Early Helladic Pottery Traditions in Western Greece: The Case of Kephalonia and Ithaca

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Abstract: Pelikata on northern Ithaca was a rare known settlement dating to the Early Helladic period in the Ionian Islands, until recent rescue excavations on Kephalonia brought to light substantial architectural remains on the EKO property at the southern entrance to the modern town of Sami. The analytical results from a total of 55 samples indicate that the Early Helladic pottery production is heavily based on local resources. The raw materials are transformed into durable clay pastes by clay mixing and tempering, as these islands (notably Ithaca) are characterised by sediments which are not suitable for pottery making if unprocessed. Imports were not identified within the analysed assemblage, suggesting the existence of a very strong local tradition and possibly the rather introvert character of Early Helladic Ionian pottery production.

Keywords: Ithaca, Kephalonia, petrographic analysis, grog tempering, plain and burnished wares

Introduction

Throughout antiquity, Kephalonia and Ithaca were key stations on sea routes between the Peloponnese, central and north-western Greece, the western Balkans and southern Italy (Fig. 1). Habitation on both islands, setting aside sporadic Palaeolithic finds, can be securely traced from the Late Neolithic onwards, continuing essentially unbroken into the Late Roman period.[4]

Early Bronze Age (EBA) settlement on Ithaca can be best understood at Pelikata, in the northern part of the island. Excavation by the British School at Athens in 1930/31, directed by Walter Heurtley, revealed parts of a fortified settlement.[5] Although most habitation layers were highly disturbed, the quantity and variety of EH II and III material recovered, as well as the fortification wall with at least one bastion exposed in five places on the eastern, northern, and western sides of the hill,[6] indicate a settlement comparable to the contemporaneous proto-urban settlements of the mainland and the Cyclades. It is difficult to assess the exact architectural layout because practically no structure was preserved. Nevertheless, Pelikata yielded intramural pithos burials (rather poorly preserved) in Areas I and VI[7] which have parallels in EH II–III burials found sporadically in Western Greece.[8] On the basis of the pottery evidence,[9] notably the large quantity of EH Urfirnis (for the most part very badly preserved) and the presence of sauceboats, Pelikata was occupied within EH II. The majority of the remaining diagnostic pottery, namely Dark Burnished

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4 Kourtessi-Philippakis 1999; Sotiriou 2012; Livitsanis 2013.
5 Heurtley 1934/1935.
6 Heurtley 1934/1935, 3, Plate I.
7 Heurtley 1934/1935, 6, 13–14.
8 E.g. in Elis: Olympia/Altis: Dörpfeld 1935, 94–110. – Strephi: Choremis 1968; Choremis 1969; Koumouzelis 1980, 27–55. – In Aetolia-Acarnania, Platygiali/Astakos: Dellaporta – Spondylis 1991; for discussion see Souyoudzoglou-Haywood 1999, 132–133.
9 Heurtley 1934/1935, 15–28; Souyoudzoglou-Haywood 1999, 97–99.

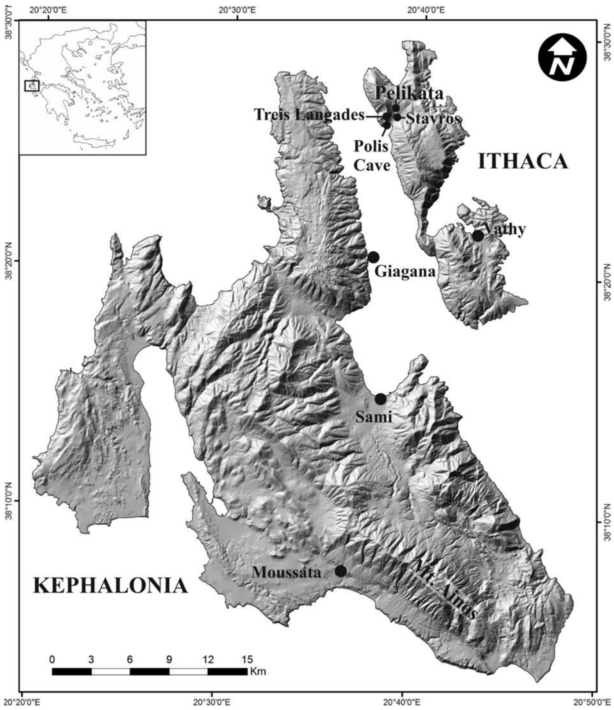

Fig. 1 Map of Kephalonia and Ithaca including all sites mentioned in the text (graphics: S. Valkaniotis)

and Fine Grey Burnished Wares, as well as the shapes (e.g. Bass-bowls, tankards and *depas*-like cups), are EH III, suggesting that the most intensive occupation belongs to that period.[10] The Fine Grey Burnished Ware of Pelikata is closely similar to pottery from EH III Olympia:[11] the prototype for both series was probably the Cetina-type pottery of the north-western Balkans and the Dalmatian coast, with Pelikata as an intermediate station on the south-bound route.[12] Further hints of long-distance connections are provided by a handful of dark on light sherds, including two identified by Branigan as coming from an EM II platter.[13] A high percentage of the pottery assemblage from Pelikata consists of handmade coarse ware in various shapes and sizes, ranging from bowls and cups to pithoi with plastic cordon decoration. Finally, a rounded terminal of a diadem in gold leaf was recovered from the area of the pithos burials, and a single disc-shaped gold bead with central hole from Area I.[14] Diadems of similar type and decorative technique are known from Troy and Crete, the largest collection being that from Mochlos, while the bead clearly resembles others from EH II contexts in the Aegean.[15]

As this evidence shows, the maritime routes which linked the western coast of the Peloponnese with the Ionian Islands were well established in EH II–III. Although the mechanisms of EBA trade are largely hypothetical, links between the Ionian Islands and the Aegean existed, and these routes can be extended to include the eastern Adriatic. Tangible proof of this connectivity is rather meagre, but the recovery of an Early Helladic (probably EH III) shipwreck at Giagana Bay in the Strait of Ithaca testifies to such maritime routes and connections.[16]

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10 Heurtley 1934/1935, 15–22, figs. 12, 17, pls. 5, 6.
11 Rutter 1983.
12 Maran 1987; Maran 2007.
13 Branigan 1975, 40.
14 Heurtley 1934/1935, 37, pl. 9 nos.167–168.
15 Souyoudzoglou-Haywood 1999, 100.
16 Evangelistis 2000.

On Kephalonia, Early Bronze Age finds (for the most part chance discoveries or from survey) indicate increased but scattered habitation. In the last few years, construction work on a number of different plots within the modern city of Sami have revealed new evidence of continuous habitation from the Bronze Age until Early Christian times. Substantial Early Helladic finds derive from a) the Pavlatou plot at Fournoi (at the southern entrance to Sami, close to the national road to Argostoli),[17] and b) the EKO plot 100m to the west. Traces of Early Helladic habitation have also been identified at the northern entrance to modern Sami (ca. 800m northeast of the Pavlatou plot). At Fournoi, paved floors and parts of a straight and of an apsidal wall were revealed, along with three (child) burials in pithoi. Rescue excavation on the EKO plot revealed part of an apsidal wall (Fig. 2), while parts of straight walls and paved floors were identified under extensive destruction layers, plus a cist grave in contact with a pile of stones (Fig. 3). Burials within habitation areas (be they cist graves or pithos burials) are regularly found in Early Helladic Western Greece, suggesting a common cultural background across this wide area.

Fig. 2 Sami, EKO plot: the apsidal wall and part of a paved floor (A. Sotiriou)

Fig. 3 Sami, EKO plot: the cist grave (A. Sotiriou)

Whether these plots were parts of the same settlement is still unknown. Nonetheless, they indicate well-structured and organised communities which shared the same material culture, as suggested by the pottery assemblage retrieved (which is characteristic of the EH II–III repertoire of the region). Macroscopic assessment of finds from the EKO plot identified various types of handmade pottery (Fig. 4) and distinguished two broad fabric groups: a) a fine fabric, usually with light brown surfaces and a darker core, and b) a coarse fabric with large inclusions, usually with red surfaces and a grey core, indicating incomplete firing. Vessels in the latter fabric are usually thick-walled with broad rims, frequently bear applied decoration in the form of a rope/coil, and are thought to have been used for storage. The fine fabric is attested mainly in open vessels of small or medium size, notably bowls.[18]

[17] Sotiriou 1999, 276–278.

[18] Similar observations were made with regard to the Fournoi pottery assemblage by Sotiriou 1999, 277; see also Souyoudzoglou-Haywood 1999, 46, for comparable remarks on EBA survey pottery from Kephalonia.

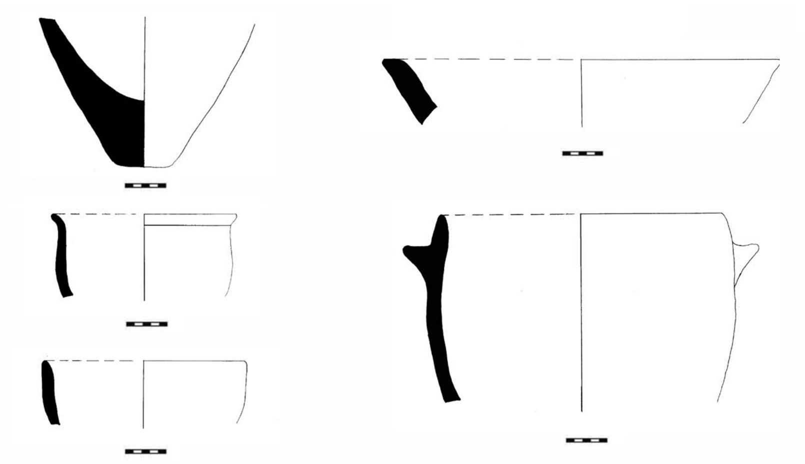

Fig. 4 Sami, EKO plot: characteristic vessel types from the pottery assemblage (A. Sotiriou)

Research aims, sampling strategy and analytical methodology

The material presented and discussed here is part of a larger analytical programme focused on the coarse and cooking wares of Ithaca and Kephalonia from prehistory until the Late Roman period. This programme aims to assess the exact character of local production through time, and to reconstruct the technological choices made at each stage of the manufacturing process.[19] A total of 404 ceramic samples dating from Neolithic to Late Roman times was selected to represent the variety observed in fabric (type, quantity, and size of inclusions, surface and core colour), ware (surface treatment and/or decoration), and vessel form, covering the available range of coarse and cooking vessels examined. Early Helladic samples (55 in total: 35 from Pelikata and 20 from Sami) mostly derive from semi-coarse and coarse Plain or Burnished Wares (Tab. 1).

Sample	Chronology	Typology	Refring colour	Coarseness	Optical activity
Pelikata					
Calcite, chert and Tcfs fabric (ITHFG2)					
ITH09/112	EBA	Dark burnished (Grey Ware?) boat-shaped vase (Heurtley 1934/1935, fig. 21, 89)	2.5YR 4/6 red	medium-coarse	active
ITH09/113	EBAIII	Dark burnished Bass bowl	2.5YR 3/6 dark red	medium	active
ITH09/115	EBAIII	Dark burnished open vessel	10YR 7/4 very pale brown	medium	active-moderately active
ITH09/117	EBA	Dark burnished deep bowl	2.5YR 3/4 dark reddish brown	medium	active-moderately active
ITH09/118	EBAIII-MBA	Dark burnished open vessel	2.5YR 3/6 dark red	medium	active
ITH09/120	EBAIII-MBA	Dark burnished open vessel	2.5YR 4/6 red	medium-coarse	active-moderately active
ITH09/121	EBAIII-MBA	Dark burnished open vessel (kantharos?)	10R 4/6 red	medium	active
ITH09/127	EBA	Plain cooking pot with impressed notches on rim	2.5YR 4/6 red	medium-coarse	active-moderately active
ITH09/128	EBA	Buff burnished open vessel	2.5YR 2.5/4 dark reddish brown	coarse	active-moderately active

Tab. 1 Summary table of samples per fabric

[19] BSA Potting Traditions.

Sample	Chronology	Typology	Refring colour	Coarseness	Optical activity
Pelikata					
ITH09/134	EBA (EBII?)	Plain jar with plastic decoration	2.5YR 4/6 red	coarse	active-moderately active
ITH09/135	EBA	Plain jar with wish-bone lug (similar to Heurtley 1934/1935, fig. 16, 52; cf. p. 22, ft. 1)	2.5YR 4/4 reddish brown	medium	active
ITH09/140	EBA	Plain jar with crescent handle (similar to Heurtley 1934/1935, fig. 16, 51)	2.5YR 5/4 reddish brown	coarse	active-moderately active
ITH09/141	EBA	Plain jar with crescent handle (similar to Heurtley 1934/1935, fig. 16, 51)	2.5YR 4/6 red	coarse	active-moderately active
ITH09/145	Bronze Age	weight / spindle whorl	2.5YR 4/4 reddish brown	medium	active-moderately active
Chert, Tcfs and calcite fabric (ITHFG3)					
ITH09/114	EBAIII	Burnished Bass bowl	2.5YR 4/4 reddish brown	medium-coarse	active-moderately active
ITH09/116	EBA	Dark burnished open vessel with pedestal base	2.5YR 5/6 red	coarse	moderately
ITH09/122	EBA	Dark plain open vessel (Bass bowl?)	2.5YR 3/6 dark red	coarse	active (-moderately active)
ITH09/123	EBAIII-MBA	Dark burnished open vessel	2.5YR 3/6 dark red	medium-coarse	active
ITH09/129	EBA	Plain pithos/jar	2.5YR 3/6 dark red	coarse	active(-moderately active)
ITH09/132	EBA	Dark burnished open vessel (Bass bowl?)	7.5YR 6/4 light brown	medium-coarse	active
ITH09/139	EBA	Plain jar with crescent handle (similar to Heurtley 1934/1935, fig. 16, 51)	2.5YR 3/6 dark red	medium-coarse	active-moderately active
Tcfs and chert fabric (ITHFG1)					
ITH09/124	EBAIII-MBA	Dark burnished Bass bowl	2.5YR 3/6 dark red	medium	active
ITH09/126	EBA	Plain cooking pot	2.5YR 3/4 dark reddish brown	coarse	active-moderately active
ITH09/143	Bronze Age	spool	2.5YR 4/4 reddish brown	medium	active
ITH09/144	Bronze Age	weight	2.5YR 4/4 reddish brown	medium	active-moderately active
Tcfs and chert fabric (ITHFG1, subgroup A)					
ITH09/133	Bronze Age	Plain waster?	2.5YR 4/6 red	medium	inactive
ITH09/136	EBA	Plain jar with wish-bone lug (similar to Heurtley 1934/1935, fig. 16, 52; cf. p. 22, ft. 1)	2.5YR 3/6 dark red	medium	active
Tcfs and chert fabric (ITHFG1, subgroup B)					
ITH09/125	EBAIII-MBA	Dark burnished jar with vertical handle and plastic decoration	2.5YR 3/4 dark reddish brown	medium	moderately-slightly active
Calcite and chert fabric (ITHFG8)					
ITH09/130	EBA	Plain pithos/jar	lime spalling (5YR 6/4 light reddish brown)	coarse	active-moderately active
ITH09/137	EBA (EBII?)	Plain jar with plastic decoration	lime spalling (5YR 6/4 light reddish brown)	coarse	moderately active
ITH09/142	EBA	Plain pithos with cordon, finger impressed decoration (possibly from Heurtley 1934/1935, fig. 23, 100)	lime spalling (2.5YR 4/6 red)	coarse	active-moderately active

Tab. 1 continued

Sample	Chronology	Typology	Refring colour	Coarseness	Optical activity
Pelikata					
ITH09/146	Bronze Age	weight	lime spalling (2.5YR 5/6 red)	medium-coarse	active
Loner fabric: Coarse calcareous fabric					
ITH09/119	EBAIII?	Dark burnished Bass bowl?	lime spalling (10YR 7/2 light gray)	coarse	active
Loner fabric: Calcite tempered fabric					
ITH09/131	EBA (EBII?)	Plain pithos/jar	2.5YR 4/4 reddish brown	coarse	active-moderately active
Loner fabric: Chert, Tcfs and quartz-rich rock fragments fabric					
ITH09/138	EBA	Plain jar with crescent handle (Heurtley 1934/1935, fig. 16, 51)	2.5YR 5/8 red	medium-fine	slightly
Sami					
Sedimentary with variable Tcfs fabric (SAMFG3, subgroup A)					
SAM11/82	EBA	Burnished bowl	10R 4/6 red	medium	moderately-slightly active
SAM11/86	EBA	Plain jar	10R 4/6 red	medium	active-moderately active
SAM11/87	EBA	Plain jar	10R 4/6 red	medium-coarse	moderately-slightly active
SAM11/88	EBA	Burnished open vessel (kantharos?)	10R 4/6 red	medium	active-moderately active
SAM11/89	EBA	Plain large open vessel	10R 4/6 red	medium	moderately-slightly
SAM11/90	EBA	Plain large open vessel	10R 4/6 red	medium-coarse	active
SAM11/93	EBA	Plain large open vessel	10R 4/6 red	medium	active-moderately active
SAM11/94	EBA	Burnished bowl	10R 4/6 red	medium	moderately-slightly active
SAM11/95	EBA	Plain cooking pot?	10R 4/6 red	medium	active-moderately active
SAM11/97	EBA	Burnished bowl	10R 4/6 red	medium	moderately-slightly active (active end)
Sedimentary with variable Tcfs fabric (SAMFG3, subgroup B)					
SAM11/84	EBA	Plain open (large vessel)	10R 4/6 red	medium-coarse	moderately-slightly active (active end)
SAM11/91	EBA	Burnished bowl	10R 5/8 red	medium	moderately active
SAM11/92	EBA	Plain pithos with impressed cordon decoration	10R 4/6 red	medium-coarse	active
SAM11/99	EBA	Burnished jar	10R 4/6 red	medium-coarse	active-moderately active
Sedimentary with variable Tcfs fabric (SAMFG3, subgroup A variants)					
SAM11/96	EBA	Plain cooking pot?	10R 4/6 red	coarse	moderately active
SAM11/98	EBA	Burnished bowl	10R 4/6 red	medium-coarse	active
SAM11/100	EBA	Plain pithos	10R 4/6 red	medium	active
Loner fabric: Medium silicate fabric					
SAM11/83	EBA	Burnished open vessel (small bowl)	10R 4/8 red	medium	active (ends) moderately active (core)
Loner fabric: Fine-medium fossiliferous fabric (grog tempered?)					
SAM11/85	EBA	Burnished open (small bowl)	5YR 7/6 reddish yellow & 2.5YR 6/8 light red	fine	inactive? 2ry calcite masks optical activity

Tab. 1 continued

Petrographic analysis was considered to be the most suitable analytical technique to investigate the research questions. Samples were thin-sectioned and examined under the polarising microscope (Zeiss Axioskop 40 POL, with a Leica DC300 camera attached to it for microphotographs). They were also subjected to refiring tests under controlled conditions in the laboratory (Naberthem L5/P furnace). Refiring of the ceramic samples in a fully oxidising atmosphere and at a higher temperature aims to distinguish different clay compositions reflected in colour, by eliminating any variation caused by ancient firing conditions.[20]

Finally, the integrated analytical approach included prospection for raw materials on both islands. Geological sampling was carried out in order to shed light on aspects of local pottery manufacture and technological choices mainly concerning clay paste preparation: thus a clearer picture was obtained of the raw materials available in the areas under study, their suitability for pottery making, and their mineralogical composition. Raw material sampling was imperative, especially for Ithaca, since for the most part, and based on the geological literature (see the following section), no clay deposits are reported. The geological prospection focused on the few formations containing materials potentially suitable for pottery making, namely the flysch formation of the Paxoi zone, attested mainly on Ithaca, and the Pliocene marls of the Ionian zone, attested on Kephalonia. A total of 87 samples was collected (Ithaca: IGS1–39; Kephalonia: KEGS1–48; see Fig. 5 for sample location), including clayey and clastic sediments (sands), rock fragments, traditional building materials, and traditional tiles. Traditional tile was sampled because no contemporary pottery workshops are reported for either Ithaca or Kephalonia (with the exception of the Ithacesian amateur potter Gerasimos Koutsouvelis, who was interviewed), whereas tile production is attested on both islands at least until the 1953 earthquake. In all, 58 of the 87 samples were clayey sediments showing plasticity and were made into briquettes (fired at three different temperatures: 700°C, 900°C, and 1050°C), while 20 were sand and rock samples, and nine traditional building materials (mostly tiles and bricks) (Tab. 2). All samples (the fired clay briquettes of all temperatures, sand and rock samples, and traditional materials) were thin sectioned for comparison with the ceramic material. This large number of samples was considered necessary because no previous analysis had taken place on either island, meaning that research on this insular complex is essentially conducted in *terra incognita*.

	Ithaca geological samples	**Kephalonia geological samples**
Raw materials showing plasticity	IGS1-4, IGS6-7, IGS9-10, IGS12-15, IGS23, IGS25, IGS27-31, IGS33, IGS37-39	KEGS1, KEGS3-5, KEGS6, KEGS7, KEGS9-10, KEGS12-13, KEGS15-19, KEGS, KEGS31-33, KEGS36-40, KEGS42-44, KEGS46-47
Unconsolidated clastic sediments	IGS5, IGS11, IGS19-21, IGS32	KEGS2, KEGS11, KEGS14, KEGS20, KEGS34, KEGS41, KEGS45
Rock fragments	IGS8, IGS17-18, IGS22	KEGS6, KEGS8, KEGS35
Traditional tiles	IGS24, IGS26	KEGS48
Traditional building materials	IGS16, IGS34-36	KEGS29-30

Tab. 2 Summary table of Ithaca and Kephalonia geological samples

20 Whitbread 1995, 390–391; Daszkiewicz – Schneider 2001.

Geological setting

The area is characterised by intense seismic activity with strong and frequent earthquakes, for it lies on the interaction zone of the African and Eurasian tectonic plates (active subduction and continental collision).[21] The basement of Kephalonia consists of east dipping, NW to NNW striking, thrust sheet fragments of a carbonate platform, which mainly belong to the Paxos/Pre-Apulian isopic zone;[22] the southeastern part of Kephalonia and Ithaca belong to the Ionian zone (overthrusted to the Paxos zone) (Fig. 5).[23]

The Paxos zone stratigraphic sequence, as observed on Kephalonia, is characterised by the following formations (starting from the oldest):[24] a thick carbonate series predominates in the northern and central parts of the island, including extensive pelagic limestone of Upper Cretaceous age, while Lower Cretaceous dolomite and limestone appear on the western slope of the Kalon and Aenos mountains. This formation is locally replaced by reef limestone, is generally very rich in microfossils (notably foraminifera), and very frequently contains chert nodules. The carbonate sedimentation continues uninterrupted until the Oligocene, and is represented by a neritic limestone series, rich in microfossils, locally alternating with chalky pelagic limestone or enclosing layers of chert nodules; the pelagic character is stronger from the Upper Eocene onwards. The carbonate series of Upper Miocene (Tortonian) age is locally overlain by conglomeratic and brecciated limestone of Upper Oligocene to Upper Miocene age, rich in microfossils.[25] Alternation with sandstone or sandy marls is observed in the upper part of the formation, passing to argillaceous marls. These formations are unconformably overlain by Pliocene sediments mainly in the south/south-western part of the island. In the Lower Pliocene there is a short stratigraphic hiatus and a transgressive well-bedded conglomeratic facies. Near the base there is a limestone bed passing upwards into sand, sandstone and sandy limestone with layers of marls. Upwards, the marls predominate and enclose a rich mollusc fauna, while in the uppermost part a series of fine-grained sandstones and sandy marls reappear. The Pleistocene formations consist of consolidated red conglomerate and breccia (locally well sorted), as well as calcitic sandstone with fossil fragments or conglomeratic calcitic sand with ostreids and algae. Finally, the Holocene deposits are composed of alluvium scree and fans.

The stratigraphic sequence of the Ionian zone is better represented on Ithaca (and partially observed in the south-eastern part of Kephalonia also), and is characterised by the following formations (starting from the oldest):[26] Triassic evaporite is overlain by a thick carbonate series of Upper Triassic-Lower Jurassic age (neritic Pantokrator limestone series). This series consists in its lower horizons of thick-bedded to unbedded dolomite and dolomitised micritic limestone, while the upper members of the formation consist of platy biomicritic limestone and chert layers. Thick sedimentation of pelagic character characterises the Ionian zone from the Lower Jurassic until the Upper Eocene, consisting of Toarcian 'Ammonitico Rosso' limestone (reddish nodular limestone with ammonites among other bioclasts). Within the 'Ammonitico Rosso' limestone there is an alternation of thin limestone and chert beds of Middle Jurassic age, locally with strong schistosity and very thin marly layers, bearing rich microfauna including Posidonia. Further up, Upper Jurassic-Lower Cretaceous limestone appears rich in radiolaria. This series is overlain by Upper Cretaceous limestone, which appears as alternations of thin limestone and chert beds in the lower horizons, shifting to thick-bedded clastic limestone, upon which lies Palaeocene-Eocene brecciated limestone. The deposition of flysch is of Oligocene-Middle Miocene age, in its lower part consisting of sandstone alternating with clayey-silty, limestone, and breccia-conglomerate

[21] Scordilis et al. 1985; Kokkinou et al. 2006.
[22] Underhill 1989.
[23] BP et al. 1985; Stavropoulos 1991.
[24] BP et al. 1985; Lekkas et al. 2001.
[25] Dremel 1968.
[26] Stavropoulos 1991; Lekkas et al. 2001.

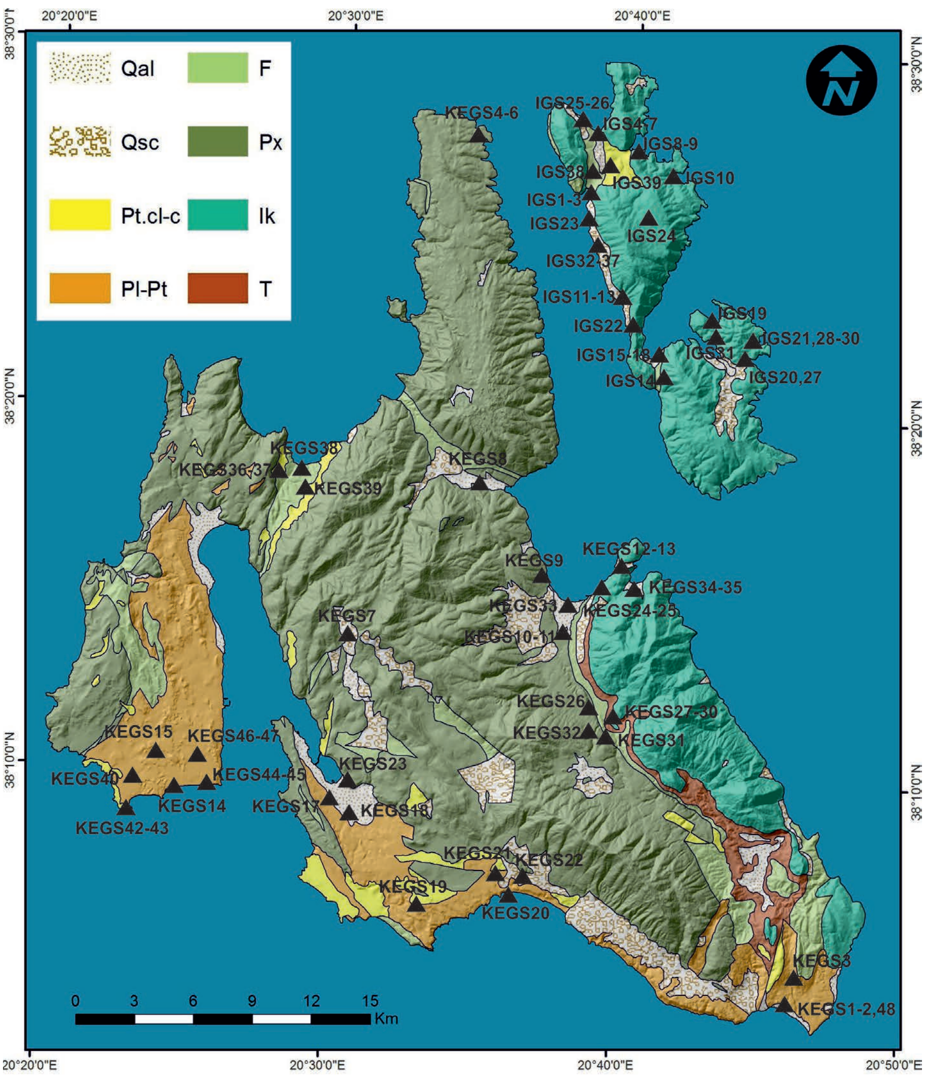

Fig. 5 Geological map of Kephalonia and Ithaca showing the geological sample locations (WGS84). Key to the geological formation symbols: alluvial deposits (Qal); scree and talus conus (Qsc); Pleistocene consolidated conglomerate and fluvioterrestrial deposits (Pt.cl-c); Pliocene marls (Pl-Pt); Oligocene Miocene flysch and clay beds (F); Paxoi zone carbonate series of Cretaceous Oligocene age (Px); Ionian zone carbonate series of Jurassic Cretaceous age (Ik); Evaporites (T) (graphics: S. Valkaniotis)

beds, while its upper part is degraded and consists of clayey marls covered by an eluvial horizon.[27] In the northern part of the island, the flysch deposits are in normal contact with the underlying Eocene limestone which develops eastwards, while the western contact is tectonic. The transition from the Eocene limestone to the flysch is characterised by the occurrence of clastic limestone and greenish calc-marly layers into the pelagic limestone. To the south, flysch appears as a rather delimited formation on the narrow land nape connecting the northern to the southern part of the island. Pliocene sediments are very limited and consist of marls, marly sandstones and breccias. The younger formations are Pleistocene-Holocene alluvial deposits, scree and talus cones.

[27] Rozos – Nikolaou 2002

The analytical results

Petrographic analysis of the entire sample set from Ithaca and Kephalonia identified a number of fabric groups: only those related to the EBA material will be presented in this section.[28] The microscopic descriptions follow a simplified version of the system and terminology proposed by I. K. Whitbread.[29] Comparative charts were used to estimate voids and the frequency,[30] sorting,[31] and roundness of inclusions.[32] Kemp's frequency groupings are adopted to characterise the frequency of inclusions (predominant >70%, dominant 50–70%, frequent 30–50%, few 5–15%, very few 2–5%, rare 0.5–2%, very rare <0.5%).[33]

a. Pelikata (Ithaca)

At Pelikata, 28 of the 35 samples fall into three closely related fabric groups which contain pots of practically all wares, shapes and sizes. All three are characterised by the presence of textural concentration features (Tcfs), chert fragments and calcite, as well as the practice of tempering for clay paste preparation. However, the relative quantity of the different components differs, and this differentiation acted as the decisive criterion for their distinction.

Approximately 40% of the samples studied (14 of 35) fall into the Calcite, chert and Tcfs fabric group (ITHFG2). This is a fairly homogeneous medium-coarse fabric, with an orange/yellowish-brown to dark orange-brown micromass in XPL,[34] and 5–10% voids. Inclusions are common, angular to rounded and poorly sorted, with grains predominantly falling into the coarse to very coarse sand classes, rarely up to pebble class, with bimodal size distribution. The fabric is characterised by frequent to few limestone fragments (predominantly of micritic calcite, few of crystalline or sparitic calcite, or biogenic/fossiliferous) and Tcfs (mostly red clay pellets and argillaceous rock fragments, few grog fragments), accompanied by common to few chert fragments, few to rare organic materials, very few to very rare microfossils (dominantly foraminifera), rare to very rare quartz, radiolaria, opaque inclusions, alkali feldspar and mudstone, and rare siltstone, plagioclase, and mica (Fig. 6a). Although this composition is not safely diagnostic, the fabric is considered to be locally produced on Ithaca on the basis of the strong compositional and textural similarities to the raw material samples collected. All samples obtained similar hues of red after the refiring tests, pointing to the use of similar clay types for all fabric members. The consistent presence of vegetal material in low frequency most probably suggests that the raw materials selected derived from a source on the surface. The optical activity of the groundmass suggests original firing temperatures <800°C for the majority of the samples. All samples are characterised by a dark core, suggesting mixed/reducing prevailing firing conditions for the majority of the samples, also a short duration of firing and incomplete carbon oxidisation (black areas around voids and vegetal matter still present in the clay paste even after firing). The Calcite, chert and Tcfs fabric includes plain coarse ware pots, including cooking pots, jars with crescent handles or wish-bone lugs, and dark burnished vessels of all shapes and sizes (including a boat-shaped vessel and a Bass bowl), and a spindle whorl.

Seven of the 35 samples fall into the Chert, Tcfs and calcite fabric (ITHFG3), which forms the second largest group within the Pelikata assemblage. This is a fairly homogeneous medium-coarse fabric, with an orange/yellowish-brown to reddish-brown micromass in XPL, and 5–10% voids.

[28] Ithaca Fabric Group (ITHFG) and Sami Fabric Group (SAMFG) numbers correspond to the numeration followed in Pentedeka 2013, where the entire set of 404 samples is treated diachronically.
[29] Whitbread 1986; Whitbread 1989; Whitbread 1995.
[30] Bullock et al. 1985, fig. 24.
[31] Bullock et al. 1985, fig. 27.
[32] Bullock et al. 1985, fig. 31.
[33] Kemp 1985.
[34] I.e. crossed polarised light.

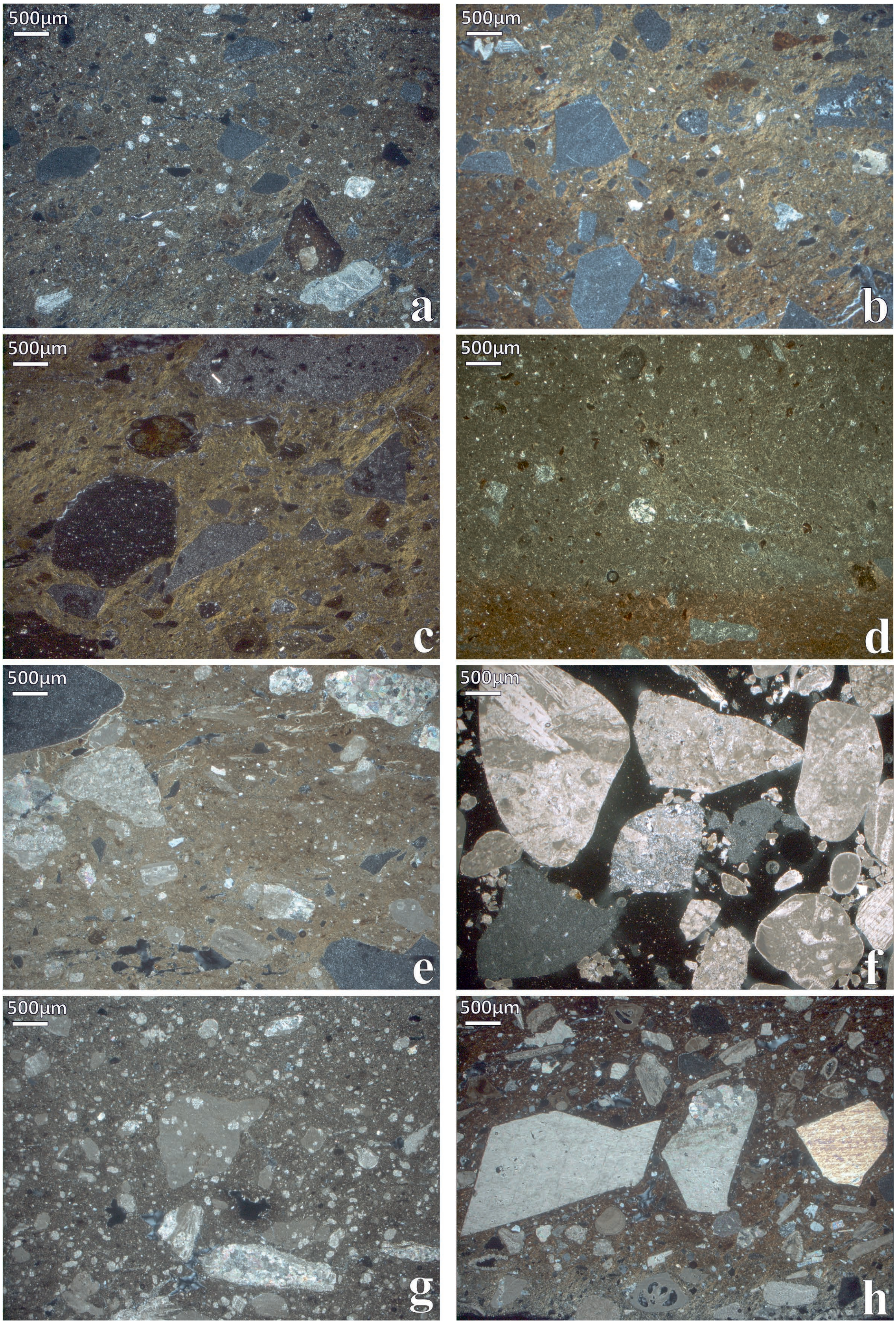

Fig. 6 Micrographs of Pelikata fabric groups and Ithaca geological samples: a) Calcite, chert and Tcfs fabric group (ITH09/127), b) Chert, Tcfs and calcite fabric (ITH09/129), c)Tcfs and chert fabric (ITH09/126), d) clayey sample IGS30 (briquette fired at 700°C), e)Calcite and chert fabric group (ITH09/130), f) IGS5 (beach sand, mainly limestone fragments), g) Coarse calcareous fabric (ITH09/119), h) Calcite tempered fabric (ITH09/131) (all samples in XPL) (A. Pentedeka)

Inclusions are common, angular to rounded, and poorly sorted, with grains predominantly falling into the coarse to very coarse sand classes, rarely up to pebble class, with bimodal size distribution. Chert, Tcfs and calcite fabric is characterised by dominant to frequent chert, common to few Tcfs (predominantly red clay pellets; grog is sporadically observed), and few to very few limestone fragments, accompanied by very few organic material, rare microfossils and radiolaria, and very rare quartz (Fig. 6b). As in the case of the Calcite, chert and Tcfs fabric, the Chert, Tcfs and calcite fabric composition is considered as locally produced on Ithaca. All samples obtained similar hues of red after the refiring tests except ITH09/132, which refired light brown, pointing to the use of similar, yet not identical, raw material sources. The clay paste was most probably tempered with large chert fragments, occasionally also with limestone or grog. The optical activity of the groundmass suggests original firing temperatures <800°C for all samples, while the dark core observed suggests mixed/reducing prevailing firing conditions for the majority of the samples, also a short duration of firing and incomplete carbon oxidisation (black areas around voids and vegetal matter still present in the clay paste even after firing). The Chert, Tcfs and calcite fabric seems to reflect an EBA Pelikata recipe, as this fabric is attested only within the Pelikata assemblage. It includes dark burnished vessels and plain coarse ware, of all shapes and sizes (including the Bass bowl, jar with crescent handles and jar/small pithos).

The third fabric group attested at Pelikata (seven of 35 samples) is that of Tcfs and chert fabric (ITHFG1). This is a medium to coarse fabric, with a strongly birefringent orange-brown to yellowish-brown micromass in XPL, and 5–10% voids. Inclusions are common, angular to subrounded, and poorly sorted, with grains predominantly falling into the coarse and very coarse sand classes, rarely up to pebble class, with bimodal size distribution. The fabric is characterised by predominant to dominant Tcfs (grog fragments, red clay pellets and argillaceous rock fragments), accompanied by few to common chert, few to rare organic material, very few to rare quartz, and very rare opaque inclusions/Fe oxides, calcite, plagioclase, alkali feldspar, rock fragments, radiolaria, epidote group minerals, and microfossils (Fig. 6c). The compositional variability observed within this fabric led to the distinction of three subgroups, one displaying a higher percentage of radiolaria and chert (subgroup A), another being richer in clay pellets than grog (subgroup B), and the third having a denser groundmass (subgroup C). Only subgroups A and B are attested within the Pelikata assemblage. In general, a fine clay is tempered with crushed pottery, possibly also with a few chert fragments. The clay base is very similar to a number of geological samples related to erosion materials from the Ionian zone limestone, e.g. of IGS30 (Fig. 6d), displaying the same strong birefringence and micromass colour, as well as very similar clay pellets. The composition of Tcfs and chert fabric is not safely diagnostic, nevertheless the fabric is considered as locally produced on Ithaca on the basis of the strong similarity to the geological samples collected. All samples obtained similar hues of red after the refiring tests; the diversity observed might be due to the fluctuating percentage of clay pellets, most probably pointing either to variability within the raw material source or to the exploitation of more than one source of similar clay. The optical activity of the groundmass suggests original firing temperatures <800°C for the majority of the samples (except ITH136 which is obviously overfired and is probably some sort of waster). The frequent dark core suggests mixed/reducing prevailing firing conditions for the majority of the samples, perhaps also a short duration of firing and incomplete carbon oxidisation (black areas around voids and vegetal matter still present in the clay paste even after firing). The Tcfs and chert fabric includes plain coarse ware (cooking pot, jar with wish-bone lugs) and dark burnished vessels (Bass bowl, jar), a spool, and a weight.

A small number of samples (four of 35) forms the Calcite and chert fabric group (ITHFG8). This is a coarse fabric, with a yellowish-brown to orange-brown micromass in XPL, and 5–10% voids. Inclusions are common to frequent, rounded to angular, and poorly sorted, the mode grain size ranging from coarse sand to granule classes, and the maximum grain size reaching pebble grade. Calcite and chert fabric is characterised by dominant to frequent limestone fragments (predominantly micritic, few biogenic/fossiliferous and crystalline) and common to few chert fragments, accompanied by few to very few microfossils, few to rare clay pellets, rare quartz, alkali feldspar, opaque inclusions (iron oxides), very rare radiolaria and phosphatic(?) nodules (Fig. 6e). This composition is compatible with local geology, and resembles a number of raw material samples collected from the northern part of Ithaca (e.g. IGS5, IGS13, IGS 25, IGS36, IGS38; Fig. 6f), thus suggesting a local provenance for this fabric. All samples refired red, pointing to the use of similar types of clay. The optical activity of the groundmass suggests original firing temperatures <800°C in an oxidising/mixed atmosphere. Calcite and chert fabric includes jars and pithoi (sample ITH09/142 is probably from a burial pithos), along with one weight.

Three loner fabrics were also identified within the Pelikata assemblage. Sample ITH09/119 is characterised by a coarse fabric containing fossiliferous limestone fragments and microfossils (Fig. 6g). Geological sample IGS25, collected at Keramario ca. 2.5km north of Pelikata, is very similar, equally containing fossiliferous limestone and foraminifera. Thus, sample ITH09/119, from a dark burnished bowl (probably a bass bowl), should have been locally produced at Pelikata. Sample ITH09/131 (plain coarse ware, probably a large jar or pithos fragment) has a coarse fabric characterised by crystalline limestone, microfossils and few chert fragments: it is most probably tempered with limestone fragments or limestone-rich sand (Fig. 6h), and the overall composition is consistent with that of many geological samples collected on Ithaca. Finally, sample ITH09/138, from a plain jar with crescent handle, is characterised by a medium-fine fabric containing quartz, chert and Tcfs (clay pellets or argillaceous rock fragments) (Fig. 7a). This composition is not particularly diagnostic, while the sample was higher fired than the rest.

b. EKO plot, Sami (Kephalonia)

On the basis of the small number of Early Helladic samples from Sami, almost 90% of the samples (17 of 19) fall into Sedimentary with variable Tcfs fabric (SAMFG3). This is a medium-coarse fabric, with an orange-red to very dark reddish-brown micromass in XPL, and 5–15% voids. Inclusions are common, rounded to angular, and moderately well to poorly sorted, with grains predominantly falling into the medium to very coarse sand classes, rarely up to pebble-granule grade. The fabric is characterised by dominant to frequent Tcfs (clay pellets and argillaceous rock fragments; unquestionable grog fragments occasionally present). With regard to the variable quantity of calcite, two subgroups can be distinguished – subgroup A with low calcite presence and subgroup B with higher calcite presence. Subgroup A (ten of 17 samples) contains frequent to common monocrystalline quartz, common to few chert and few alkali feldspar, accompanied by few to absent calcite, very few opaque inclusions (iron oxides) and mica, rare glauconite and plagioclase, very rare polycrystalline quartz, epidote group minerals, radiolaria, chalcedony, quartz-rich rock fragment and organic material (Fig. 7b). Subgroup B (four of 17 samples) is characterised by frequent to common calcite, common quartz, common to very few chert, very few opaque inclusions (iron oxides), alkali feldspar, rare mica, radiolarian, polycrystalline quartz, glauconite, plagioclase and microfossils (Fig. 7c). Three samples appear to be variants of subgroup A, displaying intense tempering, one with chert (SAM11/93) and two with grog (SAM11/96, SAM11/100; Fig. 7d). Despite the heterogeneity, observed mainly in the frequency of each inclusion type, all samples display the same range of inclusions and resemble texturally KGS31 collected at Lake Akoli, ca. 2.5km south of Sami. This raw material sample is characterised by a range of Tcfs, in particular clay pellets (Fig. 7e): during the experimental processing of the clayey raw material, dried clay chunks were also added to the clay paste, resulting in Tcfs that resembled grog (see Fig. 7e, bottom right): almost identical Tcfs were observed in the pottery thin sections. On the basis of this overall resemblance, the Sedimentary with variable Tcfs fabric is considered to be produced locally using raw materials from the vicinity of Sami. All samples acquired a homogeneous red colour after refiring, suggesting the consistent use of the same raw material. The optical activity of the groundmass varies from active to slightly active, while the condition of calcite (a reaction rim is rarely observed) suggests original firing temperatures <800°C rarely reaching ≤850°C. Almost all samples are characterised by a dark core, often accompanied

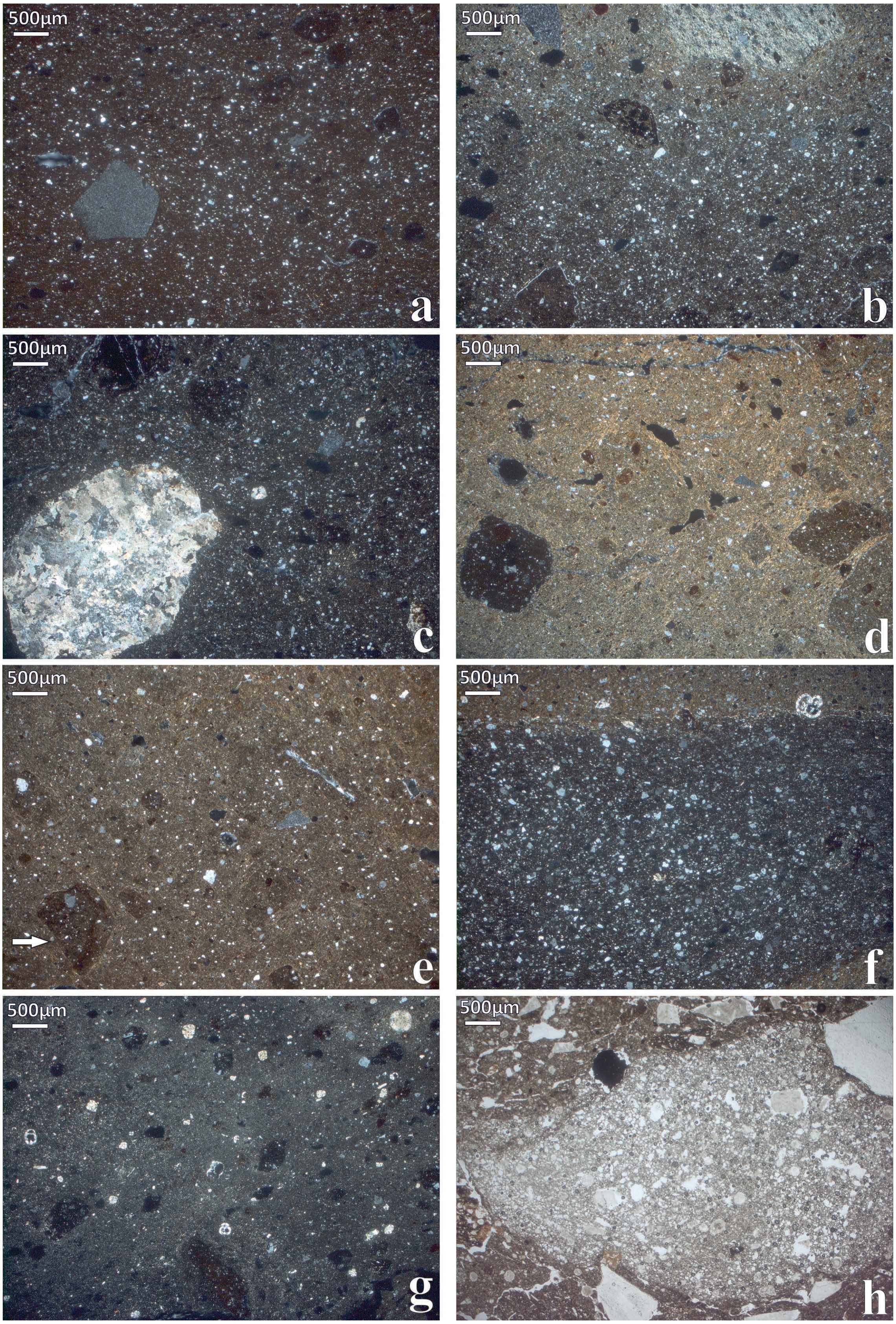

Fig. 7 Micrographs of Pelikata (a, h) and Sami fabric groups and Kephalonia geological samples(b–g): a) Pelikata Chert, Tcfs and quartz-rich rock fragments fabric (ITH09/138); Sami Sedimentary with variable Tcfs fabric b) subgroup A (SAM11/87), c)subgroup B (SAM11/84), d)subgroup A grog-tempered variant (SAM11/100); e) clayey sample KGS31 (briquette fired at 700°C; the arrow shows a large piece of dried clay); f) Sami Medium silicate fabric (SAM11/84), g) Sami Fine-medium fossiliferous fabric (possibly grog-tempered; SAM11/85); h) large high fired grog fragment, possibly from a waster (Pelikata Tcfs and chert fabric; ITH09/133) (micrographs a–g in XPL, micrograph h in PPL) (A. Pentedeka)

by fairly oxidised edges/surfaces, suggesting firing in a mixed atmosphere, possibly prevailing oxidising atmosphere and a short duration of firing, insufficient for the complete oxidisation of carbon throughout the vessel wall. All vessel shapes and sizes seem to have been manufactured in this fabric (from bowls to cooking pots, jars and pithoi) in all the wares sampled (Coarse and Burnished wares).

Two loner fabrics were also identified within the Sami assemblage, both deriving from red burnished bowls. Sample SAM11/83 is characterised by a medium silicate fabric, consisting mainly of monocrystalline quartz, along with few microfossils, alkali feldspar, clay pellets and very few limestone and chert fragments (Fig. 7f). This composition may not be clearly diagnostic of a specific provenance, but it strongly resembles that of KEGS3, making the attribution of a Kephalonian origin to SAM11/83 very plausible. Finally, sample SAM11/85 comprises a fine-medium fabric, characterised by microfossils, monocrystalline quartz, and limestone fragments, along with few clay pellets and possible grog fragments (Fig. 7g). This composition, although not securely diagnostic of origin, is compatible with local geology: the occurrence of foraminifera, typical for the Pliocene marls and other marine sediments of the island, strengthens the attribution of a Kephalonian origin to SAM11/85, at the same time suggesting that it was 'imported' to Sami from some other part of the island.

Discussion

The results of these analyses show that the production of Early Helladic plain and burnished pottery on both islands was largely based on local resources which are rich in clay pellets, argillaceous rock fragments, as well as limestone and chert fragments. On Ithaca, these raw materials were transformed into durable and rather coarse clay pastes by tempering (in particular with grog, but also limestone and chert; dried clay chunks should also have been added). Interestingly, grog tempering was also practised by Gerasimos Koutsouvelis, an amateur potter on Ithaca, in order to enrich the greyish-brown clayey sediment of variable coherence deriving from the flysch formation (known as 'skylakas' in the local dialect). Notably on Ithaca the naturally occurring sediments are not suitable for pottery making if unprocessed; even the flysch-related sediments show great variability in plasticity. Of the four large fabric groups distinguished within the Pelikata sample set, the Tcfs and chert fabric (ITHFG1) is characterised by consistent grog-tempering: the grog fragments are frequently in the same fabric, while half of them seem to be high fired, with incipient bloating due to sintering (Fig. 7h), possibly indicating the use of wasters as a basic grog source, with a sense of material recycling.

Rather predictably, the Tcfs and chert fabric (ITHFG1) seems to reflect a strong prehistoric tradition on Ithaca, attested continuously from the Late Neolithic to the Late Bronze Age in both the southern part of the island (in the Vathy area: Kanata, Palioroga)[35] and the north (Pelikata, Treis Langadas, Polis Cave).[36] Similarly, the 'traditional' clay paste recipe of Pelikata is enriched with added chert temper instead of crushed pottery, as implied by the Chert, Tcfs and calcite fabric (ITHFG3), present in this assemblage only. The other two fabric groups identified in the Pelikata assemblage equally indicate enduring clay paste recipes characterising the potting tradition of northern Ithaca throughout the Bronze Age. Calcite and chert fabric (ITHFG8) seems to be used mostly for the production of large vessels like jars and pithoi both at EBA Pelikata and Late Bronze Age (LBA) Treis Langadas, while Calcite, chert and Tcfs fabric (ITHFG2) is identified in pots of all wares, shapes and sizes within the assemblages of all Bronze Age sites studied (EBA

[35] Livitsanis 2013, 100–102.
[36] Treis Langadas: Benton – Waterhouse 1973; Polis Cave: Benton 1934/1935; Benton 1938/1939.

Pelikata, LBA Treis Langadas, Middle Bronze Age (MBA)–LBA Polis Cave, LBA Stavros cemetery fill).[37]

Kephalonia stands in an advantageous position compared to Ithaca with regard to the availability of suitable raw materials for pottery manufacture. The Pliocene marl deposits are excellent sources for fine calcareous clays, and were extensively used in the historical periods.[38] According to the present (admittedly limited) data on Early Helladic pottery production on Kephalonia, this raw material source was not exploited, at least not for the manufacture of Plain and Burnished wares (with the exception of the fabric identified at sample SAM11/85). In the case of Sami potters, this might be explained by the considerable distance to the source, and the existence of other sediments exhibiting good plasticity and firing behaviour in the vicinity of the site, which were preferred for pottery making. Moreover, grog tempering was not as widely practised as on Ithaca; instead, it seems that dried clay was added to the humid but not watery clay paste, and remained in chunks without dissolving as is often the case in clay mixing. This addition may have been intentional, with dried clay used as another kind of tempering material, or unintentional during the preparation of clay paste on surfaces or within containers where clay remainders had already dried. The Sedimentary with variable Tcfs fabric (SAMFG3) is also attested in the Final Neolithic assemblage of Moussata,[39] thus indicating a rather long-lived and widely practised tradition on Kephalonia, despite the lack of a strictly standardised recipe implied by the internal variability observed.

Apart from clay paste preparation, the petrographic analysis results, in tandem with macroscopic examination, give insight into other stages of the *chaîne opératoire*. On both islands, plain coarse wares and burnished vessels were handmade, with a surface treatment consisting of smoothing for the plain coarse wares and burnishing for the Burnished wares. Decoration is attested only on plain coarse wares in the form of plastic cordon decoration (sometimes finger-impressed) or incised notches. The firing conditions usually entail fairly low temperatures and a rather mixed (or not very well-controlled) firing atmosphere, possibly also firing of short duration, thus suggesting open-air or pit firing in all occasions.

The number of Early Helladic samples analysed does not allow further comments on the organisation of production. However, as argued above, pottery production on both islands during this period should not be seen in isolation, but rather as part of long-lasting potting traditions on Ithaca and Kephalonia that remained practically unchanged from the Neolithic until the end of the Late Bronze Age. Future analysis should also include fine and decorated wares, to examine the extent to which contact with other Early Helladic communities, e.g. in the north-western Peloponnese, influenced the otherwise durable Ionian potting traditions.

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[37] Stavros cemetery fill: Waterhouse 1952.
[38] Pentedeka 2013.
[39] Sotiriou 2012, 371; Pentedeka 2013.

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