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Géoarchéologie des îles de Méditerranée

Géoarchéologie des îles de Méditerranée

Geoarchaeology of the Mediterranean Islands

sous la direction de
Matthieu Ghilardi

Avec la collaboration de
Franck Leandri, Jan Bloemendal, Laurent Lespez et Sylvian Fachard

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Sommaire

Kouphonisi (Greece): a briefly vibrant Roman harbourage between Crete and Africa

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Abstract

This paper explores the dynamics leading to the establishment of a relatively prosperous Roman settlement on the islet of Kouphonisi in Crete. The settlement was clearly comparatively wealthy, judging from its range of public buildings (including a bathhouse, theatre, aqueducts and cistern complexes) and the opulent decor of its private residences. What conditions generated such favourable economic circumstances for the inhabitants of this tiny arid islet lying in the Libyan Sea three miles off the southeastern tip of Crete? The location of the islet, which today seems remote and far-removed, is appraised within the context of its seasonal sea currents and favourable winds which facilitated its navigational connectivity with Roman markets operating in the wider Mediterranean. Already in the Hellenistic period, the islet's strategic importance was keenly recognised by the competitive cities of eastern Crete who vied for its control: however, these serendipitous circumstances, and the site's sustainability, were short-lived. The settlement's economic boom (born of its strategic position along the wider sailing routes of the Mediterranean) ended abruptly and permanently in the late 4th century AD. Finally, the paper examines the possible nature of the drastic forces which may have been responsible for the settlement's abandonment, thereby signalling the beginning of a process of desertification which persists today.

Introduction: The identification of Kouphonisi as Ancient Leuke

Kouphonisi is a small island with an area of 5.25 km^2 located in southeastern Crete (Figure 1), *ca.* 5 km off the modern cape of Goudouras (Figure 2). It is the largest of a small cluster of islands comprising the islets of Makroulo, Strongli, Trachila and Marmara. These islets are separated from the mainland by the narrow and sometimes dangerous strait, the *Dhiavlo Koupho*. Presently arid and deserted, it is difficult to imagine the bustling activity on the island in antiquity, when it grew from a Hellenistic foundation to a relatively wealthy Roman town (Spratt, 1865; Bosanquet, 1939-1940; Sanders, 1982; Papadakis, 1983 and 1985). The island has long been associated with ancient Leuke, the island frequently mentioned in the Hellenistic inscriptions of Crete (Viviers, 1999). The islet was so strategically important in the Hellenistic period that it formed the crux of a conflict between the two most powerful cities of the wider region, Itanos and Hierapytna (see Figure 2 for location of both sites), who fought over its possession. While Itanos and Praisos had been the main cities in eastern Crete in the Classical period (480-323 BC), from the 4th century BC on, Praisos exercised an expansionary policy that would significantly alter the territorial organisation of the region. From a late 3rd century BC inscription we learn that Praisos controlled both Setaia and Stalai and that the Stalitai were obliged to pay the Praisians a tithe on port taxes and taxes on murex and fish (*IC* III, vi, 7; Chaniotis, 1996; Figure 2). The epigraphic reference to the "islands of the Stalitai", under Praisian control, may also relate to Leuke and the surrounding islets. Firstly, the island cluster is situated directly opposite Stalai and Cape Goudouras; and, secondly, murex

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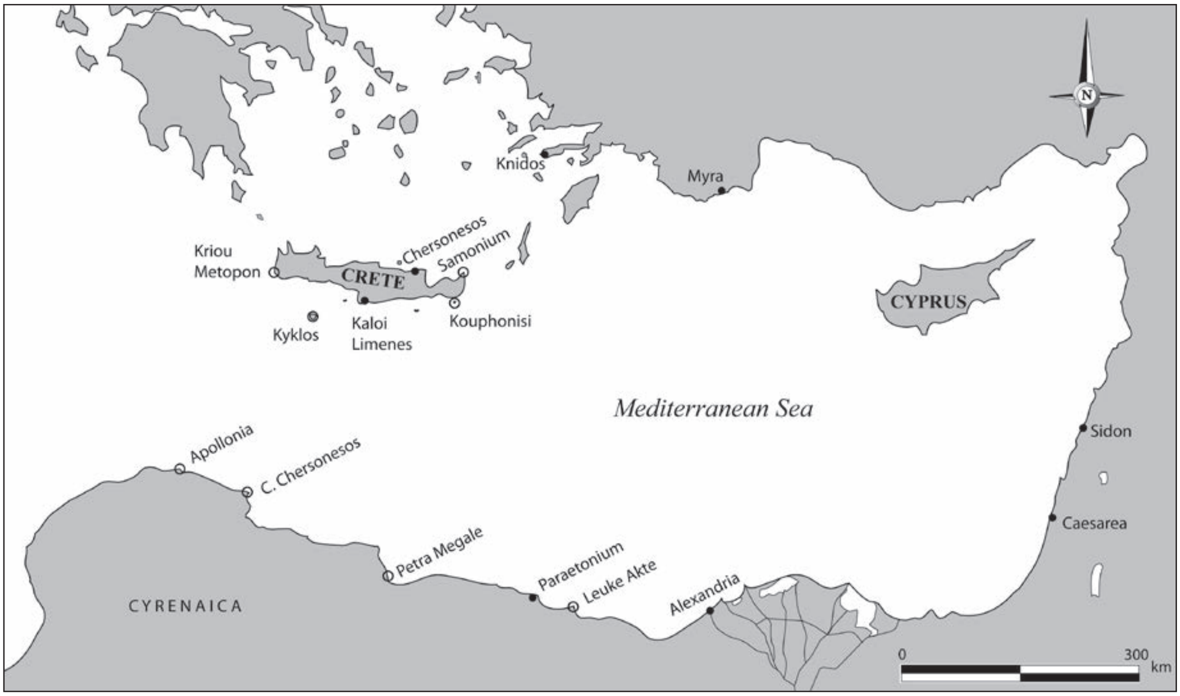

Figure 1: Map of the Eastern Mediterranean (after http://www.histgeo.ac-aix-marseille.fr/, N. Coutsinas).

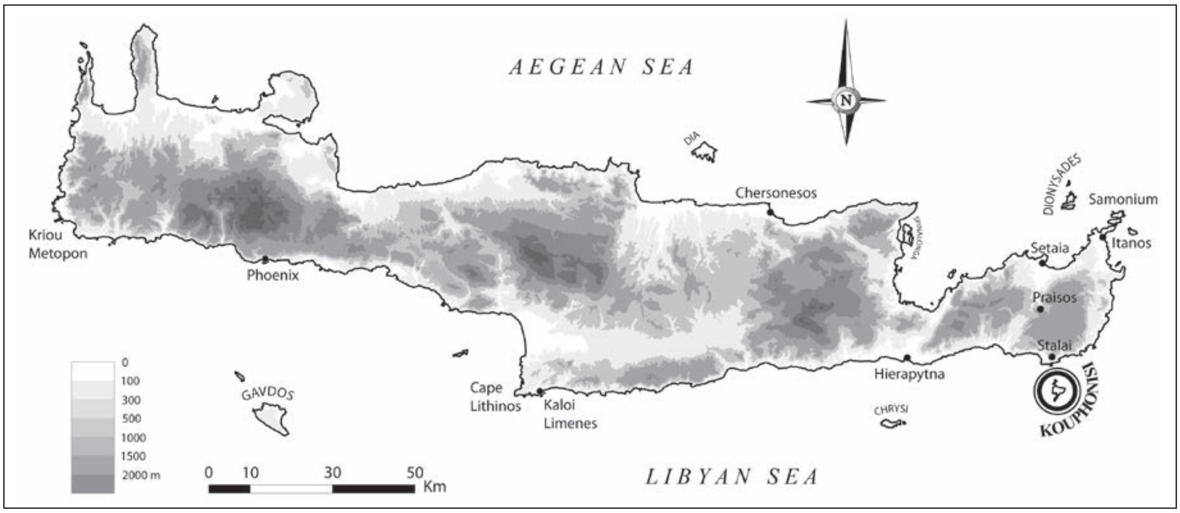

Figure 2: Map of Crete with sites mentioned in the text (N. Coutsinas).

production was an important industry on Kouphonisi (Bosanquet *et al.*, 1902-1903; Bosanquet, 1939-1940; Papadakis, 1983). Moreover, Stalai is mentioned in connection with Leuke in the 2nd century BC arbitration of Magnesia on the Meander in the conflict between Hierapytna and Itanos (*IC* III, iv, 9). In the middle of the 2nd century BC, Praisos was conquered by Hierapytna, shortly after which a conflict broke out between Hierapytna and its new neighbour, Itanos (Ager, 1996; Guizzi, 2001). The Hierapytnians wished to control the sanctuary of Zeus Diktaios and its lands, as well as the island of Leuke to which they considered having ancient rights through its prior possession by Praisos (*IC* III, iv, 9, 127)[1]. We are aware, however, that Leuke was then controlled by Itanos, since one of the garrisons pledged by Ptolemy II Philadelphos to Itanos had been founded on the

1. The famous arbitration inscription preserves a (fragmentary) letter sent by Hierapytna to Itanos concerning a certain ship, mention of which alludes to the existence of a trade route off the island's coastline.

island (*IC* III, iv, 9, 99-100; Spyridakis, 1970)[1]. After much deliberation, the court of Magnesia on the Meander eventually ruled, in 112 BC, in favour of Itanos. The importance of Kouphonisi in this dispute can only be fully appreciated through a study of its significance along sailing routes connecting Africa to Greece or Rome.

Crete - A Stepping Stone between Africa and Greece or Rome

Crete is equidistant from continental Greece, the Cyclades and Rhodes. According to the 4th century BC *periplous* of the Pseudo-Skylax, the distance between the Peloponnese and the region of Phalasarna in Western Crete could be covered in one day's sailing, where the most common standard for measuring distance and sailing time in antiquity translated 1000 *stadia* into 24 hours (a *nychthemeron*) of sailing (Arnaud, 2005). The island is also relatively close to Cyrenaica to the south (only 333 km; Figure 1), where the distance from Cape Kriou Metopon (in southwest Crete) to the coast of *Cyrenaica* could be covered in one day and one night of sailing (Ps. Skylax, *Periplous*, §47; Counillon, 2001), although this seems to be an optimistic estimate. Strabo suggested the longer sailing time between the two points (Kriou Metopon and Cyrenaica) of two days and two nights; he measured these distances from the harbour of Apollonia (in Cyrenaica), heading into the main winds which would have doubled the normal sailing time (*Geographica*, 10, 4, 5, 1-2; Arnaud, 2005). Alternatively, he calculated that reaching Egypt from Cape Samonium (on the northeastern tip of Crete; Figure 2) would require four days and nights of sailing (*Geographica*, 10, 4, 5, 4-5).

Evidence Supporting Connectivity between Crete and Africa

Early Historic connectivity between Itanos and Cyrenaica (loosely corresponding to modern Libya) is highlighted by a story in Herodotus, thought to relate to events in the 7th century BC (*Historiae*, 4, 151, 5-10; also Ptolemy, III xv 3). Herodotus relates that after a long drought, the Therans (from the island of Thera, modern Santorini) decided to send a colony to Libya, as the Pythia had instructed (the foundation of Cyrene is traditionally dated to 631 BC). Unsure of their route, they sought out a guide in Crete, eventually locating one at Itanos – the purple fisherman Korobios. Korobios claimed that he had already been to Platea, an island off the Libyan coast, when his boat was blown off course by violent winds, probably the *meltemi* that blow all summer in a north-northwesterly to south-southeasterly direction. Another famous biblical passage informs us of sailing conditions in the 1st century AD during the autumn and winter months. Saint Paul's journey from Caesarea Maritima (following his arrest in this city – see Figure 1 for location) to Rome (where he was to be tried) was famously related by his travelling companion, Luke the Evangelist (*Acts of the Apostles*, 27, 1-44; 28, 1-13 – for a detailed description of the journey see Pomey, 1997; Figure 1).

At the beginning of September AD 60 they embarked on a ship then docked at Caesarea Maritima. The vessel had journeyed there from Adramyttium, in Mysia, and was embarking on its return journey to Asia Minor. After a stopover the next day in Sidon, the ship sailed along the coasts of Pamphylia and Cilicia where it was sheltered from adverse winds by the landmass of Cyprus. On landing at Myra, in Lycia, they embarked on another vessel, an Alexandrian ship sailing for Italy. From Myra they made slow and difficult progress towards Knidos in Caria, from where they were forced, by adverse winds, to travel along the sheltered coastline of Crete, passing Cape Salmone (Samonium). They arrived at Kaloi Limenes (Fair Havens; Figures 1 and 2), near Lasaia, on the south coast of Crete with considerable difficulty, probably by the end of September AD 60 (the text records that the day of the fast was over, which is a reference to the Jewish Day of Atonement, or Yom Kippur, which takes place after the autumn equinox). The *kubernetes* (the captain) and the *naucleros* (the representative of the shipowner) had to decide if they would winter there or if they would find a more favourable location. Sailing was usually avoided in winter, for fear of storms and because cloud cover obscured the stars in high seas. The British naval captain, Thomas Spratt, who famously completed a detailed study of Crete as part of his broader surveys in the Mediterranean, cautioned when outlining sailing directions for Crete that Kaloi Limenes "Is ... not recommended as an anchorage to winter in" and notes that "there are no good ports ... on the south coast of Candia" (Spratt, 1861 and 1865). Nonetheless, the crew of Paul's vessel decided to proceed to Phoenix, a harbour situated further west at modern Loutro Sfakion. According to Spratt, it was "the only bay on the south coast where a

1. It is interesting to note, in terms of connectivity, that some of the theatre columns on Kouphonisi came from a quarry at Itanos (Papageorgakis *et al.,* 1994). Relations between Leuke and Itanos are also referenced by Pliny the Elder, although he mistakenly places the island opposite the Cape of Itanos (*Natural History*, IV, xii. 61).

vessel would be quite secure in winter" (Spratt, 1861). And indeed we know that the harbour was frequented by Alexandrian ships from the discovery at Loutro of a dedication to Egyptian gods dating to the reign of Trajan (Spratt, 1865). Evidence for a cult dedicated to Egyptian gods is also attested in the harbour of Poikilassion (west of Loutro) and Hierapytna (to the east; Reinach, 1911).

A violent north-east wind struck Paul's ship, probably when it had just passed Cape Lithinos (Figure 2), south of Matala, and pushed it on a south-westerly course towards the island of Cauda (modern Gavdos; Figure 2). There, the ship was somewhat protected by the islet, but on departing from this shelter, it was eventually forced to beach in Malta 14 days later. After waiting three months on Malta, the crew eventually continued their journey to Rome on an Alexandrian ship. This delayed departure pushed this leg of the voyage into mid-January AD59 which demonstrates that, even if winter sailing was considered difficult due to strong and sudden winds, it was, nevertheless, sometimes attempted.

A number of Roman shipwrecks discovered in the waters around Crete point to a degree of traffic plying the Cretan coast at this time. One such wreck, lying between Cape Samonium and the Dionysades islands at a depth of 43 m, is particularly relevant for this study (Preka-Alexandri *et al.*, 2012). The ship was probably about to round Cape Samonium to follow the southern coast of Crete when it hit the reef. The ship's cargo consisted mainly of type "Crétoise 2a" amphorae which date from the first half of the 1st century AD to the beginning of the 2nd century AD. These Cretan amphorae were designed to transport Cretan wine, catering for the thriving wine industry on the island which flourished in the Roman period (Marangou-Lerat, 1995). A second amphora type, "Tripolitanian 1", originating from the north African coast, and mainly found around Tripoli, was also identified on the wreck. These amphorae date from the 1st and 2nd centuries AD and were used for transporting oil to the western Mediterranean (Bonifay, 2004). In light of this dual cargo (made up of two amphora types from Crete and Africa), it is tempting to speculate that this vessel plied a route extending from Africa to perhaps Rome, featuring a stopover in Crete (among a chain of harbourages). While its cargo reflects the broader network of long-distance trade, it is important to recognise the role of local small-scale commerce and cabotage operating within, and alongside, these macro markets (Heldaas Seland, 2015; Horden & Purcell, 2000). Along the coast of Cyrenaica several capes are known to us from the ancient sources (Figure 1). The first is Cape Phycus, at the base of which is Apollonia (modern Ras el-Hamama), the port of Cyrene (Arnaud, 2005), mentioned by Strabo when measuring the distance between this point and Kriou Metopon (in southwest Crete) (*Geographica*, 17, 3, 21, 5-7). Strabo highlights the fact that, between Apollonia and Egypt, anchorages, shelters and watering places are quite rare along the north African coastline (*Geographica*, 17, 3, 22, 26-27). Strabo specifically mentions Catabathmos, a fort that was situated on the border between Cyrenaica and Egypt in the Ptolemaic period (it can still be found today on the border between Libya and Egypt where it is known as Sollum (el Salloum) – marked as Petra Megale on Figure 1). Otherwise the low-lying coastal terrain is hardly visible from sea and is exposed to violent winds. Moving east from Cape Phycus, we meet Cape Chersonesos (Ras-et-Tyn) which, Strabo informs us, has a harbour facing Kyklos island – probably Gavdos (ancient Kaudos; *Geographica*, 17, 3, 22, 30-31; Arnaud, 2005). Further east, there is a harbour, which Strabo locates facing Cretan Chersonesos (even if this site is located on the north coast of Crete; *Geographica*, 17, 3, 22, 33-37). This harbour certainly served as a daymark in the Gulf of Sollum and should probably be identified with the Petra Megale of Ptolemy, the Petras of the Stadisamus and the Petras Megas of the Pseudo-Skylax (Arnaud, 2005). Leuke Akte, modern Ras-el-Kanaïs, lies further east along the coast and Strabo mentions it along the route from Karpathos to Alexandria (*Geographica*, 10, 5, 17, 6-8). This cape was quite a distinctive daymark for ships because of its white prominent cliffs – from which its name derived – and the temple to Apollo perched on their summit. Many important navigation daymarks throughout the Mediterranean (including a range of promontories, islands and rocks) bear names incorporating the descriptor *leuko* (white), *e.g.* Leukos on the western coast of Karpathos (Nelson *et al.* 2015; for a range of other examples see Lefèvre-Novaro, 2000). Cretan Kouphonisi had a very distinctive daymark in addition to its white cliffs: a colossal sculpture of a seated figure rested on the top of a pyramidal podium (the steps of which are still visible today) overlooking the cliffs to the south of the island (Coutsinas & Guy, forthcoming). Given the distinctive attributes of Leuke Akte, it was arguably easier to set a course for this part of the coast rather than sail directly on to Alexandria, 1000 stadia further east (Arnaud, 2005). Moreover, the cape has a small protected bay that could be used for shelter while waiting for favourable winds.

The Route

While southbound journeys from Crete to Africa were facilitated by the *meltemi* (the Etesian wind), return journeys were necessarily indirect throughout the summer months when it was advisable to travel along the Levantine coast, Cyprus and the southern coast of Anatolia, in order to reach Crete and the Aegean from Alexandria, rather than risking a more direct route (Pomey, 1997; for a study focusing on Bronze Age sailing and navigation, see Lambrou-Phillipson, 1991). From September onwards, however, the regular north to south summer traffic, facilitated by the *meltemi*, tends to disappear and is replaced by the emergence of a system of more capricious currents which now allow trajectories directly to the north (as explained below). So it was possible, if one waited long enough in the season – albeit with the risk of turbulence – to travel directly south to north.

The Ierapetra Gyre

If one examines the northern part of the Crete-Egypt route in detail, we can understand the importance that Itanos and Hierapytna accorded to Leuke (Figure 3). In autumn, an anticyclonic gyre appears in the waters to the southeast of Crete (approx. diameter of 100-150 km). This feature is the "result of wind interactions with the relief on Crete and of ocean circulation in the Kasos strait[1]". It is a very rare phenomenon and only three other gyres are known in the world[2]: the Tehuantepec eddies in Mexico, the Agulhas eddies south of Africa and the Alboran eddies in the Gibraltar strait. The Ierapetra Gyre (Ierapetra being the modern name of ancient Hierapytna) appears, generally, at the end of summer and disappears in spring (Alhammoud, 2005). Its strength depends on the speed and direction of the wind. Figure 3 shows the winds and currents on a November day, when the Ierapetra current is quite strong (but not at its maximum), with speeds of 35-40 cm/second, almost a knot (1.852 km/h); at the same time, the northwest wind is weak, measuring 2-3 Beaufort where perceptible, but dropping to less than 1 Beaufort under the shelter of the island of Crete. The combination of these two phenomena facilitates a trade-route trajectory from the African coast to Crete. The way to the north through the Ierapetra Gyre ends inexorably at Kouphonisi (and extends along the eastern coast of Crete to Itanos). Indeed, the windless zone borders the western limit of the Ierapetra Gyre. The trajectory is extremely rigid but easy to follow, as once the vessel has entered the gyre from the south, it is certain to end in the windless zone and so arrive directly at Kouphonisi. Further west, there is neither current nor wind to facilitate a route to Hierapytna. When embarking from the eastern part of the Libyan coast or from Egypt, ships necessarily sail towards the eastern coast of Crete and not the southern coast of the island. On the other hand, when departing from Cyrenaica, the western route to Crete is more direct. It should be noted that the Ierapetra Gyre is not a regular phenomenon: it does not return at the same date or with the same characteristics (such as dimension in space and speed) which means that there must have been some favourable and less favourable years, depending on the climatic variations, or a weak Etesian wind (*meltemi*) causing the weakening of the gyre[3]. This direct route from Egypt to Crete seems to be recorded in the *Vita Hilarionis* of Saint Jerome where there is a reference to a stopover at Paraetonium (Marsa Matruh; Figure 1), on the border of Egypt and Cyrenaica, from where the saint sailed to Cape Samonium following an unknown itinerary (although this may have followed a direct route; see itinerary 95b on map page 212 in Arnaud, 2005; Jerome, *Vita Hilarionis* 34-36[4]). Preka-Alexandri

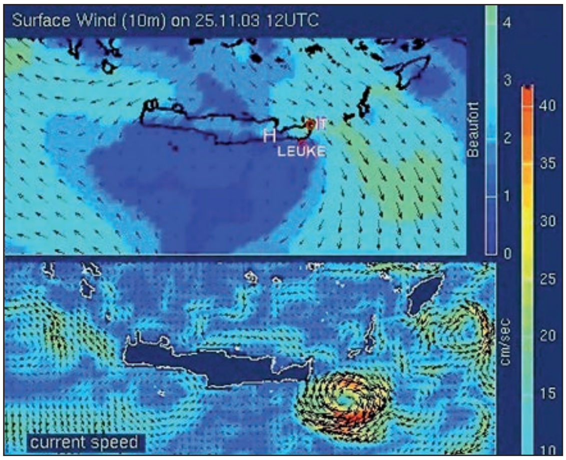

Figure 3: Current speed and surface winds around Crete 25.11.03 (http://mfstep.bo.ingv.it/ – Mediterranean Forecasting System Toward Environmental Predictions – project closed).

1. [http://www.aviso.altimetry.fr/en/applications/ocean/mesoscale-circulation/eddies-around-the-world/ierapetra-gyre.html] (Accessed November 23rd, 2015).
2. [http://www.aviso.altimetry.fr/en/applications/ocean/mesoscale-circulation/eddies-around-the-world.html] (Accessed November 23rd, 2015).
3. For variations in 2005-2006, see [http://www.aviso.altimetry.fr/en/news/idm/2007/feb-2007-ierapetra-gyre-pops-in-and-out.html] (Accessed November 23rd, 2015).
4. http://www.documentacatholicaomnia.eu/02m/0347-0420,_Hieronymus,_Vita_Sancti_Hilarionis,_MLT.pdf

et al. (2012) report that until World War II sponge divers used to return to Crete from the north African coast by sailing towards the Aegean sea. This modern parallel confirms that the route was possible, even if archaeological evidence for such voyages is lacking.

The Roman Settlement on the North Coast of Kouphonisi

Kouphonisi's strategic position along the shipping lanes that plied Crete's coast generated a degree of wealth for its inhabitants. A Hellenistic presence on the northwestern tip of the islet developed into a thriving Roman settlement equipped with a theatre, public baths, aqueducts and at least two opulent townhouses (Papadakis, 1980 and 1983). The capacity of the theatre would suggest a community on the islet sizeable enough to justify the construction of a substantial public bathhouse and a complex aqueduct system.

Kouphonisi's Water Supply System

The archaeologist Albert Leonard undertook a one-man survey of the island in the early 1970s subdividing the island into three main areas (Figure 5; Leonard, 1972). These three areas mapped onto the north coastal area, the southern coastal cliffs and the intervening plain. An architecturally-defined level area south of the theatre which Leonard interpreted as a possible *forum* (Leonard, 1972), seems instead to constitute two parallel aqueduct tracts (nos. 3 and 4). Today these tracts appear as lines of linear vegetation on approaching the settlement site from the south. It was Spratt who initially traced the low-profile aqueduct from the city to the higher ridge to the south where he identified a spring (Spratt, 1865). Leonard was, subsequently, unable to locate this source (Leonard, 1972) – although he mentions the two wells to the east of the coastal buildings which may also have supplied the settlement, or possibly sufficed for the earlier site (marked on Figure 4). It is highly plausible that the source of the aqueducts was located along the ridge dissecting the islet on an approximate southwest-northeast axis (Figure 4), as this geological fault line would serve as a natural barrier against which water might accumulate naturally while no hydraulic architectural remains have been located south of this ridge. It is perhaps no coincidence that the functioning wells are located just below this fault line, in the bay overlooked by the chapel of Aghios Nikolaos where the foundations of architectural structures are also visible in the low shrub. Leonard identified two water systems feeding the settlement (which he labelled 1 and 2); however, his plan now needs to be modified (in line with developments in aerial mapping technologies) in favour of a more extensive system which can be traced to the settlement's edge (compare Figures 4 and 5). The remains of an integrated aqueduct system, composed of tracts 1, 2 and 3 and its associated cisterns (incorporating Leonard's Water System 1), can be traced across the island's interior plain from as far south as the geological ridge to just south of the settlement (Figure 4). The overall distance, as the crow flies, from the ridge to the southern extent of the settlement is *ca.* 1 km. This integrated system consists of a low substructure wall supporting an aqueduct channel (visible along tracts 1 and 2), running on an approximate north-south axis and punctuated by at least three cistern complexes along its length. Tract 1 runs for 175 m but the substructure wall can be traced to the north for a further 75 m (in the form of Tract 2 which begins *ca.* 110 m further north of Tract 1, angling slightly along its course). This system seems to continue northwards, as Tract 3 can be traced in this direction as a linear vegetation mark (albeit incorporating a further slight angle) for a further 475 m towards the settlement's edge. A second aqueduct system comprises a separate tract (Tract 4 on Figure 4), which also survives as a linear vegetation mark, and its associated vaulted collection cistern complex located close to the settlement site. Given its close proximity to the settlement, this vaulted cistern complex (located 100 m south of the visible edge of the settlement – where its placement suggests that the settlement may have extended considerably in this direction), probably acted as a collection cistern (if not a redistribution cistern) for the site. Spratt observed that "in the plain to the south of the small tower or fortress are three vaulted and solidly built cisterns" (Spratt, 1865). Today the most southerly cistern complex, along tract 1, is the largest and most intact of any of the vaulted cisterns on the islet. It lies *ca.* 340 m north of the ridge and is constructed on an approximate north-south axis in line with the course of the aqueduct. The vaulted cistern complexes along the aqueduct's route must have served as settlement tanks (for both cleaning and incorporating shifts in direction along its trajectory) and as collection and distribution points at either end. They would also have facilitated water storage to ensure supplies during summer droughts, presumably controlled by stop-cocks which would regulate both water intake and outlet. Stop-cocks have been found at Knossos (see Kelly, 2013) and also in North Africa, at Volubilis and Djemila, where they are recorded regulating the water for private housing associated with tanks located along the main water supply system (Wilson,

Figure 4: Aqueduct tracts (N. Coutsinas).

2001). The aqueduct's substructure walls are low in profile, with the highest elevations along tract 1 (*i.e.* at the furthest distance from the settlement) where the channel dimensions are also largest. Here the aqueduct channel measures 0.35 m wide and 0.20 m deep, but these dimensions diminish slightly as the aqueduct approaches the town. The overall substructure is 0.70 m wide and stands 0.50 m high from the modern ground level, although the low elevation measurements are probably due to the topography and heavy sedimentation which obscure the structure's original height. The islet's terrain slopes gently from the ridge northwards towards the settlement which is founded along the northern shore. The aqueduct could, therefore, enter the city at a sufficiently elevated position to supply the private villas and the small public bathhouse founded at the water's edge. Within the city, water would otherwise have been redistributed to complexes through a system of pipes and water channels. A large section of a water channel, running on an east-west axis for a distance of 3.2 m, was traced to the west of the bathhouse (Figure 6; Papadakis, 1986). It pierces the eastern wall of section I of the bath and continues into area Z. Originally, the channel was supported on a low substructure wall (0.53 m high × 0.26 m wide) but silting in the area gives it a sunken appearance. Another roughly-built

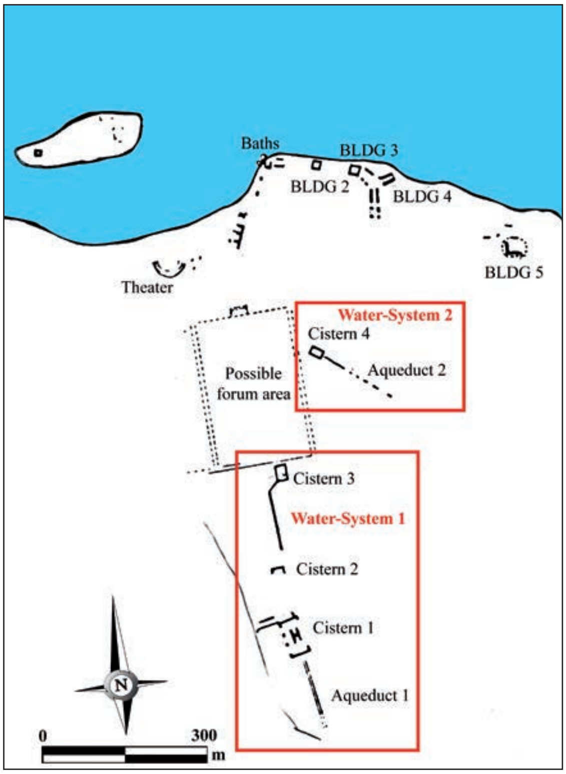

Figure 5: Sketch of the town and the Water-Systems (after Leonard 1972 and adapted by A. Kelly).

channel crossed the garden, area Z, on a north-south axis from area M. It is 17.50 m long with a height of 0.79 m, but its construction style suggests that it was a relatively later addition to the complex. In area Z of the bathhouse a terracotta pipeline, consisting of 17 separate pipes, was discovered running east to west (Papadakis, 1986). Each pipe was 0.50 m long, with the narrower ends attached to the wider ends and sealed with mortar. The pipeline was set in the ground in a double coating of mortar. The pipe terminated with a lead tube which acted as a miniature siphon (measuring 2.22 m long × 0.06 m in diameter).

The Public Bathhouse

The aqueduct fed a bath complex which was extensively excavated and published by Nikos Papadakis in the 1980s (Papadakis, 1986). Papadakis' reports include the following observations: the bathhouse featured an apsidal pool (Δ) which overlooked the sea to the northeast (Figure 6). The pool's apse lies to its eastern end while its western end incorporates a stepped bench, serving both for access into the pool and seating. The southern wall of the pool survives to a height of 2.82 m but the northern side has been badly damaged by sea erosion. The pool is faced internally with brick, which only survives in the lower tiers, while its walls and floor were also originally faced with marble plaques of varying shape, provenance and colour (Papadakis, 1986). In the centre of the floor a series of channels outline the base of a potentially decorative feature. A second pool (Γ) lies to the west of pool Δ, and, although badly damaged (where it has collapsed into the sea), it was clearly lined with *opus signinum* in keeping with a pool function (Papadakis, 1986). South of pool Δ, the walls and floor of area B are also veneered with marble. In light of this evidence, the black and white tesserae collected from this room must represent the flooring of another room, perhaps that of an upper storey. The room's function is uncertain but the excavator, Nikos Papadakis, suggested that it

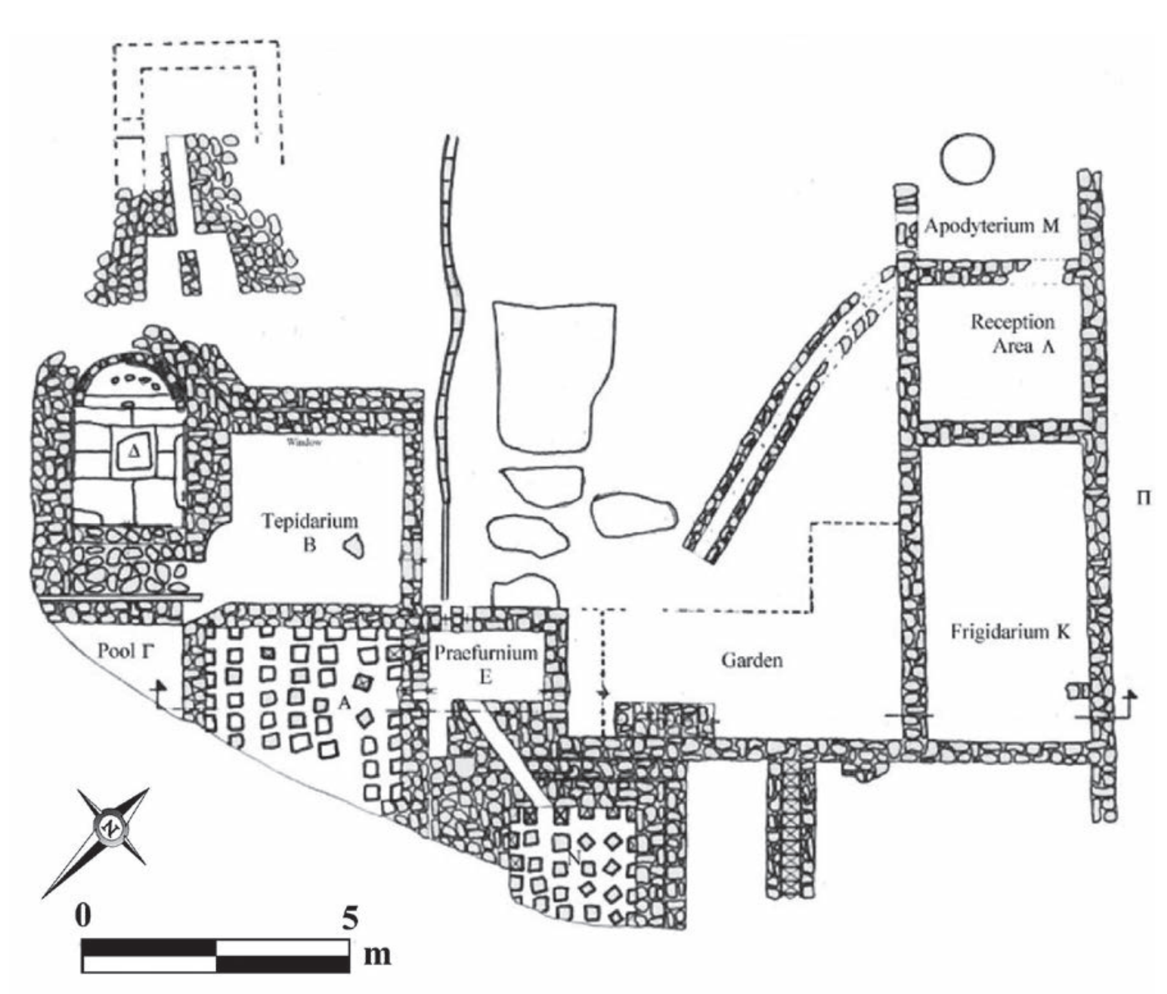

Figure 6: Bathhouse (after Papadakis, 1986, A. Kelly).

acted as an *apodyterium* or *tepidarium* (Papadakis, 1986). The main hypocaust (A) is located to the south of pool Γ. It originally consisted of 49 square *pilae* set in series of 7 × 7 m. In the southern wall a small brick arch, measuring 0.70 m × 0.40 m, communicated with *praefurnium* E. Another small hypocaust, N, is located to the west of *praefurnium* E with which it was connected via an arched opening. The ceramic *pilae* of this hypocaust were set in series of 6 × 5. This area represents a later extension to the bath installation and its construction modified the original eastern façade of the complex. The west wall of *praefurnium* E consisted of three different walls, each relating to a different constructional phase (Figure 6), and the addition of hypocaust N effectively blocked two arched windows. *Apodyteria*, reception areas or relaxation areas (areas K, Λ and M) occupy the southern block of the bathhouse which is bordered by street Π to the south. The floor of the largest room, K, was covered with burnt contexts which contained numerous lamp fragments, marble veneer, iron nails and fragments of wood, probably from the rafter beams of the roof, plaster and roof tiles.

Area Z is located in the centre of the complex and its associated stratigraphical contexts identified it as the open-roofed garden of the baths, a popular feature in Roman installations. The lowest contexts consisted of layers of earth and sand, ideal for plants, over which was a thin layer of earth containing traces of organic remains. The area to the west of the bathhouse was probably open to the elements, although this cannot be confirmed due to its damaged condition. A series of six stone steps (each with a width of 0.80 m and height of 1.7 m) were discovered along the western wall of area Z where they must have ascended to the roof of *praefurnium* E to access the second floor of the building. At the southern wall of area Z, near room K, extensive destruction layers were identified. Fragments of fallen wall painting, identical to that associated with the private house just south of the bathhouse, were discovered among the debris.

Overall, the bathhouse's ground-plan is relatively substantial, measuring 24 m × 16 m. Moreover, the complex must have had at least two storeys, as can be deduced from the stairs in area Z and the fallen tesserae found in area B. Its scale (and multiple pool areas) indicates that it could only have functioned using an aqueduct supply. The structural stages it incorporates also attest to a degree of functional longevity. The veneer, mosaics, fragments of wall painting, small finds and complex plan all point to a lavish public installation in keeping with the comfortable lifestyle of the islet's wealthy community (in line with its large and opulent housing blocks).

The Abandonment of Kouphonisi

While the town flourished during the Roman period (and most of its visible remains can be dated to the imperial period), the site's occupation was short-lived and questions remain regarding the site's demise. Excavations have shown that the settlement was destroyed at the end of the 4^{th} century AD and never reoccupied (Papadakis, 1983). While Papadakis viewed the site's demise as the result of an attack by Barbarians or fanatical Christians, his explanation remains unconvincing as such attacks have not been attested elsewhere on Crete. In contrast, one major catastrophic event stands out in the second half of the 4^{th} century AD: the powerful earthquake (8,5+ magnitude) of July 21^{st} 365 AD (for an analysis of the literary sources supporting a tsunami following the earthquake see Jacques, Bousquet, 1984). The event is presented in the ancient sources as a "universal" earthquake, and probably combines numerous earthquakes of the period (for the various references relating to "notable earthquakes that occurred between AD 355 and 450" and specifically the 363 AD event in Palestine see Stiros, 2001). An "Early Byzantine Tectonic Paroxysm" has been identified between the middle of the 4^{th} century AD until the middle of the 6^{th} century AD (Stiros, 2001). Regardless of its exact nature, this event inflicted widespread damage across the Mediterranean and, as its epicentre has been located in the Aegean arc, south of Crete, Crete itself was severely affected (for specific reference to Crete, including archaeological data, Stiros, 2001 and 2010). The earthquake of 365 AD may have affected Kouphonisi in three distinct ways: firstly, it may have destroyed the town, to the point of almost levelling it, as happened at Eleutherna and Gortyn (the capital of the island in the Roman period), in central Crete, and at Kissamos in western Crete (Stiros, 2001; for Gortyn see Di Vita, 2004). Leonard believes that the small islet of Marmara (now opposite the town) was joined to Kouphonisi in ancient times (which he bases on the presence on Marmara of architectural walling and mosaic flooring comparable with such evidence from the main settlement site). He attributes the islet's detachment from Kouphonisi to a seismic event – although he associates this destruction with a 6^{th} century AD event thought to have also submerged the harbours of both Mochlos and Itanos (Leonard, 1972). However, even with drastic levels of destruction in the 4^{th} century AD, the town on Kouphonisi could still have been rebuilt and life could have continued. Certainly, Gortyn was rebuilt and Stiros observes that the 365 AD earthquake "seems to represent only a rather minor cultural discontinuity in Crete, marking the transition from the Roman to the Christian era in the island" (Stiros, 2010). Consequently, in addition to the physical damage inflicted on the town's infrastructure, we should explore whether the broader trade network in which Kouphonisi operated was sufficiently disrupted to significantly affect the profitability of this port. Indeed, the cities on which the island depended economically (of which Alexandria represents the most important of those along the coastal Nile delta) were among those which suffered most from the aftermath (including tsunami damage) of the earthquake. Seismic activity pertaining to Crete was already noted in antiquity by Zosimus (Jacques et Bousquet, 1984) while elsewhere catastrophic events were noted by John Cassian, who was bishop in Egypt in the first quarter of the 5th century AD (Stiros, 2001). Further reports on Alexandria were made in the 4th century AD by Ammianus Marcellinus and the Church Father, Athanasius of Alexandria, while Sozomenos can be referenced for events in the 5th century AD (Stiros, 2001). Since Kouphonisi functioned as a stopover *en route* between Egypt and Greece or Rome, if one end of this route was removed or diminished the entire flow of trade would be severely interrupted. A similar hypothesis – *i.e.* the disorganization of the commercial network on which a site depended – was proposed by C. Tsigonaki to explain the progressive abandonment of Itanos in the 7th century AD, even before its sack by the Arabs (Tsigonaki, 2009). Nonetheless, in the case of Kouphonisi, this suspension of trade should only have constituted a temporary measure in the immediate aftermath of the event and trade should have resumed in line with urban recovery. Given the potential to otherwise rebuild the town on Kouphonisi and its likely re-engagement in the broader maritime network, we have to consider a third reason for the permanent demise of the islet's community. One factor which was vital for the continued settlement on the island was a secure water supply. Any disturbance to the island's groundwater would affect the aqueduct supply for the town. The island's only natural water source are two wells, previously noted by Leonard, located on the northeast coastline (marked on Figure 4). Today the island remains treeless while the interior plain is covered by low thorny scrub and shifting sand dunes; during his excavations Papadakis recorded an upper layer of sand was noted sealing the entire settlement where it was deposited by wind action (Papadakis, 1986). As noted, the source of the Roman aqueduct is thought to be situated somewhere in the middle of the island along the southwest-northeast oriented natural ridge fault. At some point, the source must have been destabilized or dislodged – either by the 365 AD earthquake or one of the series of subsequent events – resulting in the loss of the aqueduct's elevated water source which initiated a process of desertification on the island and sealed the islet's inevitable abandonment.

Conclusions

We have demonstrated that the geographical situation of Kouphonisi afforded the islet a strategic advantage in terms of coastal and deep-sea sailing and navigation in the Libyan sea. A series of conditions combined to establish the islet as an active harbourage within overarching trading networks operating in the Roman Mediterranean. The harbour income generated from call and transit (and probably also monies generated from taxes on murex and fishing) would have constituted an important source of revenue for any city controlling the island, explaining the early interest shown by Praisos, then Hierapytna and Itanos, where the latter city was particularly dependent on its maritime trade relations (Viviers, 1999). The islet's increasing profitability significantly affected relations between the city-states of east Crete during the Hellenistic and Roman period (on the Cretan economy see Chaniotis, 1999; 2005; Perlman, 1999; Viviers, 1999). By the Hellenistic period, the commercial potential of the tiny islet of Kouphonisi was already a significant factor in Crete's burgeoning involvement in the broader markets of the Mediterranean (as is attested by Ptolemaic interest in the island as a port of call). By the Roman period the maritime connections between Crete and Africa find their perfect political expression in the creation of the joint province of Crete and Cyrenaica. At this point, the Cretan capital was pointedly transferred from Knossos (with its north-facing harbour at Heraklion looking out towards the Aegean), to Gortyn, whose harbour at Lebena is oriented southwards towards the Libyan sea.

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