Journal of Ancient Egyptian Interconnections

Egyptian Trade on the Central Levantine Coast During the Early Dynastic Period: A Ceramic-Material Perspective

Mathilde Jean
Sorbonne University

Kamal Badreshany
Durham University

Abstract
This paper compares pottery finds from the Central Levant (Lebanon) and imported vessels found in Egyptian Early Dynastic contexts to help unravel the dynamics of trade activities between the two regions at the beginning of the third millennium BCE. New typological, technological, petrographic, and geochemical datasets from Lebanese sites such as Tell Arqa, Byblos, Tell Koubba, Tell Fadous, and the Beqaa Valley are compared with published data from funerary contexts at Abydos (Umm el-Qaab, tomb of king Den) and Helwan (Operation 4). By consolidating recent evidence, this study aims to provide a framework aiding in provenancing imported vessels of likely central Levantine origin found in Egyptian Early Dynastic contexts. The evidence suggests a gradual shift in trade links between Egypt and the Levant, with land routes through the Sinai being abandoned in favor of maritime ones. Likewise, Egyptian contacts are refocused from the Southern to the Central Levant. Recent evidence from the Central Levant provides finer-grained provenance analysis, shown to be the key to further defining and understanding these subtle and gradual shifts. Moreover, our study highlights chronological discrepancies pointing to practices of saving imported goods as heirlooms for more than a century to repurpose them for funerary contexts.

Keywords
Egypt; Central Levant; Lebanon; Early Dynastic; Early Bronze Age; Ceramic analysis; Petrography; Trade

Introduction
Clear evidence exists for significant interaction between Egypt and the Levant from the fourth millennium BCE during the Predynastic period. The available evidence shows that Egypt initially maintained contact primarily with the southern Levant along land routes through the Sinai. Egypt established a colonial network of sites in the region, such as Tell es-Sakan (Miroschedji 2015; Greenberg 2019). Later, during the Old Kingdom, archaeological and historical data show the reorientation of interactions northwards, toward the central Levantine coast (Badreshany et al. 2020; Greenberg and Iserlis 2020; Sowada et al. 2020).

From 2700 BCE, Byblos emerged as a leading harbor and became the primary favored Egyptian partner during the third millennium. Old Kingdom Egyptian objects found at Byblos are, in the main, of sacred character and found in sacred contexts (Espinel 2002; Badreshany et al. 2022; de Vreeze and Badreshany, this volume), illustrating long-standing, deeply embedded connections between the two

regions well beyond transactional economics. The nature of Egyptian contacts with the central Levantine coast during the early third millennium (Early Dynastic period) remains poorly understood. Some Early Dynastic stone vessels found at Byblos could indicate early trade between the central Levant and the Egyptian royal court, especially for the acquisition of cedar timbers (Sowada 2009, 50). In contrast, considerable evidence shows intensive interactions between Egypt and the northern part of the southern Levant during the Early Dynastic period (Miroschedji 2018; Iserlis et al. 2019; Greenberg and Iserlis 2020).

The ascription by scholars of the existence of intensive trade links between the central Levantine coast and Egypt during the early third millennium is predicated on outdated chronological information and assumptions based on later evidence. A number of studies of material from Egypt, for example, have used petrography to ascribe the origin of some vessels found in Early Dynastic tombs to the Lebanese coast based on geological information, but high-quality comparative Levantine data from the period was until very recently lacking (Köhler and Ownby 2011; Hartung et al. 2015; Sowada et al. 2020).

With the emergence of new early third-millennium ceramic datasets from central and northern Lebanon showing shale-derived fabrics were used almost exclusively at the time, we can say, with some certainty, that non-shale tempered vessels from that period found in Egypt probably originated somewhere else. Recent archaeological data, covering much of the central Levantine coast, has made clear the typological and petrographic development for the early to the mid-third millennium (Doumet-Serhal 2006; Badreshany and Genz 2009; Thalmann 2016; Badreshany et al. 2020; Jean 2020a), providing us an important tool for exploring the intensity, development, and orientation of Egyptian trade with this area, and further illuminating this hitherto obscure relationship. With this information, we hope to eventually explore the mechanisms behind the shift in Egyptian interaction from the southern to the central Levant during the Old Kingdom. As discussed below, repeated contacts occurred during the First Dynasty but seem to have declined through the Second Dynasty (Sowada et al. 2021), corresponding to the Levantine Early Bronze Age II–III. The absence of imported vessels in the tomb of Ninetjer, the third king of the Second Dynasty, at Saqqara, supports this point (Lacher-Raschdorff 2014, 87–89). Contacts with the Levant would develop again during the Old Kingdom.

This paper compares Levantine imports from selected Egyptian contexts with contemporary central Levantine assemblages (Fig. 1) in terms of typology, technology, petrography, and geochemistry to gain a better understanding of the nature and intensity of ED interactions with the central Levantine coast. The results will provide a better qualitative understanding of trade between Egypt and the central Levant during the key Early Dynastic period and establish building blocks for future research.

Third Millennium Egypt and Central Levant: The Contribution of Ceramic Studies

Early Exchange between Egypt and the Levant during the Predynastic Period

Beginning in the Predynastic period, Abydos became a center of power where elite members of society were buried. At Abydos-Umm el-Qaab, imported vessels were found in several tombs. In tomb U-j, in cemetery U, three-hundred and sixty imported vessels from the Levant were unearthed in a Naqada IIIA context (Hartung 2002). The tomb's inhabitant was probably an early ruler of Egypt during the late Predynastic period, around 3320 BCE, as indicated by ^{14}C analyses of wood samples from this tomb (Hartung et al. 2015, 298). Some scholars suggested he could have reigned over much of the Nile Valley, being one of the pioneers of Egyptian unity (Wilkinson 1999, 41; Köhler and Thalmann 2014, 182). Among the imported pottery found in his tomb were Levantine types. These were presumably marks of prestige linked to wine consumption in the ancient Egyptian court.

The imported Levantine vessels were investigated via petrography, but their provenance was difficult to assess because a great variety of ceramic raw materials were used in their production. Initial assessments by some scholars proposed that the vessels were made in Upper Egypt using southern Levantine know-how (Porat and Goren 2002). However, more recent work proposed several production locations covering the whole Levantine coastline (Hartung 2002; Hartung et al. 2015). Given the potential geographic scope, the provenancing of imported materials necessitates extended comparison with contemporary Levantine

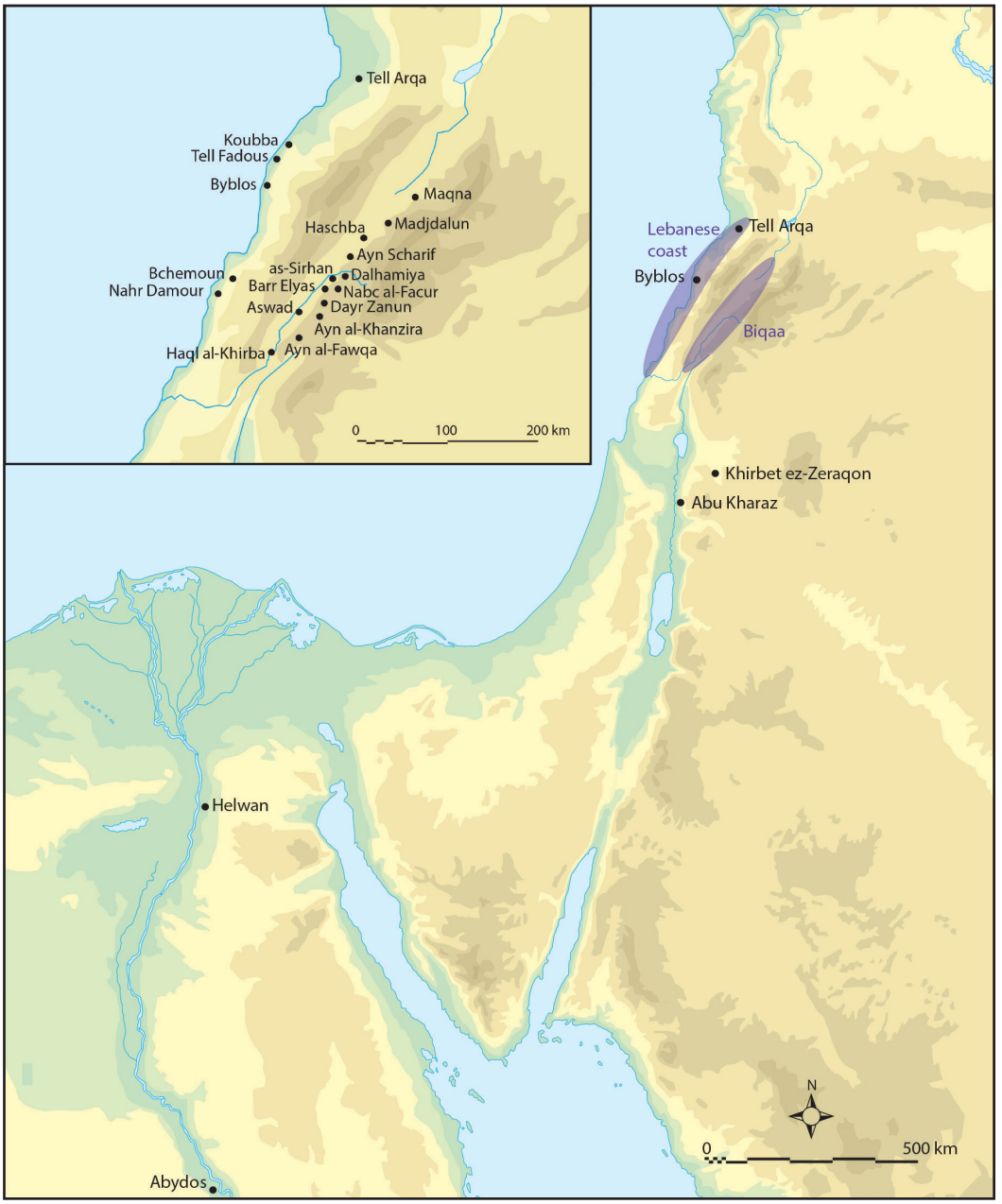

Figure 1: Map of the sites and regions mentioned in the paper (background maps: Martin Sauvage).

assemblages. In this sense, recent ceramic evidence and good chronological comparisons from the Central Levant (Doumet-Serhal 2006; Badreshany and Genz 2009; Thalmann 2016; Badreshany et al. 2020) provide a new basis for the provenancing of Egyptian ceramic finds of Levantine origin dating to the late Predynastic and Early Dynastic period.

Early Dynastic Egypt, Early Bronze Age Central Levant: Chronological Issues

The Early Dynastic period corresponds to the establishment of the Egyptian state, unifying Upper and Lower Egypt under the authority of the king. This period includes the First and Second Dynasties (Naqada IIIC and Naqada IIID, respectively). During the First Dynasty, Memphis appears as the

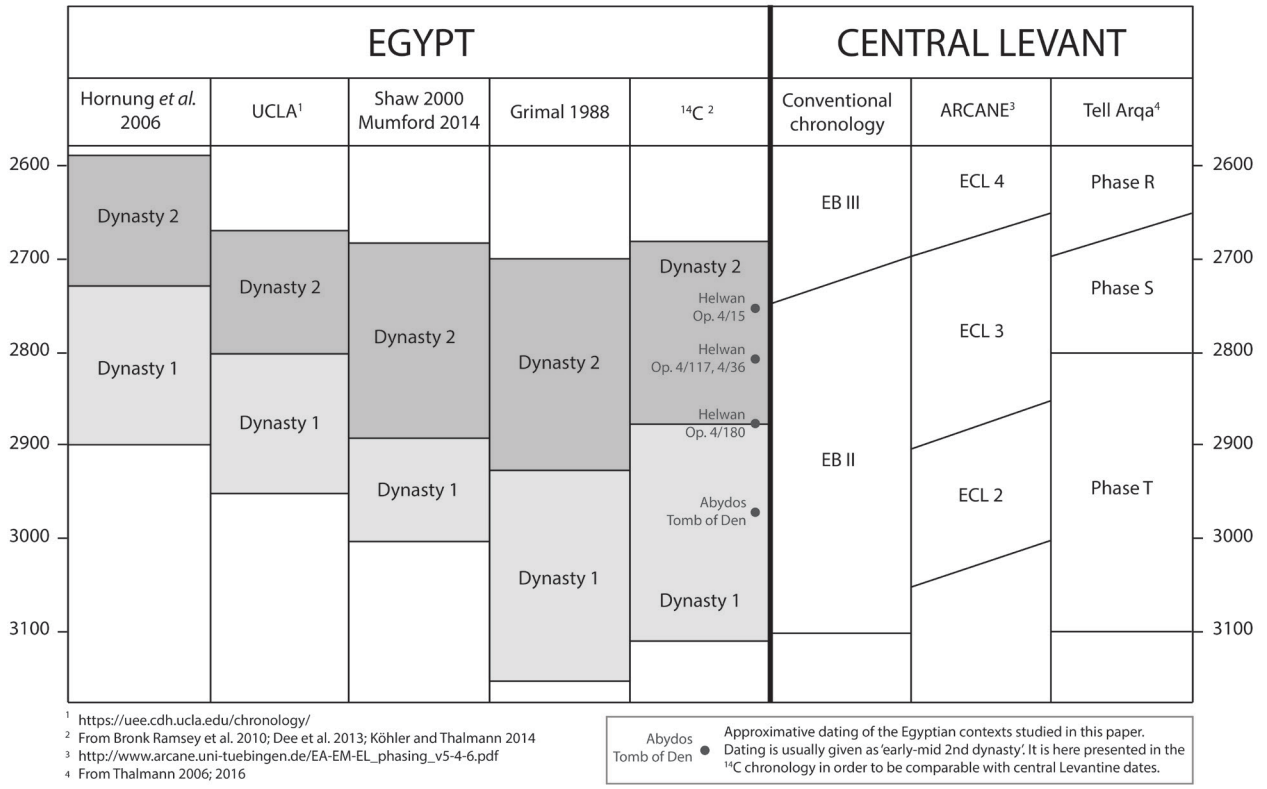

Figure 2: Chronological table of Early Dynastic Egypt and contemporary central Levant.

new royal capital, and some official elite tombs are installed in Helwan, in the vicinity of the Memphite court in Lower Egypt. However, Abydos is still an important symbolic site in Upper Egypt, where kingship originated, and sovereigns continue being buried in the royal cemetery.

To understand the relationships between Egypt and the central Levant during this period, good chronological synchronism is essential for comparing contemporary ceramic assemblages. In Egypt, the royal chronology is established from textual records such as the list of kings from the temple of Seti I at Abydos and the Turin Canon. However, the absolute date ranges for reigns and dynasties vary and rarely fit with ^{14}C dating. Moreover, chronological schemes may differ by upwards of a hundred years, depending on the sources. Comparisons with the central Levant are complicated further due to the existence of several chronological schemes.

A synchronism of chronologies based on previous work (especially Köhler and Thalmann 2014) is given in Fig. 2. The central Levantine chronology includes the so-called traditional subdivision (Early Bronze Age, EBA), the ARCANE chronology (Early Central Levant, ECL), and the archaeological sequence from Tell Arqa, which represents the best stratigraphic and ^{14}C sequence in the region (Thalmann 2006, 2016). In this paper, we use the Levantine chronologies as well as the ^{14}C dates (as mentioned in Ramsey et al. 2010; Dee et al. 2013; Köhler and Thalmann 2014) and Mumford's Egyptian chronology (Mumford 2014; also corresponding to Sowada's chronology in Badreshany et al. 2022). Figure 2 shows that the Early Dynastic period maps onto the central Levantine EB II and II/III transition. More precisely, the First Dynasty roughly corresponds to ECL2 and Arqa phase T, while the second Dynasty corresponds to ECL3 and Arqa phase S, making it possible to compare the development of the pottery assemblages directly.

Recent Work on Levantine Ceramics in Egypt

In part, Egyptian interaction with the Levant aimed at procuring resources unavailable in the Nile Valley, mostly wine, olive oil, and cedar (Thalmann and

Sowada 2014, 326; Sowada 2014, 294). The content of imported vessels is yet to be defined, though work is progressing in this area for Old Kingdom vessels from Egypt (Karin Sowada personal communication). The shift from northward, from the southern to the central Levant, of interaction networks has been proposed by scholars as linked to an increasing need for timber from Lebanon for use in Egyptian royal building projects. Generally, scholars also believe that trade developed along maritime routes, causing the abandonment of the land routes through the northern Sinai (Marcus 2002; Müller 2014; Greenberg and Iserlis 2020).

Recent ceramic studies offer new insights for understanding this important change in Egyptian relations with the Levant. Petrographic and geochemical analyses on imported materials found in Egypt provide new data on the possible provenance of these vessels (Köhler and Ownby 2011; Hartung et al. 2015; Iserlis et al. 2019; Sowada, Ownby and Wodzińska 2020; Sowada et al. 2021; Badreshany et al. 2022). These studies also show the complexity of these interactions and that archaeological context must be considered in concert with the petrographic and geochemical data to determine provenance when identified ceramic raw materials provide a good fit with local geology but archaeological evidence for production is completely lacking.

Here, we apply our new understanding of local coastal central Levantine pottery production and *Chaînes Operatoires* together with the geological evidence to provide more robust provenancing information of imported central Levantine vessels found in Egypt. The disputed provenance of imported vessels from the Predynastic Tomb U-j mentioned earlier is a good example of why such an approach is needed to prevent ambiguity (Hartung 2002; Porat and Goren 2002). Based on typological and geological data, some Early Dynastic vessels of suspected Levantine origin uncovered in Egypt have been ascribed to production on the central Levantine coast (Köhler and Ownby 2011; Köhler and Thalmann 2014; Hartung et al. 2015). To provide greater clarity on the origin of these vessels, the information is reassessed in light of recently published data from contemporary central Levantine assemblages.

Materials and Methods: The View from the Central Levant

Egyptian Sites: Abydos and Helwan

This paper investigates Early Dynastic contexts in Egypt, at Abydos and Helwan, which yielded imported pottery from the Levant dating to First and Second Dynasty contexts and where the publication included petrographic data. Contexts from Abydos are dated to the First Dynasty (ECL2), while Helwan tombs date to the Second Dynasty (ECL3); the comparative material from those sites is based on 14 published examples (Table 1). At Abydos-Umm el-Qaab, in Upper Egypt, the tomb of king Den dates from the middle of the First Dynasty, corresponding to Naqada IIIC. The grave is located in the southern part of the necropolis, dedicated to First Dynasty kings. The tomb of king Den is one of the largest tombs on the site, consisting of a large burial chamber associated with storerooms. Within the tomb, a large number of imported vessels were uncovered, among which nine samples with petrographic data were published (Hartung et al. 2015).

At Helwan, close to the royal Memphite court, imported vessels were found during Operation 4 (Köhler and Ownby 2011) in several tombs from the Second Dynasty (Naqada IIID). Operation 4 revealed more than 200 tombs spanning from the First to the Fourth Dynasty. Their diversity illustrates the long chronological range attested and the diversity in social status of the deceased buried in the necropolis. The five tombs from the Second Dynasty considered in this paper are non-elite tombs, probably belonging to urban middle-class individuals, providing an interesting, more modest contrast to the royal tomb of king Den (Köhler and Thalmann 2014). One sample from each tomb has been published with petrographic data (Köhler and Ownby 2011).

The pottery from the tomb of king Den, in Abydos, dated to the mid-first Dynasty, should be directly compared to materials from ECL2 and Arqa Phase T. On the other hand, materials from the Helwan necropolis, dating to the early- to mid-second Dynasty, should be compared to ECL3 pottery and the Arqa Phase S assemblage (Fig. 2).

Vessel Type	Site	Tomb	Date (Egypt)	Date (Central Levant)	Sample Number	Vessel Number
Jug	Abydos	Den	Dynasty 1	ECL2	#17	T-aB/251
Jug	Abydos	Den	Dynasty 1	ECL2	#11	T-KK/75
Jug	Abydos	Den	Dynasty 1	ECL2	#18	T-aB/271
Jug	Abydos	Den	Dynasty 1	ECL2	#12	T-W/71
Jug	Abydos	Den	Dynasty 1	ECL2	#13	T-aB/288
Jar	Abydos	Den	Dynasty 1	ECL2	#14	T-aB/257
Squat jar	Abydos	Den	Dynasty 1	ECL2	#19	T-aB/283
Squat jar	Abydos	Den	Dynasty 1	ECL2	#20	T-aB/290
Jug	Abydos	Den	Dynasty 1	ECL2	#16	T-aB/253
Jug	Helwan	Op. 1/1	?	?		
Jug	Helwan	Op. 4/180	Dynasty 1/2	ECL2/3		
Jug	Helwan	Op. 4/36	Dynasty 2	ECL3		
Jug	Helwan	Op. 4/117	Dynasty 2	ECL3		P06-26
Jar	Helwan	Op. 4/15	Dynasty 2	ECL3		P01-10

Table 1: List of the 14 imported vessels found in Egypt presumably from Levantine origin (from Köhler and Ownby 2011; Hartung et al. 2015).

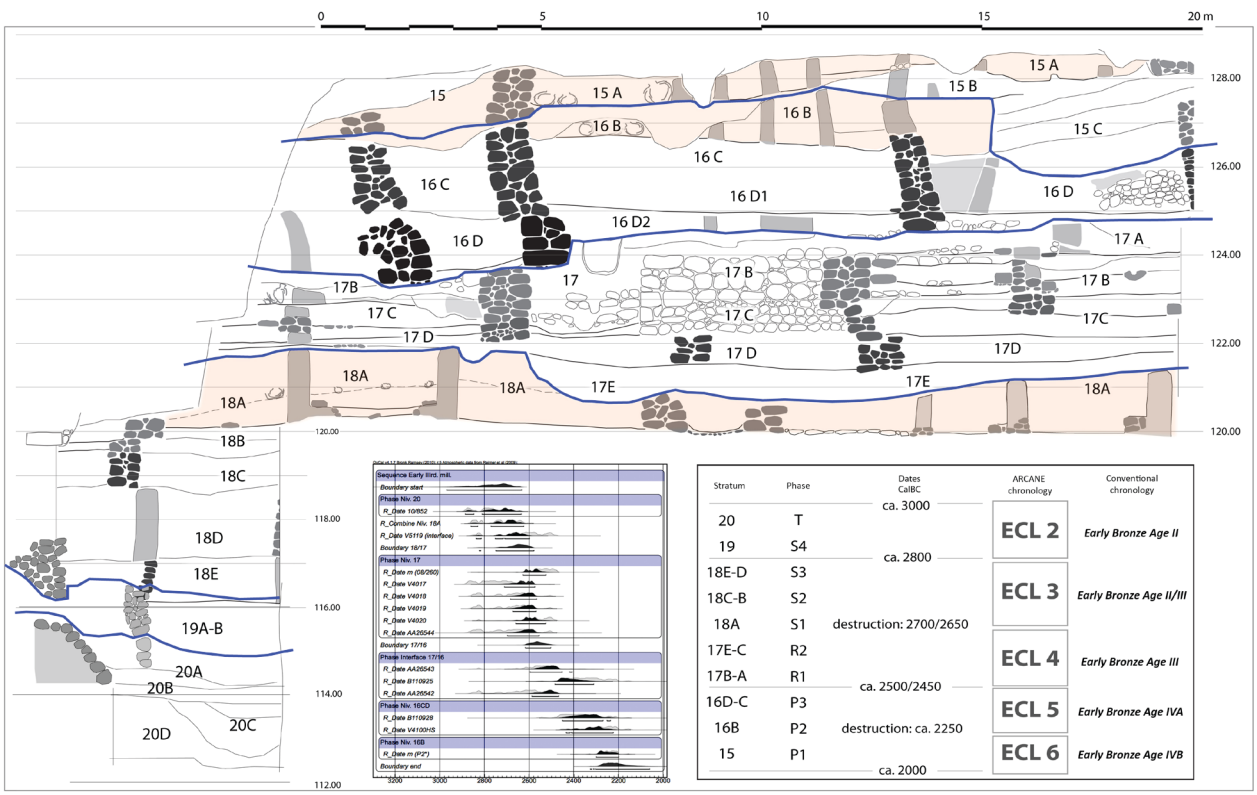

Figure 3: Stratigraphic sequence and dating of the Early Bronze Age occupation at Tell Arqa (from Thalmann 2013, Fig. 1).

The Central Levant: Tell Arqa, the Region of Byblos, and the Beqaa

In the central Levant, several ECL 2 and 3 contexts, broadly contemporary with the Early Dynastic tombs listed above, were selected for comparison: from Tell Arqa, the Byblos region, and the Beqaa Valley.

Tell Arqa, located on the southern edge of the Akkar plain in northern Lebanon, offers, until today, the best Early Bronze Age sequence among all the sites of the central Levant. The excavation led by Thalmann focused on the edge of the tell and revealed some domestic structures. Burned destruction layers punctuate the 16 m high EBA stratigraphic sequence (Layer 18A, Phase S; Layers 16A–B and 15A, Phase P) and are well-associated with radiocarbon dates (Fig. 3; Thalmann 2006, 2016). Phases T and S are contemporary with the Egyptian Early Dynastic period. Phase T (Layers 20 and 19; ECL2), the earliest EB phase excavated at Tell Arqa, was reached in a 40 sq m sounding. At the bottom of the sequence, layer 20 consists of several earthen floors and a peripheral wall probably delimiting the settlement. Layer 19 revealed the first dense settlement in the area, built of mudbricks. Phase S (Layer 18; ECL3) also comprised dense dwellings, made of stone and mudbrick walls. Stratum 18A corresponds to the first instance of destruction by fire, dated c. 2700–2650 cal BCE and excavated in a 250 sq m area. The dwellings are organized along a street, and the occupation is sealed by the destruction, which preserved a large number of complete vessels *in situ*. Pottery assemblages are well-defined for each occupation phase, including typology (Thalmann 2006, 2016), technology (Roux and Thalmann 2016), and petrography (Jean 2019, 2020), making Tell Arqa a reference for the ceramics of the EBA central Levant.

Ceramics from Byblos were obtained through surface collection, while well-stratified assemblages were investigated from the surrounding region at the sites of Tell Fadous-Kfarabida and Tell Koubba. Ceramics from these sites were unearthed in administrative, sacred, communal production, and storage contexts (see de Vreeze and Badreshany this volume, and Badreshany et al. 2020 and 2022 for a full analysis). The materials from the Beqaa originate entirely in survey materials and are chronologically much less secure than the coastal materials (Badreshany 2013; Badreshany et al. 2020).

Analytical Methods: Multiproxy Analysis

The methodology applied to this study is based on a comparative multiproxy analysis of the pottery assemblages, including chronology, typology, technology, petrography, and geochemistry. The contemporaneity of the contexts is assessed as precisely as possible based on the archaeological data. Data for Egyptian materials are taken from published sources, while the central Levantine assemblages were studied by the authors in person.

First, imports found in Egypt will be compared with local central Levantine pottery to establish degrees of chronological correlation. Next, typological characteristics will be examined, including shape, dimensions, and decoration. Technological aspects will also be considered regarding the manufacturing processes and surface treatment techniques. Finally, the utilization of raw materials to produce Levantine ceramics found in Egyptian tombs will be assessed and compared with data from the central Levant in an attempt to further narrow the provenance of the former. This last step will be undertaken at complementary scales of observation, from macroscopy to geochemistry. Macroscopic observation of central Levantine pottery has been carried out using both the naked eye and stereomicroscope. Microscopic observation in thin section was performed under a polarising microscope on a Lietz petrographic microscope at the Durham Archaeomaterials Research Centre (DARC, Durham University, UK) and a Nikon Eclipse E600 POL microscope at the MSH Mondes (Nanterre, France).

The geochemical analysis was undertaken by obtaining 100 mg of powder across the profile of each sherd using a 12-volt dental drill fitted with a 2-mm diameter solid tungsten carbide bit. The samples were prepared at the Durham Archaeomaterials Research Centre (DARC). The powders were acid digested using hydrofluoric acid and analyzed by ICP-AES and ICP-MS at the Department of Earth Sciences, Durham University, using protocols established by Ottley et al. (2003). 0.100 +/- 0.001g of powder was digested in a 4ml 40% HF e 1ml 69% HNO3 solution for 48h before evaporating to dryness and redissolving in HNO3 acid, the resulting solution being 3.5% HNO3. Next, a Re and Rh internal standard was added to this solution to compensate for possible calibration drift, matrix suppression, and dilution errors. The analysis measured 43 elements. The major elements,

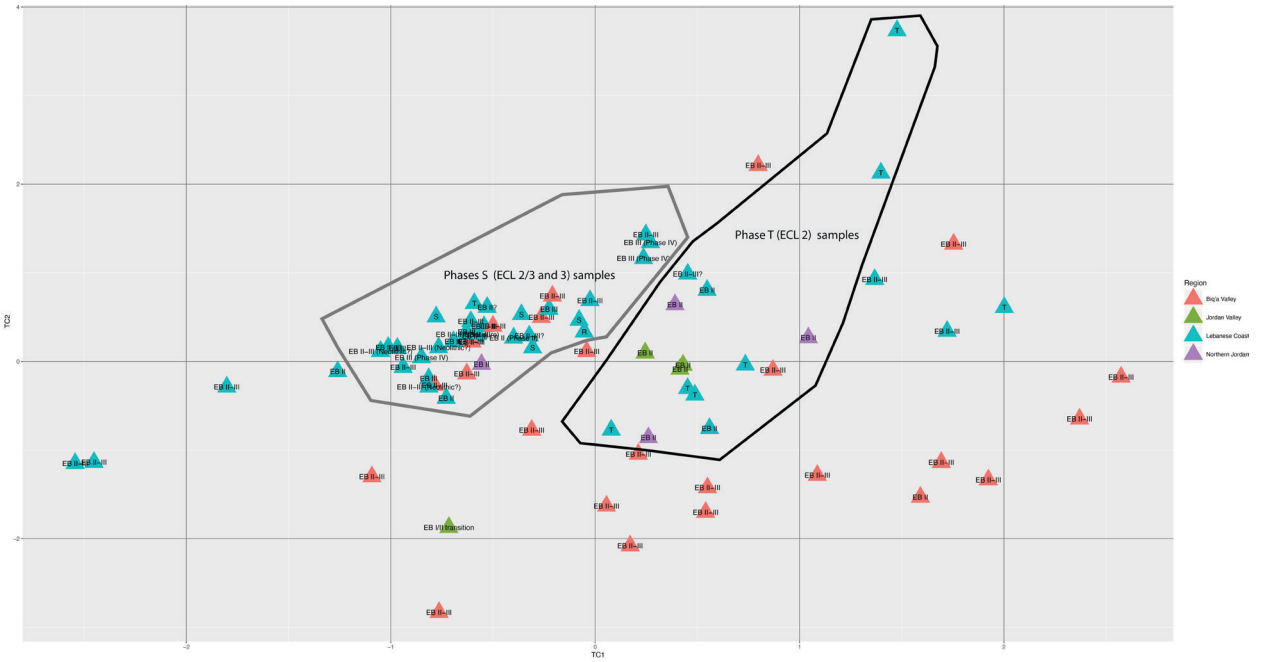

Figure 4: Plot of the factor scores generated from the Principal Components Analysis of the chemical data generated by ICP-AES and -MS for shale fabrics sorted by petrofabric and region. Factor 1 explains 62.6% of the variation and factor 2 explains 16.9%. The graph shows the existence of two groups of shale vessels produced in the northern Central Levant. One slightly coarser group dates to ECL2/phase T Arqa/first dynasty and the second dates mostly to the ECL 2/3 and 3/phase S Arqa/second dynasty).

analyzed by ICP-AES as weight percentage oxide, include Al_2O_3, Fe_2O_3, MgO, CaO, Na_2O, K_2O, TiO_2, P_2O_5, and MnO. The minor and trace elements analyzed by ICP-MS as parts per million (ppm) include Co, Cr, Cu, Ni, Sc, Sr, V, Zn, Rb, Y, Zr, Nb, Cs, Ba, Pb, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, Pb, Th, and U. Calibration was achieved via the use of in-house standards and international reference materials (W-2, BHVO-1 and AGV-1 standards) as well as a blank and standard sample being run every 10 samples to ascertain instrument calibration stability.

A Principal Components Analysis (PCA) (Orton and Hughes 2013, 176–180) was conducted to plot the similarity of the chemical composition of each sample (Fig. 4). The R software package, version 3.5.0 (R Core Team) was used for the analysis and the figures were produced using the package ggplot2 (Wickham 2009). A Log-ratio transform (base 10) was applied to the raw data (Buxeda i Garrigós 1999; Papageorgiou 2020) before processing.

Some Characteristics of ECL2-3 Pottery from the Central Levant

Based on the evidence, we list some basic criteria useful for excluding the possibility of a central Levantine provenance for ceramics found in Early Dynastic Egypt. For instance, the abundant ceramic data from Tell Arqa highlighted the systematic presence of burnishing and/or combing in non-cooking vessels (no smoothed surfaces) and the absence of slipping on local wares (contrary to vessels produced in the southern Levant; Thalmann 2016). The same can be said for other assemblages from the Lebanese coast, such as Beirut (Badre 1997), Byblos, Fadous, Koubba, and Enfeh (the authors' personal observations; Jean 2019). For all of these assemblages, slip is either non-existent or very rare.

In Lebanon, the Beqaa and the southern coast are possible exceptions to this rule (Doumet-Serhal 2006; Badreshany 2013). At Sidon, slipped vessels and vessels comparable to examples known from the southern Levant occur in limited amounts. That they are less common than non-slipped vessels suggests they are imports to Sidon rather than having been produced there. For the Beqaa, the literature suggests that, like the rest of Lebanon, slipping is rare during the ECL2-4. However, as the material is drawn from surveys, the chronological resolution is too poor to be certain. The identification of smoothed or slipped surfaces on imported vessels found in Early Dynastic Egypt may thus be

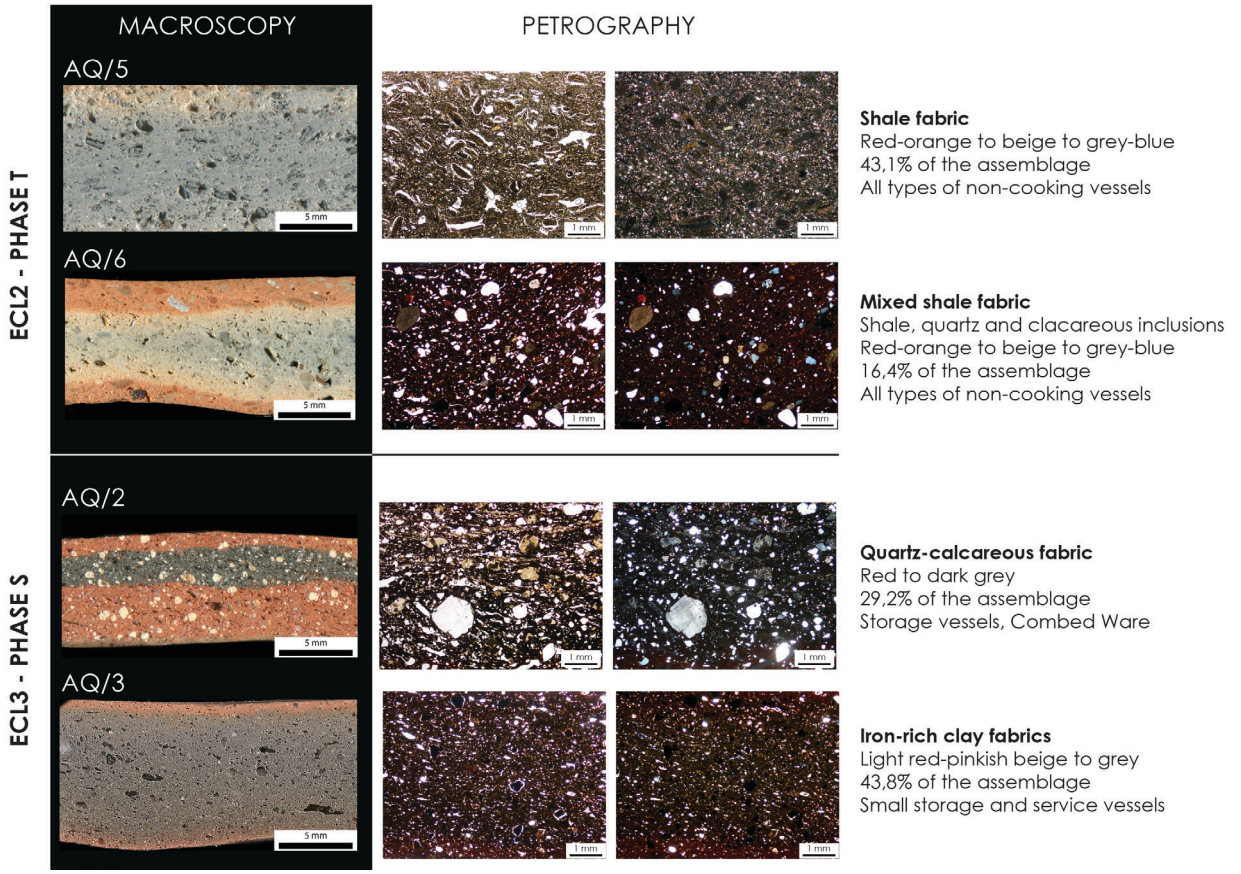

Figure 5: Main fabrics from Tell Arqa during ECL2 (Phase T) and ECL3 (Phase S), showing the shift from shale fabrics to quartz-calcareous and iron-rich fabrics (after Jean 2019).

considered an excluding criterion: they are almost certainly not from the region of Arqa, and very likely not produced on the Lebanese coast or in the central Levant. Based on those statements, we may already exclude four Egyptian samples originating in the central Levant due to the presence of a slip (Helwan, Op. 1/1 and Op. 4/36) and the absence of burnishing and/or combing (Abydos, Samples #11 and #17). Out of 14 Egyptian samples from Helwan and Abydos, nine could still fit well with central Levantine materials and need further comparison.

The macroscopic observation of fabrics is another relevant element for determining central Levantine provenance. At Tell Arqa, fabrics show clear evolution between ECL2 (Phase T) and ECL3 (Phase S) (Jean 2019, 2020). During Phase T, shale fabrics are the most common and make up 60% of the total assemblage: contemporaneous exports to Egypt should primarily be made of these fabrics (Fig. 5). An important change in pottery production is observed during Phase S when new fabrics developed. Quartz-calcareous fabrics are predominant for storage vessels and Combed Ware, while iron-rich fabrics are preferred for producing small storage and service vessels. At that time, shale fabrics became restricted to two specific pottery types: slender pattern-burnished red jugs and a unique seal-impressed jar (Thalmann 2013). This pattern is also observed on other Lebanese sites and probably reveals a region-level restructuring of pottery production systems (Badreshany et al. 2020). Identification of Levantine imports in Egypt should emphasize this technological aspect which could help clarify issues of provenance and chronology.

Abydos and the Central Levant: First Dynasty and ECL2 (Arqa Phase T)

Two types of imported vessels were identified among the samples from the tomb of king Den: jugs and jars. However, the vessels vary in shape, surface treatments, and fabrics, suggesting the coexistence of several productions and disparate provenances.

	Abydos	Tell Arqa
Sample Number	#20	1187
Vessel Number	T-aB/290	09/760.006
Context	Tomb of Den	Layer 19A
Date	Dynasty 1	Phase T, ECL2, EB II
Vessel Type	Squat jar	Small jar
Surface Treatment	Horizontal combing under lose vertical burnishing	Light combing under vertical burnishing
Technology	Coil-built	Coil-built
Base Diameter	c. 15 cm	c. 25 cm
Colour	Reddish brown surface, gray core	Orange-brown surface, gray-blue core
Fabric	Silty shale group	AQ/6.a: mixed shale fabric

Table 2: Comparison of the characteristics of squat jars from Abydos and Tell Arqa (from Hartung et al. 2015 and Jean 2019).

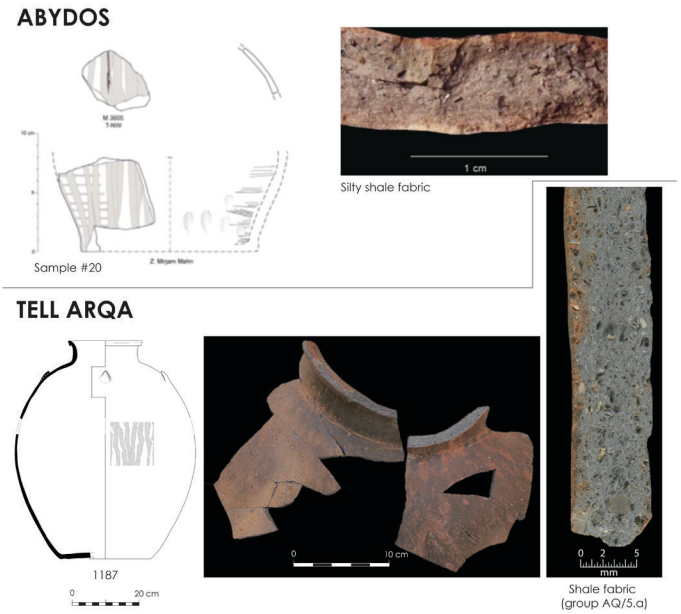

Figure 6: Comparison of the typology, technology, and fabrics of squat jars from Abydos and Tell Arqa (after Hartung et al. 2015: Figs. 16, 17:9; Jean 2019).

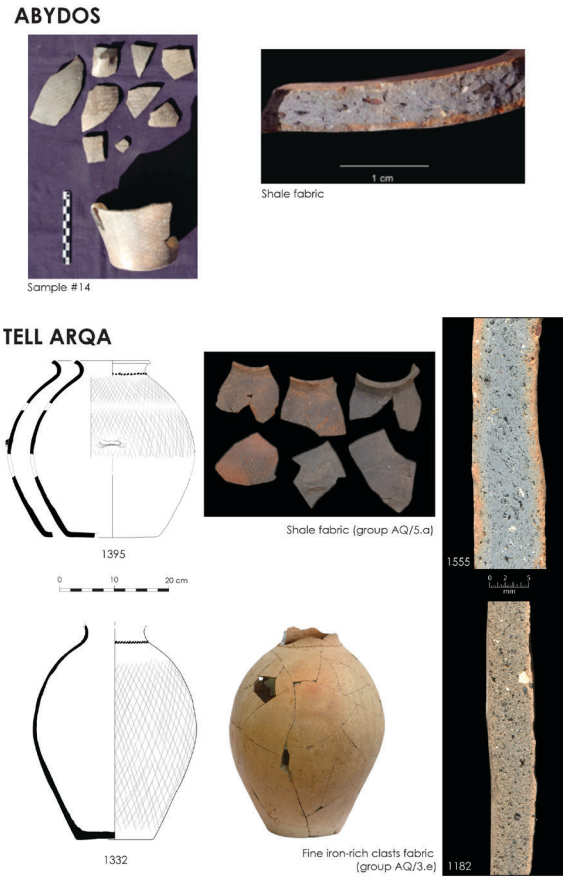

Figure 7: Comparison of the typology, technology, and fabrics of pattern-burnished jars from Abydos and Tell Arqa (from Hartung et al. 2015: Figs. 14, 17:7; Jean 2019).

Squat Vertically Burnished Jars

Two squat jars from Abydos were analyzed and published (Hartung et al. 2015). Sample #20 (Vessel T-aB/290; Hartung et al. 2015: Figs. 16, 17:9) finds a good match in the assemblage from Tell Arqa: both the shape and the surface treatments are similar, though the jar from Arqa is larger than the one from Abydos (Table 2, Fig. 6). On the other hand, sample #19 (Hartung et al. 2015, Figs. 13, 17:6), another squat jar, has no parallel

	Abydos	Tell Arqa	
Sample Number	#14	1395	1332
Vessel Number	T-aB/257	10/826.013	10/819.008
Context	Tomb of Den	Layer 19	Layer 19
Date	Dynasty 1	Phase T, ECL2, EB II	Phase T, ECL2, EB II
Vessel Type	Jar with loop handle	Medium squat jar with small horizontal lugs on the middle of the body	Medium elongated jar
Surface Treatment	Red wash, pattern burnishing on the body, between vertically burnished stripes; vertical burnishing on the neck	Pattern burnishing on the body; row of impressions at the bottom of the neck	Pattern burnishing on the body; row of impressions at the bottom of the neck
Technology	Coil-built with rotation	Coil-built	Coil-built
Measurements	c. 35 cm high; rim diameter 9.8 cm	c. 35 cm high; rim diameter c. 13–14 cm	c. 40 cm high; rim diameter c. 13–14 cm
Colour	Light red surface, gray core	Orange-brown	Beige-brown to brown purplish
Fabric	Shale group	AQ/5.a: shale fabric	AQ/3.e: fine iron-rich clasts fabric

Table 3: Comparison of the characteristics of pattern-burnished jars from Abydos and Arqa (from Hartung et al. 2015 and Jean 2019).

amongst materials from the northern Lebanese coast; it exhibits red wash and an irregularly burnished surface, suggesting it was produced in another region.

The Pattern-burnished Jars

One imported jar with a loop handle (sample #14), from Abydos, is decorated with pattern-burnishing (Hartung et al. 2015, Figs. 14, 17:7). Although the shape is not entirely preserved, satisfying parallels may be found at Arqa in jars from Phase T (Table 3, Fig. 7) with similar shapes, dimensions, and surface treatments. Some differences are nevertheless observed between the jars from Abydos and Arqa as the organization of the pattern-burnished areas in the former is delimited by large vertically burnished stripes that are not attested at Arqa. In addition, the vessels from Arqa are small jars often decorated with a row of impressions at the bottom of the neck and have either lug handles or no handles. However, loop handles are common on larger jars at Arqa and contemporary forms along the Lebanese coast; thus, their appearance on jars in Egypt should not be considered an excluding criterion for a coastal central Levantine provenance. Though this vessel is not a perfect match to central Levantine examples, the typological and decorative elements are common in the region, suggesting the vessel could have originated in the central Levant.

Recent analyses of Old Kingdom ceramics of Levantine origin suggest disparities in size and in some morphology aspects with those intended for circulation in the Levant (Thalmann and Sowada 2014; Badreshany et al. 2022); thus, it might be expected for ED vessels from the Levant to have varied from their locally distributed counterparts as well. Moreover, at Arqa, the jars might be separated into two slightly different types according to typology and petrography. The shale fabric squat jar (Fig. 7: 1395) compares well to the sample from Egypt, as well as a more elongated jar made of the fine iron-rich fabric (Fig. 7: 1332) that becomes much more common during ECL3. Further petrographic and typological analyses of the Abydos jars could help clarify the occurrence patterns of these distinct fabrics.

Jugs

The jugs from the tomb of king Den at Abydos are ovoid with flat bases. The upper part of the body is not preserved, and the shapes of the neck, rims, and whether handles occurred remain unclear.

The jugs are burnished in different ways, including short vertical strokes, fine vertical stripes, and pattern and horizontal burnishing. The fabrics are quite diverse as well, suggesting the coexistence of several regional productions in this tomb.

At Tell Arqa, pottery studies demonstrated that surface treatment and fabric are key characteristics to identifying and dating local productions (Thalmann 2016; Jean 2020b). Only vertical and pattern burnishing are documented in the assemblage from Phase T, and the production is primarily made of shale fabrics. A similar picture has emerged along the northern central Levantine coast (see below). These criteria are sufficiently well-defined to enable a reassessment of the provenance of some of the imported jugs at Abydos.

Beginning with Sample #13 (Hartung et al. 2015: Figs. 15, 17:8), strong typological parallels with material from the central Levantine coast could not be found, though the elements can be compared to the material at Arqa. As such, a possible origin for sample #13 in the central Levant can be suggested, though more data is needed to be certain because examples of jugs from Phase T are limited at Arqa (Table 4, Fig. 8). The other jugs are excluded for several reasons. Sample #12 (Hartung et al. 2015,

Figure 8: Comparison of the typology, technology, and fabrics of jugs from Abydos and Tell Arqa (from Hartung et al. 2015: fig. 15, 17:8; Thalmann 2016: Pl. 4; Jean 2019).

	Abydos	Arqa
Sample	#13	1493
Vessel	T-aB/288	10/851.003(A)
Context	Tomb of Den	Layer 20B
Date	Dynasty 1	Phase T, ECL2, EB II
Shape	Elongated jug	Large ovoid jug with a ridge at the bottom of the neck
Surface treatment	Vertical burnishing on the neck, pattern burnishing on the body	Neat vertical burnishing
Technology	Coil-built on a turning device	Coil-built
Measurement	ca. 35 cm (reconstructed)	ca. 52 cm
Colour	Pink surface, grey core	Orange-yellowish surface, grey core
Fabric	Shale fabric with quartz, few limestone	AQ/5.a: shale fabric

Table 4: Comparison of the characteristics of jugs from Abydos and Tell Arqa (from Hartung et al. 2015, Thalmann 2016 and Jean 2019).

Figs. 8, 17:1) because of its calcareous-igneous fabric which is not known at Arqa or in the central Levant during the period. Samples #16 (Hartung et al. 2015, Figs. 9, 17:2) and #18 (Hartung et al. 2015, Figs. 10, 17:3, 18:e) exhibit burnishing patterns not attested at Arqa or the wider region during the period (respectively, vertical/horizontal and short vertical strokes).

At present, the evidence from the central Levant does not support an origin from that region for three out of four imported jugs from Abydos. Only one example, #13, represents a potential match with the assemblage from Arqa and the wider region.

Abydos, Tomb of King Den: Discussion

The outcomes of the typological, technological, and macroscopic comparison show that only some of the imported vessels from Abydos may actually be attributed to the central Levant. We have shown a comprehensive approach to ceramics combining typology and petrography, but also considering local knowledge networks, technical choices, and savoir-faire, all crucial for provenancing artifacts. A reassessment of the provenance of Levantine imports from the First Dynasty at Abydos, in the tomb of king Den, shows that from the nine samples previously attributed to the central Levant and northern Lebanese coast, only three can be considered good matches with contemporary central Levantine assemblages. This conclusion is most valid for northern Lebanon and the region of Byblos, where a large amount of well-stratified data is available. The situation is less clear for the very beginning of the third millennium in the rest of the central Levant, like southern Lebanon, the Lebanese mountains, and the Beqaa, so future research might support an origin of these vessels from those areas.

Helwan and the Central Levant: Second Dynasty and ECL3 (Arqa Phase S)

At Helwan, the imported materials are represented by four jugs and one jar (Köhler and Ownby 2011). Typological description of the vessels is given for comparison with central Levantine types from Arqa and Byblos.

Pattern-burnished Slender Jugs: An ECL3 Characteristic Central Levantine Production

The Helwan imported jugs have a small flat base (base diameter c. 5 cm), elongated body, long neck, simple everted rim, and vertical handle on the rim and shoulder. One example (Op. 4/180) has a ridge below the neck and small vertical lugs on the upper body. The vessels are handmade and decorated by burnishing: pattern burnishing on the body and vertical burnishing on the neck; light combing can be observed under the burnishing on Op. 4/180 (Köhler and Ownby 2011) (Table 5, Fig. 9).

The dating of the jugs corresponds, in the central Levant, to the ECL3 and Arqa Phase S. At Tell Arqa, one group of jugs has strong typological parallels with the examples found at Helwan; these are red jugs with similar shapes and surface treatments, coil-built and made of a specific very oxidized shale fabric. These examples constitute one of the only types of shale vessels during Phase S/ECL3 (Fig. 10) in the Arqa or Byblos regions. At Arqa, the idiosyncratic nature of the shale-made jugs in the assemblage suggests that they are non-local. Based on typological, technological, and macroscopic comparisons, these jugs could originate in the Byblos region, where the red shale fabrics seem more common during the ECL3/4 despite the uncertain dating of the pottery sequence (author's personal observation).

At Byblos, similar jug types were discovered in a rock grave north of the tell, which could be dated to ECL3 (Table 5, Fig. 11; Thalmann 2019). The pottery assemblage from this tomb at Byblos also includes typical central Levantine double jugs with ram decoration (Fig. 11), which are also known at Tell Fadous (Genz et al. 2010, Pl. 6) and Sidon (Doumet-Serhal 2006, Pl. 117). Unfortunately, Thalmann's publication does not provide macroscopic or petrographic descriptions of the vessels from Byblos. However, the typological and technological match and the presence of shale fabrics in other assemblages from Byblos lend support to the notion that the red-shale pattern-burnished slender jugs originate in the Byblos region. Furthermore, based on the published evidence, they are more frequent there than in any other area, including Sidon. Similar observations have been made by the authors at Koubba, where a number of these jugs were found, belonging to the same type and made of the same fabric (Fig. 11). This type seems characteristic of the ECL3 in the region of Byblos and is probably distributed throughout the central Levant. Coastal examples are known at Bechemoun (Badreshany *et al.* 2020) and Sidon strata 4–5 (Doumet-Serhal 2006, Photos 9–10, Pls. 28:18, 58:19). Some examples are known from the Beqaa (a sherd from Tell Aswad, Fig. 11; Badreshany 2013).

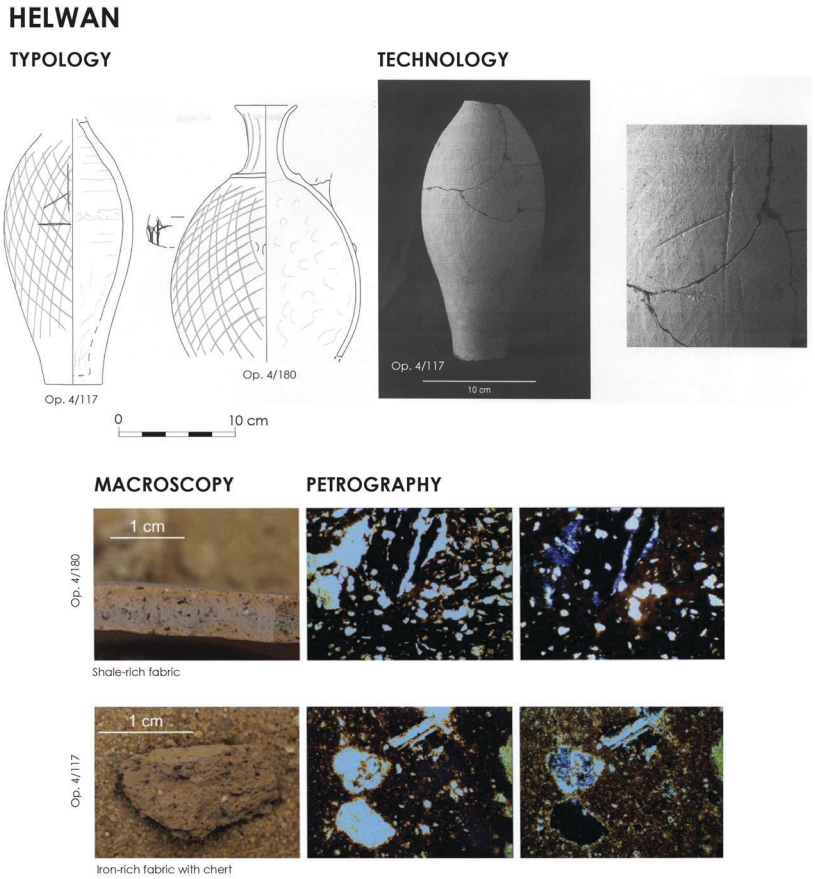

Figure 9: Typology, technology, and fabrics of slender jugs from Helwan (from Köhler and Ownby 2011: Figs. 2, 3:1, 2, 10, 11).

	Helwan		Arqa
Sample	Op. 4/180	Op. 4/117	951
Vessel		P06-26	09/720.154
Context	Op. 4/180	Op. 4/180	Layer 18C
Date	Late 1st/early 2nd dynasty	Early 2nd dynasty	Phase S, ECL3, EB II/III
Shape	Slender jug	Slender jug	Slender jug
Surface treatment	Pattern burnishing on the body and verticak burnishing on the neck. Light horizontal combing under the burnishing	Pattern burnishing	Pattern burnishing on the body and vertical burnishing on the neck, ridge below the neck
Technology	Handmade	Handmade	Coil-built
Maximal diameter	16.5 cm	11 cm	ca. 12 cm
Colour	Grey buff	Red buff	Red buff
Fabric	Shale-rich fabric	Iron-rich fabric with chert	AQ/5.b: oxydised shale fabric

Table 5: Comparison of the characteristics of slender jugs from Helwan and Tell Arqa (from Köhler and Ownby 2011 and Jean 2019).

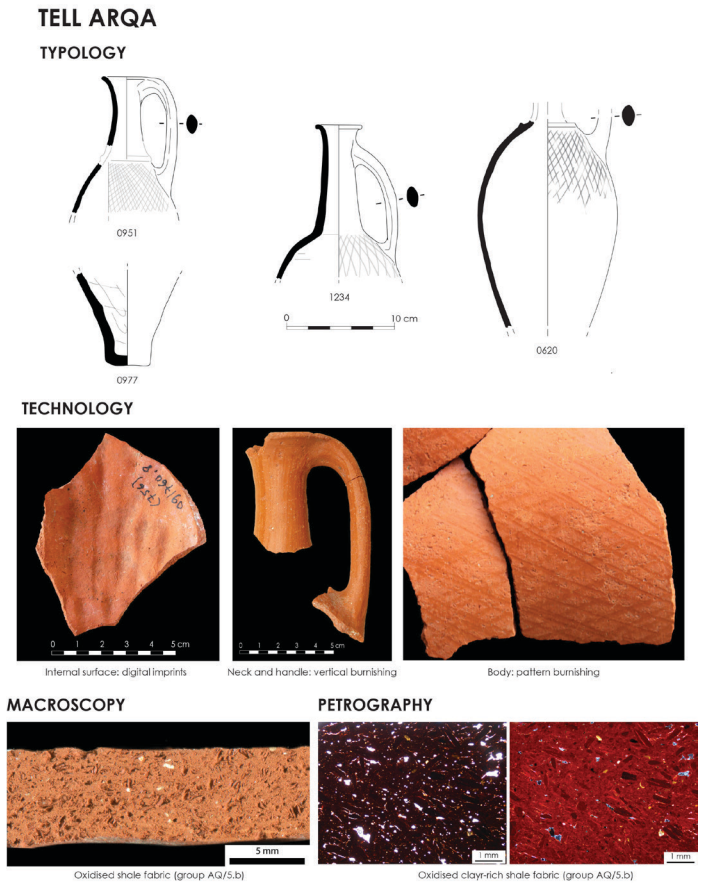

Figure 10: Typology, technology, and fabrics of slender jugs from Tell Arqa (from Thalmann 2016: Pls. 9, 13; Jean 2019).

The Globular Jar: An Heirloom Vessel?

The imported jar found in Tomb Op. 4/15 at Helwan is a large vessel with a globular upper body, short neck, and rounded rim. It is handmade, and the surface shows irregular, wavy vertical burnishing and a gritty quartz-calcareous fabric (Köhler and Ownby 2011). Jars with irregular burnishing are only known at Tell Arqa during ECL2/Phase T (Table 6, Fig. 12; Thalmann 2016, Pl. 5), earlier than Tomb Op.4/15 at Helwan, which dates to the mid-second Dynasty. At Arqa, Phase T jars are almost always made of shale fabrics, while quartz-calcareous fabrics mostly appear during ECL3/Phase S for the production of Combed Ware (Badreshany et al. 2020; Jean 2020a). This discrepancy between an older type and a new fabric indicates the presence of transitional production stage in the central Levant at the ECL2–ECL3 interface. Two examples of this type/fabric combination are known at Arqa at the end of Phase T/ECL2 (Table 6).

The jar found at Helwan cannot be identified among contemporary assemblages from Tell Arqa or the central Levant from the mid-late ECL3 but is a good match in both form and fabric with earlier vessels dating to the ECL2/3 transition. Given our current understanding of the data, the most likely explanation is that the jar is of central Levantine origin but was kept as an heirloom for c. 100 years after its production and deposited in a later grave. Typologically early jars (along with other materials) have been recognized in later tombs in Egypt (Sparks 2003; Sowada 2009, 18; Sowada, Ownby, and Bárta 2021). Likewise, there is a growing awareness that typologically earlier objects are being found in later deposits at Byblos (de Vreeze and Badreshany, this volume), indicating some commonalities between the two contexts.

Petrographic and Geochemical Comparison: The Issue of Shale Wares

Studies have confirmed that most ECL2 (EB II) pottery from central Levant was produced utilizing distinctive shale wares (Griffiths 2006; Badreshany 2013; Badreshany et al. 2020; Jean 2020a). Calcareous wares are used for cooking pots of the ECL2 and then gradually become dominant, starting with the ECL2–3 (EB II–III) transition and into the ECL3. In Sidon (and the south) and the Beqaa, the situation is difficult to assess with certainty due to fewer chronologically secure contexts, but shale fabrics are very common in both places. Little is known about the EB ceramic traditions of the Lebanese mountains at present; still, given the evidence, we expect that most vessels imported to Egypt from the central Levant during the First and Second Dynasties would have been made of shale fabrics. Jean argues that shale vessels from Phase T at Arqa are more diverse, generally coarser, and/or mixed with other inclusions, such as limestone, to a greater degree than those from Phase S, less common in the local assemblage (Jean 2020a). A preliminary study, by the authors, of the ECL2 material from Koubba I, contemporary with Phase T at Arqa, seems to validate these assessments.

We present some preliminary geochemical results comparing the shale fabrics from Arqa with regional datasets published by Badreshany *et al*. 2020. The PCA (Fig. 4)

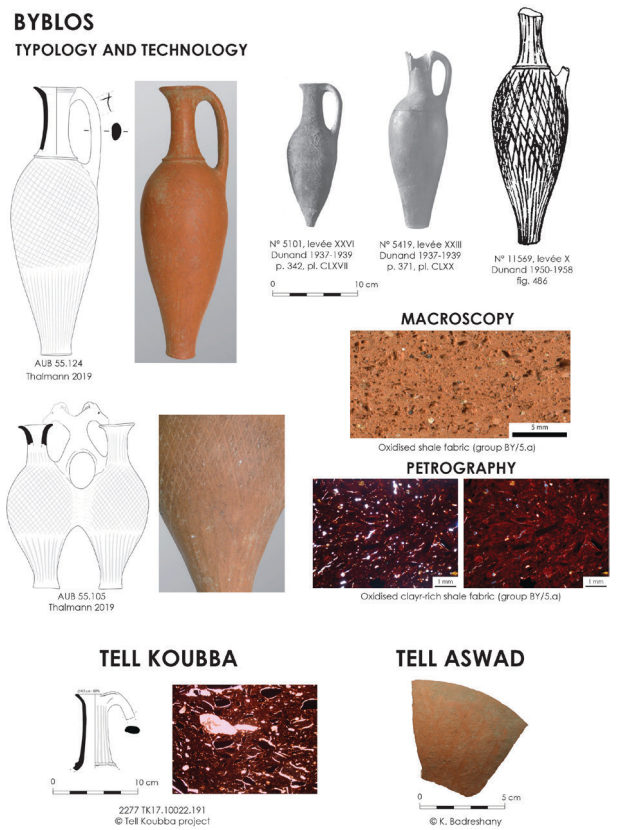

Figure 11: Typology, technology, and fabrics of slender jugs from Byblos (from Dunand 1937–1939, 1950–1958; Thalmann 2019; Jean 2019).

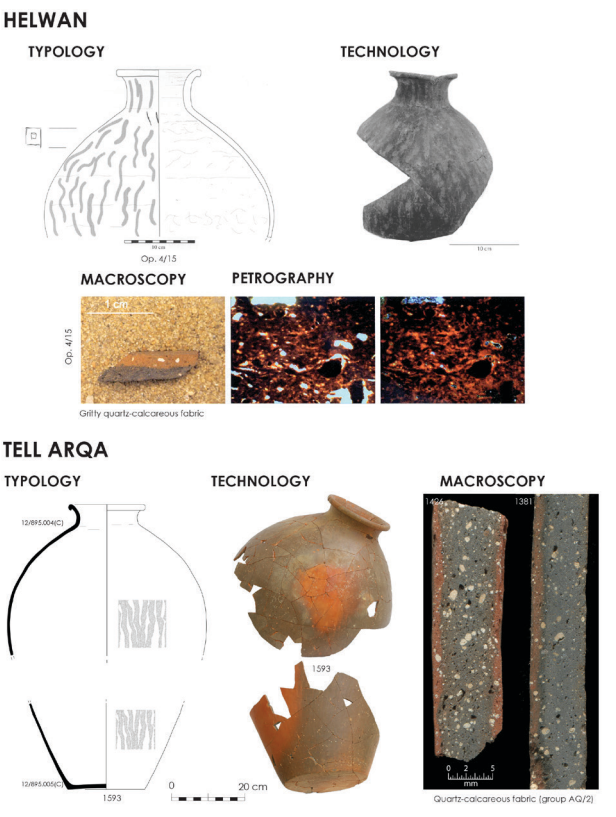

Figure 12: Typology, technology and fabrics of jars from Helwan and Tell Arqa (from Köhler and Ownby 2011: Figs. 3:5, 6:a, 8; Thalmann 2016; Jean 2019).

shows that, with a small number of exceptions, the majority of the Phase T vessels group with wares of confirmed ECL2 date to the right of the graph, while the main grouping in the center of the graph contains vessels from the ECL2–3 transition and early ECL3 (Phase S). Furthermore, the ECL2 (Phase T) vessels from Arqa tend to be somewhat higher in Calcium and lower in Rare Earth Elements than those from ECL3 (Phase S). This data will be discussed in more detail, along with the petrographic analysis of the ECL2 materials from Koubba, in a forthcoming publication.

This graph and the evidence presented above provide a basis for petrographically and geochemically distinguishing vessels of central Levantine origin produced during the First and Second Dynasties (ECL2 and ECL3). This information will hopefully be of great use in future studies for clarifying issues of chronology and provenance of ceramic vessels of central Levantine origin found in Egyptian contexts.

Conclusion

Our re-analysis of the ceramic evidence reinforces earlier notions of broad connections between Egypt and the Levant during the Early Dynastic period. Fourteen imported vessels found in Egyptian tombs were compared to contemporary central Levantine productions to refine and reassess their postulated provenance (Table 1) in light of newly available data. At Abydos, the royal tomb of Den provided a case study for First Dynasty/ECL2 contexts (Hartung et al. 2015), and the results confirmed a central Levantine provenance of three samples out of nine: two different types of jars and one jug. At Helwan Operation 4, several non-elite tombs from the Second Dynasty/ECL3 were investigated (Köhler and Ownby 2011). Out of five samples, three are highly comparable to central Levantine productions. This approach should now be extended to additional imported vessels to test their Levantine provenance by comparing them to Levantine assemblages. Based on the typological

	Helwan	Tell Arqa		
Sample Number	Op. 4/15	1381	1426	1593
Vessel Number	P01-10	10/824.e	10/829.b	12/895.004-005C
Context	Op. 4/15	Layer 19	Layer 20A	Layer 20
Date	Mid-2nd Dynasty/ Naqada IIID2	Phase T/S4, ECL2, EB II	Phase T, ECL2, EB II	Phase T, ECL2, EB II
Vessel Type	Jar with globular upper body, short cylindrical nexk and rounded rim	Jar (body sherd)	Jar (body sherd)	Jar with ovoid body, short cylindrical neck and rounded rim
Surface Treatment	Irregular wavy vertical burnishing	Irregular wavy vertical burnishing	Irregular wavy vertical burnishing	Irregular wavy vertical burnishing
Technology	Handmade	Coil-built	Coil-built	Coil-built
Measurements	Rim diameter: 12 cm; Maximal diameter: 33 cm			Rim diameter: 20 cm; Maximal diameter: 47 cm; Reconstructed height: c. 80 cm
Colour	Buff surface; orange-buff to gray-buff core	Buff surface; red-buff to gray core	Red surfaces and gray-buff core	Orange surfaces; gray-blue core
Fabric	Quartz-calcareous fabric	AQ/2: quartz-calcareous fabric	AQ/2: quartz-calcareous fabric	AQ/5.a: shale fabric

Table 6: Comparison of the characteristics of jars from Helwan and Tell Arqa (from Köhler and Ownby 2011; Thalmann 2016; and Jean 2019).

studies, it already seems that more vessels from Egypt can be attributed to the central Levant, reinforcing the conclusions of this paper.

Though based on a few samples, our study suggests that relations between Egypt and the central Levant changed in the early third millennium, from periodic to more focused and regular activity. From the earliest ECL2, the central coastal Levant is a focal point of Egyptian activity, but one of many across the central and southern Levant. Central Levantine vessels are found in similar proportions to a wide range of southern Levantine productions imported to the Egyptian court (Iserlis et al. 2019).

It is during the ECL 2–3 transition that changes are perceptible and contact with the central Levant progressively increases. During the ECL3/Second Dynasty, imported materials were less common in Egypt, and vessels from the central Levant were comparatively more frequent among them, especially typical vessels such as the red pattern-burnished jugs likely produced in the Byblos region. This leads to two distinct statements, partly contradictory, which could contribute to the complexity of understanding Levant–Egypt relations during the Second Dynasty.

First, a new practice seems to emerge, repurposing imported vessels as heirlooms for deposit in later graves. These actions may attest to an increasing status afforded to these vessels and their contents, possibly related to the relative scarcity of Levantine goods in Egypt during the Second Dynasty when compared to the first one. This practice becomes even more apparent in Old Kingdom contexts (Sparks 2003; Sowada 2009; Sowada et al. 2021). Second, Egyptian Early Dynastic contexts suggest that Levantine imports are becoming more widespread among differing social classes, from the royal tombs of the First Dynasty to non-elite tombs of the Second Dynasty attributed to the urban middle-class (though notably absent from the tomb of king Ninetjer; Lacher-Raschdorff 2014, 85–87). Both statements are supported by archaeological evidence and could have resulted from the weakening of the Second Dynasty central economy benefitting other

social classes, thus making it harder to reconstruct Second Dynasty trade networks.

The evidence indicates that the central Levant progressively becomes a focus for Early Dynastic Egypt, underpinning the region's development as its primary trade partner during the Old Kingdom. These changes, beginning during the ECL2/3 transition, are coincident with an increase in the number of settlements and building activity at many sites on the northern Lebanese coast and continue through the ECL 3/4, providing new settings for interactions between the region and the Egyptian state during the Old Kingdom (see de Vreeze and Badreshany, this volume).

Finally, this paper highlights new and existing criteria aiding in the provenance determinations of Levantine imports to Egypt based on the recent examination of several contemporaneous and stratified assemblages from Lebanon. These new datasets will help further develop the research on Egyptian–Levantine trade to better understand the role of the Levantine regions in networks and the evolution of sociopolitical and economic relationships between Egypt and the Levant during the third millennium.

Acknowledgments

Research for this paper was funded by Hesam Université, Université Paris 1 Panthéon-Sorbonne, UMR 7041 Arscan/VEPMO, and the Computational Research on the Ancient Near East (CRANE) project supported by the Social Sciences and Humanities Research Council of Canada. We would like to especially recognize Dr. Mary Ownby, Dr. Christiana Köhler, and Dr. Ulrich Hartung for their many years of work on Levantine imports in Egypt and thank them for shared insights and fruitful discussions on the topic that served as the inspiration for this paper. Of course, the responsibility for the conclusions presented here lies with the authors. We are especially grateful to the Directorate General of Antiquities of Lebanon for authorizing the authors' missions in the field and the export of pottery samples for analysis. We are indebted to the late Dr. Jean-Paul Thalmann for initiating direct comparisons between materials from Egypt and Tell Arqa and supporting the petrographic analysis of EBA pottery. Thanks are due to Attila Kreiter at the Hungarian National Museum for preparing the thin sections, and to Chris Ottley, at the Department of Earth Sciences at Durham University for undertaking the geochemical analyses by ICP-AES and -MS. Finally, we are grateful to the reviewers of this paper for their helpful comments.

References

Badreshany, Kamal. 2013. *Urbanization in the Levant: an archaeometric approach to understanding the social ad economic impact of settlement nucleation in the Biqa' valley*, Unpublished PhD dissertation, University of Chicago.

Badreshany, Kamal and Hermann Genz. 2009. "Pottery production on the northern Lebanese coast during the Early Bronze Age II–III: The petrographic analysis of the ceramics from Tell Fadous-Kfarabida." *Bulletin of the American School of Oriental Research* 355: 51–83.

Badreshany, Kamal, Graham Philip, and Melissa Kennedy. 2020. "The development of integrated regional economies in the Early Bronze Age Levant: new evidence from 'Combed Ware' jars." *Levant* 52(1–2): 160–196.

Badreshany, Kamal, Karin Sowada, Mary Ownby, Mathilde Jean, Michel De Vreeze, Alice McClymont, and Graham Philip. 2022. "The characterisation of Levantine ceramic production and Egyptian trade in the Pyramid Age." *Journal of Archaeological Science: Reports, Volume* 41. https://doi.org/10.1016/j.jasrep.2021.103309.

Bronk Ramsey, Christopher, Michael W. Dee, Joanne M. Rowland, Thomas F.G. Higham, Stehpen A. Harris, Fiona Brock, Anita Quiles, Eva M. Wild, Ezra S. Marcus, and Andrew J. Shortland. 2010. "Radiocarbon-Based Chronology for Dynastic Egypt." *Science* 328: 1554–1557.

Buxeda i Garrigós, Jaume. 1999. "Alteration and contamination of archaeological ceramics: the perturbation problem." *Journal of Archaeological Science* 26(3): 295–313.

Dee, Michael, David Wengrow, Andrew Shortland, Alice Stevenson, Fiona Brock, Linus Girdland Flink, and Christopher Bronk Ramsey. 2013. "An absolute chronology for early Egypt using radiocarbon dating and Bayesian statistical modelling." *Proceedings of the Royal Society.* https://doi.org/10.1098/rspa.2013.0395.

Doumet-Serhal, Claude. 2006. *The Early Bronze Age in Sidon: "College site" Excavations (1998–2000–2001).* Bibliothèque Archéologique et Historique 178. Beyrouth: Institut Français du Proche-Orient.

Dunand Maurice. 1937–1939. *Fouilles de Byblos I, 1926–1932* : Atlas. Paris: Geuthner.

———. 1950–1958. *Fouilles de Byblos II, 1933–1938*. Paris: Geuthner.

Espinel, Andrés Diego. 2002. "The Role of the Temple of Ba'alat Gebal as Intermediary Between Egypt and Byblos During the Old Kingdom." *Studien zur Altägyptischen Kultur* 30: 103–119.

Genz, Hermann, Riva Daniel, Alison Damick, Alexander Ahrens, Sireen el-Zaatari, Felix Höflmayer, Walter Kutschera, and Eva M. Wild. 2010. "Excavations at Tell Fadous-Kfarabida. Preliminary Report on the 2010 Season of Excavations." *Bulletin d'Archéologie et d'Architecture Libanaises* 14: 241–274.

Greenberg, Raphael. 2019. *The Archaeology of the Bronze Age Levant. From Urban Origins to the Demise of City-States, 3700–1000 BCE.* Cambridge: Cambridge University Press.

Greenberg, Raphael and M. Iserlis. 2020. "A Note on First Dynasty Egypt, Tel Bet Yerah and the Origins of Commodity Exchange on the Levantine Seaboard." *Journal of Ancient Egyptian Interconnections* 27: 38–50.

Grimal, Nicolas. 1988. *Histoire de l'Egypte ancienne*. Paris: Fayard.

Hartung, Ulrich. 2002. "Imported jars from cemetery U at Abydos and the Relations between Egypt and Canaan in Predynastic Times." In Edwin C.M. van den Brink and T.E. Levy (eds.), *Egypt and the Levant. Interrelations from the 4th through the Early 3rd Millennium B.C.E.*, 437–449. London—New York: Leicester University Press.

Hartung, Ulrich, E. Christiana Köhler, Vera Müller, and Mary F. Ownby. 2015. "Imported Pottery from Abydos: A New Petrographic Perspective." Ägypten *und Levante* 25: 295–333.

Hornung, Erik, Rolf Krauss, and David A. Warburton (eds.). 2006. *Ancient Egyptian Chronology*. Leiden, Boston: Brill.

Iserlis, Mark, Daniel Steiniger, and Raphael Greenberg. 2019. "Contact between first dynasty Egypt and specific sites in the Levant: new evidence from ceramic analysis." *Journal of Archaeological Science: Reports* 24: 1023–1040.

Jean, Mathilde. 2019. *Mémoires de terres. L'urbanisation du Levant nord au III^e^ millénaire par la pétrographie céramique*. Unpublished PhD dissertation, Université Paris 1, Panthéon-Sorbonne.

———. 2020a. "Pottery Production at Tell Arqa (Lebanon) during the 3rd millennium BC: Preliminary Results of Petrographic Analysis." *Levant* 52(1–2): 136–159.

———. 2020b. "Evolutions of pottery production over a millennium: petrographic analysis of the EB ceramic assemblage from Tell Arqa." In Melissa A. Kennedy (ed.), *A Land in Between. The Orontes Valley in the Early Urban Age*, 173–193. Sydney: Sydney University Press.

Köhler, E. Christiana. and Jean-Paul Thalmann. 2014. "Synchronising Early Egyptian Chronologies and the Northern Levant." In Felix Höflmayer and Ricardo Eichmann (eds.), *Egypt and the Southern Levant in the Early Bronze Age*, 181–206. Rahden: Verlag Marie Leidorf.

Köhler, E. Christiana, and Mary F. Ownby. 2011. "Levantine Imports and their Imitations from Helwan." Ägypten *und Levante* 21: 31-46.

Lacher-Raschdorff, Claudia M. 2014. *Das Grab des Königs Ninetjer in Saqqara. Architektonische Entwicklug frühzeitlicher Grabanlagen in* Ägypten. Deutsches Archäologisches Institut Kairo. Wiesbaden: Harrassowitz Verlag.

Marcus, Ezra. 2002. "Early seafaring and maritime activity in the southern Levant from Prehistory through the third millennium BCE." In Edwin C.M. van den Brink and Thomas E. Levy (eds.), *Egypt and the Levant. Interrelations from the 4th through the Early 3rd Millennium B.C.E.*, 403–417. London, New York: Leicester University Press.

Miroschedji, Pierre de. 2015. "Les relations entre l'Egypte et le Levant aux IVe et IIIe millénaires à la lumière des fouilles de Tell as-Sakan. " In *Comptes-rendus des séances de l'Académie des Inscriptions et Belles Lettres*, Avril-Juin 2015 : 1003–1038. Paris: Diffusion de Boccard.

———. 2018. "The urbanization of the Southern Levant in its Near Eastern Setting." In Marcella Frangipane and Linda R. Manzanilla (eds.), *Rethinking Urbanization and Its Living Landscapes from the Inspiring Perspective of a Great "Maestro"* in Memory of Robert McC. Adams: 109–148. Origini, Prehistory and Protohistory of Ancient Civilizations 42. Roma: Gangemi.

Müller, Vera. 2014. "Relations between Egypt and the Near-East during the 1st Egyptian Dynasty as represented by the royal tomb of Den at Umm el-Qaab/Abydos." In Felix Höflmayer and Ricardo Eichmann (eds.), *Egypt and the Southern Levant in the Early Bronze Age*, 241–258. Rahden: Verlag Marie Leidorf.

Mumford, Gregory D. 2014. "Egypt and the Levant." In Margreet L. Steiner and Ann E. Killebrew (eds.), *The Oxford Handbook of the Archaeology of the Levant c. 8000-332 BCE*, 69–89. Oxford: Oxford University Press.

Orton, Clive and Michael Hughes. 2013. *Pottery in Archaeology*. Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press.

Ottley, Chris J., D. Graham Pearson, and Gordon J. Irvine. 2003. "A Routine Method for the Dissolution of Geological Samples for the Analysis of REE and Trace Elements via ICP-MS." In J. Grenville Holland and Scott D. Tanner (eds.), *Plasma Source Mass Spectrometry: Applications and Emerging Technologies*, 221–230. Cambridge: Royal Society of Chemistry.

Papageorgiou, Ioulia. 2020. "Ceramic investigation. How to perform statistical analyses." *Archaeological and Anthropological Sciences* 12: 210.

Porat, Naomi, and Yuval Goren. 2002. "Petrography of the Naqada IIIa Canaanite pottery from tomb U-j in Abydos." In Edwin C.M. van den Brink and Thomas E. Levy (eds.), *Egypt and the Levant. Interrelations from the 4th through the early 3rd millennium B.C.E.*, 252–270. London: Leicester University Press.

Roux, Valentine and Jean-Paul Thalmann. 2016. "Évolution technologique et morpho-stylistique des assemblages céramiques de Tell Arqa (Liban, 3e millénaire av. J.-C.) : stabilité sociologique et changements culturels." *Paléorient* 42/1: 101–127.

Shaw, Ian (ed.). 2000. *The Oxford History of Ancient Egypt*. Oxford: Oxford University Press.

Sowada, Karin N. 2009. *Egypt in the Eastern Mediterranean during the Old Kingdom: An Archaeological Perspective*. Orbis Biblicus et Orientalis 237. Fribourg, Göttingen: Academic Press, Vandenhoeck & Ruprecht.

———. 2014. "Never the Twain Shall Meet? Synchronising Egyptian and Levantine Chronologies in the 3rd Millennium BC." In Felix Höflmayer and Ricardo Eichmann (eds.), *Egypt and the Southern Levant in the Early Bronze Age*, 293–313. Rahden: Verlag Marie Leidorf.

Sowada, Karin, Mary Ownby, and Anna Wodzińska. 2020. "The Petrography of Imported Levantine Combed Vessels from Early Old Kingdom Giza." *Levant* 52(1–2):197–214.

Sowada, Karin, Mary Ownby, and Miroslav Bárta. 2021. "The Origin of Imported Jars from 6th Dynasty Abusir: New Light on Early Bronze Age Egyptian-Levantine Relations." *Bulletin of the American Schools of Oriental Research* 386: 221–236.

Sowada, Karin, Mary Ownby, Jane Smythe, Sylvie Marchand, and Yann Tristant. 2021. "Early Bronze Age Exchange Patterns between Egypt and the Levant: A View from First Dynasty Abu Rawash." *Egypt and the Levant* 31: 425–449.

Sparks, Rachael "Egyptian Stone Vessels and the Politics of Exchange (2617–1070 BC)." In Roger J. Matthews and Cornelia Roemer (eds.), *Ancient Perspectives on Egypt*, 39–56. London: UCL Press.

Thalmann, Jean-Paul. 2006. *Tell Arqa - I: Les niveaux de l'âge du Bronze*. Bibliothèque Archéologique et Historique 177. Beyrouth: Institut Français du Proche-Orient.

———. 2016. "Rapport préliminaire sur les campagnes de 2008 à 2012 à Tell Arqa." *Bulletin d'Archéologie et d'Architecture Libanaises* 16: 15–78.

———. 2019. "Un groupe de vases du Bronze Ancien au musée de l'AUB." In Françoise Briquel-Chatonnet, Emmanuelle Capet, Eric Gubel and Carol Roche-Hawley, *Nuit de pleine lune sur Amurru* : Mélanges offerts à Leila Badre, 383–400. Paris: Geuthner.

Thalmann, Jean-Paul and Karin Sowada. 2014. "Levantine 'Combed Ware'." In Marc Lebeau (ed.), *Associated Regional Chronologies for the Ancient Near-East and the Eastern Mediterranean, ARCANE Interregional Vol. I: Ceramics*, 355–378. Turnhout: Brepols.

Wickham, Hadley. (ed.) 2009. *ggplot2: Elegant Graphics for Data Analysis*. New York: Springer.

Wilkinson, Toby A.H. 1999. *Early Dynastic Egypt*. London: Routledge.