ANCHOR FINDS FROM THE HARBOUR BASIN OF ANCIENT KLAZOMENAI AND CHYTON, TURKEY

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Introduction

Excavations to study the conspicuous submerged remains adjacent to the prehistoric site of Liman Tepe[1] on the southern shore of the Bay of Izmir, Turkey, commenced in 2000 with the aim of discerning their original function and history (Fig. 1; Artzy, 2000, Erkanal and Artzy, 2002). There are various theories about what the remains once were, such as a continuation of the large Early Bronze Age city wall that has been exposed to the south of the site or a portion of the terrestrial Archaic settlement, then called Klazomenai, that had submerged due to severe tectonic changes (Ersoy, 2004: 53). Another possibility is that the site is the remains of a harbour for one or more of the ancient settlements. The orientation of the two rubble-strewn major features, a large tongue shaped mole and a smaller (*ca.* 30 m) mole projecting from it seemed to be appropriate for this purpose. Had the structures been partially emerged the moles would have well-protected the basin that they encompass from the prevailing northern winds, including the direction of the greatest fetch. Eustatic sea-level theory would largely predict modest submergence of ancient harbours' moles (Nesteroff, 1972: 180).

In order to investigate these hypotheses, several excavation trenches were opened. It was within one of these, called Area E situated within the presumed harbour basin, that several finds of ancient wooden stock-anchor parts were exposed, leading to the conclusion that the site is indeed a harbour.[2] The anchor objects are two teeth[3] associated with fourth century BC stratigraphy, and a stone stock dating to the Archaic Period. This paper provides a preliminary description and analysis of these finds.[4]

Contextual situation of the anchor objects

These items were exposed during marine excavation of the sea-floor to the south of the larger mole, the area of the presumed harbour basin. The Area E trench is an approximately 10 × 10 m square oriented parallel to the run of the inner talus of the

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[1] The excavation was directed by Prof. Hayat Erkanal, in conjunction with the Ankara University Research Center for Maritime Archaeology (ankÜsam).

[2] For yearly reports of the excavation of Area E, see Erkanal, *et al.* (2010, 2011, 2012, 2014).

[3] For anchor teeth see Kapitän (1984: 42) and Haldane (1986: 165-166).

[4] All of which have been removed and have undergone desalinization treatment but have not yet undergone invasive investigation, such as cutting open the concretions.

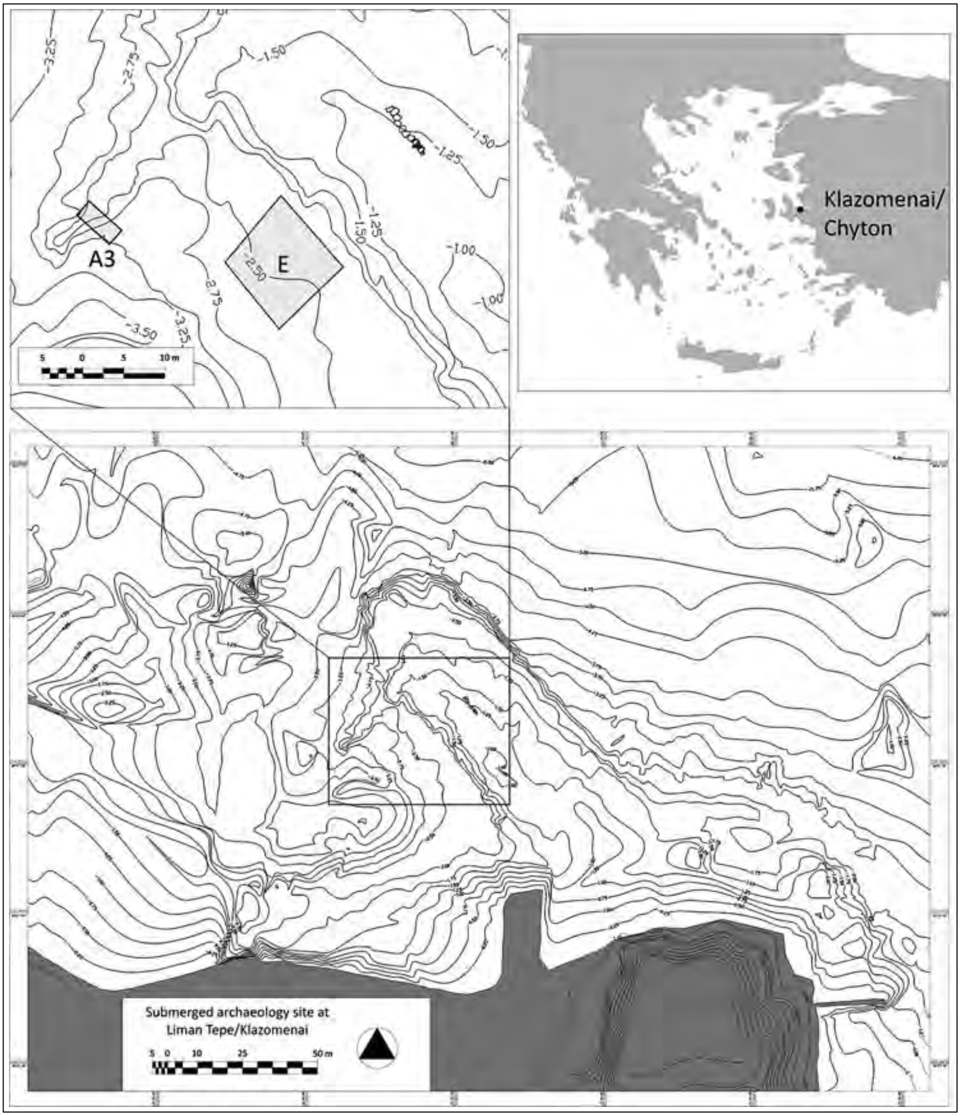

Fig. 1. Bathymetric map of the submerged harbour site with the excavation trenches mentioned in the text highlighted. The larger mole is conspicuous with its tongue-shaped form. The smaller mole is visible, with modest contours projecting from its southwestern talus. (Y. Salmon and G. Votruba).

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larger mole. The sea-floor is at a depth of *ca.* -2.5 m and, while currently largely bare, is surrounded by dense *Posidonia oceanica* seagrass meadows. Indeed, the uppermost stratigraphy, for *ca.* 1 m, proved to be *P. oceanica* matte (Votruba, *et al.* forthcoming; *cf.* Mateo *et al.* 1997), with a few anthropogenic finds that included sparse sherds of Medieval pottery representing past sea-floors. Protruding within the lower section of this *P. oceanica* matte appeared fragments of large pithos/dolia containers, some several meters in length, found within a lens of sandy sediment. Currently, these fragments and modest associated ceramics are in the preliminary stages of study, but it is feasible that they could represent a bulk pithos carrier that was wrecked upon the submerged mole, broke up, and was deposited on the mole's lee side during a storm (Artzy, 2000: 5, Erkanal and Artzy, 2002: 381). This appears to have occurred prior to Medieval times, while the culture of pithos carriers is particularly important in the early Roman Period (Heslin, 2011). The lens of sandy sediment upon which the pithos fragments rest is otherwise exceptional in the region and could feasibly have been the ballast sand of the ship, also serving the purpose to hold the pithos upright within the hold.

Immediately below the southward tapering sand layer, the maximum thickness of which is about 50 cm adjacent to the talus of the large mole, the earliest evidence of the enclosed harbour basin appears in the form of soft and highly malleable clay, along with a considerable amount of marine shells. These sediments were deposited and consolidated within the constricted basin formed by the two moles when their upper portions were emerged (Votruba, *et al.* forthcoming; *cf.* Marriner and Morhange, 2007: 175-177). Only a few centimetres down within this clay is a dense layer of material culture, including numerous ceramics dating to the fourth century BC, a period when the city was named Chyton. The palace of its tyrant, Python, may have been exposed nearby, along with substantial remains of the city generally (Özbay, 2004). Chyton was embroiled in a deep rivalry with Klazomenai, which had earlier moved to the adjacent Island, now called Karantina, under the pressure from Persian advance around 500 BC (Ersoy, 2004). When Chyton was founded in the late fifth century BC it largely followed the influence of Sparta, while the Klazomenaian islanders supported Athens. These hostilities may not have ended until Alexander the Great first constructed the causeway connecting the island and Chyton (Pausanias VII.III.9), which may have resulted in the complete abandonment of the latter.

The two anchor teeth were exposed amongst this *ca.* 30 cm of dense clay with fourth century BC ceramics and mixed stones, which may have been jettisoned ballast stones. Tooth no. 1 was found in an upright position (Fig. 2), which may suggest that it was attached to its set anchor when it separated and was lost. The orientation of tooth no. 2 was not recorded because its form is more obscure in its preserved state and was only recognized as a tooth, rather than an unusual cluster of stones, after it had been removed.

The harbour clay continues beneath this fourth century BC layer, but there is a brief lull in anthropogenic finds, which may be presumed to correspond to the period when Klazomenai had abandoned the area for the island and before Chyton was established. However, about 30 cm beneath the fourth century BC layer, dense Archaic Period ceramics appear that date to the late seventh or sixth century BC, which is presumed to be the period when the harbour was in use for Klazomenai, when it was located on the continent. This clay layer is again heavily populated by ceramics and unworked stones; however, in the northernmost corner a fractured half of a stone stock was recovered (Fig. 3). The stock was observed to be settled within the clay at -4.8/9 m, just above the final observed stratigraphic change (at *ca.* -5.0 m) which is again *P. oceanica* matte, representing the pre-harbour 'anchorage' sea-floor

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Fig. 2. Tooth no. 1 as found within the soft fourth century BC harbour clay, projecting into the northeast baulk of Area E. (G. Votruba).

(Votruba, *et al.* forthcoming). Within this Archaic matte at a different trench, while investigating the smaller mole (Area A3), a fractured wooden anchor arm, complete with its metal tooth, was found preserved in its original set position (Votruba and Artzy, forthcoming). Unlike the still set arm, in its fractured state the stock might be merely jetsam.

Description of the objects

We currently presume that the teeth were originally of iron because their hard concretion is characteristic of ancient iron (*cf.* MacLeod, 1982, 1987, Kingsley and Raveh, 1996: 20-21), which consists of a hard solidification of the surrounding material, be it clay, clasts, shells, or even large stones. The concretion has a base thickness around the metal of *ca.* 0.5 cm but is considerably thicker where large stones have become attached. Additionally, in both cases, at locations where the concretion has been inadvertently broken through, a reddish-orange rust-like material is observed within.

Despite the encrustation, the main contours are visible and are typical of the teeth of wooden anchors found elsewhere of similar age.[1] These are essentially protection

[1] For example, the fourth century BC Porticello (Eiseman and Ridgway, 1987: 19-21) and, also a find of iron from the *ca.* 300 BC Kyrenia shipwreck (van Duivenvoorde, 2012: fig. 6), and also possibly a well-preserved find from Heracleion-Thonis (Fabre, 2006: 220).

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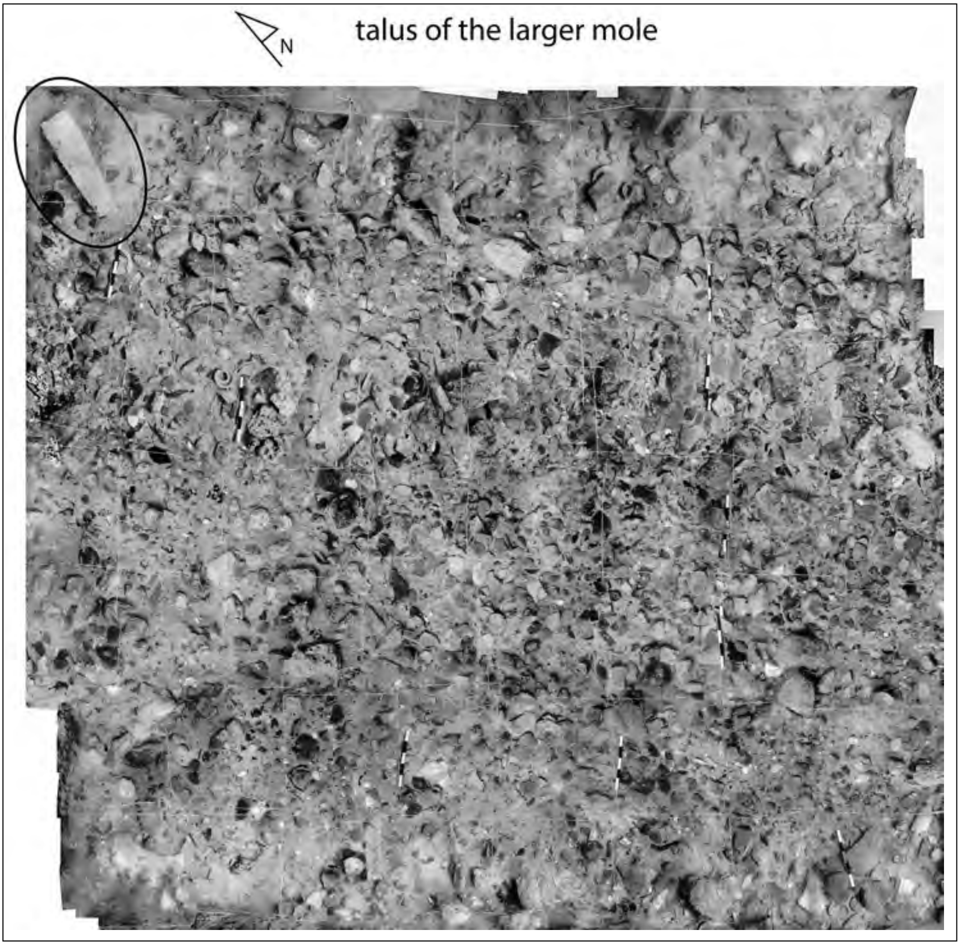

Fig. 3. Photomosaic of the exposed Archaic Period harbour stratigraphy at Area E, exposed in an area *ca.* 7 × 8 m. The stone stock is indicated in its *in situ* position. The scale bars are 50 cm. (M. Yaşar and G. Votruba).

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for the arm ends, attached by means of nails, while their nibs serve to help the arm-end find purchase and penetrate dense substrate to some extent (Figs. 4, 5). In addition to the nibs, both teeth also display evidence of the characteristic V-shaped opening in the front of the sleeve. This may have helped the shipwright to fit the tooth to the wooden arm and might have enabled the evaporation of sea water when the anchor was catted, minimizing the decay of the wood inside. As the concretions have not yet been opened, it is unclear if any of the wood remains are preserved within them.

The fractured stone stock was found lying upon one of its wider sides (Figs. 3, 6, 7). Apparently it came to rest within the silt of the harbour basin up to about half of its thickness, leaving the lower portion protected and the upper portion exposed to

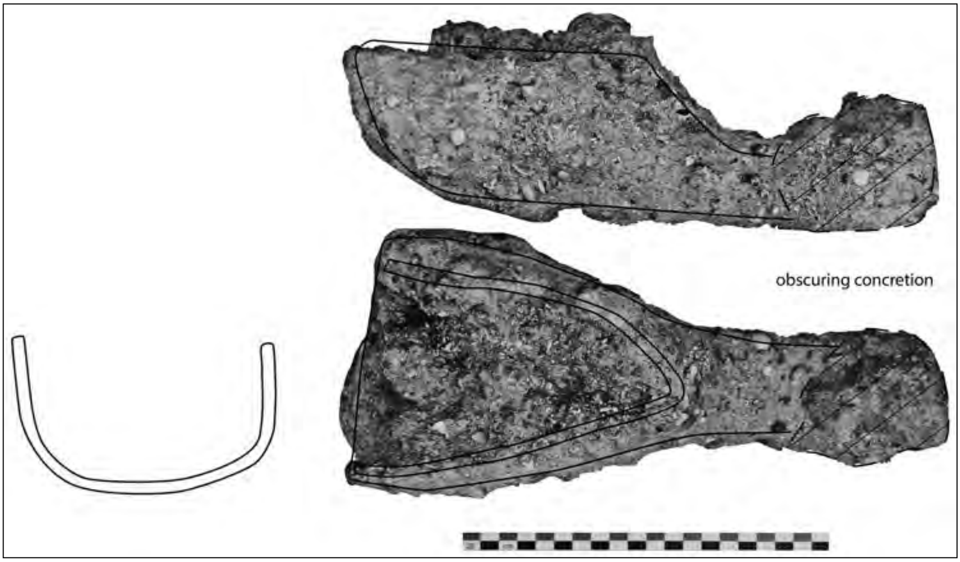

Fig. 4. Images of the concretion of tooth no. 1, with its contours highlighted (photo O. Kouka, drawing G. Votruba).

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the water column. The result is that the grey colour of the stone of the lower portion and the cut marks are preserved, while the upper portion is covered by a thin white patina of marine organisms and concretion residue. The upper portion also appears to have suffered particular damage at the upper end of its wing, which apparently, due to a slight tilt, had been exposed for a longer period. The wing end appears to be somewhat uneven and worn on the well-preserved lower face, suggesting that damage may have occurred there prior to the central fracture, putting into question whether the original length of the wing is still present. Often, such stone stocks have their arm tapering to an edge, such as an example from Aegina (Welter, 1938: figs. 13 and 14), which could suggest that it is missing *ca.* 10 cm from its end. However, other such stocks were formed with blunt ends as was an otherwise very similarly formed complete example from Syracuse (Fig. 8), leading to the possibility that the overall wing length may still have been preserved in this case.

Although only one half was found, it is clear that it originally served as a stone stock since its stepped inset is partially preserved at the broken end, which was cut on all four sides. This stepped inset would have accommodated the wooden shank of the anchor's superstructure. It is likely that, due to its relative symmetry, two enveloping shank-arm halves would have been shaped to fit taut within this cutting, as Kapitän has hypothesized (1982, Fig. 9), and as is apparently the case with the incompletely published wood-preserved find from the seventh century BC Mazarrón 2 shipwreck (Negueruela, *et al.* 2004: 478). Gianfrotta has suggested that the stone stock is characteristic of the Archaic and early Classical periods (1977), and the stratigraphic context of this example conforms with this theory. The fracture down the centre of its stepped inset inset may demonstrate that such a stone stock design was particularly

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Fig. 5. The concretion of tooth no. 2 and its visible contours.
(photo O. Kouka, drawing G. Votruba).

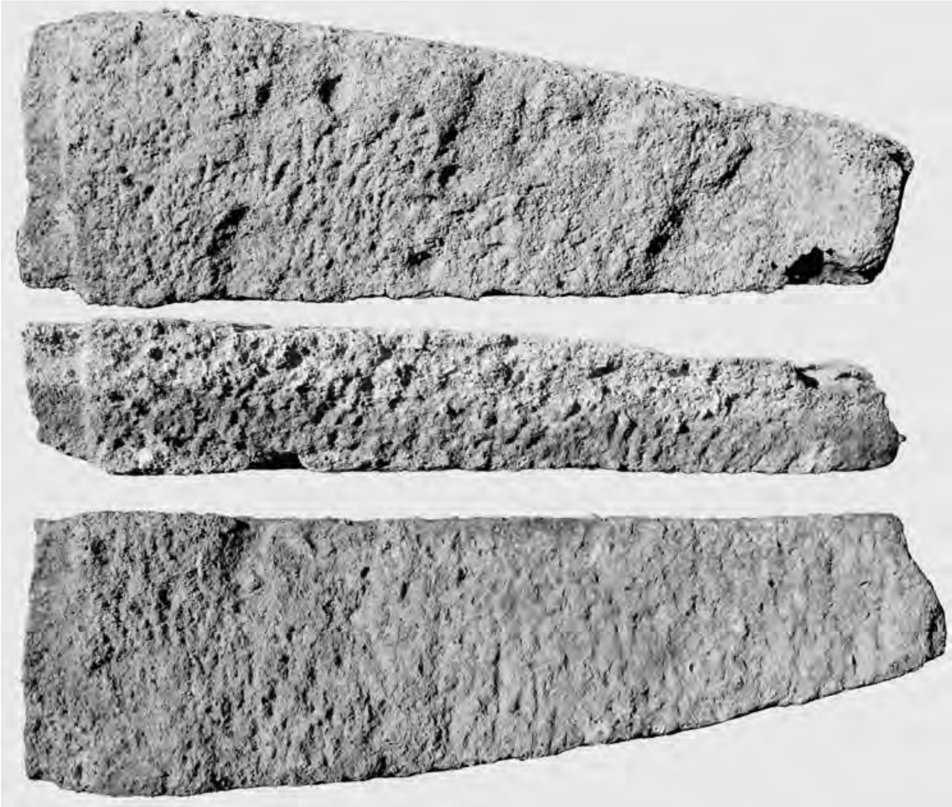

Fig. 6. Photographs of the stone stock, the upper being the upper facing side when found. (S. Mangaloğlu-Votruba).

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friable. The elastic wooden stock of the Classical Period that used lead cores as ballast was likely a well-received advancement when it was discovered (*cf.* Trethewey, 2001, Rosloff, 1991, 2003).

Indications of the Harbour

While these anchor finds confirm that the submerged features did indeed function as moles for a working harbour, they also provide modest evidence regarding the sizes of vessels that would have been anchoring. Considering its minimum 92 cm stock-wing length measuring from the stepped-inset edge, the authors are only aware of three other such finds that display equal or greater wing length – one from the South Bay of Dor/Tantura (Kingsley and Raveh, 1996: AN 121), one from Atlit (Galili and Sharvit, 1997: fig. 197 lower), both of *ca*. 92 cm length, and the largest being the famous Sostratos dedicated stock at Gravisca at 115 cm (Torelli, 1971: 55). The impression given is that the Klazomenai example is a relatively large find, suggesting that the ship that employed it was also large. Its grey limestone is also somewhat unusual for the region,

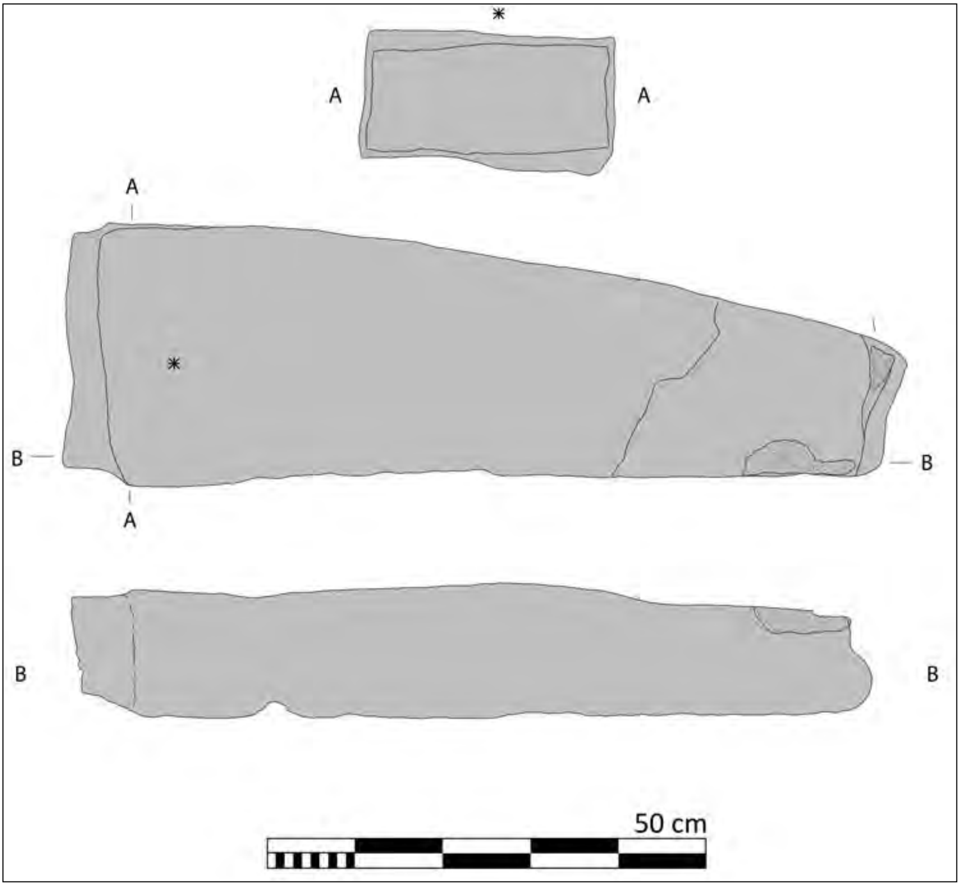

Fig. 7. Drawing of the stone stock. (R. Güler and G. Votruba).

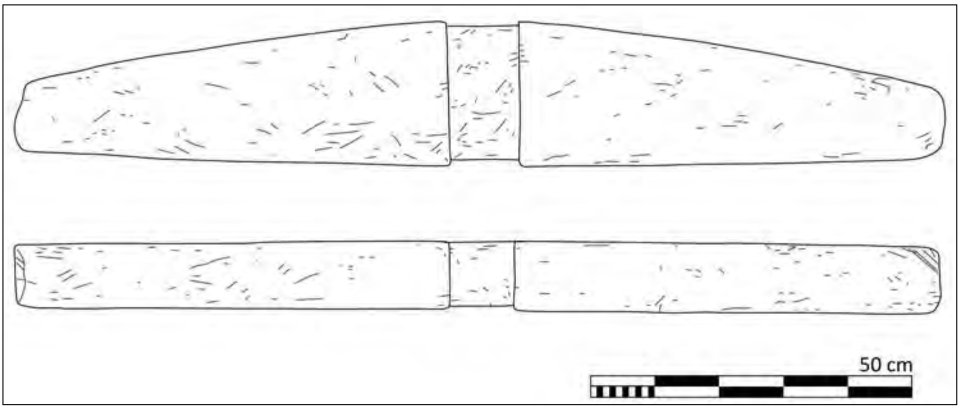

Fig. 8. A similarly formed complete stone stock find from Syracuse. (after Kapitän, 1982: fig. 2b).

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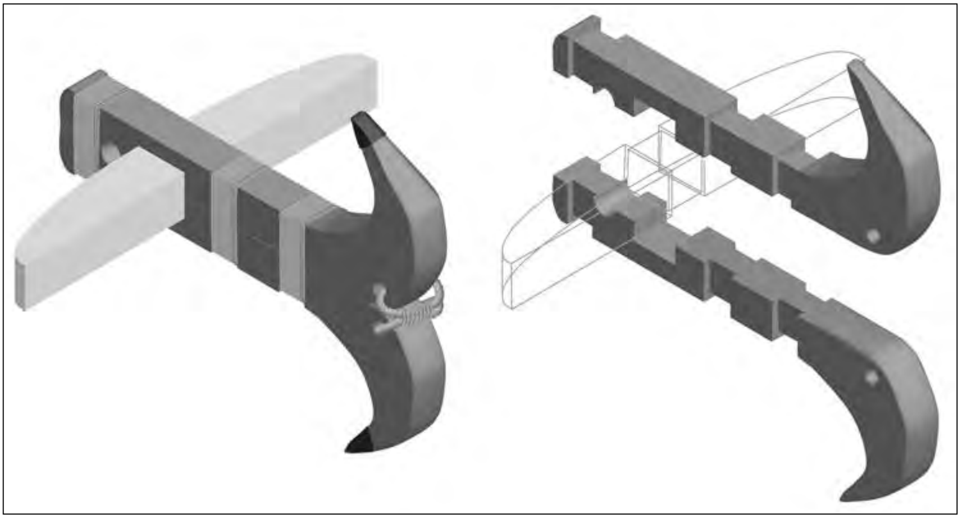

Fig. 9. Hypothetical illustration of the architecture of a stone-stocked wooden anchor. (G. Votruba).

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where a volcanic marl or white "Urla Stone" limestone variety are otherwise common, and is therefore likely of remote origin. Tooth no. 1 might also be considered relatively large, likely fitting within the range of those of the Porticello (26 to 32 cm) and Kyrenia (26 cm) shipwreck examples. Being perhaps half the size, tooth no. 2 may have belonged to a provincial boat of some type. The general impression is that this relatively modest-appearing harbour could have accommodated sea-going vessels of all sizes, as appropriate for important cities such as Ionian Klazomenai and Chyton.

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Abstract

Several parts of anchors have come to light during the excavation of the stratigraphy adjacent to mole-like submerged walls of Archaic Klazomenai and Classical Chyton. These finds include the teeth of the arms of wooden anchors and a stone stock. This paper preliminarily reports these objects with their chronological and spatial contexts, and they are compared to finds made elsewhere. These testify that the associated submerged features likely served as moles for a harbour and that relatively large ships were mooring in its basin. These objects are further informative documentation for understanding ancient anchoring technology.

Keywords: Klazomenai, Chyton, harbour, anchor tooth, stone stock, marine excavation.

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