Social Complexity and Population: A Study in the Early Bronze Age Aegean

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It is suggested that the size of a population to some extent defines the limits of its social complexity. State level societies tend to have relatively large populations, and egalitarian communities tend to be relatively small. Since the 1960s, anthropologists have tried to describe and explain this relationship between population size and social complexity, suggesting a causal link between large populations and social differentiation, based on studies of game theory and human cognitive capacity. Once a population rises above a certain level, change in social organisation is deemed inevitable. Approximate figures for these 'population thresholds' have been proposed, but their accuracy and applicability to archaeological populations and communities remain uncertain. This paper explores the hypothetical population threshold at the point when societies begin to show the first signs of ranking in the context of the Early Bronze Age Aegean, comparing the estimated population sizes of particular sites with the evidence they show for ranking and social hierarchy. While larger communities tend to show more evidence for social differentiation, it is recognised that population size is not the sole factor in determining its development.

Keywords
Aegean, Bronze Age, population, social complexity

Introduction

Population growth has long been proposed as a central factor in the development of complex social organisation and the emergence of ranking (Renfrew 1972: 225), and the general importance of understanding the scale of human communities has been newly emphasised by Whitelaw (2001: 15). While state level societies tend to have relatively large populations, egalitarian societies tend to be relatively small. Archaeologists are often unwilling to go beyond simply postulating the existence of a relationship between population and social complexity, and rarely theorise about the precise nature of this relationship or how it might be explained (*e.g.* Sbonias 1999; Whitelaw 1983: 340). Anthropologists, however, have discussed the issue at length (Carneiro 1967; Fletcher 1995; Forge 1972; Johnson 1982; Johnson and Earle 1987; Kosse 1990, 1994).

The anthropological model proposes a direct causal link between the size of a community and the structures of its social organisation. The basic premise is that human processing ability and social structures have a limited capacity, and it is suggested that once a community has reached a certain 'population threshold', neither the human brain nor existing social structures will be able to cope. It follows that unless the community fragments into smaller groups, reorganisation of social structures becomes inevitable (see below for full discussion). This model has most often been illustrated with modern ethnographic data, however, and this paper explores its applicability to past societies by considering the lowest of these population thresholds – the point at which egalitarian societies begin to show social status differentiation. The Early Bronze Age (EBA) Aegean (*c.*3300-2100 BC) has been chosen as a case study, as the relative abundance of publications about this period allows for an independent discussion of population sizes and the evidence for social complexity.

The appearance of social complexity in the EBA Aegean has been a topic of debate for many years. Seeking to demonstrate the indigenous emergence of the palatial societies of Minoan Crete (*c*.2000 BC) and Mycenaean Greece (*c*.1450 BC), archaeologists in the 1970s suggested a gradual development from earlier systems of ranking and social differentiation. Initially, there was disagreement as to whether the social complexity proposed for the Early Bronze II period (*c*.2800-2200 BC, henceforth EB II) could be reliably established. Although a general consensus has now been reached that ranked societies did indeed develop in several locations during EB II (Crete: Watrous 2001: 221; Greek mainland: Wiencke 1989: 507; Cyclades: Broodbank 2000: ch. 8-9), the theories of gradual development from these to the later palatial societies have been undermined by the apparent discontinuity in the intervening EB III period. Attention can now be turned to the ranked societies of EB II in their own right, and the possible reasons for their development. One of these reasons may have been nucleation and increased community size. In this paper, likely estimates for population sizes for sites in the EB II Aegean will be suggested and compared to archaeological evidence found at these sites for social complexity. While a simple one-to-one correlation is unlikely due to the inherently incomplete nature of the archaeological record, the results will indicate whether the theoretical relationship between population and complexity holds true for the EB II Aegean. This paper represents a preliminary investigation into this relationship, and recognises that there may have been several factors surrounding the development of social complexity in the Aegean, and that these factors may vary between sites.

Social Complexity

First, however, it is necessary to have a working definition of social complexity and its potential subdivisions. There are problems with the identification of social complexity, as it may not always appear in easily recognisable forms. Since the early 20th century, it has been recognised that there are many different forms of social organisation, and many different paths towards each of these forms (Boas 1911; Haas 2001). In addition, it is generally accepted that development towards social complexity may not proceed in a straightforward or unidirectional manner, and can be influenced by the agency of individual social actors (Haas 2001:13-18; Shennan 1993: 55). However, social complexity has been studied widely across many cultures and its development is considered to be one of the common cross-cultural trajectories of the redefined social evolutionism (Haas 2001: 16).

The most notable feature of social complexity as it is considered in many ethnographic works is a move away from egalitarian community structures, including: differential access to power, whether in the form of decision-making processes or resources (natural, human and knowledge), and vertical status differentiation. This move towards hierarchy is evident in societies with corporate as well as control systems of organisation (*e.g.* Teotihuacan and Mayan polities respectively: Feinman 2001), and inequality in both access to power and status differentiation is seen even in societies which have been dubbed 'heterarchies' (Crumley 2001: 24-27). For the purposes of this paper, the term 'social complexity' is used to refer to communities where such ranking and social inequality is evident.

While the existence of social complexity and hierarchical ranking in the Aegean in EB II is now generally accepted, a number of theories explaining its emergence have been put forward. Rejecting the straightforward diffusionist standpoint, Renfrew (1972) proposed that complexity in the EBA Aegean was a purely internal development, explainable by agricultural improvements 'kickstarting' a series of social 'feedbacks' within the closed system of Aegean society. Subsequently, the concept of agricultural advances allowing for increased social complexity was developed by Halstead (1989), who suggested that surplus generated by agricultural improvements was 'stored socially' creating unequal ties of obligation; and Sherratt (1981), whose model of a 'secondary products revolution' suggested that the use of animals for traction, riding, milk and wool increased efficiency and allowed for the generation of wealth.

Other hypotheses stressed the impact of external stimuli in the development of social complexity. Van Andel and Runnels (1988) have pointed out the importance of location for sites developing social complexity. While developments in agriculture and animal husbandry may have produced a basis for wealth, long-distance trade in the eastern Mediterranean allowed for the spending of wealth and the articulation of status through prestige goods. Participation in such trade depended on location, and van Andel and Runnels (1988: 243) suggested that social complexity in the Aegean first developed at 'emporia' at suitable nodal points along major trade routes. This idea was taken up by Nakou (1995), who stressed the importance of metals in long-distance trade, and their use as status items, and Broodbank (2000: ch 6) who mapped likely route networks in the Cyclades.

The Theoretical Models

Before examining the material from the Aegean, the theoretical models for explaining the relationship between population and complexity must be outlined. The concepts of population thresholds and cognitive limits, which suggest that there are limits to the population of basic residential and face-to-face interaction units, were first proposed by Forge (1972). Studying the Neolithic communities of New Guinea, Forge concluded that there was a tendency towards an optimum population of 350-400 individuals, and that this tendency was independent of the two factors previously used to explain population size – war and ecology. He observed that when Abelam groups exceeded this threshold, they tended to split into two or more daughter groups. The reason he suggested for this perceived population limit was that the egalitarian structures of social organisation governing these communities could not cope beyond this threshold. In Forge's words, the game of egalitarian interaction became 'unplayable'. The structural reorganisation and energy expenditure necessary to maintain larger populations seems to have favoured fission in the case of New Guinea.

The tentative explanation put forward for the impossibility of egalitarian interaction beyond certain population thresholds is biological: the number of face-to-face interactions that *Homo sapiens* can cope with, suggests Forge (1972), is limited. Elaborating on this point, Kosse (1990) asserts that the limits of human information-processing capacity impose restrictions on the size of basic residential units (as characterised by face-to-face interaction). This, she argues, is due to a 'cognitive threshold' in long-term memory (Kosse 1990: 288). There should, then, be a universal limit for the size of basic residential units, stemming from human biology. Kosse argues for a threshold of a maximum of 500 individuals in the 'acephalous local group', citing several ethnographic examples (Kosse 1990: 279). In populations larger than this, the memory stress placed on the individual becomes too high, and changes in social organisation become inevitable. Beyond the threshold, social organisation is more complex with communities composed of several smaller units and/or organised hierarchically.

Johnson considers the same issue of cognitive limits at the level of the community, rather than the individual. He shows that as population rises, the number of possible 'pair relationships' (*i.e.* each individual with every other individual) within the group increases exponentially (Johnson 1982: 392-396). He argues that this would put 'scalar stress' on the community, increasing the likelihood of disputes and decreasing the efficiency of egalitarian decision-making processes (Johnson assumes here that egalitarianism requires each individual to be consulted when decisions are made). Beyond a certain population size, such universal consultation becomes impossible, and groups must reorganise themselves to adjust. Ways of adjusting can vary, from partition into two or more daughter groups as described by Forge (1972: 372) for the Abelam, to development of either sequential hierarchy as postulated by Johnson (1982: 396-404) and the simultaneous or vertical hierarchies we tend to associate regularly with social complexity (Johnson 1982: 407-413).

The limit of human cognitive capacity is, therefore, considered to be the primary determining factor in the setting of population thresholds. The work of the Toronto-based economists Osborne *et al*. (2000) suggests, however, that social systems, as well as human individuals, also have limits in capacity. Decision-making structures are usually designed for an optimum number and are thus also affected by population increase. Using the principles of game theory, a branch of mathematics which deals explicitly with decision-making processes where individual agents are in a potentially competitive situation (Romp 1997), Osborne *et al*. (2000) concluded, like Johnson (1982), that egalitarian decision-making cannot operate effectively in very large groups. In a hypothetical egalitarian community where members have the choice whether or not to participate in decision-making meetings, it is suggested that an individual will only choose to participate if the costs of attending the meeting (*e.g*. travel time and expenses, taking a day off work) do not outweigh the benefits (their impact on the final decision). As population increases, the impact of each participant's opinion will decrease, lessening the 'benefits' of participation. Osborne *et al*. conclude, therefore, that individuals in a large community are less likely to attend such meetings (2000: 929). Such a community, although being theoretically egalitarian and inclusive, will not practically operate in a wholly inclusive way.

In addition, the subset of the population that will choose to attend decision-making meetings will not be a random sample accurately representing the entire population. In a system where the final decision is made by considering the views of all present, individuals with extreme views will skew the final outcome in their favour, meaning that the 'benefits' of participation will be greater for extremists than moderates (Osborne *et al*. 2000: 929-930). Both of these conclusions favour the emergence of a sub-group within the community which dominates decision-making processes – in other words, a political elite.

According to these theories, changes in the social structures of egalitarian groups become necessary when a population threshold of 350-400 (Forge 1972) or 500 (Kosse 1990) is reached. If this is correct, social complexity should be evident at all EB II sites which are thought to have populations higher than this threshold. Although the above scholars indicate that their figures are tentative and claim neither accuracy nor universality, the figures may be helpful in establishing a sense of the relative scale of egalitarian communities.

Population in EB II

Significantly, there seems to be a general growth in the size of communities in the EBA. The overall population of the southern Aegean appears to grow, with both a larger number of sites and larger sizes of sites recorded (Watrous 1994: 703-704; Wiencke 1989: 497-499). There are a number of possible explanations for this significant population growth (Renfrew 1972; Sherratt 1981; Watrous 1994; Wiencke 1989), but the primary concern here is with growth in the populations of individual sites, and although this is linked to changes across the landscape as a whole, a distinction between the two should be made. In explaining the increase in the size of communities, it is significant that sites with larger populations seem to have an evolutionary advantage. Kosse explains that while maintaining a large population requires energy expenditure in organisation, the benefits in competition with neighbouring groups may be sufficient reason for their survival (Kosse 1994: 39-43). Sbonias (1999: 28) discusses this in the context of the Mesara plain on Crete: larger settlements (with more than one tholos tomb) tended to show more evidence for wealth, indicating their competitive advantage over their neighbours.

Estimating and quantifying population size for any specific site is notoriously difficult, even for societies with detailed written records and census documents (Nixon and Price 1990). For the Bronze Age Aegean, there are two main methods of population estimation as identified by Whitelaw (2001: 15-17): the first uses site size, applying a multiplier for residential density; the second is calculated from the number of houses on a site, using a multiplier for average number of residents per house. A third method, deriving from cemetery evidence, can also be added to these established methods. Using Bintliff's figure of an average of 20 deaths per nuclear family per century (Bintliff 1977: 639-640), the approximate number of nuclear families, and thus the population, can be estimated in a cemetery of known duration (Branigan 1970; Whitelaw 1983).

The first method is problematic initially, as there can be unavoidable difficulties in determining site size – working from sherd scatter and architectural remains, accounting for erosion and other possible landscape changes. A second issue is the reliability of the density multiplier. Universal density multipliers such as Naroll's (1962) have been shown to be unreliable (Whitelaw 2001: 16), and multipliers drawn from ethnography, however geographically or temporally specific, are equally questionable. The third method also presents problems, owing to the incomplete nature of the mortuary record. Cemeteries may not accurately represent the population of the nearest site, perhaps serving multiple settlements, or specific social groups within a settlement.

The second of these methods, although arduous and requiring precise excavation, is clearly preferable as it is site-specific and reduces the number of arbitrary assumptions. A reasonable multiplier for the average number of residents in a house can be found by investigating basic social units. For Crete, Whitelaw (1983: fig. 70) suggests a nuclear family of four to six individuals, based on mortuary deposits in the Mesara tholoi, and has calculated plausible population estimates for several sites (Table 1).

Site	Estimated Size (ha)	Estimated Population
Crete		
Myrtos Fournou Korifi	0.09	25-30
Mochlos	0.83	220-330
Phaistos	1.13	300-450
Malia	2.58	690-1030
Knossos	4.84	1290-1940
Cyclades		
Chalandriani-Kastri	0.5	150-250
A. Irini	–	150-300
Daskaleio-Kavos	2 x 0.5	100-300
Mainland		
Thebes	20	4000-6000
Lerna	2.5	200-700
Tiryns	5.9	1180-1770
Manika	45	9000-13 500
Askitario	0.45	90-135
Raphina	3	600-900
Zygouries	1.1	220-330
Eutresis	8	1600-2400
Agios Dimitrios	0.6	120-180
Eastern Aegean		
Thermi	1.5	300-450
Poliochni	1.6	320-480
Troy	1	200-300

Table 1. Population estimates for Aegean sites in EB II (after Broodbank 2000: 215, 218, 225; Konsola 1990: 465-466; Whitelaw 1983: 339).

The rigorous excavation and publication required for such an approach makes it impossible, however, for other Aegean regions considered in this study. In the Cyclades, Broodbank (2000) has estimated population using a combination of both settlement size and the mortuary method where cemeteries are available (Table 1). He uses a population density multiplier proposed by Renfrew (1972: 251) of 200-300 individuals per hectare, adjusted from the population densities of early Mesopotamian urban sites. While the validity of such cross-cultural equivalences may be questioned, Broodbank points out that Whitelaw's house-based population estimates for Crete produce comparable densities, and also calibrates his results from Renfrew's multiplier with the results gained from mortuary data. The two methods of estimating population act as checking mechanisms for the reliability of the estimates, which can be taken as sound.

On the mainland, however, populations of sites in the EBA have yet to be formally estimated. Carothers and McDonald (1979) have estimated populations for a number of Late Helladic III Messenian sites using a density multiplier based on modern Messenian populations. There does not appear to be any firm justification for this analogue, however, and in the absence of more suitable options, this analysis follows Broodbank in his use of Renfrew's density multiplier. Konsola (1990) has estimated the sizes of several mainland sites in the EB II, which have been used here to estimate their population (Table 1). Similarly, the estimates presented here for the eastern Aegean (Table 1) were calculated using site sizes from Konsola (1990: 465-466), and the density multiplier proposed by Renfrew (1972: 251).

Social Complexity in EB II

The sites show a wide variation in their estimated populations, ranging from 25-30 (Myrtos Fournou Korifi) to 9000-13 500 (Manika). Also variable is the quality and quantity of evidence for status differentiation and social complexity found at each site. However, if the anthropological theories presented above are to be believed, sites with populations over the proposed threshold of 350-500 should always show some evidence of social complexity, as long as other factors do not intervene (*e.g.* preservation and excavation bias).

Recognising evidence of complexity in the archaeological record is problematic. Central storage spaces, although providing possible evidence for differential access to natural resources, can also be used in egalitarian redistributive systems. The means of their construction, however, may be better evidence for hierarchy. The large and impressively-built Rundbau at Tiryns would have needed a large, centrally organised labour force, and may be a testament to an individual, or group of individuals, within the community capable of commanding labour. Similar conclusions can be drawn from correspondingly large-scale constructions such as the monumental terracing at Knossos and the fortification walls of Troy II. Monumental architecture and large-scale construction works can, therefore, be taken as evidence for differential access to labour resources. Although these large constructions demonstrate unequal wealth distribution rather than being directly indicative of centralised political power, they are still plausible signs of social complexity as defined above – they seem to point to the central organisation and management of a substantial workforce.

Differential access to natural resources may also be inferred from seals representing central administration of agricultural products, possibly by an elite. The practice of using sealings to designate ownership or as a guarantee started in the Near East, and was initially linked to elites (Aruz 1999). However, such systems could also be interpreted as egalitarian redistribution. It is also useful to view seals as items potentially signifying individual ownership and/or control, and thereby demonstrating status differentiation (Renfrew 1972: 386-388; Sbonias 1999: 33-35). Unfortunately, this may not necessarily be vertical differentiation, as evident from a recent reassessment of the seals and sealings from Lerna by Weingarten (1997). In addition, large quantities of seals have been found in the Mesara tholoi, which are famously regarded as evidence for egalitarianism (Branigan 1970), and so seals alone are not strong indicators of complexity.

Status differentiation is well illustrated by the uneven distribution of prestige goods and the unequal treatment of different individuals in burial; phenomena that often appear together within the abundant mortuary evidence. In the case of the Mochlos cemetery, the West Terrace tombs are not only far more elaborate in construction than their South Slope counterparts, but also contain much greater quantities of status and prestige goods (including foreign exotic imports, detailed metalwork and ceramic finewares). Similarly, the built house tombs of the Nécropole des Pierres Meulières at Malia are not only impressive in their construction, but also contain several pieces of fine Kamares Ware, whereas the pithos cemeteries along the coast do not (Soles 1988).

A linked, but separate issue is that of craft specialisation. While the existence of even part-time specialists is evidence in itself for some form of status differentiation (if not necessarily vertical), the ability to acquire high-quality prestige items is essential to the maintenance of a differentiated elite (Renfrew 1972: 340-371). The quality of manufactured items is often cited as evidence for craft specialisation, as it is argued that the experience and skill necessary to produce high-quality items, such as the jewellery of Tombs IV, V and VI at Mochlos, requires a certain level of specialisation (Renfrew 1972: 340). This could also be evidence for the existence of a consumer elite. The time, effort and expense of producing high-quality craft items is only practical if there is a demand for such items. Such a demand, while not necessarily signifying an established and institutionalised elite, is at least evidence for competition surrounding elite status, and shows that differences in status were recognised.

There are, therefore, a number of ways in which differential access to resources and status differentiation can be discerned in the archaeological record. Such evidence for social complexity has been collected for the 20 Aegean sites that were assigned rough population estimates in the previous section, and is presented below. The evidence varies, however, in the extent to which it provides a case for social complexity. For example, the monumental architecture of Troy II's extensive fortifications is better evidence for social complexity than the bastions of Askitario. Due to spatial constraints, the layout of the tables below does not account for such differences.

Of the 20 sites reviewed, seven are 'large'; *i.e.* definitely above the postulated population threshold necessitating complexity (Knossos, Malia, Thebes, Tiryns, Manika, Raphina and Eutresis). The evidence from these sites is presented in Table 2.

Site	Differential access to resources	Status differentiation
Knossos	- large building: West Court House - monumental architecture: extensive terracing and stone-paved ramp	
Malia		- differential mortuary treatment
Thebes	- monumental building: large central building, fortifications	
Tiryns	- monumental architecture: large central building	- craft specialisation: metallurgy, workshops, high quality of masonry - prestige objects: metalwork
Manika	- seals	- craft specialisation: metallurgy, workshops - differential mortuary treatment - seals
Raphina		- craft specialisation: metallurgy, workshops
Eutresis	- seals - monumental architecture: large central building	

Table 2. Evidence for social complexity at 'large' sites (after Konsola 1986; Pullen 1994; Rutter 1993; Soles 1988; Watrous 1994; Wiencke 1989).

A further nine sites (Myrtos Fournou Korifi, Mochlos, Askitario, Zygouries, Agios Dimitrios, Chalandriani-Kastri, Agia Irini, Daskaleio-Kavos and Troy) can be categorised as 'small' *i.e.* definitely below the threshold, and are considered in Table 3.

Site	Differential access to resources	Status differentiation
M. F. Korifi		
Mochlos	- seals	- differential mortuary treatment - prestige goods: metalwork, ceramics - seals
Askitario	- craft specialisation: metallurgy - monumental architecture: fortifications	
Zygouries	- large central building - seals	- seals - prestige goods: metalwork
A. Dimitrios	- seals	- seals
Chalandri-ani-Kastri	- monumental building: fortifications	- craft specialisation: metallurgy, 'tool kit', quality of ceramics - differential mortuary treatment - prestige goods: metalwork, ceramics
A. Irini	- seals	- prestige goods: metalwork, ceramics - seals
Daskaleio-Kavos		- craft specialisation: metallurgy, masonry
Troy II	- monumental building: fortification walls, paved ramp, large central building	- potter's wheel - prestige goods: 'Priam's Treasure'

Table 3. Evidence for social complexity at 'small' sites (after Broodbank 2000; Konsola 1986; Korfmann and Mansperger 2001; Pullen 1994; Soles 1988; Wiencke 1989).

The estimated population of the remaining four sites is too close to the threshold to designate them one way or the other, and they are termed 'borderline' (Phaistos, Lerna, Thermi and Poliochni) (Table 4).

Site	Differential access to resources	Status differentiation
Phaistos		- differential mortuary treatment (?) at A. Onouphrios
Lerna	- monumental architecture: large central building, fortifications - seals	- seals - prestige goods: metals, ceramics - craft production: quality of tiles, hearth rim
Thermi		- craft production: metallurgy
Poliochni	- town planning, specialised buildings - seals	- seals - prestige goods: 'Giallo' hoard

Table 4. Evidence for social complexity at 'borderline' sites (after Konsola 1990; Lamb 1936; Nakou 1997; Pullen 1994; Rutter 1993).

Interpretation and Conclusions

Nearly all of the 20 sites considered for this study demonstrated at least some evidence for social complexity. This is likely due to biases of excavation and publication. The societies of the EBA have sometimes been studied as potential forerunners of the palatial societies of the Middle Bronze Age and Late Bronze Age, rather than in their own right, and therefore more work has been done on sites which suggest social complexity. There are still some conclusions, however, that can be drawn from the above tables.

The 'large' sites tend to show strong evidence for social complexity. The architectural remains of EB II Knossos are impressive enough to infer some level of social complexity in terms of differential access to resources, in the form of both land and labour. The 'corridor houses' of Thebes and Eutresis seem to point to a similar conclusion. The same can be said for Tiryns, where the quality and scale of the building works, in addition to the substantial indications of craft specialisation and circulation of prestige goods, seem to imply the presence of social hierarchy. The status differentiation in the burials at Malia suggests a huge disparity between the treatment of the individuals buried in pithoi and rock crevices, and those interred in the wealthy house tombs. Similarly, the inequality of the burials at Manika are a convincing testament to a ranked community, especially when considered alongside evidence for sealing systems and craft specialisation. It is only at Raphina that the available evidence is too weak to suggest complexity. The lack of evidence from Raphina may, however, be due to less extensive excavation, publication or research, or a miscalculation of the initial population estimate.

Of the 13 'borderline' and 'small' sites, six of them: Lerna, Poliochni, Mochlos, Troy II, Chalandriani-Kastri and Zygouries, show strong evidence for social complexity. This suggests that population is not the only possible explanation for the emergence of social ranking in EB II. It does not, however, eliminate population size from being one of the potential factors in the emergence of social complexity.

In conclusion, the evidence from the Aegean in EB II is mute on the conjecture that once a community has crossed a population threshold of 350-500, social complexity must be developed to avoid the community fracturing. The case of Raphina, the only 'large' site not to show evidence for complexity, may be enough to cast doubt on the hypothesis, though judgement for this site should be suspended until the state of publication is improved. The evidence from the other sites, however, also does not suggest a straight one-to-one correlation between population size and social complexity. Although the remaining six sites with estimated populations over the threshold demonstrated convincing evidence for social complexity, the fact that six out of 13 'small' and 'borderline' sites also showed evidence for complexity suggests that while population may be a factor in the emergence of social complexity, it is not the only, or even the most important factor.

It was noted above that the location of a site on nodes of communication and lines of trade may also have encouraged the development of social ranking and differentiation (Sherratt and Sherratt 1991: 367; van Andel and Runnels 1988). This possibility has been discussed in detail elsewhere for a number of EB II sites and may partly explain the development of complexity at some of the 'small' or 'borderline' sites considered here. Several of these are amongst those thought to have been located on important nodes of maritime communication: Mochlos (Branigan 1991), Manika (Broodbank 2000: 279), Poliochni (Nakou 1997: 645), Agia Irini, Chalandriani-Kastri and Daskaleio-Kavos (Broodbank 2000: 279). While local connectivity may allow for the concentration of wealth at a nodal point or a regional 'bottleneck', long-distance trade routes would offer the opportunity for acquiring status goods and prestige.

While this may be a plausible explanation for the apparent development of social complexity at sites with good connections within the maritime network, such as those listed above, it is more difficult to apply to the EB II sites on either the Greek or Anatolian mainland. Many of the mainland sites considered here as showing signs of social complexity, however, were coastal sites, and it has been suggested that the intersection of overland and maritime routes may have contributed to their social development (Broodbank 2000: 280-281). While our knowledge of EBA overland routes on the Greek mainland is imperfect, this intersection of routes seems to have played a major factor in the development of Troy II. Troy seems to have been linked into the silver trade with the Near East (Sherratt and Sherratt 1991: 367) and was well located to oversee trading both into the Aegean and the Black Sea via the Dardanelles (Korfmann 1995). In conclusion, population increase may be a sufficient, but clearly not a necessary, precondition for the emergence of social complexity, and the location of a site with respect to both local and long-distance trade routes may have been a more significant factor in the emergence of social complexity in the EB II Aegean.

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References

Aruz, J. 1999. The Oriental Impact on the Forms of Early Aegean Seals, in Betancourt, P. P., Karageorghis, V., Laffineur, R. and Niemeier, W-D. (eds.) *Meletemata: Studies in Aegean Archaeology Presented to Malcolm H. Wiener as He Enters His 65th Year.* Aegeaum 20. Liège, 7-14.

Bintliff, J. 1977. *Natural Environment and Human Settlement in Prehistoric Greece*. Oxford: British Archaeological Reports Supplemental Series 281.

Boas, F. 1911. *The Mind of Primitive Man*. New York: Macmillan.

Branigan, K. 1970. *The Tombs of the Mesara*. London: Duckworth.

Branigan, K. 1991. Mochlos – An Early Aegean “Gateway Community”?, in Laffineur, R. and Basch, L. (eds.) *Thalassa: L’Egée Préhistorique et la mer: actes de la troisième Rencontre égéenne internationale de l’Université de Liège, Station de recherches sous-marines et océanographiques (StaReSO), Calvi, Corse, 23-25 avril 1990*. Aegaeum 7. Liège: Université de Liège, 97-105.

Broodbank, C. 2000. *An Island Archaeology of the Early Cyclades*. Cambridge: Cambridge University Press.

Carneiro, R. L. 1967. On the Relationship Between Size of Population and Complexity of Social Organisation. *Southwestern Journal of Anthropology* 23, 234-243.

Carothers, J. and McDonald, W. A. 1979. Size and Distribution of Population in Late Bronze Age Messenia: Some Statistical Approaches. *Journal of Field Archaeology* 6, 433-454.

Crumley, C. L. 2001. Communication, Holism, and the Evolution of Sociopolitical Complexity, in Haas, J. (ed.) *From Leaders to Rulers*. New York: Kluwer/Plenum, 19-36.

Feinman, G. M. 2001. Mesoamerican Political Complexity: The Corporate-Network Dimension, in Haas, J. (ed.) *From Leaders to Rulers*. New York: Kluwer/Plenum, 151-176.

Fletcher, R. 1995. *The Limits of Settlement Growth: A Theoretical Outline.* Cambridge: Cambridge University Press.

Forge, A. 1972. Normative Factors in Settlement Size of Neolithic Cultivators (New Guinea), in Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds.) *Man, Settlement and Urbanism*. London: Duckworth, 363-376.

Haas, J. 2001. *From Leaders to Rulers*. New York: Kluwer/Plenum.

Halstead, P. 1989. The Economy Has a Normal Surplus: Economic Stability and Social Change Among Early Farming Communities of Thessaly, Greece, in Halstead, P. and O’Shea, J. (eds.) *Bad Year Economics: Cultural Response to Risk and Uncertainty*. Cambridge: Cambridge University Press, 68-80.

Johnson, G. A. 1982. Organisational Structure and Scalar Stress, in Renfrew, C., Rowlands, M. J. and Segraves-Whallon, B. A. (eds.) *Theory and Explanation in Archaeology*. London: Academic Press, 389-421.

Johnson, G. A. and Earle, T. 1987. *The Evolution of Human Societies: From Foraging Group to Agrarian State*. Stanford: Stanford University Press.

Konsola, K. 1986. Stages of Urban Transformation in the Early Helladic Period, in Hägg, R. and Konsola, D. (eds.) *Early Helladic Architecture and Urbanization*. Göteburg: Paul Aströms Forlag, 9-19.

Konsola, D. 1990. Settlement Size and the Beginning of Urbanization, in Darcque, P. and Treuil, R. (eds.) *L’habitat égéen Préhistorique*. Paris: École Française d’Athenes, 463-471.

Korfmann, M. and Mansperger, D. 2001. *A Guide to Troia*. Istanbul: Ege Yayýnlarý.

Korfmann, M. 1995. Troia: A Residential and Trading City at the Dardanelles, in Laffineur, R. and Niemeier, W-D. (eds.) *Politeia: Society and State in the Aegean Bronze Age.* Aegaeum 12. Liège, 173-183.

Kosse, K. 1990. Group Size and Societal Complexity: Thresholds in the Long-Term Memory. *Journal of Anthropological Archaeology* 9, 275-303.

Kosse, K. 1994. The Evolution of Large, Complex Groups: A Hypothesis. *Journal of Anthropological Archaeology* 13, 35-50.

Lamb, W. 1936. *Excavations at Thermi in Lesbos*. Cambridge: Cambridge University Press.

Nakou, G. 1995. The Cutting Edge: A New Look at Early Aegean Metallurgy. *Journal of Mediterranean Archaeology* 8, 1-32.

Nakou, G. 1997. The Role of Poliochni and the North Aegean in the Development of Aegean Metallurgy, in Doumas, C. G. and La Rosa, V. (eds.) Η Πολιοχηι και η Προιμη Εποχη του Χαλχου στο Βορειο Αιγαιο. Athens: Scuola Archeologica Italiana di Atene, 634-648.

Narroll, R. 1962. Floor Area and Settlement Population. *American Antiquity* 27, 587-589.

Nixon, L. and Price, S. 1990. The Size and Resources of Greek Cities, in Murray, O. and Price, S. (eds.) *The Greek City from Homer to Alexander*. Oxford: Clarendon Press, 137-170.

Osborne, M. J., Rosenthal, J. S., and Turner, M. A. 2000. Meetings with Costly Participation. *The American Economic Review* 90, 927-943.

Pullen, D. 1994. A Lead Seal from Tzoungiza, Ancient Nemea, and Early Bronze Age Sealing Systems. *American Journal of Archaeology* 98, 35-52.

Renfrew, C. 1972. *The Emergence of Civilisation: The Cyclades and the Aegean in the Third Millennium BC*. London: Meuthen.

Romp, G. 1997. *Game Theory: Introduction and Applications*. Oxford: Oxford University Press.

Rutter, J. B. 1993. Review of Aegean Prehistory II. *American Journal of Archaeology* 97, 745-797.

Sbonias, K. 1999. Social Development, Management of Production, and Symbolic Representation in Prepalatial Crete, in Chaniotis, A. (ed.) *From Minoan Farmers to Roman Traders: Sidelights on the Economy of Ancient Crete*. Stuttgart: Franz Steiner Verlag, 25-52.

Shennan, S. J. 1993. *Social Evolutionism: A Critical History*. Oxford: Blackwell.

Sherratt, A. G. 1981. Plough and Pastoralism: Aspects of the Secondary Products Revolution, in Hodder, I., Issac, G. and Hammond, N. (eds.) *Pattern of the Past: Studies in Honour of David Clarke*. Cambridge: Cambridge University Press, 361-405.

Sherratt, A. G. and Sherratt, S. 1991. From Luxuries to Commodities: The Nature of Mediterranean Bronze Age Trading Systems, in Gale, N. H. (ed.) *Bronze Age Trade in the Mediterranean*. Göteburg: Paul Aströms Forlag, 351-386.

Soles, J. 1988. Social Ranking in Prepalatial Cemeteries, in French, E. B. and Wardle, K. A. (eds.) *Problems in Greek Prehistory*. Cambridge: Cambridge University Press, 49-61.

van Andel, T. H. and Runnels, C. N. 1988. An Essay on the "Emergence of Civilisation" in the Aegean World. *Antiquity* 62, 234-247.

Watrous, L. V. 1994. Crete from Earliest Prehistory Through the Protopalatial Period. *American Journal of Archaeology* 98, 695-753.

Watrous, L. V. 2001. Addendum: 1994-1999, in Cullen, T. (ed.) *Aegean Prehistory: A Review.* Boston: Archaeological Institute of America, 216-223.

Weingarten, J. 1997. Another Look at Lerna: An EH IIIB Trading Post? *Oxford Journal of Archaeology* 16, 147-166.

Whitelaw, T. M. 1983. The Settlement at Fournou Korifi, Myrtos and Aspects of Early Minoan Social Organization, in Krzyszkowska, O. and Nixon, L. (eds.) *Minoan Society. Proceedings of the Cambridge Colloquium 1981*. Bristol: Bristol Classical Press, 323-345.

Whitelaw, T. 2001. From Sites to Communities: Defining the Human Dimensions of Minoan Urbanisation, in Branigan, K. (ed.) *Urbanism in the Aegean Bronze Age.* Sheffield: Sheffield Academic Press, 15-37.

Wiencke, M. H. 1989. Change in Early Helladic II. *American Journal of Archaeology* 93, 495-509.

Whitelaw, T. 1983. The Settlement of Fournou Korifi Myrtos and Aspects of Early Minoan Social Organisation, in Krzyszkowska, O. and Nixon, L. (eds.) *Minoan Society*. Bristol: Bristol Classical Press, 323-345.

Whitelaw, T. 2001. From Sites to Communities: Defining the Human Dimensions of Minoan Urbanisation, in Branigan, K. (ed.) *Urbanism in the Aegean Bronze Age.* Sheffield: Sheffield Academic Press, 15-37.

Wiencke, M. H. 1989. Change in Early Helladic II. *American Journal of Archaeology* 93, 495-509.