understood that Central Anatolia and the southern Mediterranean part of Anatolia were perhaps more affected by the early Holocene cooling event than Western Anatolia, absolutely dated archaeological evidence for large-scale collapse or migration at that time is still scant. On the other hand, at about 7.5 ka BP there were major cultural transformations or abrupt changes in virtually all regions of Anatolia (see Çevik, Erdoğu 2019), which seems to indicate another climate event (Hou *et alii* 2019).

The situation is different at Uğurlu, which is an island settlement. Once people settled on the island, adaptation and survival become an important focus of their daily lives. An island experiences certain pressures, limitations, but it may also benefit from its insularity. Islanders are isolated from or connected to the lands and peoples that surround them. Connectivity via the sea is a key feature of island life. Island identities may be founded on their isolation, and historical and cultural sense of belonging, social interaction within communities, and a persistence of traditional values (Burhold *et alii* 2013). Although Gökçeada had sufficient resources, it was suggested that the construction of a past islander identity did not occur before 6000/5900 cal BC (Erdoğu 2014).

A small agricultural community lived on the island until the 8.2 ka BP climate event. Although the agricultural land on the island is quite limited, their subsistence economy seems to have been based mainly on agriculture and partly animal husbandry, rather than hunting and fishing. It may be suggested that climate change affected mainly crop yields but also livestock production on the island. Although life in the settlement seems to have perhaps been disrupted by the climatic event, the continuity in material culture only indicates a gradual cultural change.

In the future, it is essential to carry out studies to reveal the past climate proxies directly on the island of Gökçeada and compare them with the archaeological data.

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