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(1) Reading the ecohistory of Eastern Mediterranean on fish bones, sea shells and fish hooks: evidence from the Sanctuary of Poseidon at Kalaureia, Greece.¹

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(2) How did people make a living off the sea in the past? What did the sea was like? What were the marine resources available to humans? How did exploitation by humans affect them? How did fish and shellfish contribute to the diet? How did people prepared and processed them? What was the social context of their consumption? What was the role of the sea and its resources in the economy? How did the sea and its resources contributed to the formation of the people's world views, of the religion, mythology, daily rituals? How did people perceive the seascapes? How did all these applied to specific locations and times? More specifically, how would these questions be answered for the multitude of the coastal communities of the Eastern Mediterranean through their history?

These questions are by no means new in the archaeological and historical discourse. Attempts have been made to answer some or several of these as early as the end of the 19th century, if not earlier. Despite this fact, these questions still remain open. Nowadays however, they are accompanied by a whole different, self reflecting and methodological set of questions. How can we know about all these? What sort of data can we use in our quest? Are the methodological tools offered by humanities enough or do we need the input of the life sciences and of the so called hard sciences?

¹ This presentation is based on past and current research of the author. This is the presentation text; the numbers in red correspond to illustrations in pdf (see accompanied file); bibliographical references are not included in the text but in the bibliographical note at the end of it.

All of us participating in this workshop would, I presume, answer "yes" to this last question. Yes, we need to collaborate. Yes we need inter-disciplinarity. Yes, we believe that we can only gain from such an approach.

But how do we go about doing it? How do we bridge the gaps between different scientific languages, different methodologies, diverse data resolution levels and different scales of analysis? These days more and more attempts towards this type of approach are made by archaeological and historical projects all over Eastern Mediterranean. The success of the results varies, but the intension is there.

Today I will talk to you about such a research program, one that placed inter-disciplinarity at its core and for which the marine element was quite important, although not central at the beginning.

(3)The setting of this Research program was the Sanctuary of Poseidon at Kalaureia, on the Island of Poros, a small island very close to the coast of the Peloponnesse on the southern part of the Saronic Gulf. (4)The Saronic Gulf is an area that witnessed important historical developments throughout Greece's history and its waters are among the most travelled ones all over the Aegean, for fishing, for commercial and military reasons.

(5)The Sanctuary of Poseidon was well known in antiquity for two reasons. It was the seat of an amphictyony, a confederation of 7 cities, and also it was the place where ancient Greek orator Demosthenes died. Despite its regional importance however, the sanctuary was left in the limelight of Classical research mostly because of its bad preservation during the last centuries. It was used as a stone quarry from people in the area, its buildings were demolished and the stones removed elsewhere, its metals were scavenged and its statues were melted in lime kilns to produce building materials.

(6)The first excavations on site took place at the end of the 19th century for two years and the site was almost forgotten until the very end of the 2nd millennium, when the Swedish Institute at Athens resumed research. (7)Work on the site took the form of two subject-specific research Programs, funded by the National Bank of Sweden. The first program had the title "*Natural Environment and Everyday Life at the Sanctuary*

of *Poseidon at Kalaureia*. The second was titled *The Sea, the City and the God*. Both programs are completed now.

As you can tell by the titles themselves, research in the sanctuary moved from the typical interests of Classical archaeology in sanctuaries, which in the past focused mostly on monumental architecture, art and inscriptions to more mundane matters, to the every day, to the physical and social environment of the sanctuary. Also, significantly, the issues of cult were approached through the materiality of cultic actions first, rather than through the written sources, as is usually the case.

The field methodologies applied were adapted to the research questions. (8) So documentation was state of the art. (9) We did systematic sampling (10, 11) and water flotation for the retrieval of the smallest organic remains such as these (12). We employed a range specialised analysis, such as the chemical analysis to pottery and the analysis of other amorphous substances, such as the fibbers preserved in within metal objects, or the organic lumps that proved to be bread or fruit cakes etc. Apart from the usual specialities in a Classical excavations, that is people working with pottery, architecture, metal finds, lamps, amphorae, etc... we had a diverse team of specialists who dealt with the various organic remains.

(13) Here it is.

These people are from different nationalities, different backgrounds, some in sciences and some in archaeology and they have different personal research interests.

In the Kalaureia Research programs the issue of inter-disciplinarity, was important and we made a special effort to achieve it. The results were not always successful, but some times they were. Whatever the outcome, however, we came out of it wiser.

(14) We realised that there are some ways that make inter-disciplinary approaches within a broad research program easier to achieve. One way was to place emphasis on contextualisation. We tried to examine our finds and discuss them in a temporal, spatial, geographic or cultural context-specific way. Also we found that working around specific themes, such as “dining in the sanctuary”, “sacrifices and offerings”, “provisioning”, “borders” etc. made integration more natural and easy. Such a subject-

specific approach also permitted the implementation of the third way to achieve inter-disciplinarity that is the combination of different approaches and different disciplines, to answer the same questions. In this process, the results were often contradicting each other and this was the actual strength of this method, because it forced us to find explanations or look for more ways to explore the issue at hand.

A number of issues around the sea and its resources were actually a focus of such an exercise in inter-disciplinarity. Here I will present the results that were produced around a simple question: was the sanctuary of Poseidon, the god of the sea, linked to any actual fishing communities in the area and how can we detect them?

Before I go on, I should make a parenthesis here to tell you that the sea-related elements found in the sanctuary and just outside it, are fish bones, marine molluscs and remains of fishing tools. Also, purely by accident we located marine algae. As the sanctuary is located at the centre of the island, some km away from the coast, we can be sure that all marine elements were brought on site deliberately.

(15) Excavation took place in several locations around the sanctuary. Not all excavated strata and deposits were equally informative from the point of view of the bio-archaeological remains, either because of poor preservation or because of their disturbed condition. Today I will talk to you about one particular area that proved very informative as far as the marine elements are concerned and which provided two closed contexts rich in organic remains. This is the area of the so called Building D. Building D was a stoa, situated within the sanctuary precinct, on its borders, near its entrance. (16) Building D had a cultic function as is evident by the two altars found near it and from the cultic objects found within it. It also had at least two dining rooms and two cisterns just outside it. The building itself dates from the Archaic to the Hellenistic times but it is underlined by another Geometric building. The upper fill of the cisterns is Roman, and dates to the 1st century AD. Here I will be talking mostly about the fill of one of the cisterns (D019), and of the so called “dining deposit”, an intentional accumulation of dining debris in a specially prepared space, just outside Building D.

Let me start with a very rich concentration of marine elements, the so called dining deposit (17).

The excavation outside the SW corner of Building D revealed an unusual feature. A large amount of broken pottery, small finds, animal remains and carbonised plant remains were deposited in this triangular area that had been prepared for the enclosure of these materials. It is interesting to consider the range of finds within this deposit (18, 19, 20, 21, 22, 23, 24). Even viewing the finds like this, in a list form, one can clearly see the food and eating related associations. (25) I will not go into the details of the analysis of this assemblage but I will give you an outline of the final interpretation.

At around 165 BC. a very large feast was held at the sanctuary of Poseidon: more than a hundred and fifty people ate and drank there together at a night time event. They consumed meat of kids, lambs, veal and pork, probably of animals which had been sacrificed before the feast. The menu also included eggs, chicken and a panorama of marine creatures, from rocky fish and migratory tunas to euryaline gray mullets and to limpets and top shells. Vegetal foods were also eaten during this feast. The food was boiled or stewed rather than roasted in a variety of small and large, deep and shallow cooking pots. Drinks, perhaps wine, were consumed during the meal. When the feasting meal was over, all pots and pans, cups and pitchers were broken. Some of the resulting refuse was deliberately heaped outside Building D, in a confined triangular space and covered by soil.

That is the broad picture. Lets now focus on the marine elements in this deposit and start uncovering some really interesting features.

The analysis of the fish bones revealed the following trends:

1. (26) In this dining assemblage are represented almost all the fish taxa that are found on site at all phases, that is 15 families with several taxa each. In other words, the assemblage includes all the fish that were caught in the area (and here is a visual representation of the variety of these fish).

2. (27)The fish range in size from over a meter long for tunas to about 15 cm for the picarel
3. (28)All the inshore fish, even the very large ones, such as the groupers, arrived on site whole, and we find bones from all parts of their body. On the contrary, the migratory, seasonal fish seem to have arrived beheaded. Only their vertebrae have been found.
4. The fish that have been identified in this assemblage represent three distinct habitats. (29)The inshore, mostly rocky waters, (30) the eutrophic, brackish waters of lagoons and estuaries and finally (31) the open waters from which fish approach the coast seasonally.

This is an interesting point. (32)The fish from the dining deposit seem to have originated from localities in the broader coastal area around Kalaureia and the nearby mainland coast.

The inshore fish and the sea shells that we found in the dining deposit exhibit the typical variety for this type of resource in the Aegean. (33)This is what a fisherman catches if he sets his nets or his hooks and lines near the coast: many species, represented by one or a few individuals each. The inshore fish found in the dining deposit could have been caught in any spot around the complex coastlines and the rocky islets in the area of Kalaureia.

The inshore fishing around Kalaureia is actually witnessed by another class of finds from the sanctuary. These are the fishing tools which probably entered the sanctuary as offerings and are found scattered all over the place. We have found several fish hooks of various sizes (and here is an example of them - 34) and also we found quite a few lead net sinkers. These finds are what survived from a variety of nets and from hooks and lines, tools regularly used near the coast in the past. None of these objects has been found in situ, but scattered in fills and re-worked soil, so we can not elaborate on the configuration of these tools. We can not tell for example whether the lead net sinkers were from a cast net, a gill net or other.

The second group of fish originated from brackish environments (35). Lagoons and estuaries are such typical places. Nowadays, the coast across Kalaureia on the mainland is rich in such environments and ancient sources speak of the presence of a coastal lake there which could harbor a rich euryaline fauna. It is interesting however, that such locations seem to have been exploited only for fish and not for shellfish. Shells that are typical of this type of environment are only present on site with one tiny fragment only. Also these environments were the source of special resources for the sanctuary, such as the water snakes which have been found in an unusual cultic context of Roman date.

Coastal lagoons are the most eutrophic aquatic environments on the Aegean coastline. In early modern times, from at least as early as the Ottoman period, from the 17th century onwards, these ecosystems had been systematically exploited. (36) A specialized capture technology had developed, which was also linked to fish preservation and trade. Its economic importance was locally so great that the exploitation of lagoons was state regulated and taxed. It is interesting, however, that although ancient Greek literature abound with references to gray mullets, the typical fish of the coastal lagoons, so far we have no indication, epigraphical, literary or archaeological for such a systematic exploitation of the rich waters of the lagoons. And at the sanctuary of Poseidon at Kalaureia, the fish from the lagoons are relatively few.

(37) The third group of fish found in the dining deposit, are those pelagic fish that are seasonal, migrating, approaching the coast twice a year. Nowadays, tunas and the like approach the area in spring and summer and again in autumn. The seas around Kalaureia are upwelling areas, which means that they are rich in nutrients and good feeding grounds for many fish and especially the seasonal. (38) The area has a tradition in this type of fishing. This photograph has been taken at a little cove on Methana peninsula, which is called “Thynni” (and here is this location - 390) . (40) It shows a permanent fish trapping device, designed to catch the migratory fish. This device is called *thynni* in modern Greek and has apparently given the name to the location. The name “Thynni” actually reflects the ancient word for the same type of establishment, which is THYNNEION (you might be familiar with this term in other languages: daliani, tonnara, almadrabas). You see what flimsy constructions they are!

Just an arrangement of wooden poles and nets. (41) In the drawing, you see the detailed arrangement of such a small scale thynni.

This interplay between place names, fishing methods, locations and history obviously reflects a long tradition of this type of fishing in the area.

The most tantalizing piece of evidence, however, is an inscription, roughly contemporary to our dining deposit.

(42)The inscription, describes the agreement between Troizen, on the mainland, and a neighboring unknown city, which according to some ancient historians was Arsinoe on Methana peninsula. A stretch of land on their borders was changing hands depending on the political situation and eventually both cities had developed economic interests on it and could claim the profits from them. (43)The resources from this piece of territory were considered common and the agreement on stone regulated the way in which profits should be shared. One of the resources that is referred to on this inscription are the common *thynneia*, the permanent nets, and of course the tuna catches. Also reference is made to revenues from salt pans. Salt pans are usually located in places of very shallow water, common in lagoons. Here the theme of lagoons emerges again.

One point to keep in mind is that since the revenues from tuna catching were worth putting on stone, they must have been considerable. (44) Ethnographic observation shows that the exploitation of this seasonal resource, the migrating fish, is a highly specialized activity, which involved specialized equipment, and communal labor. People anticipate the coming of the fish they set immobile nets on the coast in a manner that takes advantage of the habitual moving of the fish. Towers are erected for the fishermen to watch the movement of the fish. When fish are passing, on average and good years, very large quantities may be trapped.

(45) In older days, when rapid transportation and freezing were not an option, these huge quantities of fish required some form of preservation. So in areas of such abundance, salting establishments flourished. The fact that tuna catching was an equally complex and large scale venture also in ancient Greece is evident by

inscriptions from other places, such as the island of Cos for example, that describe the renting of tuna towers. It is also evident from renowned salted fish products from certain favored areas, such as the island of Thassos.

(46) So it seems to me reasonable to propose the hypothesis that such installations existed also in the area of Kalaureia or the mainland coast, nearby. The reference to the shared salt pans, adds credibility to such a hypothesis, since salt was one of the most basic ingredients in the fish preservation business. I remind you here an observation made on the tuna bones from the dining assemblage. They are all vertebrae; no head bones, no pectoral bones. In other words the body parts that are removed first when these fish are preserved, in order to avoid spoilage, are also missing from our assemblage. It could be reasonably suggested that the tunas brought in the sanctuary could be preserved.

The fish that were consumed and buried in the dining deposit varied a lot: they were of many species, of many sizes and from various different fishing grounds, caught by different fishing methods. It has become obvious by now, I hope, that these fish could not all possibly be caught by the same nets in one fishing effort, in the same location. This variety in size and taxa might just indicate that fish came in from different sources to supply the table. The large number of participants and the large numbers of small cooking pots in the assemblage may support the idea that fish were cooked and brought in small bunches. Probably different participants or participant groups were bringing their own fish and selfish in their own cooking pot (this is a scenario that is also supported by other lines of evidence such as the wood charcoal).

(47) So, all in all, in the dining deposit we have evidence for the existence of at least four sectors in a sea-oriented economy around Kalaureia: the inshore fishing, the brackish water fishing, the fishing of migratory fish and possibly the fish preservation. All found their way into the sanctuary.

Approaching the end of this presentation let me take you to another deposit now that witnesses the existence of yet another distinct sector of this sea-oriented activity, the purple dye production.

(48) Three species of purple shells, members of the Muricidae family are commonly found throughout the Aegean. The *Hexaplex trunculus*, the most abundant, the *Bolinus brandaris* and the *Thais haemastoma*, which is less common. Many such individuals have been found scattered all over the sanctuary, and two concentrations of crushed *Hexaplex trunculus* have been found in Archaic strata. (49) The most impressive find however comes from the Roman fill of Cistern D019. In that case, over two thousand purple shells had been found, on top of a pile of very strange items. (50) Glass vessels, skinned and eaten dogs, puppies, burned snakes, frogs, lizards, chicken, a crow and eggs, with very little pottery and even less charcoal or ash had been dumped in the cistern.

(51) The purple shells were intact, with no wholes or other alterations they belonged to the same species, the *Bolinus brandaris*. Their analysis shows that they had probably been fished in one locality, at one go. We can not be sure why the purple shells had been brought on site, but apparently they were involved in a process, or a series of processes that included all those unlikely elements that I described earlier. The analysis of the fill of the cistern suggests that we have the leftovers of offerings out of the ordinary, perhaps linked to the sphere of healing, augury or magic. It is possible that in this context, the purple shells had been eaten. Their large number however in a single closed context, implies their importance for some people in the area.

In the standard archaeological practice in the Aegean, even much smaller accumulations of purple shells are usually incorporated into discussions on the production of purple dye (52), a pigment that is produced by a gland of the shellfish. This used to be a prosperous business in several locations around the eastern Mediterranean as early as the Middle Bronze Age, which also flourished during the historical times. In this business, whole communities were involved. Fishing of the shells was only one element of their activity. The purple dye manufacturers, the cloth manufacturers, and all sorts of technicians were involved in the business.

(53) Ermione is a place on the Peloponnesian coast, a short distance SW of Kalaureia which was famous in antiquity for this type of product. Purple cloth from there had even reached the palace of Persian king Darius. This cloth was found by Alexander

when he entered the treasury and according to Arian Alexander was very impressed by the fact that a two centuries old cloth retained the brilliance of its purple color. The archaeological site of Hermione is nowadays strewn by crushed purple shells. Concentrations of purple shells have also been located in the area of Epidaurus, a close distance from Kalaureia. We could hypothesize that people working in the purple industry, probably from a place such as Ermione, came to the sanctuary as worshipers bringing their produce as offerings or as contributions to the feasting tables. Alternatively, it could be possible that a similar business was taking place somewhere closer at home. In this context the sack-full of over 2000 purple shells in the cistern would be especially meaningful.

(54) So, if we include this find, we end up having evidence for five sea-related activities in the sanctuary.

I would like to conclude this presentation by returning to basics: to the sea and its resources.

(55) Inshore waters in the Aegean, especially its southern part, form an extremely complex ecosystem. Coasts are mostly rocky, with small sandy patches here and there. The bottom gradient is very steep, so the waters become quite deep very near the shore, and the richness of the waters varies vastly from one location to the next. In essence the Aegean coasts form a string of alternating tiny ecosystems. (56) This is reflected to the ichthyofauna in these waters. It is characterized by a very large number of species, which however are found in very small populations in each location. Fishermen in these waters have developed a very elaborate fishing tool kit. A review Oppian's *Halieutics* of the 2nd c. AD, as well as a review of more recent works on traditional fishing in the Aegean, makes it clear that if you want to exploit these inshore waters you need to be able to use, many different tools and techniques, many of them quite crafty, which take advantage of the fish's biology and ethology. The capture of the parrot fish for example, as it is described by Oppian and by Leukadites (1941), authors separated by almost two millennia, is to catch a female fish, attach it to a line alive, and then drag it behind your rowing boat, thus attracting the male fish of the area, which you can then catch by a cast net.

In other words, to be a successful fisherman in the Aegean (and other similar ecosystems in the Mediterranean) you need to be very knowledgeable. Anthropological studies in various parts of the world have demonstrated that in traditional societies, learning the fishing skill, the transmission of this knowledge, requires the total participation of the trainee to the life of the fishing community, to all aspects of it. The mere absorption of information is not enough.

This is a very interesting point, because it makes us think that the successful exploitation of the marine resources in this area around Kalaureia, as this is attested by the evidence described above, presupposes the existence there of distinct fishing communities, some of which might have been specialized. These transmitted their knowledge to the next generation and were fully involved in the social and spiritual life of their communities. They became involved in the life of the sanctuary in an integrated way. The fishing communities were represented there as clearly as the farming and pastoral communities.

This is something important because in the discourse around ancient Greece, its economy and culture, the people who made a living off the sea, are almost invisible. Some of their produce appears here and there in various discussions, but they do so in a disconnected and rather faceless manner. Focused, comprehensive research on the topic however, makes it clear that there is for us a whole coastal world to uncover.

Thank you!

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Here follow some key publications on the issues discussed in this presentation, which include extensive references to the relevant literature.

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