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**TITLE:**

**MEANINGFUL MATERIALS? BONE ARTEFACTS AND SYMBOLISM IN  
THE EARLY BRONZE AGE AEGEAN**

**SUMMARY**

Symbolically-laden use of materials is well documented ethnographically but hard to demonstrate archaeologically, especially for animal bones and teeth, use of which in post-Neolithic contexts is commonly considered expedient. Early Bronze Age southern Aegean mortuary assemblages have yielded three distinctive classes of bone artefact. Comparison with contemporary unworked bone assemblages and contextually or formally related objects in other materials reveals complex cultural associations, the symbolic meaning of which is explored through heuristic use of ethnographic analogues. It is concluded that alternative value systems operated alongside those structured around exoticism and technological sophistication, usually deployed to understand EBA southern Aegean cultures.

**INTRODUCTION**

Archaeologists often consider that animal bones and teeth (henceforth ‘bone’) were selected for working, especially in post-Neolithic contexts, as readily available substitutes for functionally or visually similar, but more valuable, materials (e.g. Maeir et al. 2009, 41). A symbolic dimension to such raw material selection, although richly documented ethnographically, has proved elusive archaeologically. To address this issue, a threefold strategy is adopted here.

First, an artefact-centred approach investigates the form, function and contextual associations of finished bone objects, drawing comparisons with formally, functionally and contextually related objects in other materials. *Inter alia*, this reveals ‘skeuomorphic’ imitation of bone prototypes in other materials and, more broadly, suggests webs of shared meaning between materials. Secondly, whereas different specialists tend to study worked and unworked assemblages following different protocols, application of zooarchaeological methods to both enables comparison of these datasets (Isaakidou 2003, 233; Allentuck 2013, 379). Zoological (anatomical, taxonomic, demographic) and taphonomic (e.g. fragmentation, attrition) data, interpreted in the light of ethnographic and experimental studies, reveal selective working of taxa or body parts<sup>1</sup> and the place of raw material acquisition in carcass processing and consumption routines (cf. Isaakidou 2003<sup>2</sup>). Thirdly, analysis of visual and tactile properties (e.g. colour, texture), by highlighting raw material selections not comfortably attributable to practical considerations, suggests the outline of unfamiliar emic material taxonomies and value systems.

This approach is here applied to the Early Bronze Age (EBA – third millennium BCE) southern Aegean (Figure 1), for which built tombs with elaborate grave goods mark significant departures from Neolithic practices. The distinctive styles and raw materials of these grave goods, supplemented by archaeometric studies of provenance (e.g. Renfrew et al. 1965; Stos-Gale and Macdonald 1991), suggested Cycladic participation in extensive trade networks within and beyond the southern Aegean (e.g. Renfrew 1972). More recent models, inspired by Pacific anthropology, emphasise the role of voyaging, exchange, and arcane knowledge – especially of geographically restricted raw materials (e.g. obsidian, silver) and complex

transformative technologies (notably metallurgy) – in underpinning physical and social reproduction (e.g. Broodbank 1989; 1993; 2000; Nakou 1995; Bevan 2004).

The earlier models of trade adopt modernist perceptions of raw material and object value systems (e.g. Barber 1984, 11; Renfrew 1972, 455: ‘For the first time, too, there was a commodity [metal] really worth trading’), while the latter highlight the prestige value of exotic artefacts and materials ‘as markers of liminal knowledge and power’ (Bevan 2004, 110). Both paradigms treat ‘bone’ artefacts only as finished objects and rarely discuss their raw materials. The tacit assumption that animals were routinely consumed and their discarded remains readily available dismisses bone as unimportant in prevailing value systems. Failure to explore possible symbolic meaning in the use of bone to manufacture objects found in funerary contexts has precluded recognition of other principles of value alongside scarcity, exoticism and technological sophistication.

Using the three analytical steps outlined above, the following sections explore the production and consumption biographies of three bone artefact types from the EBA southern Aegean to argue that the use of bone (and other materials) carried culturally important meanings. These are tentatively interpreted with heuristic reference to ethnographic analogy.

## BONE ARTEFACTS IN THE EBA SOUTHERN AEGEAN

Bone artefacts are regular components of Neolithic assemblages in Greece, but in the EBA southern Aegean their frequency and variety decline dramatically and novel objects appear, including palettes, ring seals and colour tubes (Figure 2).

*Bone palettes* are oblong, concave objects, typically ca. 17-20 cm long and 4-5 cm wide (Table 1) and occasionally with holes at two or four corners. Dimensions, overall shape and wall thickness show that the best-preserved examples were formed on sections (half the circumference and most of the length) of cattle long bone shafts. In some cases, anatomical characteristics reveal the body part used: the anterior shaft of cattle femurs for the Lakkoudes palette (Table 1, 1) and two or three Tsepi examples (Table 1, 13 and probably 16); and the anterior shaft of cattle metacarpals for other Tsepi and Koropi palettes (Table 1, 14 and 18; Figure 3).

Known bone palettes are restricted to the late EB I-early EB II Cyclades and ‘Cycladicising’ sites in neighbouring Attica and Euboea. Apart from the unusual ‘settlement’ context at Koropi (Table 1, No 19), all provenanced examples come from cemeteries. Although far fewer settlements than cemeteries have been systematically investigated and reported (e.g. Marthari 1997, 362-3), the overwhelmingly mortuary deposition of bone palettes strongly suggests a symbolic meaning. Their absence from Early Minoan (EM) contexts, mortuary or otherwise, on Crete is also significant, as discussed below.

The only other materials used for such objects are white marble (Doulas 1977, 76) and a ‘whitish porous stone’ (Pantelidou-Gofa 2005, 165). In dimensions and shape, the stone palettes listed in Table 1 more or less closely imitate bone prototypes, the size and form of which were dictated by the skeletal elements and species selected as raw materials. Consistent with stone palettes being skeuomorphs of bone prototypes, the former were found in later contexts than the latter at Tsepi (Pantelidou-Gofa 2005, 321) and the Aplomata marble examples (dated to Early Cycladic II – henceforth ‘EC II’), are likewise younger than the earliest bone examples.

One proposed function for bone palettes was as cradles for marble figurines (Doumas 1977; also Getz-Preziosi 1994, 17, fig. 2). Reported traces of red pigment on three bone palettes from Tsepi (Table 1, Nos 3, 10-11; Pantelidou-Gofa 2005, 320-1), however, support an earlier interpretation, as receptacles for mixing pigments (Bosanquet 1896-7; *pace* Sherratt 2000, 122) and thus as accessories in culturally significant body modification practices (e.g. Broodbank 2000; Carter 2008).

*Bone ring seals* (BRS) are hollow cylindrical objects with a carved face occupying about a quarter of their outer surface (Figure 4). Size and morphology identify the raw materials as transverse shaft sections of cattle metapodials (often metatarsals) and of sheep and/or goat long bones (again probably metapodials). The natural form of the raw material dictated the form of the objects, with variable size reflecting use of bones from different species.

Krzyszkowska drew attention to the raw material of BRSs and noted occasional traces of the distinctive internal *septum* (Figure 4a; Krzyszkowska 1989, 119). She attributed these traces, which could easily have been removed by grinding, to craftsmen deliberately enabling consumers to differentiate between ruminant bone and hippopotamus ivory (Krzyszkowska 2005, 67-8), but they were perhaps intended rather to emphasise the use of a *particular* skeletal element (cf. Allentuck 2013, 392), just as a decorative rib carved around the outer circumference of several seals obviously references the natural form of the distal articulation (condyles) of ruminant metapodials (Figure 4b; e.g. CMS II.1 nos 14, 31, 34). Interestingly, the ‘handle’ of another type, the ‘hammer-head’ seal, reproduces a very similar shape (e.g. CMS II.1 nos 46, 131, 474).

The BRS is replicated only in hippopotamus ivory (Krzyszkowska 1989, 120) and Krzyszkowska has argued, from typological analysis incorporating raw material selection, that there is no clear evidence of ivory giving way to bone, as might be expected if a ‘more valuable’ imported material was substituted by one locally available (Krzyszkowska 2005, 64). Conversely, imitation of long bone morphological characteristics, such as the cylindrical shape and marrow cavity (the latter requiring creation of a hole in the solid ivory), as well as the rib referencing the condyle (e.g. CMS II.1 no 69), strongly favour the skeuomorphing of bone prototypes in hippopotamus ivory, rather than *vice versa*.

To date, BRSs are known exclusively from EM II-MM I (i.e. *Cretan*<sup>3</sup>) *funerary* contexts. In most cases, closer dating is impossible due to disturbance of the tombs for later burials, ritual handling of human remains and looting. Best dated are a group of animal bone BRSs and an ivory skeuomorph in an undisturbed EM IIA context in Papoura Tomb I (Warren 2004, 41).

Possible evidence for context of manufacture is provided by a group of cattle metatarsal articular ends, removed by sawing, in EM II rubbish deposits at the Poros-Sanoudakis Plot (Isaakidou 2005, 213, fig. 6.30e). These offcuts almost certainly represent manufacturing debris, as sawing of bone in EBA (and later) contexts is too rare and anatomically restricted to result from carcass processing for consumption (Isaakidou 2005, 182). Their presence at Poros suggests that extraction of preforms, if not the whole process of crafting BRSs, occurred in settlement contexts. Finished BRSs are unknown from settlement contexts, but wear and smoothing observed on several examples and possible reworking of segments of broken BRSs into the *epomion* seal type (e.g. CMS II.1 no 61) suggest lengthy use before mortuary

deposition. Lengthy use and possible reworking in turn underline the social significance of these artefacts.

*Bone colour tubes* (BCT) were apparently fashioned exclusively from sheep or goat<sup>4</sup> femurs<sup>5</sup>, from which articular ends were removed exposing the marrow cavity. One end is cut perpendicular to the shaft and complete objects often preserve two perforations on opposite sides to secure a stopper – stone stoppers with matching holes have been found with colour tubes (e.g. Doumas 1977, 129, plate L, i). The other end is cut obliquely into a point. The outer surface is often incised with patterns arranged in bands, linking BCTs to similarly decorated pottery and stone vessels commonly deposited in mortuary contexts.

The shape and contents of the best-preserved BCTs make clear their function. Tsountas identified the largest known concentration of 35 BCTs in the Chalandriani cemetery on Syros as paint containers and applicators, since eleven held blue pigment (Tsountas 1899, 104<sup>6</sup>; also Sampson 1985, 315; Marangou 1990, 52; Birtacha 2003, 268).

The vast majority of BCTs as described above are from Early Cycladic IIB cemetery contexts (Tsountas 1899; Broodbank 2000, 249). A few closely similar examples are reported from Euboea, in Early Helladic II tombs at Manika (Sampson 1988, table 12) and a funerary context in the recently excavated Ayia Triadha cave (Mavridis and Tankosić 2012, 1018, fig. 14), and further afield in Tomb 4 at Steno on Lefkas (for a full list of known objects see Kilian-Dirlmeier 2005, 167).

Few examples closely matching the description above are known from settlements *outside* their main distribution area (the Cyclades and Euboea): at Poliochni (Bernabò-Brea 1964, plate CLXXVIII, 12), Thermi and Troy in the

northeast Aegean and Tiryns in the Peloponnese. Published illustrations and/or descriptions suggest that reports of BCTs from Aegina (Walter and Felten 1982, 179, plate 128, 525, IX), Eutresis (Caskey and Caskey 1960, plate 52, II.44, 45, 19, plate 53, VIII.62) and Lithares (Tzavella-Evjen 1984, 174, table 93) are incorrect. The Eutresis objects (Caskey and Caskey 1960, plate 53, VIII.62 and 166 [where no parallel is drawn with Cycladic BCTs]) are ‘spatulae’, common Neolithic bone artefacts, while others from Lithares are probably handles or beads – although Tzavella-Evjen reports traces of red pigment in one example (Tzavella-Evjen 1984, 174). Other examples are poorly or not illustrated (e.g. Aghios Kosmas [Mylonas 1959, 28], Lithosoros [Papadakis 1915, 56]), precluding evaluation of their identification. The Pefkakia example is a small fragment with incised decoration reminiscent of a BCT, but otherwise undiagnostic (Christmann 1996, 311, table 153, 15). Finally, of five examples recently recovered at Dhaskaleio-Keros, two are reported to contain pigment and only one of these preserves enough features for identification as a BCT<sup>7</sup>. This would be the only certain BCT from a Cycladic settlement but the raw material, in contrast to examples from *funerary* contexts, has been identified as sheep or goat *tibia* (Trantalidou 2013, 440, object 11845).

Bone objects from eastern Mediterranean sites have variously been interpreted as examples, imitations or prototypes of Cycladic BCTs, implying cultural contact between the Cyclades and eastern Mediterranean (e.g. Zarzecki-Peleg 1993; Sherratt 2000, 17). A recent study (Genz 2003) reiterates this view, despite providing detailed descriptions, photographs and drawings, and occasional information on raw material that invite the opposite conclusion. Although occasionally bearing incised geometric patterns or containing colouring substances (not usually both), the non-Aegean examples are dissimilar in form and lack the selectivity of species and body part of



Aegean examples. Use of long bones as pigment containers and handles is widespread, geographically and chronologically, but grouping such disparate objects obscures the striking zoological, morphological and functional coherence of southern Aegean BCTs.

No other materials were used to make colour tubes and, with the exception of a few clay aryballoi, *marble* vessels are most regularly associated with colouring substances, as noted by Tsountas (1899, 100; also Birtacha 2003, 265), who identified blue pigment on six marble bowls at Chalandriani. A marble bowl with a bone colour tube containing pigment from Naxos (Marangou 1990, 68, plate 48) strikingly exemplifies this association.

Bone palettes, ring seals and colour tubes thus reveal clear patterns of raw material selection and artefact production and consumption. Each artefact type was consistently made of selected body parts (metapodials and/or femurs) and domestic animals (sheep/goats and/or cattle), while skeuomorphs of palettes and ring seals were likewise selectively made of white marble or limestone and hippopotamus ivory, respectively. Apart from raw material selection, the three artefact types are closely related in their association with the human body, as paraphernalia of bodily decoration and in their systematic deposition in mortuary contexts.

These patterns may be better understood by placing them in the context first of animal exploitation strategies and processing sequences and secondly of other similarly deployed raw materials.

## EBA ANIMAL EXPLOITATION AND BONE ARTEFACTS

Zooarchaeological analysis demonstrates that, of the taxa preferred for palettes, ring seals and colour tubes, only sheep and sometimes goats were common in broadly contemporary unworked faunal assemblages, mainly representing consumption debris, from the southern Aegean (e.g. Jarman 1972; Halstead 1987; Hamilakis 1998; Trantalidou 2006, 228, table 9.9; Isaakidou 2011; Molloy et al. 2014). The scarcity of cattle bones suggests preferential selection for manufacturing palettes and BRSs, probably (given this species' large size) from rare events of large-scale commensality. Conversely, pig bones were more abundant in food debris, highlighting their avoidance for working. Most pigs were slaughtered young, providing bones less robust and less suitable for tools than other domesticates (Isaakidou 2003, 235), but robusticity was not essential for ring seals or colour tubes (pig bones were too small for palettes of the usual dimensions). Indeed, the exclusive use of relatively fragile sheep/goat femurs for colour tubes invites the opposite conclusion, while the less bowed shape of pig femurs would have been better suited to exerting vertical force if the point of BCTs was used with force to combine colour application with scarification in the manner of Maori *moko* (e.g. Cisco 2010, 16-7).

Anatomy, nutritional value and carcass processing practices are also important for understanding selection of skeletal elements. Experiments (see references in Isaakidou 2003) highlight the need to work bones while fresh. Metapodials, not bearing meat, are often removed from the carcass during initial dressing (e.g. Binford 1978), and anatomical representation and the distribution of butchery marks suggest this was a common practice in the Aegean at least from the later Neolithic onwards (Halstead and Isaakidou 2011). Conversely, obtaining femurs would have required prior removal of large amounts of raw or cooked meat, adding a further step to extraction.

Metapodials and femurs also contain marrow and bone grease, both important sources of fat and vitamins (e.g. Speth 1983, 149). In ethnographic studies, these within-bone nutrients are widely valued and regularly retrieved, by heating bones over a fire and cracking them to extract the liquefied marrow (e.g. Binford 1981, 142) or by smashing and boiling. In unworked bone assemblages from several Greek prehistoric sites, the robust long bones of cattle and older individuals are more heavily fragmented than the fragile bones of smaller species and younger individuals, implying that deliberate breakage was routine (e.g. Halstead 2011, 769-770; Isaakidou 2005, 196-202). Such processing produced splinters unsuitable for manufacturing the objects described above. Finally, evidence of carnivore attrition in these assemblages implies that much bone was freely available to scavengers after discard (e.g. Halstead 2011, 762; Isaakidou 2005, 150-153; 2011). At EM Poros, where possible by-products of BRS manufacture were identified, the extreme rarity of cattle remains, heavy fragmentation of cattle, sheep and goat long bones, and frequent carnivore gnawing in the unworked faunal material indicate that acquisition of suitable raw materials would have required radical adjustment of normal processing, consumption and discard practices.

The blanks required for crafting BCTs (complete femur shafts), BRSs (metapodial shaft sections) and palettes (full-length femur and metacarpal shaft sections) must have been acquired not during, but before, the ‘regular’ carcass processing and discard practices documented for this period. Moreover, other long bones and species, which *could* have provided suitable blanks, were avoided, suggesting that non-practical considerations governed the anatomical and taxonomic selection of raw materials.

#### BONE, SHELL AND STONE: RELATED MATERIALS?

Although clay, metals, stones and shell were also used to craft artefacts deposited in the funerary contexts where BCTs, palettes and BRSs are found, they were not freely interchangeable. Early Cycladic human figurines are almost exclusively made of white marble (e.g. Getz-Preziosi 1994, 18), with alternatives essentially limited to shell, animal bone and ivory. Shell figurines are reported from Cycladic contexts (Karantzali 1996, 160; Marangou 1990; Sherratt 2000, 34-5) and examples of animal bone, hippopotamus ivory and shell from Crete (e.g. Papadatos 2005, 32). The mortuary assemblage from Hagios Charalambos cave on Crete contains one bone, one marble and three hippopotamus ivory figurines, two schematic examples in shell (*Spondylus gaederopus*), and a single example in a *pale* green igneous rock (Ferrence 2008, 570-5). The avoidance of clay for representing the human figure in the EBA Cyclades (Hendrix 2003, 441) and beyond, contrasting with Neolithic practice, is striking. Equally enigmatic, on the traditional equation of exotic with prestigious, is the lack of EB metal figurines<sup>8</sup>.

The complementary (and exclusive) use of marble, shell and bone is paralleled in other artefact types, such as miniature birds of marble and shell (Sherratt 2000, 180, quoting Krzyszkowska 1990, plate 32b) and a range of 'ornamental' items, possibly beads and pendants (e.g. Xanthoudides 1924; Sakellarakis and Sakellaraki 1997). Regarding the exclusive use of bone and stone for *body* ornaments in Tholos E at Archanes-Phourni (Panagiotopoulos 2002, table 1), Panagiotopoulos speculates that only particular materials were considered appropriate for contact with the human body. For EM seals, Krzyszkowska (2005, 60) notes avoidance of clay and metals in favour of bone, ivory, soft stones and a man-made, synthetic substance used to manufacture 'white pieces' (Krzyszkowska 1989, 116). Moreover, given the use of hard stones in other types of craftwork, Sakellarakis and Sakellaraki (1997 vol. II,

672) argue that a preference for bone and ivory over soft stones for various Prepalatial seal types in the Archanes-Phourni cemetery was not imposed by lack of expertise or equipment.

Few researchers have sought to explain such selective use of raw materials. Regarding human figurines in white marble, Hendrix offered the circular suggestion that Cycladic islanders 'did not find it desirable or necessary to fashion clay versions of themselves' and needed to conform to a regional *koine* (Hendrix 2003, 441). Sherratt saw colour as the desired attribute, noting that in the Near East and Egypt white was associated with 'high-status female flesh' (Sherratt 2000, 133-4) and, with regard to palettes, that 'some symbolism [was] embodied in the conjunction of shape and the original material' (i.e. bone) (Sherratt 2000, 122). Given the importance of the sea to Cycladic communities, she considered seashell of great symbolic value, citing a possible silver copy of a scallop shell from Dokathismata on Amorgos and the association of scallop shells with metal tweezers, needles and pigments, all related to bodily decoration and modification, at Chalandriani (Sherratt 2000, 181).

These perceptive comments only partly address the observed patterns of raw material selectivity, which plainly is not reducible to functional and technical necessities. In crafting specific artefacts, bone, ivory, marble and shell were interchangeable, while clay, despite its malleability, and metals, despite their high value and malleability, were avoided. What qualities linked bone, stone and shell?

Most accessible to modern observers, sharing the same senses with EBA consumers, are the macroscopic properties of these materials: they are hard, compact, off-white<sup>9</sup> and opaque, and cold and smooth to the touch. Their durability would also have been evident to prehistoric users accustomed to processing animal carcasses for

consumption and raw-material extraction and to ritual handling of bones (e.g. Doumas 1977, 56-8; Isaakidou and Halstead 2013; Triantaphyllou 2008; 2010). Increasing evidence for ritualised treatment of animal remains from the Late Neolithic onwards (e.g. Halstead and Isaakidou 2011; Tzevelekidi 2012) demonstrates that animal as well as human remains were symbolically charged, strengthening the argument for a symbolic dimension to the selective use of animal bone, shell and marble raw materials.

Ethnographic studies offer invaluable comparative insights into ‘non-scientific’ understanding of the material world and how traditional cosmologies may invest materials and objects with value and meaning. In the Sepik provinces of New Guinea, rituals are described as ‘our bones’, while bone is also a metaphor for strength (Newton 1989, 306) and the Sepik Arapesh believe that a person’s bones, the most durable parts of the body, are inherited from the father (Tuzin 1977, 206). The Kundagai Maring also refer to staple sweet potatoes as ‘our bone’ (Healey 1985, 159).

Animal bones and teeth are widely worn in traditional societies as charms (e.g. Thomson 1882) and particular body parts and taxa are often selected for symbolic objects. The Amazon Nukak fashion flutes for coming-of-age rites from jaguar humeri and deer tibiae, consumption of which is otherwise prohibited (Politis and Saunders 2002, 124). In the Sepik provinces of New Guinea, ceremonial bone daggers for ritual killing were made from the tibiotarsus of the cassowary, locally regarded as the creator of the world, the human race, and horticultural village life (Newton 1989, 309-10). Indeed, ‘all the creatures that served as sources of bone figured in Sepik mythology; thus bone was not only useful, versatile, and figuratively “strong” but its “strength” derived from the powers of the supernatural world’ (Newton 1989, 307). Displaying such implements on the human body invested the wearer with qualities of

the animal (e.g. bones of cassowaries conferred strength, speed and courage) and communicated the personal achievements of the owner. For example, ceremonial bone daggers could be worn only in combat and selected rituals and if the wearer had already used them to kill (Zegwaard 1959, 1033, 1036).

Ethnography also sheds light on associations between materials. In selecting raw materials for stone tools, aboriginal Australians favoured geological formations prominent in cosmogonic myths as these are thought to be Ancestral Beings incorporated into the landscape during Dreamtime (Taçon 1991, 195). These were selectively quarried to procure raw materials for artefacts considered ‘more powerful and effective in hunting and warfare, as they were seen to contain the essence of the creatures that formed the sites from which the raw stone was obtained’ (Taçon 1991, 198). The deposition of human bones in rock clefts reinforced the association between bones and stones, and between humans and Ancestral Beings, making human bones ‘symbols of persistence and immortality’, like stone and human and animal spirits (Taçon 1991, 201).

Aboriginal categorisation of materials reveals some less expected relationships. Animal fat from specific animals and around specific organs (kidneys) is particularly prized (Morphy 1989, 131). Fat, blood, quartz and quartzite, being bright and shiny – properties associated with life and Ancestral Beings, are imbued with spiritual power and smeared on the bodies of ritual participants (Taçon 1991, 198-9). Blades used in combat and for hunting large animals were preferentially made from the innermost layers of rock of a particular quartzite quarry and likened to kidney fat (Taçon 1991, 203).

Ethnography thus illustrates how, in guiding raw material selection, cultural reason may draw both on categorisations that are widely shared (e.g. those based on physical properties) and on others that can be understood only with reference to relevant cosmological systems (e.g. the Aboriginal association of shiny quartz with fat, life and ancestral beings). Despite the obvious perils, a tentative attempt will be made, to identify such webs of meaning in raw material selection in the EBA southern Aegean.

Bones, shells and stones share visual and tactile attributes evident to the modern observer and widely emphasised in the ethnographic record: they are off-white, opaque, solid and cold to the touch. That bones and shells are the most durable parts of living organisms probably contributed to their symbolic importance as raw materials for socially significant artefacts. Drawing inspiration from the ethnographic literature, the white colour of processed bone, shell and marble recalls that of body fat and bone marrow, substances that EBA consumers doubtless prized and recognised as indices of a slaughtered animal's condition. Researchers have also highlighted the symbolic associations of the colours of bodily fluids (e.g. the white of semen and milk, the red of blood) with reproduction and regeneration, life and sexuality (e.g. Tilley 1996, 321).

As to the particular anatomical parts selected, the femur, supporting the largest muscle mass of both humans and domestic ruminants, perhaps symbolised strength (as in several ethnographic cases; cf. the Homeric and Classical Greek practice of burning cattle femurs in sacrifices to Olympian gods, apparently also practiced in Mycenaean palaces – e.g. Isaakidou et al. 2002). If blue signified life and rebirth in the Aegean Bronze Age, as Peters (2008, 203) argues, it may be significant that femurs contained the blue pigment accompanying important dead in the EBA



Cyclades. If animals were consumed infrequently and dietary fat was scarce (e.g. Halstead 2007), it may also be significant that the femur has the largest *volume* of marrow in a domestic ruminant carcass, while metapodials contain the highest *quality* marrow, rich in the most nutritious fatty acids and most resistant to dietary stress (Binford 1978, 24). The importance of the latter may also be symbolised in the bone seal from Papoura Tomb I, carved in the shape of a ruminant's lower foot (CMS II.1 no 170).

The selected materials may thus have drawn on a common web of meanings and symbolic references (e.g. to life, vitality, death, ancestors, power) richly paralleled in the ethnographic record. Finally, the selective use of *cattle* bones for rings and palettes, artefact types skeuomorphed in rarer marble and hippopotamus ivory, must be related to the economic and symbolic importance of this largest and most powerful, but least common, domesticate.

## CONCLUSIONS

Distinctive components of EBA southern Aegean mortuary assemblages are artefacts associated with bodily decoration, including palettes, ring seals and colour tubes made of animal bone. Zooarchaeological analysis shows that manufacture of the latter did not involve opportunistic use of available raw materials, but planned selection of skeletal parts and species. Contextual analysis demonstrates selective use of raw materials for artefacts associated with the representation or decoration of the human body, including skeuomorphs of bone prototypes (white marble and limestone for palettes, hippopotamus ivory for ring seals). The strong preference for these materials, and avoidance of clay and metals, suggests symbolic systems overlooked in

studies emphasising scarcity, distance and technological complexity as dominant sources of value in the EBA Aegean. Drawing on ideas from ethnography and the physical and contextual associations between materials in EBA mortuary assemblages, some tentative suggestions have been made as to meanings that these raw material choices referenced.

Whatever the meanings of these choices, the investment of animal bones with symbolic value and their conceptual association with shell and stone is quite widely paralleled in later prehistory. Third-millennium BCE examples of anatomical and taxonomic selection of bones for anthropomorphic figurines include use of unfused goat metacarpals at Horvat 'Illin Tahtit in Israel (Allentuck 2013), of sheep radii (e.g. Molina-Burguera and Pedraz Penalva 2000) and equid first phalanges in Iberia (e.g. Ayala Juan 1985). From Mesopotamia, third-millennium BCE lexical lists, treating shells as stones (Postgate 1997, 214), exemplify conceptual association between materials, while first-millennium BCE texts record the magical and medical properties of various stones and symbolism of attributes like colour (Postgate 1997, 217-8).

While symbolically charged artefacts widely made selective use of bone, shell and white stone raw materials, their types, styles and associations were regionally variable and so too, presumably, were the webs of meaning that they referenced. In the EBA southern Aegean, despite close connections between the Cyclades and Crete, palettes and colour tubes were almost exclusively consumed in Cycladic or 'Cycladicising' and bone ring seals in Cretan contexts.

The contrast between the shared meaning and value of bone (and other) raw materials across the EBA southern Aegean and the region-specific consumption of finished artefacts is significant for two reasons. First, Cycladic practices, cosmologies

and artefacts were not adopted wholesale on Crete, but adapted to local traditions (Papadatos 2007; Legarra-Herrero 2009, 45 & 48). Secondly, if bone palettes and colour tubes were associated with body decoration, their absence from Cretan tombs suggests that this practice was performed differently than in the Cyclades. The corollary, that palettes and colour tubes represent strongly indigenous Cycladic practices, strengthens the argument that Cycladic bone tubes are only superficially related to supposedly similar objects from East Mediterranean contexts. Finally, it is significant that ring seals made of cattle bone in the local Cretan tradition predate those made of ivory. These regionally distinctive traditions of raw material selection counterbalance recent emphasis on the exotic as a source of value and thus on exogenous models of culture change in the Aegean. However important, distant voyaging and consumption of exotica were social practices grafted onto strong pre-existing traditions of crafting and exchanging materials with rich symbolic associations.

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<sup>1</sup> Based, for the objects discussed here, on visual examination, mainly of museum displays, or on published photographs and descriptions.

<sup>2</sup> For similar approaches see Driver 1984; Allentuck 2013; Choyke 2013; Luik 2013.

<sup>3</sup> One possible exception is an object from Chalandriani Tomb 468 on Syros (Tsountas 1899, plate 10, 8).

<sup>4</sup> Morphological differentiation between sheep and goat femur shafts is extremely difficult.

<sup>5</sup> Hekmann (2003, 158) claims that tibiae were also used, but observation of several examples displayed at the Athens National Museum and detailed drawings in Rambach (2000) confirm identification of sheep/goat femurs.

<sup>6</sup> Tsountas very precisely identifies the type of artefact described here, and reports blue pigment in some examples (e.g. NM 6818). A distinctively different bone object with incised decoration (NM 5125), he plausibly identifies, based on its tubular shape and straight cut ends, as a handle (Tsountas 1899, 104 and plate 10, 5). This object, on display at the NM, is clearly a distal segment of a sheep or goat tibia.

<sup>7</sup> One item listed as an artefact (Ugarković 2013, no 10051, figure 31, 15) bears marks typical of rodent gnawing rather than working, which poses questions regarding its identification.

<sup>8</sup> The two lead figurines discussed by Renfrew (1967, 4-5) are rare exceptions.

<sup>9</sup> The naturally coloured outer surface of shell is normally removed during processing.