



# Cyprus and Sardinia in the Late Bronze Age: Nuragic table ware at Hala Sultan Tekke

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## ARTICLE INFO

### Keywords:

Eastern Mediterranean archaeology  
Late Bronze Age  
Sardinian/Nuragic table ware  
Hala Sultan Tekke, Cyprus  
Provenance studies  
Petrography  
NAA

## ABSTRACT

In the course of the Swedish excavations at Hala Sultan Tekke, Cyprus, table ware and domestic pottery of unknown provenance were discovered in offering pits dating to the 13th century BCE. These vessels comprise six hand-made and black burnished vessels, all of which have close typological parallels in the Nuragic culture of Sardinia. Comparative petrographic investigation confirmed their Sardinian provenance. Other archaeometric analyses include FTIR on the Cypriot and Sardinian material, and NAA on the Sardinian vessels from Hala Sultan Tekke. These vessels further extend the nature of intercultural relations of the site, which comprise a vast area including the Aegean, Anatolia, the Levant and Egypt. The paper presents the archaeometric results and briefly discusses their implication for Cypro-Sardinian connections in the Late Bronze Age.

## 1. Introduction

The connection between the Late Bronze Age Nuragic culture on Sardinia and Cyprus (Fig. 1) has been demonstrated by numerous Cypriot oxhide ingots of copper reported from Sardinia, which to date are known from around 40 Sardinian sites (Fig. 2; Lo Schiavo, 2018). Vice-versa, the first Sardinian imports to Cyprus were identified only recently comprising transport vessels from Pyla-Kokkinokremos (Karageorghis, 2011, 89–91; Bretschneider et al., 2015, 2017). The nature and extent of the connections between the two islands, which are approximately 2200 km apart as the crow flies, are much-debated (e.g. Lo Schiavo et al., 1985, 2009; Lo Schiavo, 2012, 2018; Lo Schiavo and Campus, 2013; Russell and Knapp, 2017).

The primary aim of this paper is the petrographic investigation of imported table and domestic wares discovered at the Late Cypriot harbour city of Hala Sultan Tekke (henceforth HST). The vessels from

HST have no counterparts in the local and eastern Mediterranean ceramic repertoires but – based on typological and production technology grounds – they are identical with Sardinian-produced pottery. The implications of the identification of these table ware vessels as imports from the Nuragic culture will briefly be discussed in this paper to shed further light on the far-reaching cultural, social and economic interactions of the two islands in terms of agents, navigation systems and routes.

In order to provenance the vessels from HST, which were primarily classified as Nuragic, five black burnished vessels were analysed by petrography. Only virtually complete vessels and fragmentary vessels which allow the reconstruction of the general shape for comparison with Sardinian counterparts were chosen. Additional sherds from HST of possible or likely Sardinian provenance were excluded because the vessel shape could not be reconstructed which prevented the classification based on visual criteria.

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**Fig. 1.** The position of Sardinia and Cyprus in the Mediterranean; drawing by P. Waiman-Barak.

The analysed assemblage from HST consists of three hand-made black burnished bowls with rounded bases, interior grooves and vestigial handles (Fig. 3:2–4; N11 in Fig. 3:1 was not analysed due to export restrictions); one small black burnished hemispherical bowl with vestigial handle (Fig. 3:5); and a vessel of the same production technique, the shape of which resembles a cooking pot (Fig. 3:6). Petrographic data for comparisons between corresponding Cypriot and Sardinian assemblages are presented. In addition, neutron activation analyses (NAA) of the material from HST were carried out for future comparisons with Nuragic samples from Sardinia. The Sardinian material could not be analysed with NAA because of export restrictions at the time of this study. Finally, Fourier transform infrared spectroscopy (FTIR) was performed on Sardinian and Cypriot assemblages. The results of NAA and FTIR can be found online in the [Supplementary information](#).

## 2. Archaeological contexts

### 2.1. Hala Sultan Tekke

The city of HST on the south coast of Cyprus was founded at the end of the Middle Cypriot Bronze Age around 1650 BCE (Fischer and Bürge, 2018a). HST flourished mainly in the Late Cypriot II (LC II) period until its final destruction and abandonment in the first part of the LC IIIA, i.e. in absolute terms from approximately 1500 to 1150 BCE. Initial magnetometer and georadar surveys indicate that the settled area is at least 23 ha, if not larger.

During the Late Bronze Age, the city was a major trade centre in the eastern Mediterranean, attested by a wide range of imported goods from the Aegean, Anatolia including Troy, the Northern and Southern Levant, and Egypt (Fischer and Bürge, 2018a). In addition to trade, the

city's wealth was based on intra-urban copper production and the manufacture of purple-dyed textiles. This is evidenced by tons of copper slag and ore (Fischer and Bürge, 2018b, 59), numerous tools for the production of textiles and hundreds of kilograms of murex shells for the production of purple dye (Fischer and Bürge, 2018a).

Since 2014, six almost complete black burnished vessels – five bowls and a vessel whose shape resembles a cooking pot – have been discovered from the roughly two hectares suburban Area A where burials and other ritual activities took place. This area is located to the east of the city, just outside the city wall and close to the famous mosque Umm Haram of HST (see also Fischer and Bürge, 2018a, 5, Fig. 1.5). Extensive geophysical surveys revealed over one hundred magnetic anomalies in this area, of which the subsequent excavations have so far identified 7 tombs, 15 offering pits and 22 wells. The rich contents of the tombs and offering pits reflect the wealth of the inhabitants of Hala Sultan Tekke (Fischer and Bürge, 2017; Fischer, 2019a, b).

The analysed vessels derive from three offering pits located close to tombs: Pits B, Z6 and Z7. These offering pits, either circular or 8-shaped, closely resemble each other in terms of structure and deposited material, and can all be dated to the LC IIC (13th c. BC). This date is based on several Mycenaean imports of LH IIIB date from the same contexts (e.g. Fischer and Bürge, 2015, 46, Figs. 25a, b; cf. also numerous radiocarbon dates from HST in Wild et al., 2019). Four of the bowls are almost identical in shape and surface treatment: they are shallow with an internal groove below the rim with one vestigial handle and a black burnished surface (Fig. 3:1–4). The fifth bowl is hemispherical, displaying a similar vestigial handle (Fig. 3:5). Among additional fragments of likely Sardinian provenance is the upper part of a cooking pot-shaped vessel from Pit Z6 (Fig. 3:6).

The standardised shallow bowls have rim diameters of 10–12 cm,





Fig. 2. The distribution of oxhide ingots in Sardinia; drawing by L. Tocco.



Fig. 3. Nuragic vessels from HST; drawings and photographs by T. Bürge.

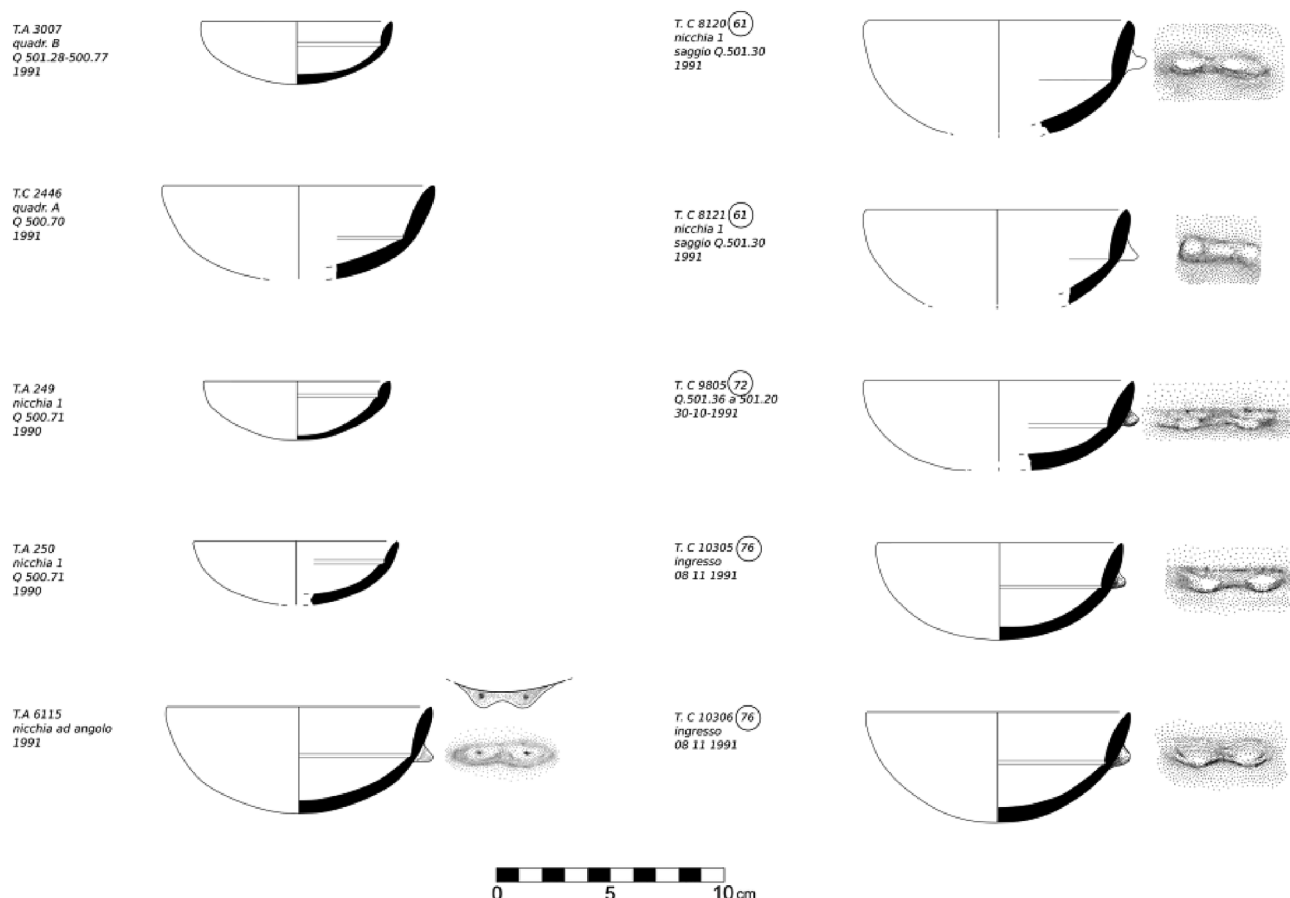


Fig. 4. Nuragic bowls from the Nuraghe Arrubiu Tower A (1–5) and Tower C (6–10); drawings by G. Pisano.

heights of 3.8–4.2 cm and their capacities to the rim are 0.13–0.17 l. The hemispherical bowl has a rim diameter of 10 cm and a height of 6.5 cm with a capacity of 0.35 l. All of the vessels are hand-made and hard-fired (see details on the firing temperature, in average 600–700 °C, in the [Supplementary information](#)), and display an almost black, horizontally burnished surface with a high, metal-like, lustre which was achieved by smoothing the surface with a hard tool before firing. Macroscopically, the average fabric is very dark grey to almost black with a matrix containing a medium number of fine to medium coarse voids and a medium number of mainly white inclusions of fine to medium-fine size.

## 2.2. Sardinia

The shape of the shallow bowls from HST, especially those with internal groove and vestigial handle (Fig. 3:1–4), is alien to the Cypriot and eastern Mediterranean pottery repertoires. Identical shapes, in local terms “scodelline a risega interna”, are known from the Nuragic culture of Sardinia (Fig. 4; Types 240–242 in [Campus and Leonelli, 2000](#), 184–185, 218, pl. 113, types 240–242; [Leonelli, 2006](#), 379–381, Fig. 1, nos. 18, 19). The type is most common in central and southern Sardinia (see distribution in Fig. 5) in the Recent Bronze Age 2 (c. 13th–first half of 12th c. BC; i.e. synchronous with LC IIC–IIIA1; see [Ugas et al., 2004](#),

400, tab. 1; new dates discussed by [Lo Schiavo and Perra, 2018](#), 62, Table 5, who propose c. 1250–1200 BCE, i.e. LC IIC2). However, in Towers A and C at Nuraghe Arrubiu-Orroli in central/south-eastern Sardinia (see Fig. 4) they appear as early as in the Recent Bronze Age 1, which in Sardinia starts approximately 1350 BCE ([Perra, 2018](#), 33, Fig. 4). After the 12th century BCE these bowls were no longer produced in Sardinia ([Relli, 1994](#)).

In contrast, the hemispherical bowl with vestigial handle (Fig. 3:5) has a longer life span lasting from the Middle to the Recent Bronze Age (c. 14th–12th c. BC) and has close counterparts in Mitza Purdia-Decimoputzu in southern Sardinia and in Kommos on Crete ([Campus and Leonelli, 2000](#), 187, 221, pl. 116:10–11, type 249 Scod. 37, var. A). The best parallel to the larger vessel which resembles a cooking pot (Fig. 3:6) is the “olla con orlo distinto svasato, forma panciuta” ([Campus and Leonelli, 2000](#), 485, 545, pl. 298, types 817–819 Ol. 52–54).

The Sardinian counterparts of all six vessels are classified as Nuragic Grey/Black ware, also referred to as Slate Grey ware, “grigio-ardesia” ([Ferrarese Ceruti, 1981](#), 606). This specific ware is mainly attested in central and southern Sardinia and is especially frequent in Nuraghe Antigori-Sarroch in the Recent and Final Bronze Ages (14th–10th c. BC; see [Giumlia-Mair and Lo Schiavo, 2018](#), 11), where it is also associated with imported Mycenaean pottery ([Lo Schiavo, 2013](#), 676–677).



## Distribuzione scodelline a calotta con risega e solcatura interna

tipo 240 ●

tipo 241 ▲

tipo 242 ■

- 1 SARROCH, nuraghe Antigori ●▲■
- 2 SANTADI, grotta Pirsu ▲
- 3 CAGLIARI PIRRI, villaggio Is Bingias ■
- 4 SELARGIUS, villaggio Bia 'e Palma ●▲
- 5 VILLAMASSARGIA, tomba di giganti 1 Monte Ollastu ●
- 6 GONNESA, nuraghe Serucci ▲
- 7 SESTU, villaggio S. Gemiliano ▲
- 8 IGLESIAS, sacca nuragica Via Cappuccini ▲
- 9 S. SPERATE, insediamenti Via Monastir e Via E. Arborea ●▲
- 10 SERRENTI, villaggio Sa Serra ▲■
- 11 GUASILA, tomba di giganti Sa Mandara ●
- 12 GUAMAGGIORE, pozzo sacro S. Maria Maddalena ▲■
- 13 ESCALAPLANO, nuraghe Pranu ilixi ▲
- 14 VILLANOVAFRANCA, nuraghe Su Mulinu ●▲
- 15 COLLINAS, tomba A Sedda sa Caudeba ●
- 16 LUNAMATRONA, nuraghe Trobas
- 17 ORROLI, tomba della Spada ▲
- 18 ORROLI, nuraghe Arrubiu ●▲
- 19 ORROLI, capanna nuragica Martingiana ▲
- 20 MOGORO, nuraghe Cuccurada ▲
- 21 SERRI, villaggio S. Vittoria ●
- 22 VILLANOVATULO, nuraghe Adoni ●
- 23 GENONI, capanna 1 Sa Corona Arrubia ●
- 24 SEULO, nuraghe Su Nuraxi ▲
- 25 ORISTANO, Madonna del Rimedio ■
- 26 MEANA SARDO, nuraghe Nolza ●▲
- 27 MASSAMA, villaggio Montigu Mannu ■
- 28 SORRADILE, santuario Su Monte ▲
- 29 FONNI, villaggio S. Michele ■
- 30 POZZOMAGGIORE, nuraghe Alvu ■

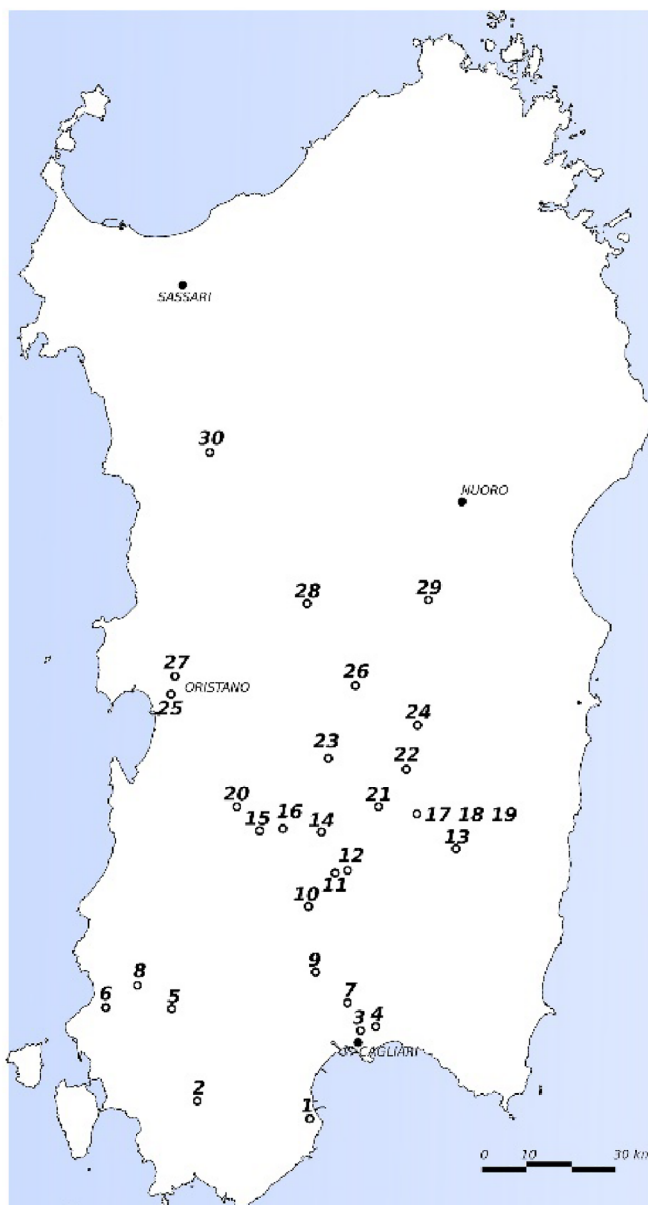


Fig. 5. The distribution of the shallow bowls with internal groove and vestigial handle (types 240–242) in Sardinia; drawing by M. Perla and G. Pisano.



Fig. 6. The geology of Cyprus; drawing by P. Waiman-Barak.

### 3. The geology of Cyprus and Sardinia: an overview

Cyprus and Sardinia have distinctive geological features (Figs. 6, 7). In the heart of Cyprus is an uplifted area of oceanic crust of Cretaceous age known as the ‘Troodos Ophiolite’ which affects the mineralogical composition in sediments throughout the island (Fig. 6). Sardinia is an original part of the Gondwana continent (Pre-Cambrian-Ordovician) that, after the Alpine Orogeny (Jurassic-Oligocene) and the opening of the south Tyrrhenian basin (Late Miocene), drifted away from Europe and underwent a counter clockwise rotation reaching its current location in the Mediterranean Sea (Fig. 7; Carmignani et al., 2015).

#### 3.1. Cyprus

Cyprus is divided into three main geological regions (Fig. 6):

1. The Troodos Massif surrounded by the Circum-Troodos Sedimentary Succession in the centre.
2. The Kyrenia range to the north.
3. The Mamonia complex to the west.

Ancient ceramic industries produced vessels using local clays from the riverbeds, rock formations or soils rich in clay minerals (Robertson and Woodcock, 1979; Kähler and Stow, 1998; Poole and Robertson, 1998; Cann et al., 2001; McCay and Robertson, 2012).

HST, located on the shore of the Larnaca Salt Lake was founded on biocalcarenes and sands of the Athalassa Formation. Exposed nearby is the Kalavassos Formation, composed of gypsum and chalky marls (GSD, 1995). The Tremithos River, which transports clays, silts and pebbles eroded from the pillow lavas, carbonate rocks and alluvial deposits, flows through and carries fragments of the Ophiolite mixed

with calcareous rocks (Ghilardi et al., 2015). The Miocene Lefkara Formation is characterised by calcareous microfossils (Robertson, 1998).

#### 3.2. Sardinia

Sardinia presents, from a geological viewpoint, a history inclusive of the most important global events that occurred over the last 540 Ma. There are four main geological units (Fig. 7; Carmignani et al., 2015):

1. The Variscan basement.

The oldest rocks with paleontological records are limestones of Cambrian-Lower Ordovician age which crop out in the south-west part of the island. The large part of the Variscan basement consists of metamorphic rocks (from a greenschist to an amphibolite facies) deformed during the Early Carboniferous; a Permian-Carboniferous plutonic batholith and dikes complex including leuco-granites, monzogranites, granodiorites and tonalites.

2. The Permian-Oligocene platform.

When Sardinia was part of the south of Europe during the Mesozoic, the opening of the Tethys ocean led to the deposition of a widespread carbonate platform.

3. The Upper Oligocene–Upper Miocene Volcano-Sedimentary cycles.

Above the Variscan basement lies a thick Mesozoic-Cenozoic volcano-sedimentary series containing continental, transitional and marine deposits associated with the Oligo-Miocene calcalkaline volcanism,



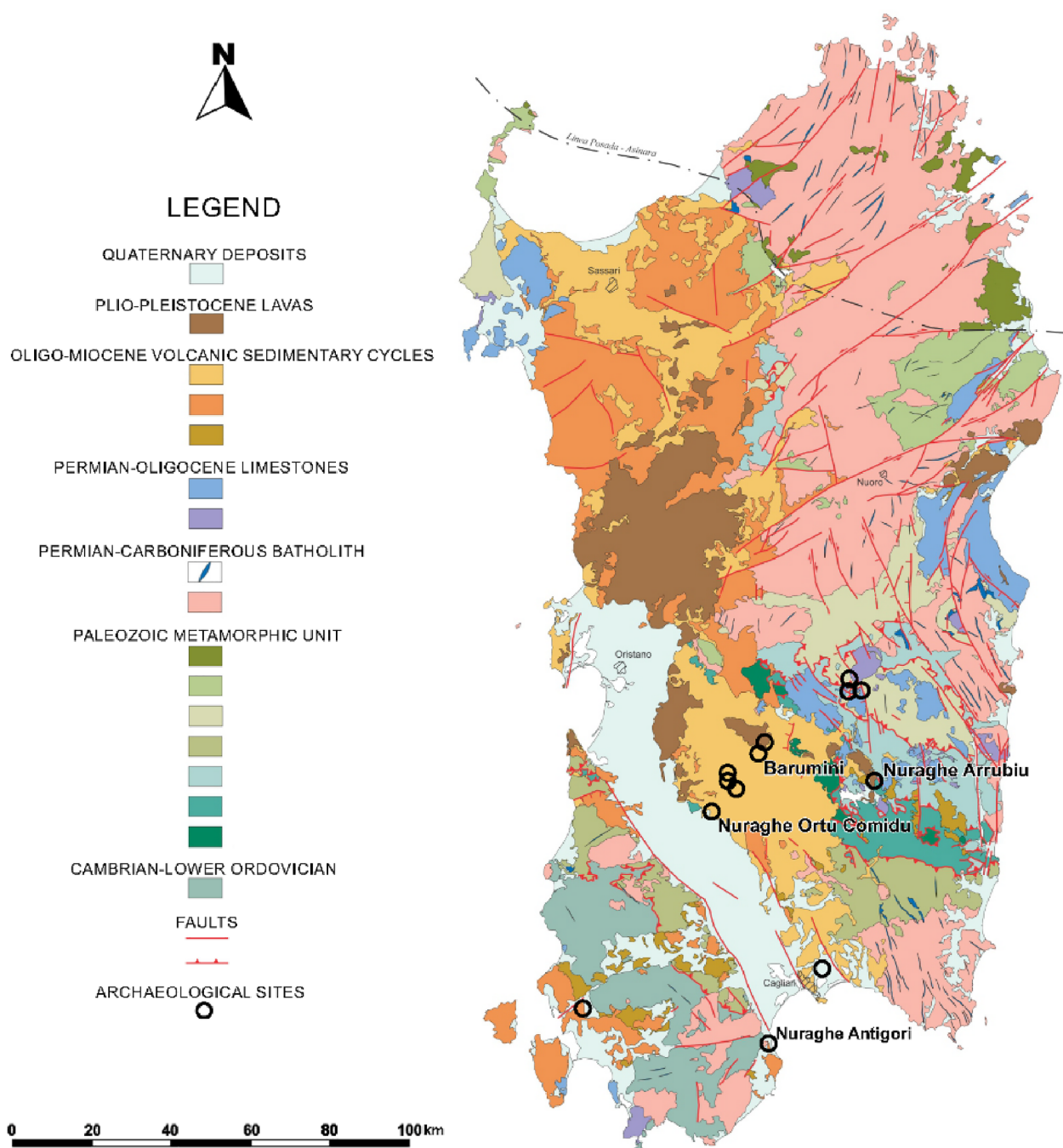


Fig. 7. The geology of Sardinia. Archaeological sites from which samples were taken are indicated by black circles; drawing by M.G. Gradoli.

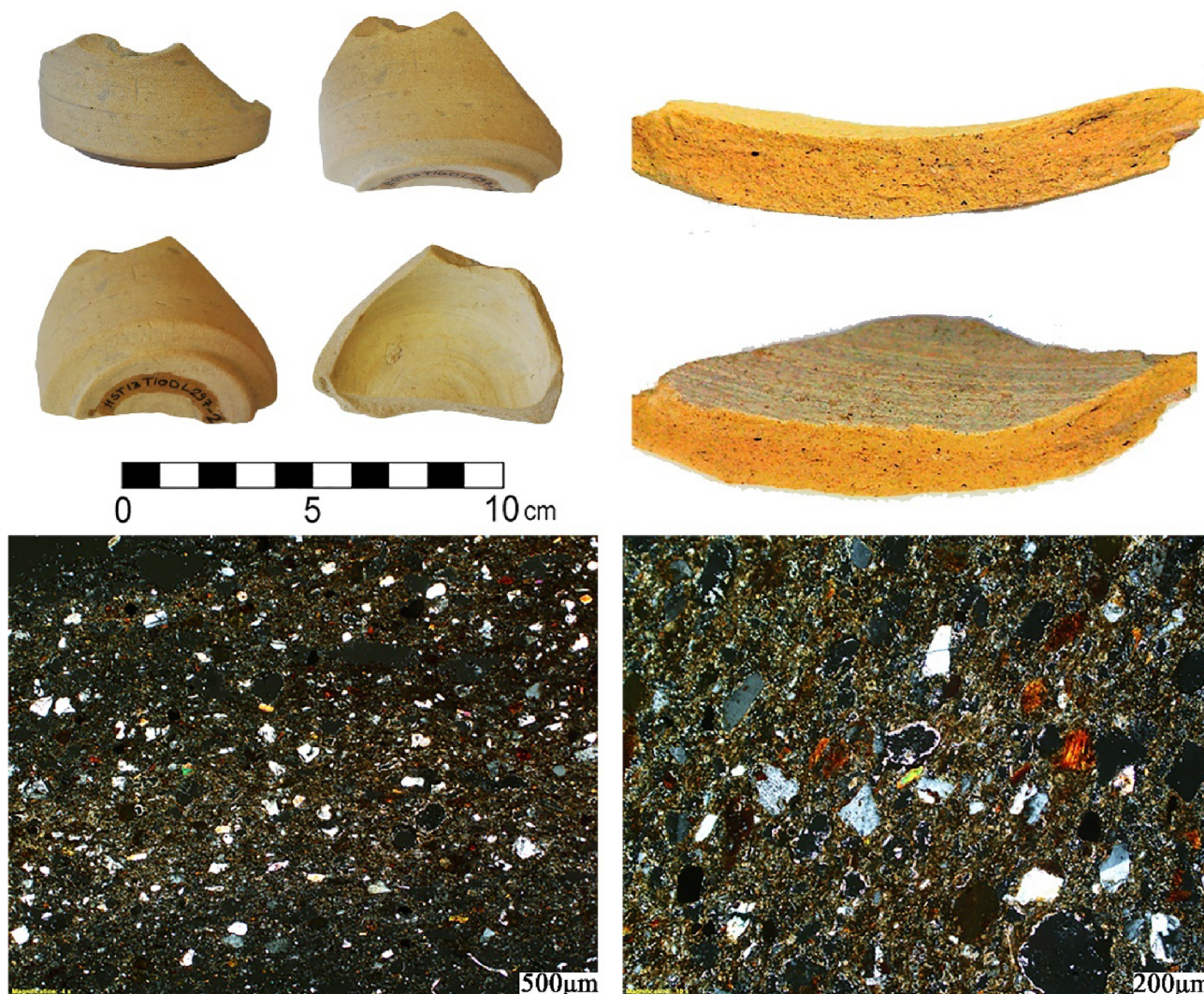
mainly andesites (First Miocene Cycle); marine and continental deposits with prevailing riolitic-dacitic volcanic rocks (Second Miocene Cycle); continental deposits covered and partially interlayered with basaltic lava flows (Third Miocene Cycle).

#### 4. Quaternary deposits

The Quaternary is mostly represented by continental, lagoon and marine-littoral deposits.

#### 4. Methods

In addition to petrography which is presented in detail, FTIR on the



**Fig. 8.** Plain White Wheel-made cup of the locally produced calcareous group at HST (L297-2) showing basaltic minerals, micas and iron oxides (photo, fresh break and thin sections in XPL); photos by M. Creisher and T. Sokolsky.

Cypriot and Sardinian samples and NAA on the Cypriot samples (see above) were also carried out (see [Supplementary information](#) which also contains geological details on the identified Sardinian groups).

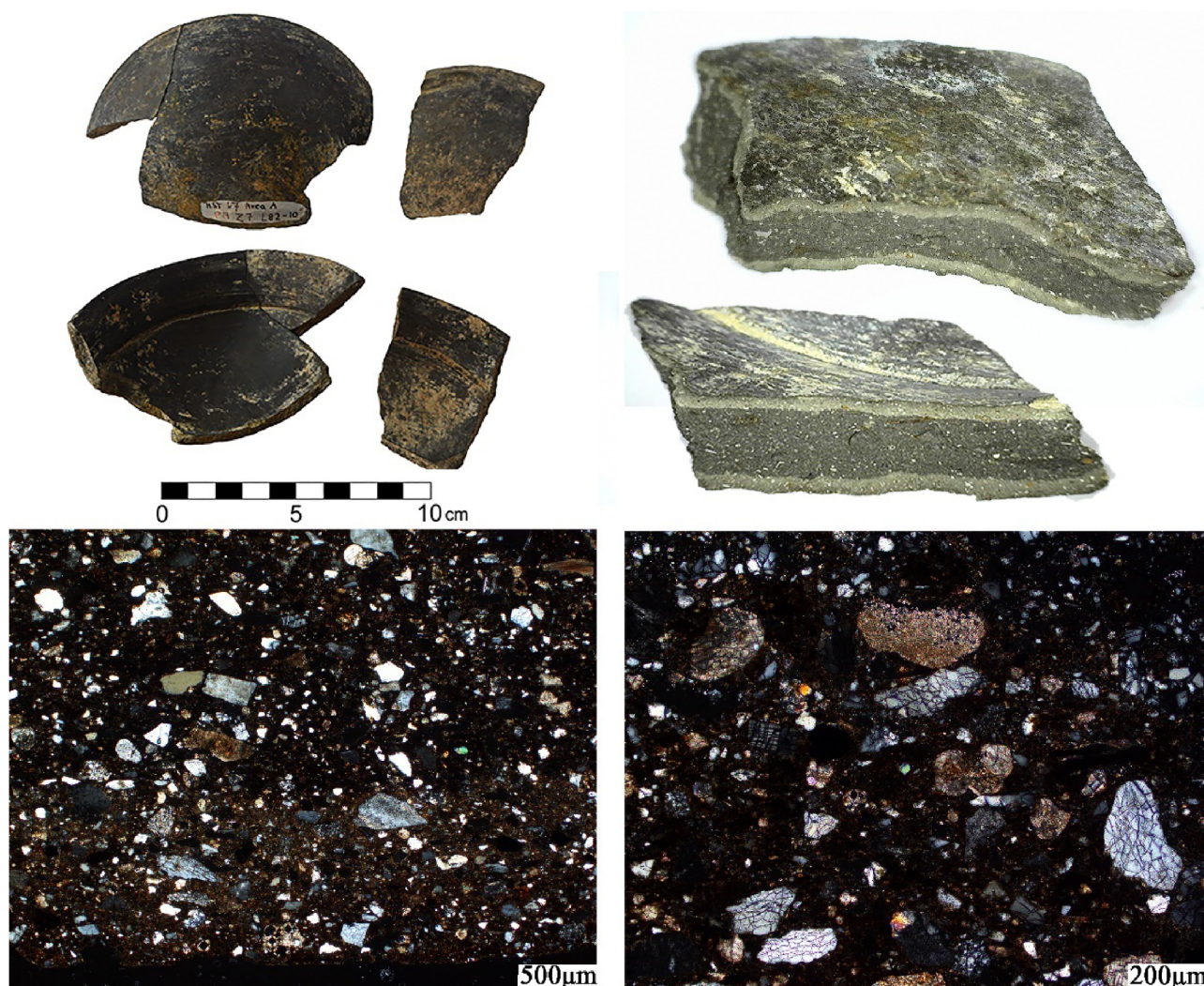
Five black burnished vessels from HST were thin-sectioned (30 µm) and studied under plane (PPL) and cross-polarized light (XPL) using either an Olympus BX51-P or a Brunel SP-300-P polarizing microscope, equipped with a Canon 1100D camera following [Whitbread \(1989\)](#). The thin sections were compared to approximately 400 unpublished ceramic thin sections from HST (see examples on the Levantine Ceramics Project website: <https://www.levantineceramics.org/sites/1597-hala-sultan-tekke>) and 700 Bronze Age ceramic thin sections from Sardinia ([Gradoli, 2012, 2015, 2016, 2019](#); see also [Supplementary information](#)). The latter represents the most extensive petrographic database available for Sardinia and includes ceramics from nine single and composite Bronze and Iron Age Nuragic settlements (1700–800

BCE), three ritual caves (4200–1500 BCE), and one settlement in south-west Sardinia (900–600 BCE).

In connection with the ongoing study of local clays and Cypriot ceramics at HST reference clays were collected from the alluvial plains north of HST, the banks of the Larnaca Salt Lake (i.e. the ancient harbour of the city) and from areas surrounding other key sites in Cyprus, which provided ample data for comparison. In addition, five locally produced Cypriot vessels were selected for comparative analyses.

Seventy Sardinian clays, from an average radius of 15–20 km surrounding relevant archaeological sites (see [Fig. 7](#)) were sampled to verify how clay sources were distributed within the modern landscape, to assess their degree of natural variation, and to investigate functional and cultural considerations of raw material sourcing by ancient potters ([Gradoli, 2019](#)).





**Fig. 9.** Bowl from HST (Fig. 3:4) representing the Sardinian Plutonic-Metamorphic Group. Note burnished surfaces, polycrystalline quartz and metasandstone grains in thin section (XPL); photos by M. Creisher and T. Sokolsky.

## 5. Results

The particular geologies of Cyprus and Sardinia allow differentiation between ceramic fabric compositions and technology typical of the Sardinian and Cypriot productions, respectively. The complex geological history in Sardinia intermingled several repetitive volcanic cycles with plutonic, metamorphic, and sedimentary lithostratigraphic units (Carmignani et al., 2015). Consequently, the same residual fluvial and marine transported clays were used in a varied range of compositional groups and classes (Gradoli, 2019).

### 5.1. Cyprus: Calcareous fabric with igneous derived minerals

The fabric is yellowish/green/red in PPL, silty, and foraminiferous with some iron oxides. The silt (~10%) is composed mainly of calcareous fragments, mica and minerals derived from igneous rocks, gypsum

and glauconite accumulations, and well-sorted fine calcareous sand (~15% up to 250 µm, Fig. 8). In most samples of this group the clay is usually dark, with non-optically active foraminifera and other calcareous components poorly preserved which suggests firing above 750 °C. The co-occurrence of calcite and high-temperature calcium silicates in the FTIR spectra suggests a slightly lower range of firing temperature between 600 and 750 °C (see Supplementary information).

HST is located on the shore of the Larnaca Salt Lake, identified as the silted port of the site abandoned in the late 12th century BCE (Morhange et al., 2000; Devillers et al., 2015; Fischer and Bürge, 2018a). Affirming the local ancient environment, this group is the most common fabric typical to the marine/brackish source at the foothills of the Troodos. Although some of the volcanic and plutonic rocks of the Cypriot Troodos Ophiolite have mineralogical compositions similar to those from Sardinia, this does not lead to confusion since during the Late Bronze Age these sources were used for specific Cypriot wares,



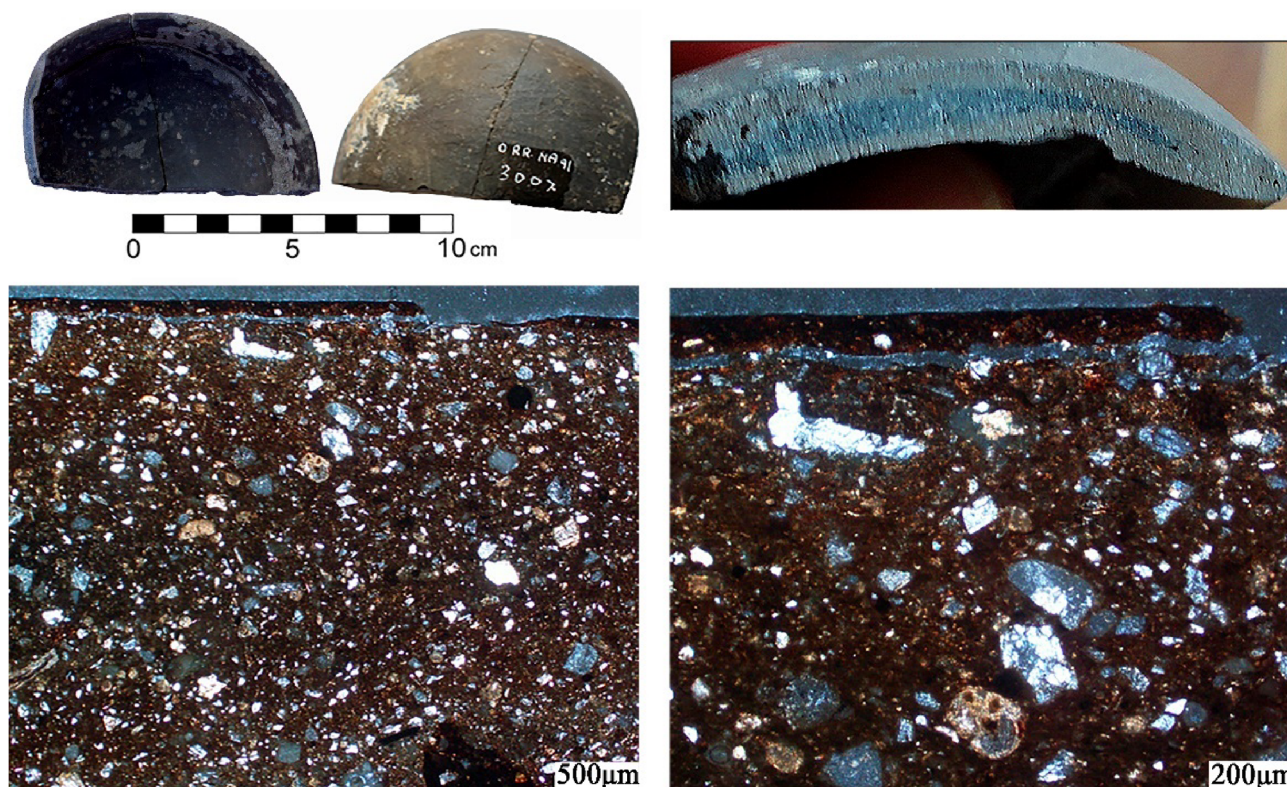


Fig. 10. Bowl from Tower C, Nuraghe Arrubiu, Sardinia, characteristic of the Sardinian Plutonic-Metamorphic Group (thin sections in XPL); photos by M.G. Gradoli.

including cooking pots, Base Ring and White Slip wares (Vaughan, 1987; Hatcher, 2007; Dikomitou-Eliadou et al., 2016).

## 5.2. Sardinia

From a total of 488 ceramic samples, the characterization study of the Sardinian Bronze Age ceramics permitted to identify seven fabric groups divided into 38 classes. Two classes comparable to the HST fabrics (Gradoli, 2019) are described below.

In general, clays possessing the best workability and lowest linear shrinkage – belonging to the Volcanic, Plutonic, Plutonic-Metamorphic, and Metamorphic groups – proved to be those most commonly used by Bronze Age Sardinian potters (Gradoli, 2019). Indeed, in the dataset studied these fabric groups constitute long lasting manufacturing and cultural traditions and, in the case of the Plutonic-Metamorphic group, a specific technological style identified only at the Nuraghe Arrubiu (Gradoli, 2012, 2015, 2016, 2019). The special appearance, including great care taken in the production, finishing and burnishing, suggests both a functional and social importance of these vessels (Gradoli, 2019).

### 5.2.1. Sardinian Plutonic-Metamorphic group

Two of the black burnished bowls from HST (Fig. 3:2, 4) belong to fabrics derived from Plutonic-Metamorphic and Volcanic raw materials which represent only a fraction of known fabric groups used for ceramic production in Sardinia. The fabric includes well-sorted, fine mono- and polycrystalline quartz, and metasandstone grains with preferred orientation (Figs. 9, 10). In the Sardinian repertoire this fabric is well-

represented at Nuraghe Arrubiu during the Recent Bronze Age.

### 5.2.2. Sardinian Volcanic group

The Volcanic group is represented at HST by two bowls and the cooking pot-like vessel (Fig. 3:3, 5, 6). This fabric is characterized by subangular and subrounded, poorly sorted, devitrified andesitic grains in which, occasionally, multiple twinned plagioclases with concentric zoning are still visible (Figs. 11, 12; cf. Group 2 from Pyla-Kokkinokremos in Fragnoli and Levi, 2011). In the Sardinian dataset, this fabric is well-represented at the Ortu Comidu Nuraghe during the Late/Final Bronze Ages (Gradoli, 2019).

## 6. Discussion

The fabric of the black burnished vessels from HST macroscopically stands out in any Cypriot assemblage mainly composed of light-coloured calcareous ceramics. Manufacturing technology, surface treatment, firing conditions and fabric composition are comparable to tableware found at various production centres in central-southern Sardinia. In addition to the unambiguous results by visual examination, our petrographic results demonstrated that these vessels fit excellently with two fabric groups from southern/central Sardinia: the Plutonic-Metamorphic and Volcanic. This was verified by a methodological approach which used reference materials from Sardinia and Cyprus of which large Late Bronze Age assemblages of ceramics and raw materials were investigated. Hence, petrography proved to be very useful not only in characterising clay sources and the fired ceramics, but also





**Fig. 11.** Bowl from HST (Fig. 3:3) characteristic of the Sardinian Volcanic group. Note devitrified andesitic grains in thin section (XPL); photos by M. Creisher and T. Sokolsky.

enabled the separation between the Sardinian groups. The FTIR analysis provided mineralogical data supporting the petrographic analysis, as well as information regarding firing temperatures. In addition, NAA shows a distinct chemical difference of the black burnished vessels from HST with respect to all the other ceramic material from HST. As soon as the export restrictions by the Sardinian authorities are lifted, our NAA-results will be useful for future comparisons with NAA on Sardinian ceramics.

The fact that all discussed vessels were found in offering pits in proximity to tombs is striking, as these were integrated in a genuine Cypriot cultic practice (Bürge, 2017). Perhaps, they were regarded as very special, exotic items, which – in case of the bowls – were suitable in the context of libation and other ritual ceremonies. Regarding similar vessels from Sardinia, biochemical analyses suggest that they were used for holding and serving liquids, such as wine, beer (Gradoli and Garnier, 2017) and dairy products (Perra et al., 2015).

The contexts from which these vessels derive can securely be dated to the LC IIC, i.e. mainly the 13th century BCE. This corresponds excellently to the chronological evidence from Sardinia, in specific regarding the shallow bowls with internal groove, which are attested from the mid-14th to the early 12th centuries BC. The only other Cypriot site where imports from the Nuragic culture – four ovoid jars of impasto ware – have been found is Pyla-Kokkinokremos, a short-lived settlement of the LC IIC, approximately 17 km east of HST (Bretschneider et al., 2015, 2017). The contexts of the roughly 50 fragments of Sardinian imports from the trading centre of Kommos, southern Crete, also point to the 13th century BCE, i.e. the LM IIIB (Watrous et al., 1998; Rutter, 2006, 674–675; 2017, 270–271). Here, closed vessels dominate the assemblage, although bowls are present, too – however, none of them of the type with an internal groove.

Further west and outside Sardinia, Nuragic pottery has been found at Cannatello in southern Sicily, from where abundant Mycenaean and



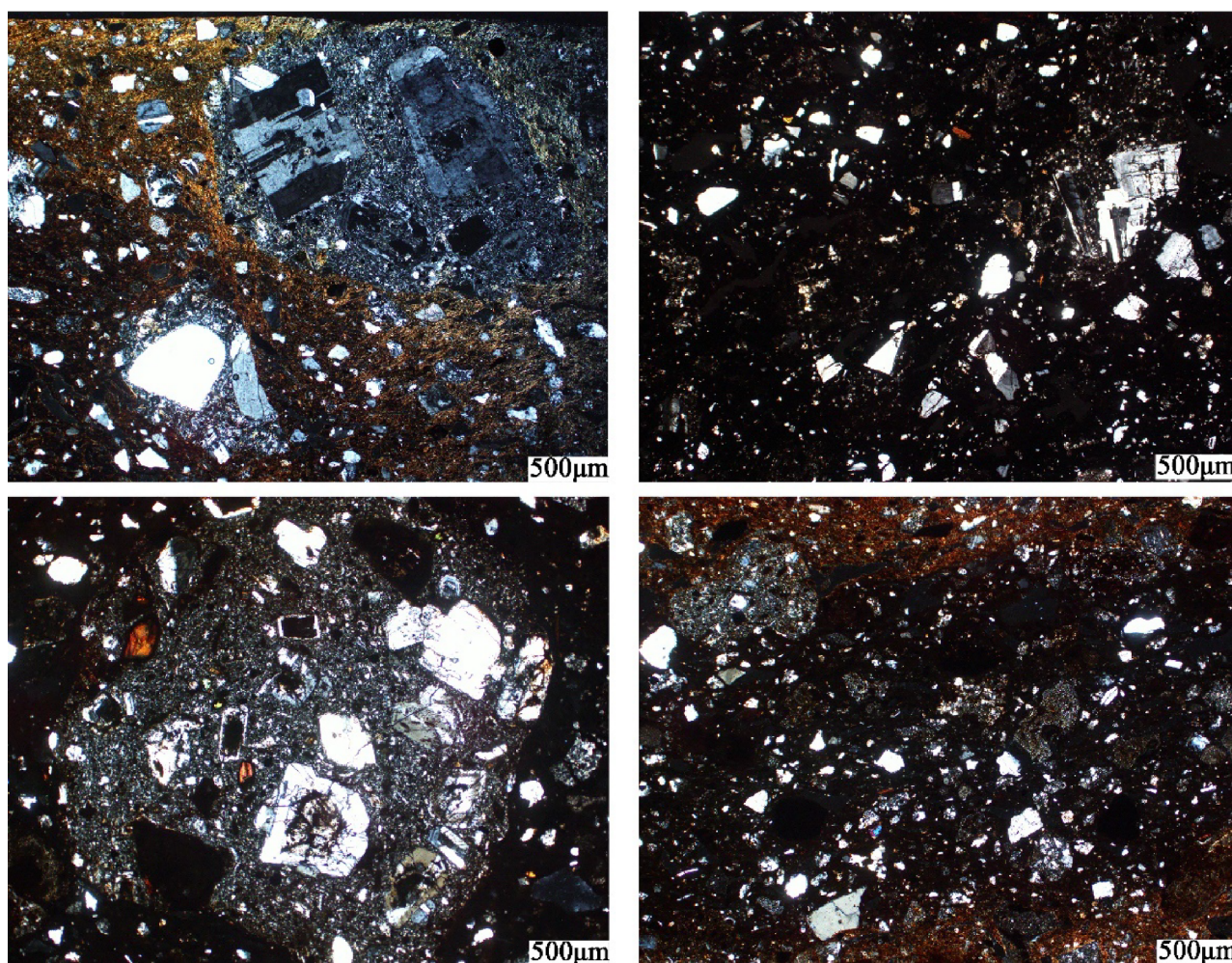


Fig. 12. Thin sections (XPL) of bowls from Ortu Comidu, Sardinia characteristic of the Volcanic group. Note devitrified andesitic grains and multiple twinned plagioclases with concentric zoning; photos by M.G. Gradoli.

Cypriot pottery is also known (Levi, 2004; Levi et al., 2017), and on the Aeolian island of Lipari (Ferrarese Ceruti, 1998; Cavalieri and Depalmas, 2008; Campus and Leonelli, 2012). All these sites represent trading posts connected, *inter alia*, with copper trade. In fact, Cypro-Sardinian contacts in the Late Bronze Age are most strikingly evidenced by numerous Cypriot oxhide ingots known from around 40 sites in Sardinia (Lo Schiavo, 2018). With the exception of just two published pottery fragments (a third is a Cypriot-style; Vagnetti, 2001; Russell and Knapp, 2017; there is – as yet – no other definitely confirmed (and published) Cypriot ceramic evidence among the hundreds of imported Mycenaean and locally imitated Mycenaean sherds at the Antigori Nuraghe, Sarrach. On the other hand, there is accumulating metallurgical evidence, including tools and other bronze objects found in Sardinia, showing Cypriot influences (e.g. Lo Schiavo et al., 1985; Vagnetti and Lo Schiavo, 1989; Lo Schiavo, 2012).

In general, there are two opposing positions of how the Late Bronze Age exchange networks were organised. One model explains the connection between Sardinia and Cyprus mainly by low-level cabotage and

other local modes of trade meshed with interregional to international systems. In general, this model refuses direct trade between these two islands, as well as the presence of Cypriots in Sardinia or Sardinians in Cyprus (e.g. Russell and Knapp, 2017). However, the findspots of Sardinian imported pottery, the amount of which is constantly growing, suggest a direct trade route from (southern) Sardinia via Sicily and southern Crete to Cyprus (see also Bürge and Fischer, 2019). Hence, Lo Schiavo and Campus (2013, 158) suggested that Sardinian sailors and traders followed these sea routes to acquire Cypriot oxhide ingots. This trade may have started as early as in the 14th century BCE (Lo Schiavo and D'Oriano, 2018, 124) and seems to have been most intense in the 13th century BCE, which is supported by our archaeological contexts.

The question about which goods Cyprus received from Sardinia in exchange for the copper remains unanswered, as the relatively small amount of pottery, even if we consider the possible contents of the larger vessels from Pyla-Kokkinokremos, are definitely not a sufficient exchange value. Thus, perishable products should also be considered (Bürge and Fischer, 2019).



## 7. Conclusions

Petrography confirmed the Nuragic provenance of the black burnished vessels from HST in 13th century BCE contexts. NAA supports the petrographical results by excluding the possibility that this pottery was locally produced. Hence, the presence of Sardinian imports proves once more the vast connections of this harbour city and transshipment centre, which included not only all regions of the eastern Mediterranean, but also the central Mediterranean (Bürge and Fischer, 2019; Fischer, 2019a,b).

The growing evidence of Cypriot imports in Sardinia and Sardinian imports in Cyprus suggests a determined and well-organised long-distance trade between Cyprus and Sardinia. However, more studies are needed to explain the complexity of these far-reaching contacts, which were the consequence of the dynamic Late Bronze Age metal trade in the Mediterranean and beyond.

The findings of Sardinian-manufactured table and domestic ware at HST integrated in a genuine Cypriot cultic practice may further hint at the presence of Sardinians in Cyprus. DNA and strontium isotope analyses of skeletons from the tombs at HST are presently being carried out, which may contribute to understanding patterns of human mobility between these two islands and to characterise the intercultural spirit of one of the most important trade hubs of the eastern Mediterranean.

## Acknowledgments

We are much obliged to the Department of Antiquities of Cyprus for the export license of samples from the Swedish excavations at Hala Sultan Tekke directed by Peter M. Fischer. The excavations and the analyses (petrography and NAA) were supported by the Söderberg Foundation (Swedish id. ÖT4/18), The Swedish Research Council (Swedish id. 2015-01192), INSTAP (USA id. 0000000060) and the Royal Swedish Academy of History and Antiquities (Swedish id. FS2019-0100). Further support was contributed by the Swedish Riksbank Anniversary Fund (Swedish id. F19-1036:1). FTIR analysis was conducted at the Laboratory for Sedimentary Archaeology, University of Haifa, directed by Ruth Shahack-Gross. Michelle Creisher provided technical assistance. The Sardinian Bronze Age ceramics were sampled with permission from the Soprintendenza Archeologia, Belle Arti e Paesaggio per la Città Metropolitana di Cagliari e le Province di Oristano e Sud Sardegna. Thin sections from Sardinia were photographed and studied under the microscope by Maria G. Gradoli as part of her PhD thesis at the School of Archaeology and Ancient History of the University of Leicester, UK.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jasrep.2020.102479>.

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