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'IN THE SHADOWS OF A GIANT?' A SPATIAL ANALYTICAL METHOD FOR ASSESSING COASTAL PROXIMITY USING R: A CASE-STUDY FROM THE BRONZE AGE SARONIC GULF (GREECE)

'¿A LA SOMBRA DE UN GIGANTE?' UN MÉTODO ANALÍTICO ESPACIAL PARA EVALUAR LA PROXIMIDAD DE LA COSTA UTILIZANDO R: UN CASO DE ESTUDIO EN LA EDAD DE BRONCE DEL GOLFO SARÓNICO (GRECIA)

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Highlights:

- The study introduces novel methods in spatial analysis to reinterpret long-standing archaeological theories about settlement distribution
- Spatial analysis reveals fluctuating proximity of Bronze Age settlements to the coast in the Saronic Gulf, influenced by socio-cultural and climatic changes.
- Shifts in settlement patterns and external factors like the rise of Argolic centers reshaped Kolonna's influence, reorienting it towards its hinterlands.

Abstract:

This study explores the interrelation between settlement dynamics and coastal proximity during the Bronze Age in the Saronic Gulf, utilising an innovative spatial analytical approach. By integrating Geographic Information System (GIS) and statistical methods in R, this paper analyses a dataset comprising 258 archaeological sites across diverse coastal and inland environments. The methodology uses the Movecost package for R to calculate least-cost paths, quantifying the ease of access to coastlines, and enabling a nuanced interpretation of settlement patterns over time. Results indicate significant shifts in settlement patterns linked to socio-economic, climatic, and political changes. The early phases, particularly during Early Helladic II, show an increased distance from the coast, suggesting a period less reliant on maritime activities despite the existence of extensive maritime networks. Conversely, Early Helladic III and Middle Helladic III–Late Helladic II periods mark a more pronounced coastal orientation; in the first case, it was probably connected to climatic instability and survival strategies and, in the second one, connected to socio-political change and economic opportunities. The analysis challenges traditional views of constant coastal habitation. Instead, it reveals a complex pattern where coastal proximity was not solely dictated by maritime capabilities: it was a strategic choice influenced by a myriad of factors, including security, agricultural potential, external trade relations and climatic change. The rise and fall of Kolonna, a significant urban centre, underscores these dynamics, as shifts in its regional influence correlate with broader Aegean power structures and climatic events. This paper contributes to the understanding of how ancient societies adapted their settlement strategies in response to changing socio-political circumstances. It also demonstrates the potential of R and spatial statistics as powerful tools for archaeological inquiry, providing new perspectives on traditional interpretations of ancient settlement patterns.

Keywords: coastscapes; Bronze Age Greece; Geographic Information System (GIS); R statistical package; maritime networks; spatial analysis

Resumen:

Este estudio explora la interrelación entre la dinámica de asentamientos y la proximidad costera durante la Edad de Bronce en el golfo Sarónico, utilizando un enfoque analítico espacial innovador. Mediante la integración de un Sistema de Información Geográfica (GIS) y métodos estadísticos en R, el trabajo analiza un conjunto de datos que comprende 258 sitios arqueológicos en diversos entornos costeros y del interior. La metodología emplea el paquete Movecost para R para calcular rutas de mínimo coste, cuantificando la facilidad de acceso a las costas y permitiendo una interpretación matizada de los patrones de asentamiento a lo largo del tiempo. Los resultados indican cambios significativos en los patrones de asentamiento vinculados a cambios socioeconómicos, climáticos y políticos. Las fases tempranas, particularmente durante el Heládico Temprano II, muestran un aumento de la distancia desde la costa, sugiriendo un período menos dependiente de las actividades marítimas a pesar de la existencia de extensas redes marítimas. Por el contrario, los períodos del Heládico Temprano III y Heládico Medio III–Heládico Tardío II marcan una orientación costera más

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pronunciada; en el primer caso, probablemente a causa de la inestabilidad climática y estrategias de supervivencia y, en el segundo, por cambios sociopolíticos y oportunidades económicas. El análisis desafía las visiones tradicionales de habitación costera constante. En su lugar, revela un patrón complejo donde la proximidad costera no estaba dictada únicamente por las capacidades marítimas, sino que fue una elección estratégica influenciada por una variedad de factores, incluyendo la seguridad, el potencial agrícola, las relaciones comerciales externas y los cambios climáticos. El ascenso y la caída de Kolonna, un centro urbano significativo, subraya estas dinámicas, ya que los cambios en su influencia regional se correlacionan con estructuras de poder más amplias del Egeo y eventos climáticos. Este documento contribuye a la comprensión de cómo las sociedades antiguas adaptaron sus estrategias de asentamiento en respuesta a circunstancias sociopolíticas cambiantes. También demuestra el potencial de R y las estadísticas espaciales como herramientas poderosas para la investigación arqueológica, ofreciendo nuevas perspectivas sobre las interpretaciones tradicionales de los patrones de asentamiento antiguos.

Palabras clave: paisajes costeros; Grecia de la Edad de Bronce; sistema de información geográfica (SIG); paquete estadístico R; redes marítimas; análisis espacial

1. Introduction

Coastal landscapes, or coastscapes, have the potential to be dynamic places at the interface of terrestrial and maritime realms, mediating differing cognitive associations (land, habitation, sea, exchange) alongside differing ecological environments (Tartaron, 2013: 188–9). The Saronic Gulf (Figure 1) epitomises this dynamic, featuring a complex configuration of open water, islands, peninsulas, and a substantial stretch of coastline (Pullen & Tartaron, 2007). The unique geomorphology of the Saronic region lends itself well to being a discrete 'maritime small world' (Sherratt & Sherratt, 1998: 329–43; Broodbank, 2000: 175–210; Tartaron, 2013: 189–98), with relatively short sailing distances from any part within the gulf and several low-lying coastal plains bounded by a mountainous interior. Settlement patterns within this 'small world' have exhibited temporal variations, demonstrating an intensified coastal focus during specific periods (Siennicka, 2002: 189; Tartaron, 2013: 216–46; Gilstrap, 2015: 2). Previous research, however, has taken a cartographic approach to ceramic and site distribution analyses (Rutter, 1993: fig. 12; Siennicka, 2002; Gilstrap, 2015), with little spatial analytical qualification for proposed interpretations. A solution is the integration of spatial analytical concepts concerning coastal habitation. One such concept is *Coastal Proximity Analysis* (CPA) (Nuttall, 2021b; Nuttall, 2024), a spatial analytical measure of the relationship between centres of human activity and the coastline. The concept uses a Geographic Information System (GIS) to provide a quantification of site coastal proximity (Nuttall, 2024). GIS has found increasing application in addressing research questions in Greek archaeology (Farinetti, 2011; Déderix, 2015; Argyriou et al., 2017; Bonnier et al., 2019; Efkleidou, 2019) and has the potential to provide new perspectives on old research questions and data. The analysis presented here offers a new avenue to the approach, utilising the R statistical package (R Core Team, 2021) to permutate least cost paths according to specific parameters in a package entitled *Movecost* (Movecost, 2024) for the R Studio platform (R Studio Team, 2020), a novelty not undertaken in earlier attempts at the spatial analysis of coastal proximity (Nuttall, 2024).

The Saronic coastscape has an archaeological record spanning several millennia. Its archaeological record is particularly rich in the prehistoric period (7000 BCE–1100 BCE), confirmed by over 100 years of archaeological exploration (Loy, 2020). Early work focused on the excavation of more obvious, extensive settlements such as Kolonna (Welter, 1938), Athens Acropolis (Broneer 1933) and Eleusis (Mylonas, 1933) before a shift towards landscape archaeology in the 1970s (Rutter, 1993: 747–58; Cherry, 1994: 91–112). The region spatially overlaps with the study areas of several fieldwalking surveys, including the *Southern Argolid Exploration Project* (Jameson et al., 1994), the *Methana Survey Project* (Mee & Forbes, 1997), the *Eastern Corinthia Survey Project* (Tartaron et al., 2006), the *Mazi Plain Survey Project* (Fachard et al., 2015) and the *Saronic Harbours Archaeological Research Project* (Tartaron et al., 2011). In more recent years, increasing demand for attractive coastal land to satisfy tourist and urban development has led to a wide range of new sites being investigated through rescue excavation, especially along the coasts of Attica (Papadimitriou et al., 2020: xix).

A preference for coastal habitation to take advantage of trade routes has been suggested (Siennicka, 2002: 189) for the later Middle Helladic (MH) and Late Helladic (LH) periods, while the best-known archaeological site, Kolonna on Aigina has been suggested to have dominated the region throughout the Bronze Age (Tartaron, 2013: 243). However, scholarly investigations into the prehistoric Saronic have often centred primarily on Kolonna, consequently offering a somewhat restricted perspective on the wider exploitation of Saronic coastscapes. The focus here is shifted towards the littoral landscapes and islands of the Saronic Gulf. More specifically, this paper considers the material record of the Saronic coastscapes from the start of the Early Helladic II period (c. 2700 BCE) to the end of the Late Helladic IIIA period (c. 1300 BCE) and how they were exploited. Taking this long-term perspective allows for the investigation of a range of general prehistoric Aegean societal developments, from the emergence of long-distance trading networks (Renfrew, 1972: 451–5; Broodbank, 2000) and the evidence for increasing societal complexity in the monumental 'corridor houses' (Shaw, 1987; Nilsson, 2004) of EH II, retrenchment and potential climatic stress of EH III (Nüzhet Dalfes et al., 1997; Broodbank, 2008: 68; Finné et al., 2011), the social stratification of the Shaft Grave period (Graziadio, 1991) and its crystallisation in the form of the Mycenaean palaces (Shelmerdine & Bennet, 2008). More importantly, however, is the question of how these societal developments affected the communities of the Saronic Gulf coastscapes.

1.1. The archaeological record of the Saronic coastscape

The earliest evidence for human activity in the littoral and insular Saronic Gulf dates to the later part of the Neolithic (Table 1). The material record of the Early Helladic (EH) period shows the region being incorporated as a peripheral component of wider intra-Aegean exchange

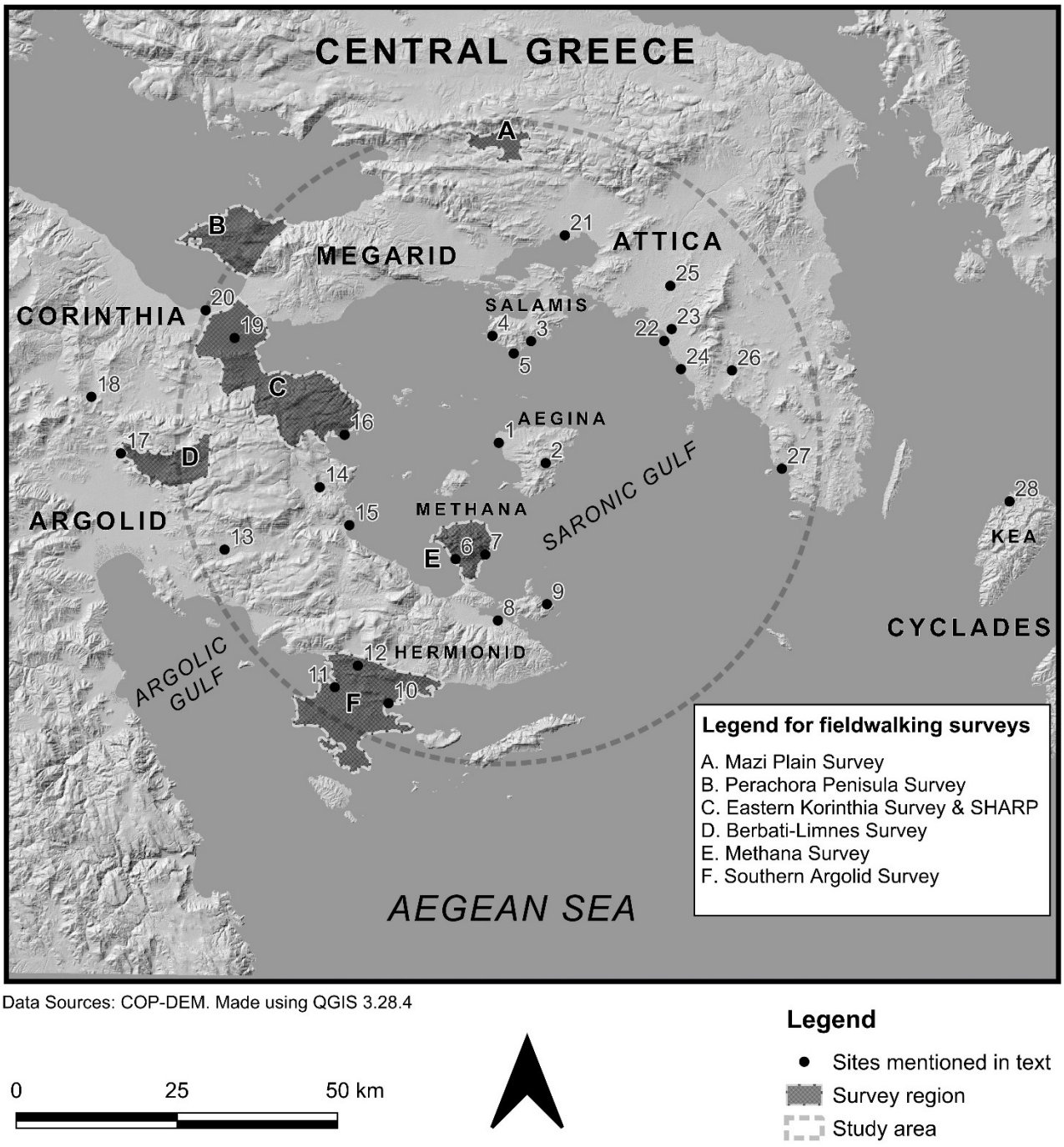

Figure 1: Map of Saronic with regions and key sites mentioned in the text. 1. Kolonna. 2. Lazarides. 3. Sklavos. 4. Kanakia. 5. Lykopoulou. 6. Palaiokastro. 7. Ayios Konstantinos 8. Megali Magoula, Galatas 9. Kavos Vasili. 10. Ermioni Magoula. 11. Delpriza Kranidi. 12. Petres. 13. Ayios Ioannis Kazarma. 14. Vassa. 15. Palaia Epidauros. 16. Kalamianos. 17. Mycenae. 18. Tzoungiza. 19. Perdikaria. 20. Korakou. 21. Eleusis. 22. Ayios Kosmas. 23. Pani Hill. 24. Asteria Glyphada. 25. Athens. 26. Kiapha Thiti. 27. Anavyssos. 28. Ayia Irini.

networks of the EH II period (Nazou, 2010: 11). The EH II (2800 BCE), a period spanning around 500 years, sees a large increase in site numbers attested through fieldwalking survey (Mee & Taylor 1997, 42–51; Jameson et al. 1994, 348; Forsén 1996, 117), though it is highly unlikely that all of them were contemporary (Mee & Taylor 1997, 50), and several are likely to have been agricultural farmsteads, obsidian processing sites, disturbed cemeteries and hamlets, in addition to habitation centres.

The EH III period (2300 BCE) sees a significant decline in settlement numbers, in line with other regions of Mainland Greece (Mee & Taylor, 1997: 53; Forsén, 1996: 119; Jameson et al., 1994: 367; Konsolaki-Giannopoulou, 2011), before the nucleation of population at specific larger settlements in the MH, while extra-site activity is more difficult to detect. The region suffers from the same "Middle Helladic hiatus" that is attested through fieldwalking survey both within the region (Mee & Taylor, 1997: 54; Runnels & Van Andel, 1987: 314–5) and outside of it (Nemea Valley: Davis, 1988: 164–5). The LH

period sees some change towards its end, with a modest increase in settlement numbers evident through fieldwalking survey, particularly from LH IIIA (1430 BCE) onwards (Mee & Taylor, 1997: 52; Jameson et al., 1994: 368; Schallin, 1996: 173). The 'colonisation' of the interior attested in the late MH–LH I Peloponnese (Rutter, 1993: 781) is delayed in the Saronic Gulf region (Siennicka, 2002: 184). Throughout, the coastscapes of the region are occupied, though the extent of their exploitation varies over time and space (Supplementary File Table S1).

Table 1: Relative and absolute chronology for the study area.

Relative chronology	*Absolute chronology start ate (BCE)*
Final Neolithic	4500
Early Helladic (EH) I	3100
EH II	2800
EH III	2300
Middle Helladic (MH)	2000
MH III–Late Helladic (LH) I	1750
LH II	1550
LH IIIA	1430

The best-known prehistoric site of the region, Kolonna (Figure 2), has been extensively investigated and serves as the main source of information concerning prehistoric society in the region (Gauss, 2010). The earliest evidence for activity at the coastal site comes in the Late Neolithic/Final Neolithic (FN) period (Weisshaar, 1994) with evidence of habitation more-or-less throughout until LH III (Gauss, 2007). The settlement appears to have been on a par with other medium-sized settlements in EH II before expanding to pre-eminence from EH III onwards (Walter & Felten, 1981: 23–50; Tartaron, 2013: 223). The substantial site bears evidence for social stratification and long-distance trading links in the MH (Kilian-Dirlmeier, 1997; Gauss, 2006; Forstenpointner et al., 2010), before an occupational hiatus in LH II (Wild et al., 2010: 1020, Table 3). The LH III evidence is much disturbed by later building activity (Gauss, 2010: 746) and is difficult to interpret.

1.2. Study area and paleo-environment

The Saronic Gulf was formed roughly 13000 years BP (c. 11000 BC) through rising sea levels, which are estimated to have been 70 m lower than at present (Mariolakos & Theocharis, 2003: 305–6). By 3000 BCE the sea-level would have been between 4 m – 5 m below the present level (Lambeck, 1995; Baika, 2008: 34–5) and by the end of the Bronze Age, the sea level is likely to have been around 3 m below the present level. EH Greece had wetter conditions than seen at present, with a sharp period of aridity around 2200 BCE, the so-called '4.2 ka' climatic event (Finné et al., 2011; Bini et al., 2018: 555–77), as well as warmer conditions for much of the Bronze Age (Triantaphyllou et al., 2009). The climate can be characterised as unstable, with oscillations between wetter/dryer and warmer/cooler conditions over the whole Bronze Age (Finné et al., 2017). Compared to the more volatile Aegean Sea, the Saronic Gulf has a consistent wind pattern, lacking the heavy winds which limit the performance of maritime transport even today (Heikell, 2002: 17). The *meltemi* (north wind) blows from the north consistently from July–August, while winter winds more variable and harsher winds are possible but uncommon. Currents and wave patterns provide favourable conditions for seafaring (Olson et al., 2007), and the region is notable for land never being out of site from any position in the Saronic Gulf.

The Saronic Gulf is a tectonically active zone situated as the northwest terminus of the Hellenic Volcanic arc, with the islands of Poros and Aigina having active volcanoes in the Pliocene (5.5–2.3 Mya), with a still-active volcano on the Methana peninsula (Dietrich et al., 1988; Pe-Piper & Piper, 2002). The region is characterised by pockets of lower-lying coastal areas bounded by mountains (Attica, the Megarid, Corinthia and Troizinia), large peninsulas (Methana and the Hermionid), steep coastal areas (Eastern Corinthia), larger islands (Aigina, Salamis and Poros) and a range of smaller islets. The Saronic Gulf serves as a crossroads of sea and land routes, possessing maritime travel routes to the Cycladic islands and beyond, land routes through the Corinthia towards the Argolid and the Peloponnese, a land route across to the Corinthia to the Corinthian Gulf and upland routes through Attica to Boeotia and Central Greece. This diverse geomorphology allows for a range of prehistoric site environments, from lower-lying coastal promontories (Kolonna, Kalamianos and Korakou), near-coastal uplands (Sklavos and Kavos Vasili), inland valleys (Kiapha Thiti and Petres) and inland acropolis sites (Athens and Ayios Ioannis Kazarma). Other than sea-level rise, little work has been undertaken to determine localised landscape change, and it is difficult to establish how applicable the present configuration is to the Bronze Age, though it is clear that Greek coastlines have been consistently eroded through anthropogenic activity, wave and wind agency (Alexandrakis & Poulos, 2014: 4; Alexandrakis et al., 2021: 3/24).

Figure 2: Kolonna on Aigina. By author, facing west.

1.3. Objectives

The results of a *Coastal Proximity Analysis* (CPA) for a total of 258 sites in the research area are presented in this study. These data permit an updated characterisation of Saronic Gulf coastscapes, allowing for a reassessment of interpretations of settlement patterns, power dynamics and coastscape engagement in the chronological study period utilising a novel spatial analysis. While this sample is not indicative of the wider Aegean region as a whole, it is a starting point in the characterisation of a discrete coastal landscape which allows for comparison with future applications of the method.

2. Materials and methods

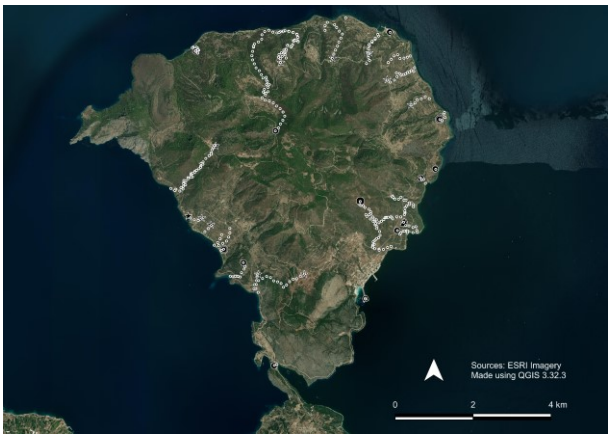

Figure 3: Least cost paths from the Methana peninsula.

The extent of the Saronic coastscape, which spatially encompasses the Saronic archipelago and parts of the modern regions of Attica, Corinthia, and Argolis, is difficult to define. The general boundaries of coastal regions can vary considerably, ranging from merely the beachfront areas (McGranahan et al., 2007: 17–37) to the landscapes within sight of the sea (Tartaron, 2013: 188–9) to the interior landscapes influenced by coastal dynamics through exchange networks (Stanners & Bourdeau, 1996). To address this methodological challenge, this paper adopts a strategy that takes the central island of Aigina as a focal point, delineating a study area with a 50 km radius. This approach facilitates the investigation of both coastal landscapes and inland areas, thus avoiding the circular logical fallacy of attributing a coastal focus to settlement patterns located in coastal regions, in addition to avoiding bias in the selection of the settlement data. In this study, all site types are considered, irrespective of size or function. This inclusive approach means that industrial sites (special purpose industrial non-habitation sites), mortuary sites (cemeteries or isolated burials), smaller habitation sites (hamlets), and cult sites (shrines or sanctuaries) were analysed alongside habitational centres (those exceeding 0.8 ha in size). These classifications (Table 2) are informed by the scatter size characterisations put forward by Nowicki for Crete (2014: 249) and based on the descriptions offered by the archaeological literature. This strategy enables a comprehensive understanding of the character of coastscape activity.

The sites under discussion have been identified through a bibliographic analysis of published works, which include rescue sites documented by the Greek Archaeological Service, survey sites published in the aforementioned fieldwalking surveys, or synthetic works (Hope Simpson & Dickinson, 1979; Konsolaki-Giannopoulou, 2011).

Table 2. Site classifications used in this study based on scatter size.

Group	*Size (hectares)*
Habitation Centre	>0.80
Hamlet/Small Settlement	0.05–0.80
Burial Site	<0.05
Industrial Site	Publication specific

Determining chronological synchronicity based on survey data poses substantial challenges, necessitating some compromises. The poor chronological resolution stemming from fieldwalking projects or rescue excavation means that certain chronological labels are merely suggestive, and doubts are expressed where the chronology remains ambiguous. Specific periods, such as EH III, emerge as problematic, either due to a genuine lack of evidence or an insufficient ceramic definition for the timeframe in question. In several instances, the reported data include only broad chronological labels, such as EH, MH, or LH. Nevertheless, every effort has been expended to refine these unclear chronological

labels where feasible. For instance, the discovery of kylix pottery fragments are taken to indicate a LH III date, while sauceboat fragments indicate an EH II date. If a site's general chronology remains undeterminable, it is omitted from the analysis. To ascertain a site's *Coastal Proximity Value* (CPV), this analysis employs the *Movecost* package (Movecost, 2024) of R Studio (R Studio Team, 2021). Using an R script (Supplementary File), it is possible to enter a large database of spatial information into the 'least cost-path' analysis (LCP). This paper offers an alternative to the Tobler's hiking function cost function used in previous GIS-based applications of this method

Table 3: Median values (minutes from coast on foot) for the CPA undertaken in this study, divided by site type and chronology. The values are in minutes. SOIC means 'Sites on the immediate coast'. M is the median value, while μ is the mean.

Type	*FN–EH I*	*EH II*	*EH III*	*MH*	*MH III–LH I*	*LH II*	*LH IIIA*
Habitation Centres (M)	21.35	54.04	10.25	36.54	17.10	16.45	34.87
Hamlet (M)	35.84	37.61	21.80	21.80	16.94	18.19	38.22
Burial (M)	39.05	9.58	6.52	69.86	28.26	14.87	29.88
All (M)	**31.56**	**35.32**	**17.74**	**27.03**	**17.74**	**17.74**	**37.24**
All (μ)	**75.48**	**68.11**	**53.86**	**63.60**	**48.54**	**53.24**	**79.56**
Modified Z-score outliers	15	15	5	11	8	12	18
Outliers excluded (M)	**21.54**	**27.40**	**14.09**	**17.10**	**15.04**	**13.30**	**28.37**
SOIC (%)	28.33	32.19	47.62	39.71	48.65	46.94	18.80
Count	130	156	25	75	49	61	129
Standard Deviation (SD)	99.40	90.87	74.17	80.56	64.73	74.25	101.07
SD/μ ratio	1.32	1.33	1.38	1.27	1.33	1.39	1.27

Table 4: Change in the median values of the CPA undertaken in this study, rounded to the nearest whole number. Green represents a landward shift, orange represents no change and blue represents a coastward shift.

Type	*EH II*	*EH III*	*MH*	*MH III–LH I*	*LH II*	*LH IIIA*
Habitation Centres (M)	+153 %	–81 %	+256 %	–53 %	–4 %	+111 %
Outliers removed	+155 %	–82 %	+184 %	–39 %	–6 %	+67 %
Hamlet (M)	+5 %	–42 %	0 %	–22 %	+7 %	+110 %
Outliers removed	+35 %	–51 %	–7 %	–5 %	+1%	+119 %
Burial (M)	–75 %	–32 %	+971 %	–60 %	–47 %	+101 %
Outliers removed	+83 %	–22 %	+601 %	–67 %	–34 %	+52 %
All (M)	+12 %	–50 %	+52 %	–34 %	0 %	+110 %
All (M) minus outliers	+27 %	–49 %	+21 %	–12 %	–12 %	+113 %
Mann-Whitney U Test All	0.64	0.37	0.55	0.42	0.96	0.07

(Nuttall, 2024) and instead tests a modification of this method, the so-called 'Modified Tobler function' (Márquez-Pérez et al., 2017), which compared favourably in a recent modelling of 18th century paths in the Mani peninsula of the Peloponnese, Greece (Seifried & Gardner, 2019: 403). The CPA method involves the plotting of the geospatial coordinates of a site in three-dimensional space, using a Digital Elevation Model (DEM) to gauge the 'cost' of moving between two points, in this case, from the site to the coast. In this analysis, COP-DEM data (Copernicus, 2024) was used covering the study area at a 30 m spatial resolution, with the ancient coastline demarcated as a series of points, approximately 5 m distant. This coastline was derived from extracting a contour line based on an elevation value of 0 m ASL and then converting this line into a series of points. With these parameters and functions implemented, the resulting LCP calculation chooses the path with the least cost between the site and the shortest point representative of the coast.

Using an R script allows for some further customisation of the modelling. In this analysis, the DEM surface was given a terrain factor (weight) of 1.25, which represents a flat trail or overgrown path (Movecost, 2024). Critical slope was set at 10%, with values above being avoided due to their undesirability for effective movement. The modelling also uses the so-called 'knight's move' move direction, taking into account sixteen possible directions in which DEM raster cells are connected. Finally, the modelling incorporates cognitive slope, which factors into human experience of gauging slope, which tends to be overestimated (Pingel, 2010). Areas with steep slopes are generally avoided in LCPs due to the higher energy

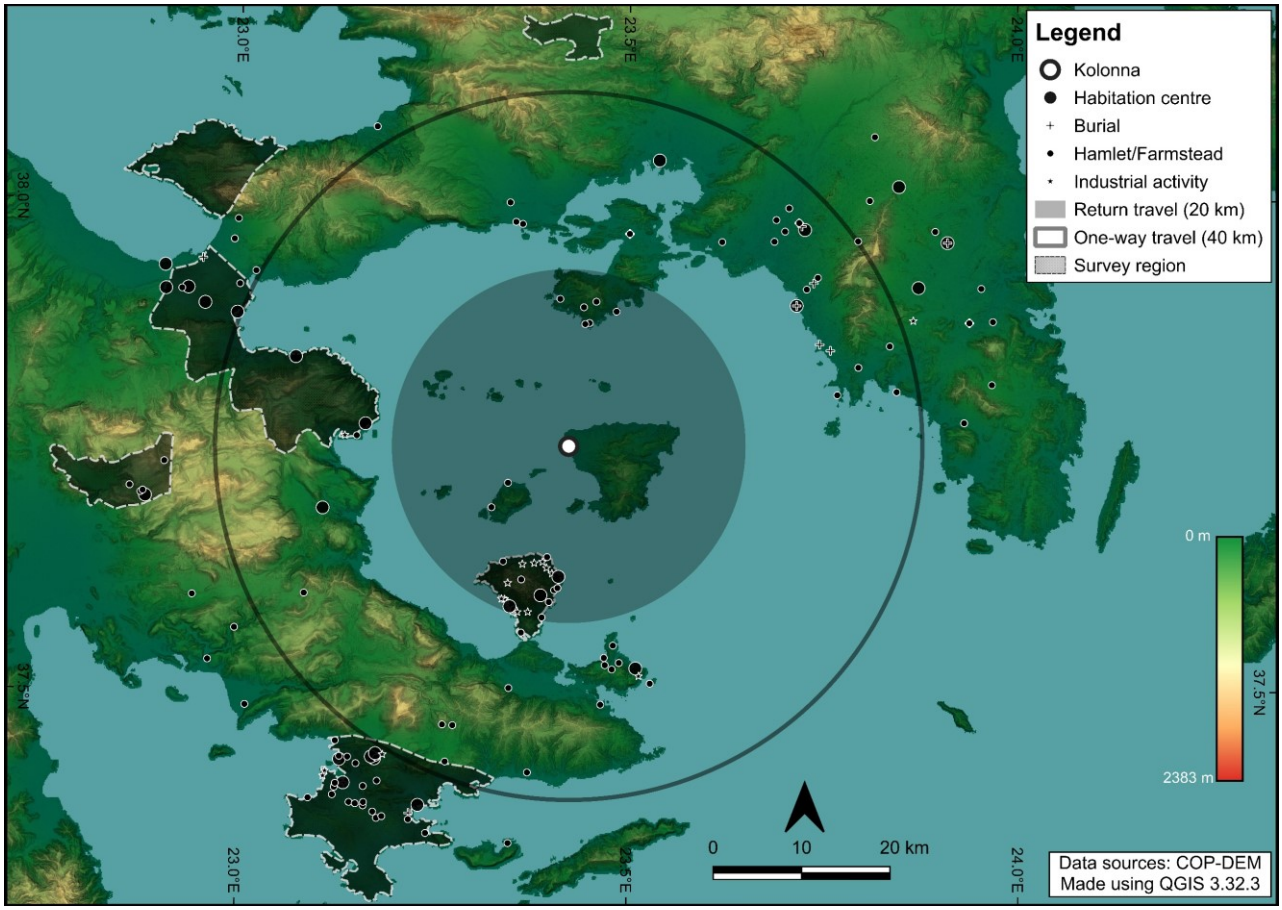

Figure 4: Map representing the distribution of sites in the study area dated to EH II. Coordinates are in EPSG:4326 – WGS 84.

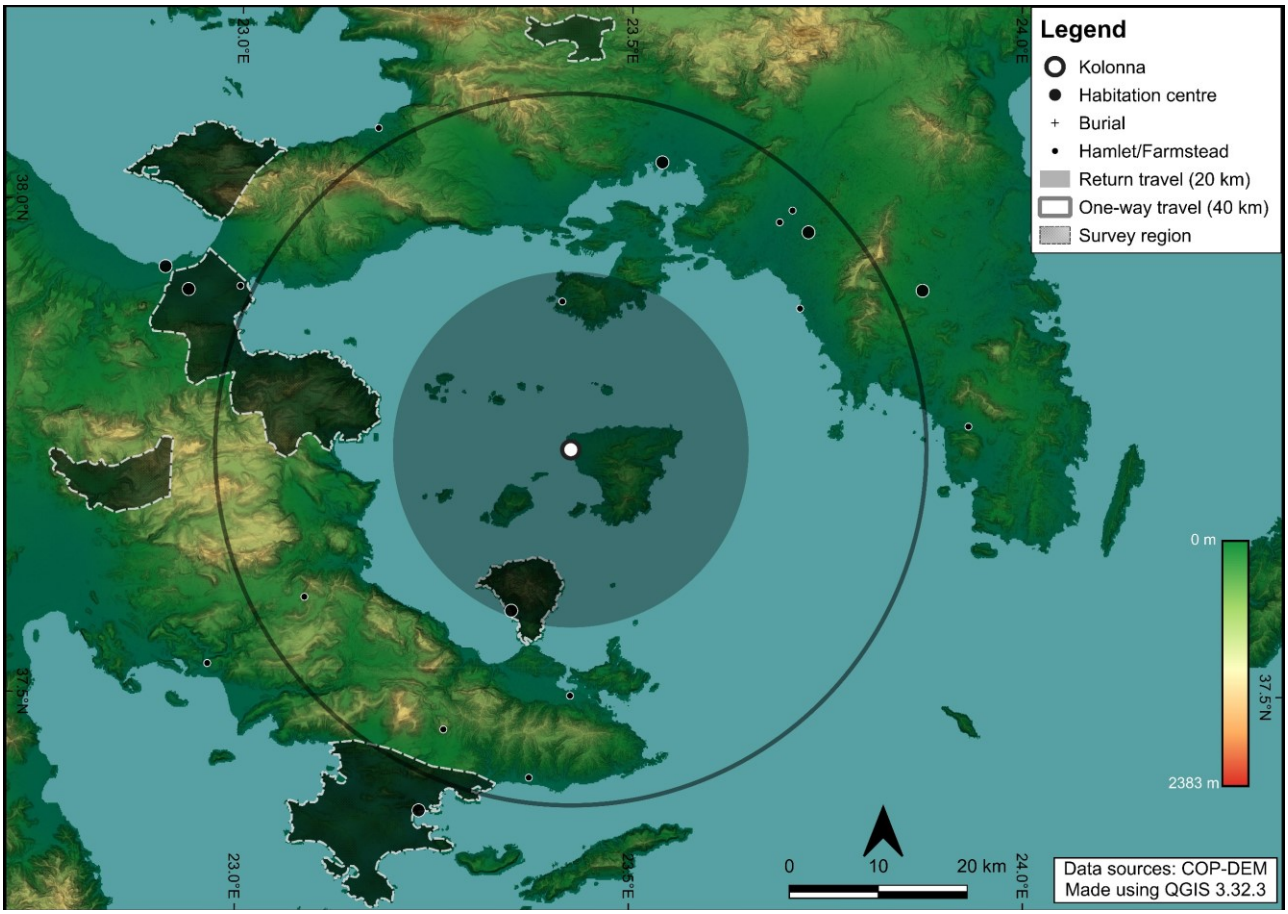

Figure 5. Map representing the distribution of sites in the study area dated to EH III. Coordinates are in EPSG:4326 – WGS 84.

expenditure required, favouring regions with lower slopes or level ground (Figure 3). The lower the value, the shorter the duration of travel on foot to the coastline. It should be underscored that the pathways proposed in this analysis represent potential routes, not definitive paths, for movement between the site and the sea. Alternative preferences that remain unknown could have influenced the actual routes chosen historically. Despite this, the proposed pathways serve as valuable references for comparative discussion.

3. Results

Firstly, the resulting outputs of the modelling were visually verified to ensure that no errors were introduced in the modelling. Generally, the paths follow logical routes, sometimes with multiple switchbacks in order to avoid areas of excessive slope. Considering the primary application of the data in chronological and site-type analyses, the median value was favoured for establishing statistical trends, although employing the mean typically results in similar patterns (Supplementary File Table S2 & S3). As well as the values for the time cost of travel between the ancient site and the coastline, the SOIC (Site on the Immediate Coast) figure presents the proportion of sites within 1 km of the ancient coast, with sea visibility (Table 2).

Compared to the FN–EH I phase (included here by way of comparison), the median CPV for habitation centres in EH II is much higher (+153 %), though the value for other site types remains broadly similar (Table 3). The median CPV for burial sites is several times lower than all habitation site types. While based on a small sample size, there is an appearance of the greater use of coastal spaces for burial in Attica in EH II, which is indicated also in the lower median CPV for burials (Table 3). The median CPV's for southeastern Argolid, the Corinthia and Methana is broadly the same as those observed in FN–EH I. Discussion of specific regions will only be compared against the same space in different periods, given the different geomorphology of different regional landscapes.

For EH III, there is a dramatic reduction (–81 %) in the median CPV for habitation centres and a significant reduction in the median CPV for smaller habitation sites (–42 %). Special-purpose industrial sites, for example chipped stone production sites, and extramural cemeteries almost entirely disappear within the material record of EH III landscapes. The most perceptible regional shift is observed in the southeastern Argolid, where the median CPV drops considerably (–63 %) in EH III. The median CPV for habitation centres increases substantially in the MH period (with outliers: +256 % / without outliers: +184 %) though smaller habitation sites follow the patterns established in EH III. This shift is also mirrored in burial patterns in the study area (with outliers: +971 % / without outliers: +601 %). In southwestern and southern Attica, there is an increase in the median CPV for habitation.

There is a reduction in the median CPV for both habitation centres (with outliers: –53 % / without outliers: –39 %) and smaller habitation sites (with outliers: –22 % / without outliers: –5 %) from the MH period into the MH III–LH I transition, a trend that continues through to LH II. These

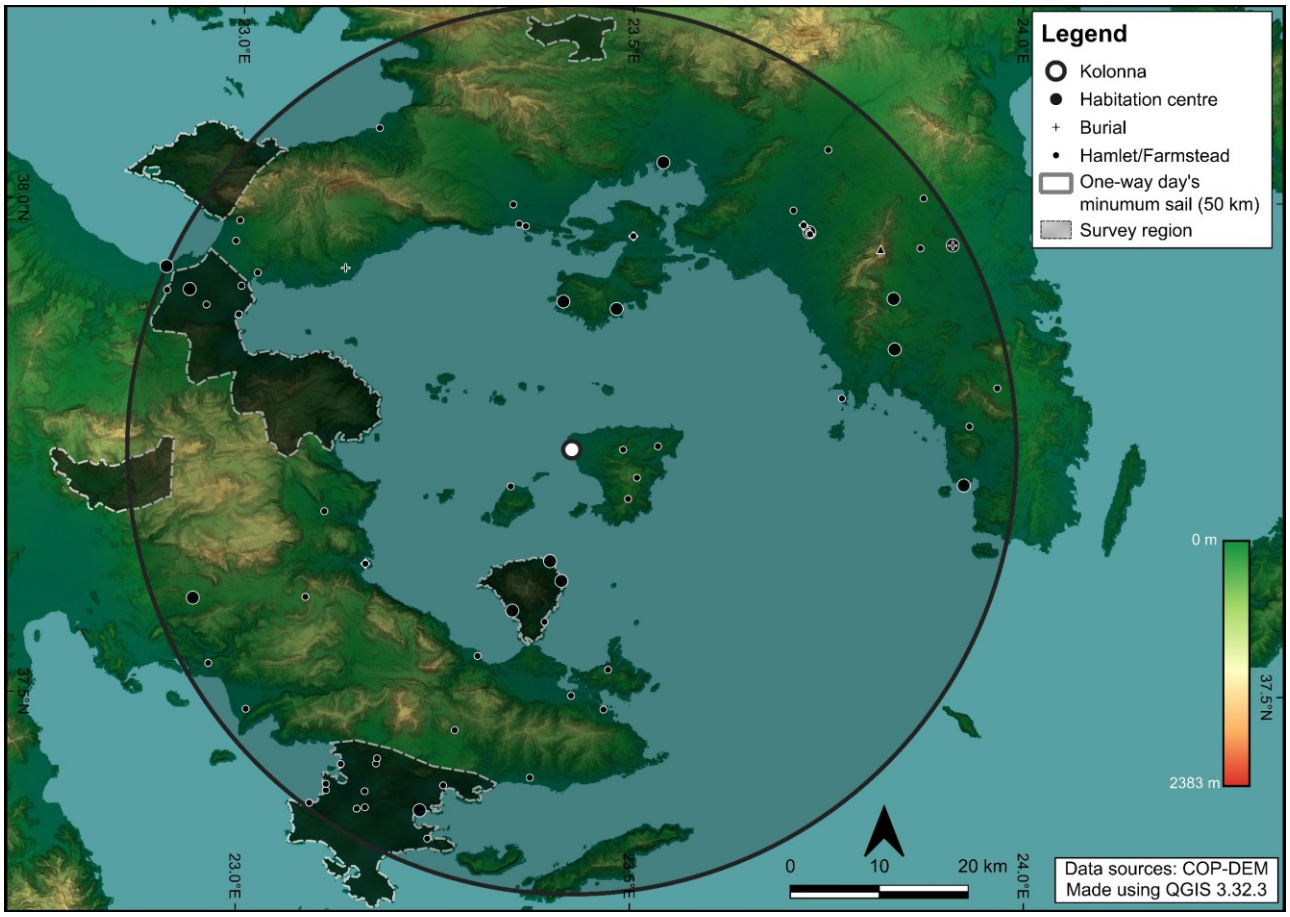

Figure 6: Map representing the distribution of sites in the study area dated to the MH period. Coordinates are in EPSG:4326 – WGS 84.

periods, contemporary with the 'Shaft Grave era', exhibit continuity and are therefore treated together below. The median CPV for burial decreases from earlier MH values. Southwestern and southern Attica see a drastic reduction in the median CPV for habitation. LH IIIA sees an increase in the median CPV for habitation centres (with outliers: +111 % / without outliers: +67 %), and for smaller habitation sites (with outliers: +110 % / without outliers: +119 %). Many more sites are identifiable in the study area, attesting to an expansion of habitation. The SOIC proportion for LH IIIA (18.80 %) is lower than any period in the chronological study area and marks a reasonable decline from LH II. There is, however, a greater use of coastal space for habitation and burial in LH IIIA in addition to inland areas. Based on the results of the analysis presented, four chronological developments can be determined, Early Helladic II (4.1), Early Helladic III (4.2), Middle Helladic (4.3), Middle Helladic III–Late Helladic II (4.4) and Late Helladic IIIA (4.5).

4. Discussion

4.1. An EH II 'Small World'

The EH II period stands out as the period with the highest median CPV value for habitation centres, meaning that most of the population in the study area was further away from the coast than at any other point in the study (Figure 4). While this stands in contrast to the periods' characterisation as 'international', with a more extensive network of maritime contacts (Renfrew, 1972: 451–5), it may more accurately reflect the concentration of habitation at a few, larger coastal centres (Broodbank, 2000: 279–87), with an explosion of settlement activity more generally in the landscape (Tartaron, 2013: 217). The possible circuit walls at several EH II coastal sites in the study area, such as Lykopoulou on Salamis (Lolos, 2011: 9), Pani Hill (Kaza-Papageorgiou, 2009: 105–6) and possibly at Kavos Vasili on Poros (Konsolaki-Giannopoulou, 2019: 219), indicates that coastal traffic was not always friendly, and that competition is likely to have taken place (Broodbank, 1989: 336).

Notably, Kolonna appears to have been undefended in EH II (Gauss, 2010: 742). The presence of the corridor houses (linear buildings with central passageways, indicative of early social complexity and settlement organization) *Haus am Felstrand* of advanced EH II, and *Weisses Haus* of EH II late, as well as evidence for the storage of agricultural supplies in the *House of the Pithoi* (Felten, 2007) indicate some form of centralised administration at Kolonna at this time, though the suspected size of the site, at about 0.6 ha (Walter & Felten, 1981: 9) only puts it on a par with contemporary Aegean coastal settlements such as Ayios Kosmas (Attica) at around 1 ha (Konsola, 1984: 98) and Ayia Irini (Kea) at slightly less than 1 ha (Broodbank, 2000: 218). The absence of any other known corridor houses in the study area could be a coincidence, or in some way inhibited by the influence of Kolonna, which may already have played an important role as a hub for the movement products and influences from outside the Saronic within (Forsén, 2010: 58). Indeed, its role as the main source of andesite for millstones in Attica and the Peloponnese has been demonstrated (Runnels, 1985; Kardulias et al.,

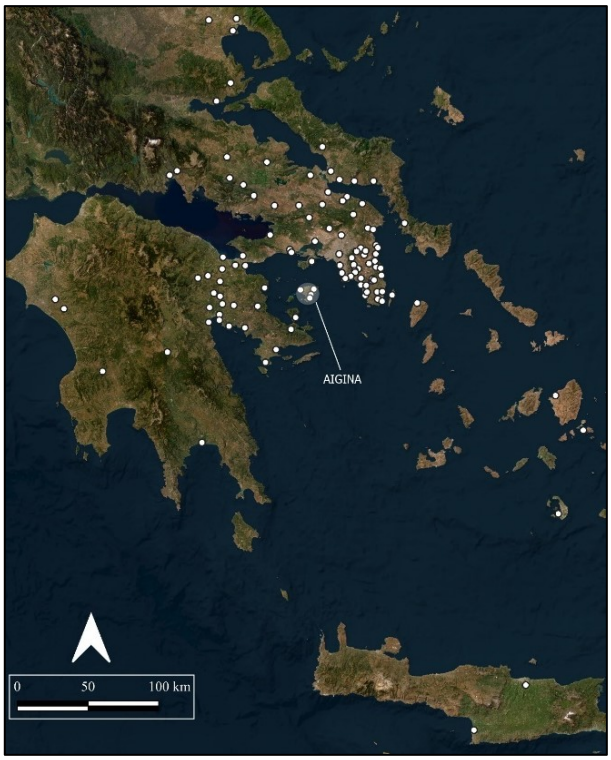

Figure 7: Map showing the distribution of Aiginetan gold-mica exports dated to the Middle–Late Bronze Age. After Tartaron, 2013: 227, fig. 7.7 and Gauss, 2020: 614, fig. 8.

1995: 9), though this role may have been in cooperation or competition with Kavos Vasili on Poros, which appears to have also been heavily linked to the exchange of andesite (Konsolaki-Giannopoulou, 2019: 233–5). The only other candidate for a corridor house site within the study area—or substantial EH II site at the very least—is in the Fournoi valley of the southeast Argolid, where there is a cluster of unexcavated sites around Petres and Fournoi (Jameson et al., 1994: 509, 513). This area is notably outside of one day's travel by boat from Kolonna, using the 40 one-way estimates for longboats put forward by Broodbank (2000: 260).

The lower median CPV for burial spaces is worthy of comment. While this could be a result of greater rescue archaeological work due to urban development in desirable locations, the presence of extramural coastal cemeteries such as Asteria Glyphada (Kaza–Papageorgiou, 2020), Delpriza Kranidi (Kossyva, 2011) and Agios Kosmas (Mylonas, 1959) is a feature not repeated in subsequent periods until LH III. While these cemeteries were placed within close proximity to their parent settlements, they may also have been placed to be visible from, or at least reference, coastal navigation routes (Nuttall, 2021b: 59), which in this period of dugout canoes and longboats, would have hugged the coast before the widespread adoption of the sail in the MH (Broodbank, 2000: 341–2) meant that more direct routes were possible. The presence of *periboloi* (stone-built enclosures) and other forms of arrangement indicate a transformation of this coastal space for the performance of burial practices. The presence of Cycladic or Cycladicising objects at these cemeteries (Kaza-Papageorgiou, 2020; Kossyva, 2011; Mylonas, 1959: 162–3) further underscores this maritime connection between the Saronic coastscape and the Cyclades in EH II.

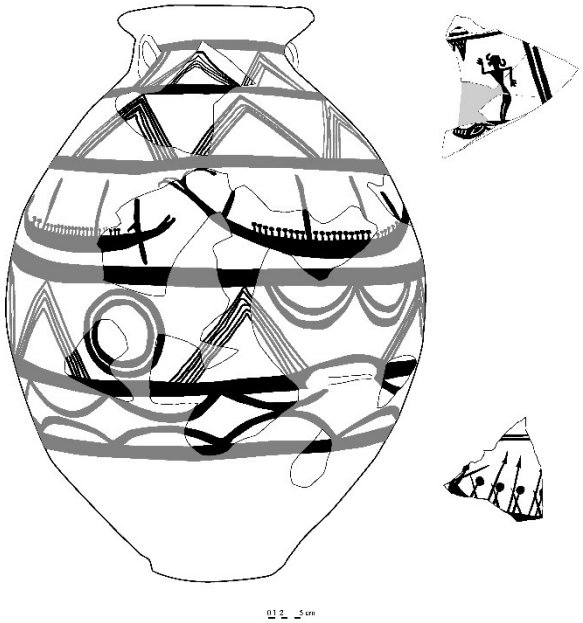

Figure 8: Ship representations on MH matt-painted ceramics from Kolonna, Aigina. Re-drawn by author, after Siedentopf, 1991: 24–5, nos. 75, 158 and 162.

4.2. Crisis and consolidation in EH III

Early Helladic III sees a dramatic reduction in site numbers from the previous period. Remarkable, however, is the drastic shift in the median CPV for habitation centres, which is now at its lowest point within the chronological study period, meaning that EH III sees the greatest societal investment in coastal living, corresponding with an almost 50 % proportion of sites of all types being immediately on the coast (Figure 5). With the collapse of the extensive coastal networks of EH II, evinced through a cessation of Cycladic imports at Kolonna until the very end of EH III (Gauss, 2010: 744), society appears to have shifted closer to the coast. This decision, however, may have been prompted by the so-called 4.2 ka (thousand years ago) climatic event, connected to a series of droughts and societal collapses at several locations in the Eastern Mediterranean and Mesopotamia (Finné et al., 2011). This situation appears to have led to an abandonment of smaller sites, particularly those inland, to congregate at nucleated coastal sites. This social response could also have been influenced by a greater threat of violence (Caskey, 1960: 299–302; Vermeule, 1964: 29–31), though there is a lack of EH III fortified sites in the region, other than Kolonna (Walter & Felten, 1981: 28–42). During this unstable period, societal frameworks may not have permitted communities to focus on defence. Another possibility is that there were better soils to be found beside the coast in a period where soil degradation and erosion is argued to have played a substantial role in the disruption of pre-existing agricultural practices (van Andel et al., 1990: 379–96). The discernible coastal inclination in settlement patterns, however, can also be read as a testament to the relative security, or perhaps even the necessity, of coastal habitation. This spatial patterning hints at the pivotal role that maritime networks might assume in resilience strategies during periods of instability and uncertainty.

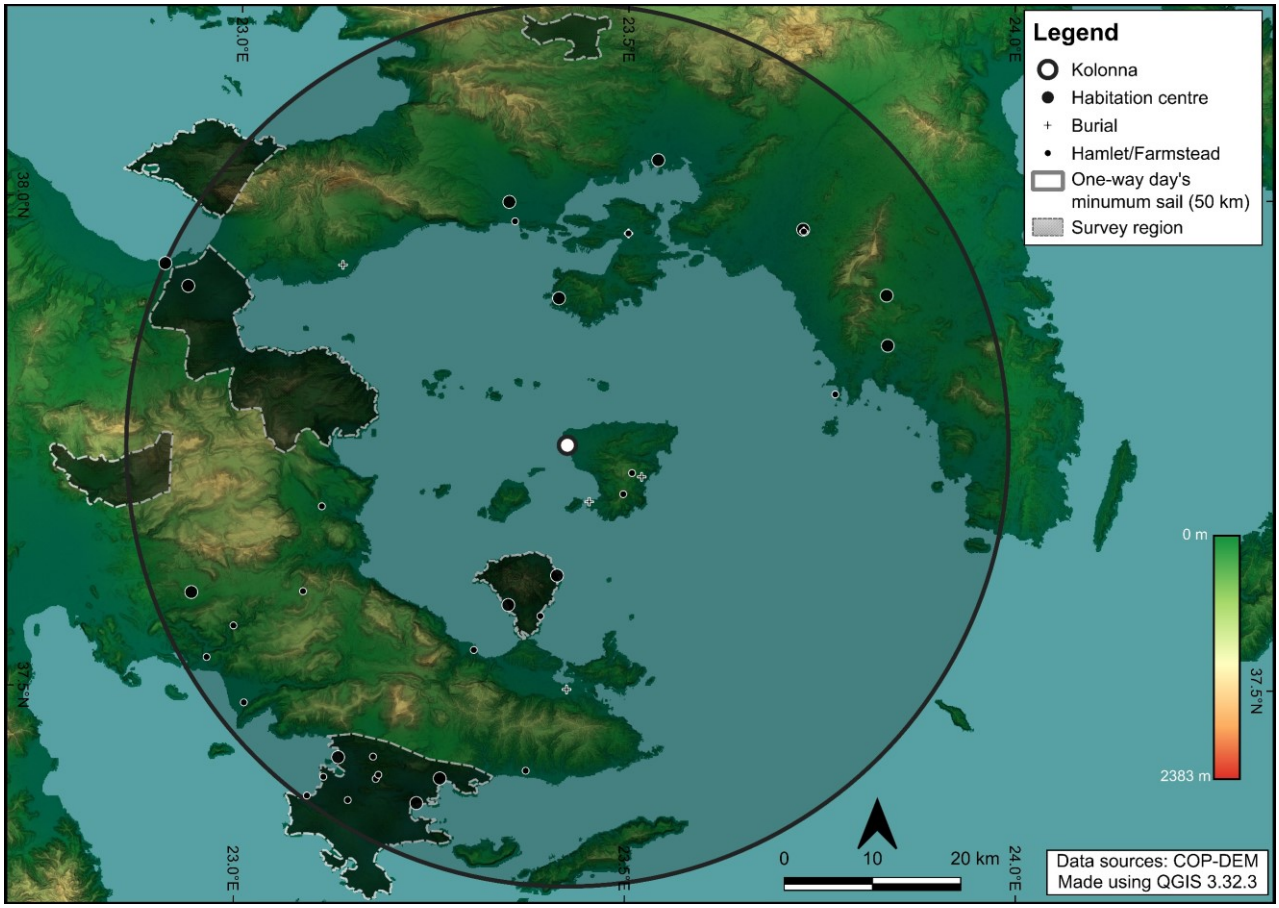

Figure 9: Map representing the distribution of sites in the study area dated to MH III-LH II. Coordinates are in EPSG:4326 – WGS 84.

The evidence of fire destruction in Kolonna V and a partial destruction in Kolonna VI (Gauss, 2010: 744), suggests that despite its defences, even the largest sites were not safe from attack. Despite this threat, however, Kolonna appears to thrive in EH III, particularly Kolonna V-VI, with evidence for metallurgical practices in Kolonna IV (Walter & Felten, 1981: 23–28). The recovery of a remarkable late EH III jewellery hoard from House 19 (Felten, 2009: 34–5), indicates increasing social stratification (Forsén, 2010: 61) and the centralisation of far-reaching trading contacts at Kolonna. The recovery of an Aiginetan ceramic import in EH III layers at Lerna (Dorias & Shriner, 2002) is an early indicator of the growing role Kolonna would play as a pottery producer and transmitter in the region later in the MH.

These signs of insipient wealth are an indication that Kolonna was beginning to become atypical for the region. One potential rationale for this development could be that the tumultuous period provided ambitious Aiginetans with opportunities to forge advantageous alliances with extant Early Helladic III societies, likely balanced in favour of the Aiginetans. Moreover, access to the metal sources at Laurion might have presented a strategic advantage, particularly if the local objectives there intersected with those of Minoan traders. Kolonna's off-shore position may have afforded the community the opportunity to ride out the instability of the period in relative safely, taking advantage of their strategic location at the intersection of Peloponnesian, Attic, and Cycladic exchange routes.

4.3. The ascendancy of Kolonna in the Middle Helladic period

In the MH period, there is a notable shift in the positioning of habitational centres, which gravitate further inland than in previous eras (Figure 6). Coastal sites either are encapsulated by circuit walls or strategically situated in defensive locations. This trend is manifested across various notable sites in the region, including Sklavos (Lolos, 2010: 181–5) and Kanakia (Lolos, 2013: 2–17) on Salamis, Palaiokastro (Mee & Taylor, 1997: 126, no. MS10) on Methana, and extends to several areas in southeastern Argolid, specifically, Megali Magoula, Galatas (Konsolaki-Giannopoulou, 2010: 67–76), and Ermioni Magoula (Jameson et al., 1994: 487–8, no. E13). Further illustrations of this development are Megara Palaikastro (Hope Simpson & Dickinson, 1979: 73–4, no. A94) in Megaris and Anavyssos (Hope Simpson & Dickinson, 1979: 208–9, no. F23) in southern Attica, reinforcing the strategic migration of habitational centres towards more fortified, coastal positions. It is difficult to see this shift as unconnected to the growing power of Kolonna.

By this stage, Kolonna was defended by a large fortification wall (Kolonna VII–IX), protected by bastion towers (Gauss, 2010: 745). The large central structure, the so-called 'Large Building Complex' (Gauss et al., 2011), stands out as a monumental mansion and surely the centre of political power at Kolonna. Kolonna emerges as a pottery production powerhouse in the MH (Rutter, 1993: 777), with a far-reaching network of distinctive matt-painted pottery (Figure

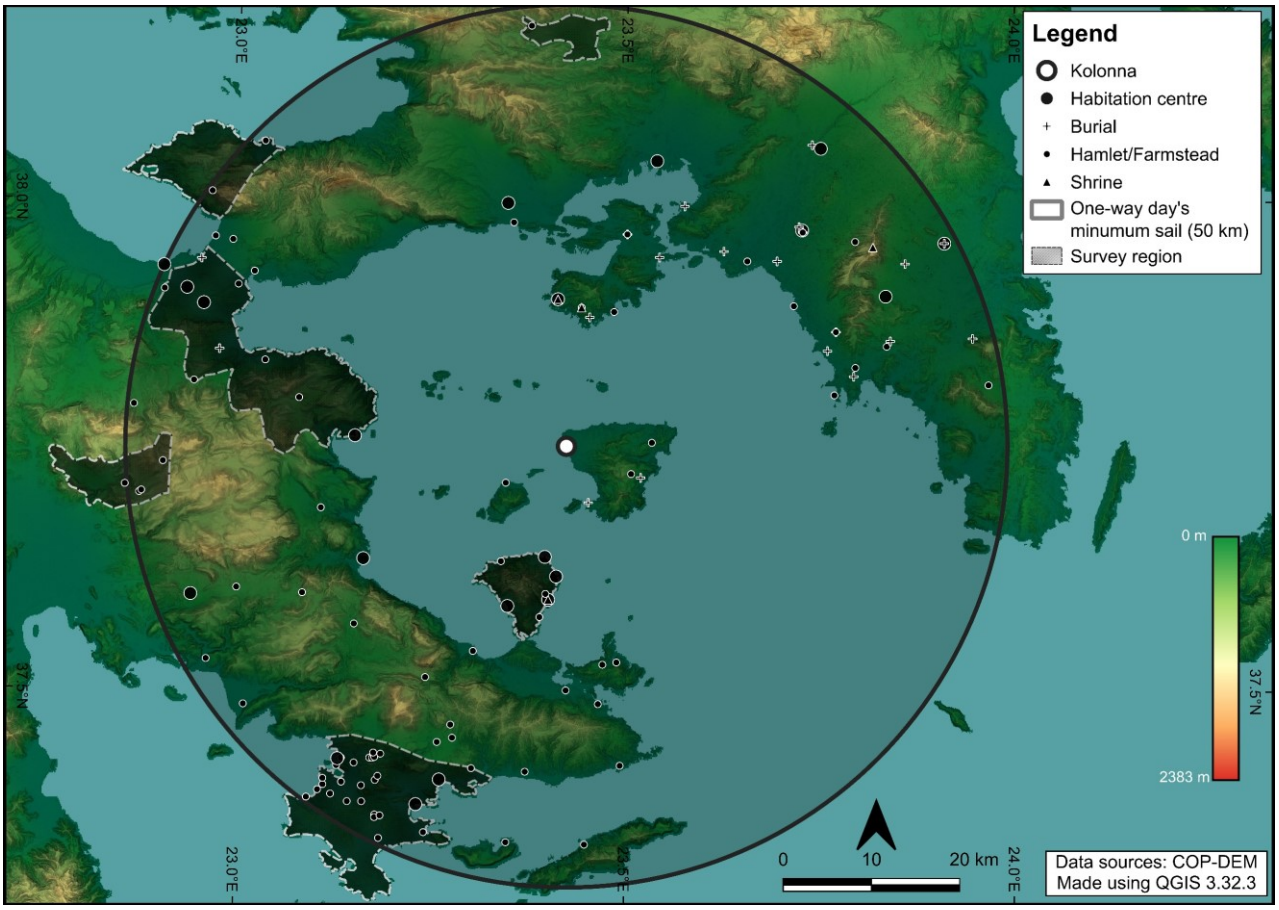

Figure 10: Map representing the distribution of sites in the study area dated to LH IIIA. Coordinates are in EPSG:4326 – WGS 84.

7), storage vessels and cooking pots (Lindblom, 2001: 40–2), which extended beyond the Saronic to central Greece (Maran, 2007), the Argolid (Nordquist, 1995: 44; Zerner, 1978: 156–8), the Cyclades (Nikolakopoulou, 2007) and Minoan Crete (Hiller, 1993). Minoan and Cycladic imports and locally made versions indicate a direct connection to both Crete and the Cycladic region (Gauss, 2006; Gauss & Smetana, 2007), which is reinforced by the down-dated "Aigina Treasure", a collection of gold jewellery and precious stones (Higgins, 1979), which is likely to have come from a looted MH tomb (Fitton, 2009; Williams, 2009) with the gold likely sourced through Minoan contact networks. The discovery of a MH II warrior 'shaft grave' (Kilian-Dirlmeier, 1997), in front of the fortification wall, close to the gate, further reinforces the increasing evidence for social stratification and regional power. Most telling, however, is the recovery of Aiginetan matt-painted pithos fragments bearing the representation of ships (Figure 8), indicating a societal focus on seafaring, which may have underpinned societal developments at Kolonna. This seafaring was certainly linked to ceramic exchange but may have had a military undertone (Muskett, 2001: 59; Nuttall, 2021b: 226).

How, therefore, should we interpret the emergence of fortified coastal sites in this region? Were they built to defend against potential Aiginetan aggression, or to serve as forward bases to oversee the Saronic seaways? If they were designed to counter Aiginetan aggression, we could expect fewer Aiginetan ceramics outside of Aigina as a form of 'embargo' against an untrusted neighbour. However, the ability of Kolonna to access objects beyond the Saronic suggests that these coastal sites are a signal of Kolonna's dominance in the region. This control appears to have been multifaceted. Locations such as Sklavos and Palaiokastro were strategic points for controlling important maritime routes both within and beyond the Saronic, while other places like Ermioni Magoula, Megali Magoula, Galatas, and Anavyssos enabled access to sheltered bays —namely Hermioni bay, the Poros Gulf, and Anavyssos bay— which also afforded access to extensive arable valleys. This relationship with agriculture is significant, particularly in light of the role agricultural produce played in the state formation of the Minoan Protopalaces on Crete (Manning, 2008: 118–9). Indeed, Kolonna has been considered the most likely candidate for a 'proto-state' outside of Crete (Niemeier, 1995; Gauss, 2010: 745). So far, only Megali Magoula, Galatas has been extensively excavated, revealing Aiginetan matt-painted pottery, indicating close connections (Konsolaki-Giannopoulou, 2010: 71–2). The marine themes represented on matt-painted pithoi from Kolonna —large storage vessels designated for agricultural produce (Rutter, 1993: 780)— further illuminate its potential involvement in the acquisition of grain reserves and its redistribution (Nuttall, 2021b: 226).

4.4. Reoriented shaft grave period Saronic networks

MH III–LH IIB, the periods concurrent with the Shaft Grave period in the Argolid, witness a renewed emphasis on coastal activity (Figure 9). These phases (MH III, LH I, LH IIA and LH IIB) are examined together here due to substantial continuity between them. The theorised "colonisation" of the interior, posited for the northeastern Peloponnese (Rutter, 2007: 42–3), is only modestly supported by evidence in the broader study area, with slight increases in activity during the LH I–II period noted in fieldwalking studies (Mee & Taylor, 1997: 52; Runnels and Van Andel, 1987: 315).

(a)

(b)

Figure 11: 'Cyclopean' (megalithic) construction: (a) Kazarma bridge; (b) Tiryns Citadel for comparison.

It has been proposed that Kolonna's significance waned during this period (Gauss, 2010: 746). Despite this, the existence of a substantial, cyclopean-like wall and the sustained usage of the Large Building Complex until at least LH I suggests that the settlement maintained some level of influence. However, the abandonment of several coastal, defensive sites towards the end of the MH period may signal a decrease in the importance of the Saronic Gulf coastscapes, and specifically Kolonna, in relation to developments occurring on the mainland, which were increasingly focused on the Argolic Gulf. The construction of the Shaft Graves, along with the deposition of vast quantities of wealth at the rising centre at Mycenae might indicate a shift in Minoan contact-focus from the Saronic to the Argolid Gulf, a role in which Kolonna likely formerly served as an intermediary (Tartaron, 2013: 226).

Aiginetan matt-painted pottery continues to be produced well into the Mycenaean period, with imports known as late as LH II from the Athens Acropolis, Eleusis, Agios Kosmas and Kiapha Thiti (Cosmopoulos, 2014: 454; Maran, 1993: 203–5; Mylonas, 1959: 50–1). A strong link with Eleusis has been posited (Cosmopoulos, 2014: 167, 188; Papadimitriou, 2010: 250–1), where large quantities of matt-painted pottery were imported and a warrior burial, similar in character to the 'shaft grave' from Kolonna, has been identified. Links can also be observed at Lazarides on Aigina (Sgouritsa, 2010), where a focus on small-scale lead metallurgy has been identified, and even outside the study area at Tsoungiza in Nemea Valley, where Aiginetan gold-mica pottery comprised of up to 10 % of the LH I assemblage (Lindblom, 2001: 41).

The construction of a substantial tomb (Tomb 3) in the study area at Megali Magoula, Galatas (Konsolaki-Giannopoulou, 2010) is an interesting development[1]. The small size of its parent settlement (0.1 ha) does not give the impression of centralised authority (*cf.* Salavoura, 2020: 646). The recovery of a Type A sword (Konsolaki-Giannopoulou, 2003: 179, fig. 71a-b), a type of Minoan inspiration (Molloy, 2010: 404), may indicate the key role Kolonna played in transmitting external and Minoan influence and material culture in this period, if the presence of Minoan elements is indicative of the presence of Minoans at Kolonna in late MH/LH I (Gauss, 2010: 745). The possibility that Kolonna may have colonised or stimulated growth at some of these coastal centres is made more likely given the suggestion that Agia Irini IV on Kea was settled by Aiginetans (Crego, 2010: 842–5). While the significance of Kolonna may have waned during the Early Mycenaean period, its former outward focus on distant trading partners in the MH appears to have changed to a localised focus on the Saronic Gulf (Tartaron, 2013: 228), as suggested by increased evidence for habitation with a greater coastal focus. The power of Kolonna may have been dispersed between other connected settlements (Eleusis, Kiapha Thiti, Lazarides, Megali Magoula, Galatas), indicating a more decentralised factional control over the region, perhaps strengthened through political and social ties.

LH II likely sees the beginning of a 'changing of the guard' in terms of influence over the Saronic Gulf. The absence of any significant sites on the eastern coast of Corinthia from EH II onwards is difficult to interpret, but can be an indication of an inhibition, most likely initiated by Kolonna. Contacts between Kolonna and northern Corinthia appear to have been strong between MH–LH II, with Aiginetan cooking ware, storage ware and pouring vessels attested at Corinthian sites (Davis, 1979: 241, 258–9; Lindblom, 2001: 41). LH I pottery is rare in Corinthia (Davis, 1979) and the Saronic region (Siennicka, 2002: 181–4), though LH IIA pottery is more common, being found at Kolonna, Kiapha Thiti, Eleusis and Athens (Mountjoy, 1999: 492). This shift is also seen outside of the study area at Tsoungiza in the Nemea Valley (Rutter, 1993: 91). The fact that Aiginetian and Mycenaean pottery were found together at several Corinthian sites may indicate an increase in competition between Kolonna and Mycenae, attesting to Mycenae's strategic interest in the Saronic Gulf. The construction of two LH II tholos tombs at Megali Magoula, Galatas may be read as either an effort for Kolonna-affiliated elites to reassert territorial authority over an increasingly contested region, or perhaps more likely given the construction of several tholoi at Mycenae in LH II, the celebration of victory for the Argolic-affiliated authority over this coastal, fortified centre.

[1] Konsolaki-Giannopoulou (2010: 72–3) stresses a MH III/LH I date for 'Tomb 3', though its classification as a tholos tomb seems more inconclusive.

Figure 12: View over the east coast of the Argolid over Palaia Epidauros on the Saronic Coast. Photograph by the author, facing north.

Figure 13: View over Korphos Bay and the LH III settlement of Kalamianos on the eastern coast of Corinthia. Photograph by the author, facing south-east.

4.5. Emergence of the Mycenaean Palaces in LH III

The remarkable increase in the median CPV's for all parts of the study area indicates that there was a greater use of inland space in LH IIIA (Figure 10). This is likely to have been a result of a process of a further 'filling-in' of the landscape, which is seen elsewhere across the Peloponnese (McDonald & Rupp, 1972: 138; Hope Simpson & Dickinson, 1979: 378; Cavanagh, 1995: 81–3), surely stimulated by the economic needs of the Mycenaean palaces and the stability they provided. It is unlikely that Kolonna itself was a palatial centre (Gauss, 2010: 746), though rich chamber tombs in the vicinity indicate that it still housed a wealthy elite. Evidence of a possible hiatus in occupation at Kolonna in LH IIB (Gauss, 2010: Table 55.1) speaks to a crescendo in competitive tension between Mycenae and Kolonna, with the hiatus intimating that Kolonna may have found itself on the losing end of this geopolitical struggle. Athens is likely to have been a substantial palatial centre and the growth of other centres within the study area, such Eleusis, Kanakia, Korakou, Perdikaria, Ayios Konstantinos and Ayios Ioannis Kazarma, indicate a reorientation of power.

The presence of a tholos tomb at Ayios Ioannis Kazarma, in addition to the presence of a closeby road, indicates the growing significance of this inland route (Hope Simpson & Dickinson, 1979: 51, no. A25). Given the Cyclopean nature of the construction (Figure 11), it is likely that this development is linked to the expanding power and territoriality of the palatial centres of the Argolid, seeking to secure a key inland route, which ultimately terminates on the Saronic coast at Palaia Epidauros (Figure 12). Indeed, the presence of LH III sherds and potential stretches of Cyclopean wall at Vassa (Hope Simpson & Dickinson, 1979: 53, no. A30) may also indicate a similar protection of another coastal route, this time heading towards Nea Epidauros. Perhaps most telling is the creation of the LH IIIA port site at Kalamianos (Figure 13) on Korphos Bay (Tartaron et al., 2011), with an unbroken view directly across to Kolonna on Aigina, marking the first such construction on the coast in Eastern Corinthia since EH II. It has been speculated that Kolonna may have played a role in suppressing the emergence of a palace state in Corinthia (Pullen & Tartaron, 2007: 157; Tartaron, 2013: 243) though with Ayios Ioannis Kazarma and Vassa, and their protection of land routes from the Argolic through to the Saronic Gulf, as well as the port at Kalamianos, there is a strong indication that this area now came under the sway of Argolic palatial centres.

5. Conclusions: Saronic coastscapes in the shadows of a giant?

The coastal proximity analyses presented in this study can assess several prevailing interpretations of socio-cultural developments in Saronic coastscapes. The assertion that most settlements were founded on the coastline (Siennicka, 2002: 189) is not demonstrably true, though it can be said that some periods (such as EH III and MH III–LH IIB) had a greater coastal focus. The suggestion that MH settlement pattern 'tradition' continued into the Shaft Grave period (Siennicka, 2002: 189) has some element of truth, with the MH 'tradition' representing one way of life centred on Kolonna, while the new Mycenaean culture, slow to be adopted in the Saronic, represented a way of life in orbit around Mycenae and the Argolid more generally. Kolonna does appear to have played a dominant role in Saronic power dynamics between EH III–LH II (Tartaron, 2013: 213; Siennicka, 2002: 190), potentially even earlier in the FN if the andesite exports are an indication of its central role at this early stage. The assertion that Kolonna reinvested its focus from external contacts to its neighbouring Saronic communities in LH I (Tartaron, 2013: 228) appears to be implied in the coastal shift that can be seen more generally in settlement patterns, in contrast to the MH.

In addition to evaluating previous assertions, new perspectives can be offered on Saronic coastscapes. Between EH I to late MH, there are hints at a localised interest at Kolonna in agricultural produce. This originally took the form of andesite millstone exports in FN–EH II Attica and northeast Peloponnese, but then was manifested in the establishment of the *House of Pithoi* in late EH II and the representation of seafaring on large storage pithoi in the MH. The island of Aigina, particularly the area that Kolonna is situated in, is moderately fertile and exchange patterns in the EH period appear to have held an agricultural component. The disruption of EH III appeared not to affect Kolonna so readily, though the construction of a fortification wall in this period may be telling. The general coastal distribution of EH III settlements in the region may have afforded a more militaristic community the opportunity to coerce and

control Saronic coastscapes. In addition, its agricultural and natural resources may have allowed Kolonna to generate favourable relationships with those EH III communities that remained, upgrading their role from that of a key participant in FN–EH II networks, to a central node. The creation of several fortified sites in adjacent areas is likely to have been stimulated by Kolonna and it is notable that these come in areas with access to arable regions or strategic bays. At the same time, exchange relationships were being forged with more distant trading partners, most notably Minoan Crete. Kolonna's access to resources and influence over exchange networks allowed for the localised generation of social stratification, if not already in EH III, then certainly in the MH period. It appears then, that the Saronic coastscape, particularly between EH III and MH III, was something of a 'hinterland' for Kolonna. A region to exploit agricultural resources and export Aiginetan ceramics.

The nature of its influence over the Saronic in the MH is open to debate. Some scholars have advocated for an economic influence, with Kolonna having a 'competitive advantage' and a connectivity network centred on 'preferential attachment' (Tartaron, 2013: 231–2), though here a more militaristic interpretation has been advocated. As is common in many maritime societies, for example in Viking (Raffield, 2022), Soloman (Irwin et al., 2019) and perhaps even Early Cycladic (Broodbank, 2000: 253) societies, the lines between trading and raiding can be blurred and dependent on political circumstance. The rise of several fortified or defensive sites in the Saronic region has been suggested here to have been a result of Aiginetan enterprise in controlling sailing routes, inland/coastal movement routes and arable regions. A martial element to society at MH Kolonna, however, is suggested through the warrior burial in the "shaft grave", in addition to the depiction of seafaring and armed individuals. This martiality is replicated later in the warrior burials in the shaft graves at Mycenae and the display of martial prowess, through iconography and bodily manipulation, may have been more for competitive display and as a coercive threat to the regions under the sway of Kolonna, rather than an actual daily reality (Georganas, 2018: 190–2). Control of trade routes and the promotion of Aiginetan products inside and outside of the Saronic Gulf enabled Kolonna to maintain its position of primacy, allowing its elites to competitively express their identity and to deploy sufficient military power to carry a threat if this system was challenged.

By the beginning of LH I, the Saronic region appears to undergo a transformation. Tartaron's argument that Kolonna appears to invest more in its neighbouring Saronic communities than previously (2013: 228) can be supported by the data presented here. This shift is likely to have been prompted by both the loss of direct Minoan contact, which shifted toward the Argolid Gulf, and the burgeoning power of the Argolic centres, forcing a reorientation of focus for Kolonna towards its Saronic coastscape hinterlands. This paper has argued that power was more decentralised between Kolonna and its connected settlements between MH III–LH II. From this point onward, the role of Kolonna in the region only diminishes, eventually to be replaced by Mycenae as the dominant regional power by LH IIIA. In light of suspected Mycenaean takeovers on Crete (Wiener, 2015) and Melos (Barber, 1987), a Mycenaean takeover of Aigina cannot be ruled out, whether through military or political means.

Sites along the Saronic coastscapes played important roles in intra and extra-regional contact, though were ultimately dominated Kolonna, particularly between EH II and LH II. A close reading of the spatial analysis data has allowed for a more nuanced interpretation of developments in the Saronic region. In some periods settlement patterns were more coastally focused, such as in EH III, when the fallout from the late EH II collapse and potential climate change meant that communities needed maritime connections to maintain their resilience in challenging times, avoiding habitation of the landscape interior. MH III–LH II also appears as another such high period for coastally-focused settlement patterns, taking advantage of Kolonna's greater local emphasis in the Saronic Gulf, while a colonisation of the interior lagged behind other areas such as the Argolid and Messenia. LH IIIA and EH II stand out as having a comparatively lower coastal focus to settlement patterns, which is likely to have been stimulated by the existence of stable centralised authorities encouraging a greater use of interior landscape areas. The MH period, that of Kolonna's zenith, stands somewhere between the two extremes. What stands clear then, is that greater societal coastal proximity is not necessarily connected to periods of more intensive maritime contact, rather appears to be connected to periods of greater social challenges, when maritime networks are an essential feature of maintaining a community.

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Supplementary files

This article contains a Supplementary File, accessible via https://doi.org/10.4995/var.2024.21694.

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