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Harbour sites as a support to the reconstruction of networks and influences: the case of the Mistras Lagoon (Sardinia, Italy)*

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Abstract: Ancient harbours and anchorages are valuable contexts to investigate the different material culture that could reach a region, and to reconstruct ancient commerce and connections between different areas. Moreover, as they usually present waterlogged and anoxic sedimentation conditions, organic materials are preserved in addition to ceramics and other inorganic objects, giving more elements to the archaeological reconstruction. This is the case of the Mistras lagoon in Central-West Sardinia. The lagoon has been identified as the harbour of the city of Tharros, active during the Punic period, from the 7th to the 3rd century BC. It is characterised by an interior sandy barrier, recognised as a palaeobeach; here the University of Cagliari held two archaeological excavations during the years 2014 and 2015, revealing a natural stratigraphy rich in archaeological materials, typical of a waterlogged site. The analysis of the carpological remains, seeds, and fruits, recovered by sampling 29 different stratigraphic units, reveals the presence of a great number of cultivated species. Some of the species identified were possibly introduced during that period to the island, together with agricultural practices and technologies that improved local cultivations. Concerning the xylological remains found in the excavations, some fragments of manufactured wood provide important information about objects of common use, while other fragments are attributable to remains of ships.
Keywords: Tharros, Punic period, harbour archaeology, carpology, xylology.

Riassunto: Gli antichi porti e approdi sono siti di grande valore per ricostruire le antiche rotte commerciali e più in generale le connessioni tra diverse regioni. Inoltre, grazie alla frequente presenza di condizioni di sedimentazione anossiche, essi possono restituire non solo ceramiche e altri materiali inorganici, ma anche elementi organici, raramente preservati sui siti terrestri, che forniscono elementi aggiuntivi alla ricostruzione archeologica e paleoambientale. È questo il caso della laguna di Mistras, nella Sardegna centro-occidentale. La laguna è stata identificata come porto della città di Tharros in età punica, tra il VII e il III sec. a.C. Essa è caratterizzata nella parte interna da una cuspide sabbiosa, riconosciuta come una paleospiaggia; in quest'area, durante gli anni 2014 e 2015, l'Università degli Studi di Cagliari ha condotto due campagne di scavo archeologico che hanno consentito di indagare una stratigrafia di formazione naturale ricchissima di materiali archeologici, tipica di un sito

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impregnato d'acqua. L'analisi dei reperti carpologici, semi e frutti recuperati grazie al campionamento sistematico dei sedimenti, sta rivelando la presenza di un gran numero di resti di specie coltivate. Alcune di queste furono probabilmente introdotte nell'Isola durante il periodo in questione, altre sono già attestate durante i periodi precedenti e continuano ad essere sfruttate con nuovo impulso.
Per quanto riguarda i resti xilologici rinvenuti negli scavi, alcuni frammenti di legno lavorato forniscono importanti informazioni su oggetti di uso comune, mentre altri sono attribuibili a resti di imbarcazioni.
Parole chiave: Tharros, periodo punico, archeologia portuale, carpologia, xilologia.

INTRODUCTION (M. M.)

Ancient ports and harbours, due to their importance in understanding past societies and maritime landscapes, have long been a major subject for scholars studying coastal areas. In fact, through the archaeological materials found in these contexts, we are able to discover a wide spectrum of interactions at local, regional, and interregional level, not to forget their relationship with the city they served and its hinterland.

Moreover, thanks to their peculiar depositional environment, and in contrast with most terrestrial sites, harbour fillings are generally rich in plant remains preserved by waterlogging in anoxic conditions, such as wood, pollen grains, seeds, fruits, leaves[1].

One relevant case in ancient Sardinia is the Mistras lagoon, in the northern part of the Gulf of Oristano. Interdisciplinary research allowed its identification as the harbour of the city of Tharros during the Punic period[2]. According to geomorphological data the lagoon changed its conformation over the centuries, passing from a protected bay to the actual configuration thanks to natural sedimentary processes favoured by the construction of monumental structures[3].

The present contribution focuses on some preliminary results of the excavations held by the University of Cagliari[4] on the sandy barrier present nowadays in the interior part of the lagoon, attributed to an ancient beach[5].

The peculiar depositional conditions, combining a stratigraphy characterised by an alternation of sand, mud, and seagrass of *Posidonia oceanica* (L.) Delile with waterlogged conditions, created a favourable environment for the preservation of plant remains, mostly wood and carpological remains. The stratigraphy is also characterized by a high presence of scattered ceramic material, mostly fragments of Punic transport amphorae, and of

1 SADORI *et alii* 2015: 217-218.
2 PASCUCCI *et alii* 2018: 280-282; DEL VAIS *et alii* 2020: 886.
3 DEL VAIS *et alii* 2008: 409; PASCUCCI *et alii* 2018: 275-276; DEL VAIS *et alii* 2020: 881-882.
4 The excavation was made under ministerial concession to the Departement of History, Cultural Heritage and Territory of the University of Cagliari, under the direction of Prof. Carla Del Vais (Concessione di ricerche e scavi archeologici DG Prot. 4892, Class. 34.31.07/345.2, 21/05/2013), that we thank for involving us in the study and for allowing us to present in preview the results.
5 PASCUCCI *et alii* 2018: 273-275; DEL VAIS *et alii* 2020: 882-883.

archaeozoological remains. In some measure the archaeozoological remains, and some of the carpological ones, could originally have been the content of the transport amphorae or other vessels, as already documented in several Sardinian contexts as the Santa Gilla lagoon[6], the harbour of Cagliari[7], Nora[8], the Santa Giusta lagoon[9], and the harbour of Olbia[10], as well as outside the island in the anchorage of Torre la Sal in the Iberian Peninsula, inside a Punic transport amphora attributed to a central Mediterranean production[11], not to forget eastern Mediterranean contexts such as Iron Age Beirut[12].

THE WOOD ELEMENTS (M. M.)

During the excavations a relevant number of wood elements were recovered, totalling several thousand of finds (Fig. 1)[13]. Their complete analysis and evaluation are underway, but many of them could be identified simply as natural wood remains which landed on the beach thanks to the sea action or other sedimentary processes.

Manufactured wood pieces were also recognised. Small objects of parallelepiped shape proceed from different stratigraphic units; their attribution is uncertain, but they could eventually be interpreted as joints, wedges, or supports, while other manufactured objects in poor preservation conditions can also be some kind of waste derived from the fabrication of larger objects.

The use of wood was attested in the fabrication of common objects already known from other artisanal categories. A clear example is a dish, preserved for half of its shape in four fragments that can be assembled. It can be punctually compared with ceramic objects found in Archaic contexts, suggesting a dating to the first half of the 6th century BC[14].

Small findings are also quite interesting. Perhaps one of the most intriguing is an object composed of three assembled parts. A cylinder, more or less 3 cm long, is crossed longitudinally by a thinner cylindrical element; a flat rectangular element is inserted perpendicularly to the outer cylinder. It may be part of a hinging mechanism originally composed by several elements juxtaposed one on top of the other. A good, even if not identical, comparison for this closing mechanism can be found in the writing set discovered on the Bronze Age shipwreck of Uluburun, in Turkey[15]. However, in the absence of other

6 VIVANET 1892: 35; 1893: 256-258; SOLINAS, ORRÙ 2005: 249.
7 SANNA *et alii* 2010: 106; SANNA 2019: 44-47.
8 MARINVAL, CASSIEN 2001: 124-128; POPLIN 2014a; 2014b.
9 FANARI 1988: 100; DEL VAIS, SANNA 2009: 132-133; 2012: 209, 215-217; UCCHESU *et alii* 2017a: 542; SABATO *et alii* 2019.
10 PALLARÉS 1986: 113.
11 WAGNER 1978: 323; RAMON TORRES 1995: 47.
12 BADRE 1998: 114.
13 DEL VAIS *et alii* 2020: 884; MUREDDU *et alii* 2020.
14 SECCI 2000: 256, fig. 12, a-b; GUIRGUIS 2004: 77, fig. 12, 7; SECCI 2006: 178, fig. 37, 25; DEL VAIS, SANNA 2012: 214, fig. 13, 633.
15 PAYTON 1991: 101-103.

elements, it is not possible to attribute the hinge to an analogous writing set, as it could also be part of the closing mechanism of some other item.

Another wood fragment deserves a close analysis. It is a piece of frame, probably proceeding from a ship or a boat. It is luckily preserved at the exact point of a junction. This fact enables the identification of the assemblage system used, which is a mortise and tenon pegged joint. This method is widely used in shipbuilding from the Classical and above all from the Hellenistic period in almost all the Mediterranean, and most scholars agree in determine its origin in the Levant, at least since the Bronze Age[16]. In the western Mediterranean it is first documented on ships related in some way to the Phoenician and Punic cultural influence, like the Mazarrón shipwrecks on the coast of Cartagena[17], and the Binissafúller one in Minorca[18]. Significatively another context in Sardinia where this type of assemblage is documented is the underwater Punic context of the Santa Giusta lagoon, in the central part of the Gulf of Oristano[19].

XYLOLOGICAL ANALYSIS (F. S.)

Xylological analyses were held on the wooden manufactured materials, enabling the identification of the essences used for the fabrication of the objects (Fig. 2).

After their recovery, the wooden remains were stored in boxes immersed in a solution of distilled water, to allow their optimal preservation. To allow the taxonomic identification analysis, samples were taken in small fragments from the objects, in portions not visible or already partially damaged, so as not to compromise the original vision of the wooden object.

The xyloremains were analysed using a reflected light metallographic microscope (Nikon ECPLIPSE ME 600), allowing the achievement of high magnifications (40x-100x) to permet the taxonomic diagnostic observation of the anatomical-cellular systems of the woody tissues, which are unique by genre and plant species. Methodologically, the taxonomic diagnostic investigation takes place by inspecting three fundamental sections of the wooden fragment: transverse, longitudinal tangential and longitudinal radial[20].

The taxonomic analysis defined that stone pine (*Pinus* cf. *pinea*)[21] is absolutely predominant. In the lower layers of the excavations, it is present in 90% of the analysed materials, while in

[16] MEDAS 2000: 93; POMEY 2009: 358-359; PULAK 2008: 303; DE JUAN FUERTES 2017: 65-68.
[17] NEGUERUELA 2005: 24; GUERRERO AYUSO 2008: 107; DE JUAN FUERTES 2017: 71; CABRERAS TEJEDOR 2018: 304-307.
[18] DE JUAN FUERTES *et alii* 2010: 62; DE JUAN FUERTES 2017: 75.
[19] DEL VAIS, SANNA 2009: 34-35; 2012: 208.
[20] CASTELLETTI 1990: 321-333; DI PASQUALE 2011: 36-51.
[21] SCHWEINGRUBER 1990: 127.

upper layers it reaches 80%. There is also evidence of the use of evergreen oak (*Quercus* type *ilex*)[22], olive tree (*Olea europaea* L.)[23], and mediterranean heath (*Erica multiflora* L.)[24].

One can say that among the Archaic and Classical Punic levels, the numerous parallelepiped-shaped objects are made of stone pine (*Pinus* cf. *pinea*) wood, while the many fragmentary remains are made up of stone pine, and also evergreen oak (*Quercus* type *ilex*) wood. Only for the Classic Punic levels, in smaller numbers, there are xyloremains of probable artifacts in olive (*Olea europaea*) and mediterranean heath (*Erica multiflora*) wood.

From the xylo-taxonomic results, it could be argued that there was an obvious intention in the choice and specific use of these woods. These taxa probably fully met the technological needs for the manufacture of such artifacts, in particular for those, most likely, related to the structures of boats.

Pine is a wood suitable for shipbuilding. It is a compact wood having as well elastic properties, without or with few knotty elements (ease of working) and, above all, the trunk, being generally straight, offers a good advantage in the manufacture of the masts and planks of boats.

Similar is the oak wood, in this particular case the green oak, also widely used in shipbuilding, in particular in the masts, as compact and leathery wood, not particularly elastic, but with a long and straight parting[25].

In the case of olive and mediterranean heath wood, they may have been used for building small and medium-sized artifacts. The olive tree is a gnarled and twisted wood, not easily workable for large elements, heather, being a shrub, cannot provide particularly large artifacts. The advantage of using these two species is that they are two rather hard woods, suitable for the manufacture of strips, seals, or cylinders for the unification of various elements.

One important observation was that in many xyloremains there were clear traces of combustion, which certainly favoured their conservation even in this humid context.

What cannot be defined with certainty is the origin of the wood and hence of the artifacts, as taxa identified in the diagnostic analysis have a fairly broad phytogeographical distribution: the entire Mediterranean basin. Therefore, they could be either local works and raw materials or come from external inputs to the island.

CARPOLOGICAL REMAINS (M. M.)

Other plant macroremains represented in the analysed contexts are seeds, fruits, and leaves that give us hints about the exploitation of the surroundings, the palaeoenvironment, and on

[22] SCHWEINGRUBER 1990: 402-403.
[23] SCHWEINGRUBER 1990: 573.
[24] SCHWEINGRUBER 1990: 369.
[25] GIORDANO 1981: 659-666; GUIBAL, POMEY 2002: 96-100.

economy and networks (Fig. 3). These small remains were recovered by the systematic sampling of the sediments, processed by wash-over in laboratory using different mesh sizes, from 1 mm to 0.25 mm. The carpological remains were then selected and identified using a stereo-microscope (Euromex NexiusZoom, magnification 6.5-45x), and finally preserved under waterlogged conditions. About one hundred samples were collected, ranging from a volume of 2 l up to 20 l for the most interesting layers. A total of 52.333 macroremains have been selected at this time, and 130 taxa identified. However, as the complete study of all the materials is still ongoing, as well as more specific analysis and quantitative considerations, we present here only some preliminary results and general remarks.

A small number of cereals and pulses are listed, and they are found only under charred conditions. In fact, in contrast with other organic materials, they are not well preserved in waterlogged environments, and especially in salt water[26]. However, it was possible to identify remains of hulled barley (*Hordeum vulgare* L. subsp. *vulgare*), free-threshing wheat (*Triticum aestivum/durum/turgidum*), and lentil (*Lens culinaris* L.). These crops are attested in Sardinia since the Neolithic[27]; during the period under consideration cereals and pulses have been recorded in the site of S'Urachi, in the northern part of the Sinis peninsula[28].

Among the fruit plants one of the most representative species is the grapevine (*Vitis vinifera* L.). Seeds, pedicels and sometimes even fruits are perfectly preserved and easily recognisable. Archaeobotanical analysis in Nuragic contexts have already revealed that vine growing started in Sardinia during the Middle Bronze Age, presumably also with secondary domestication events held on the island[29]. At the same time, chemical residues analysis show that wine production was already established in Sardinia during the Nuragic period[30], presumably to some extent as a consequence of the different influences coming from the Eastern Mediterranean[31].

For the periods under study, the Archaic and especially the Classical Punic period, we can at least hypothesise a significant improvement in the cultivation of this plant, as a result of the changed political, economic, social and cultural factors. Besides, the role of Phoenician people in the spread of viticulture in the western Mediterranean has already been underlined[32], and *V. vinifera* remains are well attested in Punic Carthage[33]. Concerning Sardinia, the huge number of grape seeds found in all the waterlogged contexts of this period, as in the case of Nora[34], and the Santa Giusta lagoon[35], as well as in the investigations on

[26] JACOMET 2013: 499-500.
[27] UCCHESU *et alii* 2017b: 6-7.
[28] VAN DOMMELEN *et alii* 2018: 153; PÉREZ-JORDÀ *et alii* 2020: 6.
[29] UCCHESU *et alii* 2015: 594-596.
[30] PERRA *et alii* 2015: 109-111; DAMASCO *et alii* 2020.
[31] BOTTO 2016.
[32] BUXÓ 2008: 147-148; PRADOS MARTÍNEZ 2011; PÉREZ-JORDÀ *et alii* 2017: 535; 2021: 7.
[33] VAN ZEIST *et alii* 2001: 31; KROLL 2007: 852.
[34] MARINVAL, CASSIEN 2001: 124-128.
[35] DEL VAIS, SANNA 2009: 133; 2012: 216; SABATO *et alii* 2019: 11-12.

production sites as Truncu 'e Molas[36], seems significant in that sense. At the same time, Tharros pollinic record shows an increase of *V. vinifera* during the 5th-3rd century BC, a noteworthy information, even if pollen does not enable a distinction between the wild and domesticated subspecies[37].

Well represented among fruit crops is also the olive tree (*Olea europaea* L.)[38]; its presence in Archaic and Classic Punic Sardinia has already been highlighted in Santa Giusta[39], and S'Urachi[40].

The fig tree, *Ficus carica* L., is omnipresent; this species is already well documented in Sardinian Bronze Age sites[41], and it is commonly attested in Archaic and Classic Punic sites, when the archaeobotanical data is available[42].

A few, but important remains of plum (*Prunus domestica* L.) represent another parallel with the findings of the Punic context of the Santa Giusta lagoon, where the presence of this fruit was first recognised[43]. This confirms, at the actual state of knowledge, the supposed period during which this fruit plant was first introduced on the island.

Another fruit probably brought to Sardinia thanks to the bonds created by the presence of the Phoenicians, is the pomegranate (*Punica granatum* L.). We cannot establish whether the plant was already cultivated on the island during the Punic period, but the presence of the fruit is attested in Mistras by several seed remains. Besides, the role of the Phoenician people in the diffusion of this fruit is suggested by the analysis of iconographic and literary sources, and by sporadic findings in archaeological excavations in other regions of the western Mediterranean basin[44]. Significantly seed remains of pomegranates were recently identified at S'Urachi, in a context dated between the mid-7th and the mid-6th century BC[45].

Several nutshells were recovered, in particular of hazelnut (*Corylus avellana* L.), almond [*Prunus dulcis* (Mill.) D. Webb.], and pine nut (*Pinus pinea* L.), all species already detected in the Santa Giusta lagoon[46]. Hazelnuts and pinecones were also found in the harbour of Olbia, inside Late-Punic transport amphorae[47], and in some of the Punic amphorae found in the Santa Gilla lagoon[48].

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36 VAN DOMMELEN, GÓMEZ BELLARD 2012: 262; VAN DOMMELEN *et alii* 2012: 507-509.
37 ACQUARO *et alii* 2001: 48-49; DI RITA, MELIS 2013: 4279-4280.
38 MUREDDU *et alii* 2022.
39 DEL VAIS, SANNA 2012: 215; SABATO *et alii* 2019: 11; MUREDDU *et alii* 2022.
40 VAN DOMMELEN *et alii* 2018: 153; PÉREZ-JORDÀ *et alii* 2020: 6.
41 SABATO *et alii* 2015: 208.
42 MIOLA *et alii* 2009: 915; VAN DOMMELEN *et alii* 2018: 153; PÉREZ-JORDÀ *et alii* 2020: 6.
43 UCCHESU *et alii* 2017a: 544-547.
44 PEROTTI, SECCI 2016-2017; TORRES GOMARIZ 2017: 628-636; NIGRO, SPAGNOLI 2018: 59-63.
45 PÉREZ-JORDÀ *et alii* 2020: 6.
46 DEL VAIS, SANNA 2009: 133; 2012: 216; SABATO *et alii* 2019: 11-12.
47 PALLARÈS 1986: 112.
48 VIVANET 1892: 35; 1893: 258.

Moreover, the presence of melon (*Cucumis melo* L.) and black mulberry (*Morus nigra* L.) is attested, both already known in Sardinia in the Bronze Age[49].

Instead, the presence of coriander (*Coriandrum sativum* L.), documented here for the first time in Sardinia, constitutes an absolute novelty. This species, which is one of the oldest aromatic crops[50], appears in the western Mediterranean during the 1st millennium BC, according to the remains found at Carthage[51], Sicily[52], and the Iberian Peninsula[53].

Among the spontaneous plants which could have been harvested and consumed, we underline the presence of common myrtle (*Myrtus communis* L.), and thornless blackberry (*Rubus ulmifolius* Schott.).

The recognised wild plants are particularly important as palaeoenvironmental indicators. Species connected to wetlands are abundant, as the sea clubrush [*Bolboschoenus maritimus* (L.) Palla], the widgeon grass (*Ruppia maritima* L.), the rush (*Juncus* Tourn. ex L.) and the lesser bulrush (*Typha angustipholia* L.).

The strong presence of ruderal species is more eloquent in terms of correlation between man and landscape, indicated by the remains of plants such as the corn marigold [*Glebionis segetum* (L.) Fourr.], the turnipweed [*Rapistrum rugosum* (L.) All.], the sowbane (*Chenopodium murale* L.), the curly dock (*Rumex crispus* L.), the sun spurge (*Euphorbia helioscopia* L.), and the common poppy (*Papaver rhoeas* L.), to cite only a few of the species identified. All these plants are typical of cultivated areas and pastures, and more in general associated with ruderal areas affected by a strong human impact. These data on the spontaneous vegetation seem to coincide with other palaeoenvironmental analysis available for the territory, which indicate an exploitation of the landscape already evident from the 2nd millennium BC, and progressively increasing during the Punic period, in particular from the 5th century BC[54]. However, during this last period the persistence of a certain degree of arboreal coverture is also detectable, together with a certain variety of the crops[55].

In the final analysis and interpretation of the carpological assemblages, it will be important to consider which processes contributed to the deposition of the remains and to the formation of the stratigraphy. Some remains, mainly the ones belonging to crop species, could have been in some measure part of the cargo of boats and ships anchored in the bay, lost perhaps during transhipment operations. On the other hand, we cannot forget the role

49 SABATO *et alii* 2015: 208.
50 ZOHARY *et alii* 2012: 163.
51 VAN ZEIST 2001: 30.
52 STIKA *et alii* 2008: 144.
53 PÉREZ-JORDÀ 2020: 146.
54 FEDELE 1980: 95; 1983: 648-649; LENTINI 1993: 193-194; 1995: 132; ACQUARO *et alii* 2001: 48-50; DI RITA, MELIS 2013: 4276-4280; LENTINI 2014: 855.
55 ACQUARO *et alii* 2001: 48-49; DI RITA, MELIS 2013: 4279-4280; LENTINI 2014: 855-856.

of currents and natural depositional processes in the transport and sedimentation of all these small elements, especially concerning the wild species[56].

CONCLUSIONS (M. M.)

The study of the wooden elements revealed some interesting data, even at this preliminary state. In particular, the fragment attributed to the frame of a ship confirms the use of the area as a harbour, and its significance is even more relevant, as it attests the use of a Punic architectural shipbuilding technique. Other wood remains, such as the dish, prove the use of perishable materials in the fabrication of everyday objects, something that can be attested only exceptionally in dry contexts. In addition, the fundamental contribution of the xylological analysis gives a more complete framework of the wood elements and helps in their interpretation and in the definition of their technological characteristics.

Data about the carpological remains enable some general considerations on the exploitation of Tharros hinterland. Cereal growing, as important as it may have been, does not seem to be the only agricultural activity; the frequency and variety of fruits attested in the archaeobotanical assemblages speak in favour of a variegated agriculture held in the territory, even considering that some of the products found on the site could be imported. Anyway, it can be stated, as in other cases in Sardinia[57] and in further western Mediterranean regions, that since their arrival Phoenician people played an important role in the development of fruticulture[58], thanks to the trade and introduction of new domestic plants, as well as new varieties of already known ones.

The importance of the rural penetration during the Classic and Late Punic periods, linked to agrarian activities, has been underlined in vast areas of the island[59]. In the territory of Tharros this agricultural expansion is well attested by research on the rural sites of the hinterland[60], and can thus be linked to the influence of Carthage on the central Mediterranean regions. The dominance of the North African city and its political project directed, or at least reinforced, the impulse towards the extensive exploitation of the resources of the hinterland[61]. It seems then significant that Sardinian amphorae, in particular those attributed to Tharros and more in general to the central-western area of the island, are frequently found in Carthage[62]; this seems to indicate that the local production was not only intended to fulfil

[56] CAPPERS 1993; ANTOLÍN *et alii* 2017; STEINER *et alii* 2020.
[57] UCCHESU *et alii* 2017a: 546-547; SABATO *et alii* 2019: 13-14.
[58] PÉREZ-JORDÀ *et alii* 2021: 8-9.
[59] VAN DOMMELEN, FINOCCHI 2008; ROPPA, VAN DOMMELEN 2012; VAN DOMMELEN, GÓMEZ BELLARD 2012: 255; ROPPA 2013: 67-100.
[60] TORE 1991; STIGLITZ 2011; DEL VAIS 2014.
[61] BARRECA 1988: 34-38; MOSCATI *et alii* 1997: 73-74; BERNARDINI 2009: 192; DEL VAIS 2014: 106; GARBATI 2014-2015: 105, n. 93; SECCI 2016: 112-113.
[62] BECHTOLD 2013: 430-431; DOCTER, BECHTOLD 2021: 169, 173, 176-178.

local needs, even if this was probably the main destination, but was also in part meant to be exported towards the North African city[63].

Finally, the evidence of a wide variety of cultivated plants, and especially fruits, contributes to a renewed vision of Punic Sardinia with regard to the question on agriculture: while in past decades the region was considered one of the pre-eminent sources of cereal provisions for Carthage[64], this picture is now being partially deflated as new data about the diversification of agriculture emerge; even if the importance of cerealiculture cannot be underestimated, the role of fruit cultivation during the Punic times must also have been of great relevance[65].

The investigation on the materials found in the archaeological sites of the Mistras lagoon, the ones here preliminary presented as well as other categories, is still ongoing. It will help in the definition of a more complete view of the context and will add new valuable information about the evolving economy of Tharros, its connections and its landscape.

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63 DEL VAIS, MUREDDU 2022.
64 BARRECA 1988: 34-38; MANFREDI 1993: 208; MOSCATI *et alii* 1997: 73-74.
65 PÉREZ-JORDÀ *et alii* 2010: 296, 301; VAN DOMMELEN *et alii* 2012: 509; ROPPA, VAN DOMMELEN 2012: 52-53.

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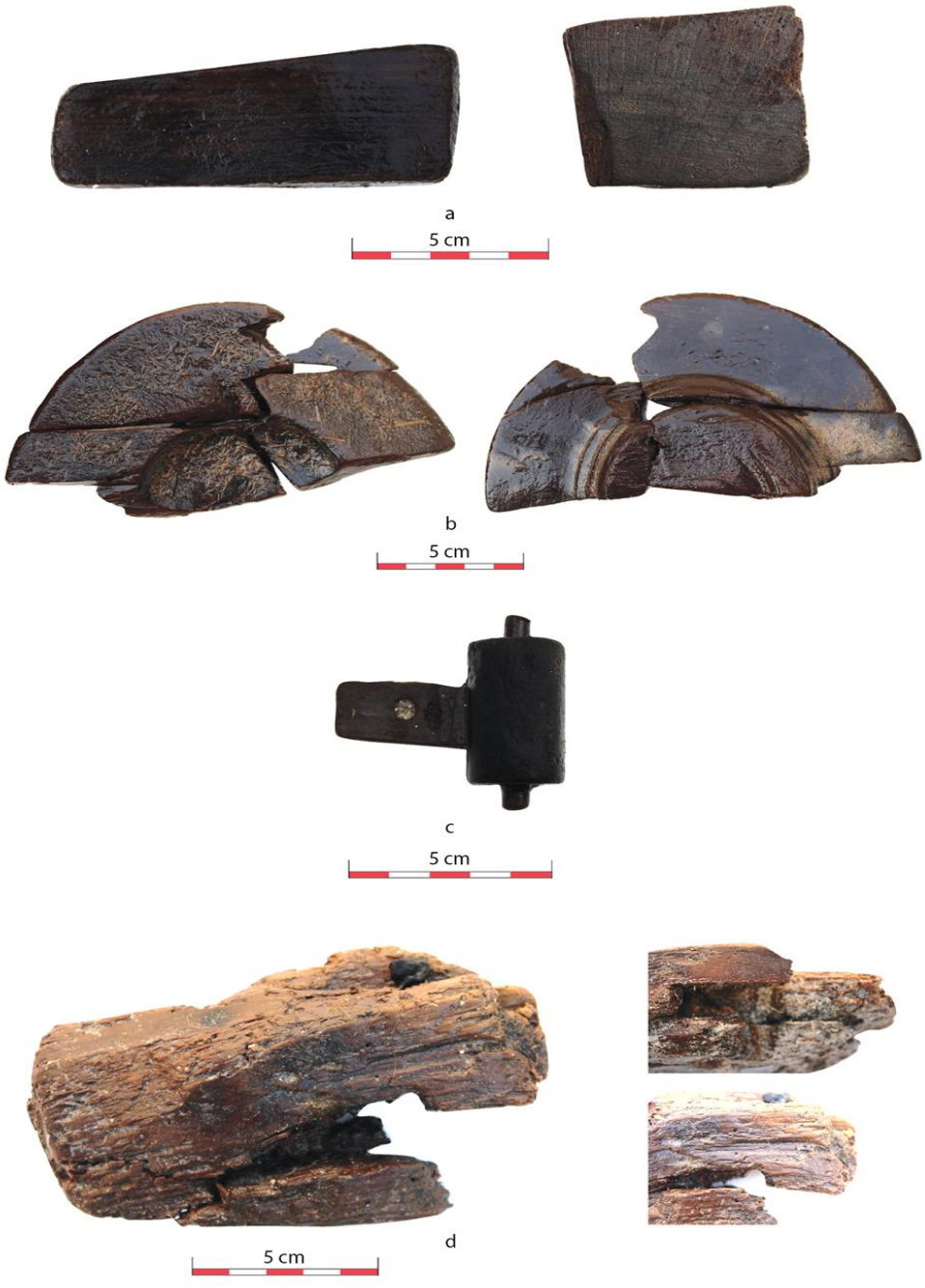

Fig. 1: Wood elements: a) parallelepiped objects; b) dish; c) hinge; d) frame (ph. M. Mureddu).

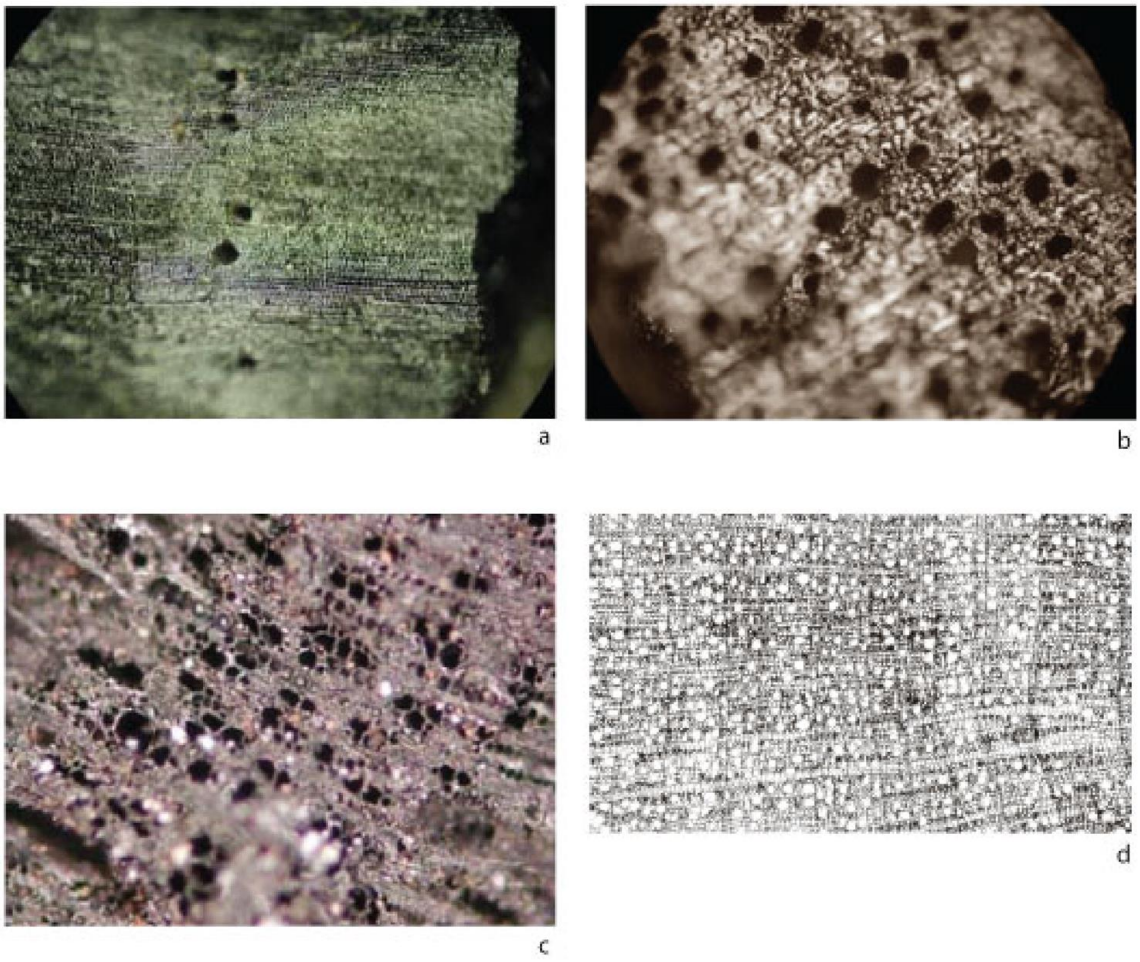

Fig. 2: Transversal sections of wood remains for xylological analysis: a) pine (*Pinus* cfr. *pinea*); b) evergreen oak (*Quercus* type *ilex*); c) olive (*Olea europaea* L.); d) mediterranean heath (*Erica multiflora* L.) (ph. F. Solinas).

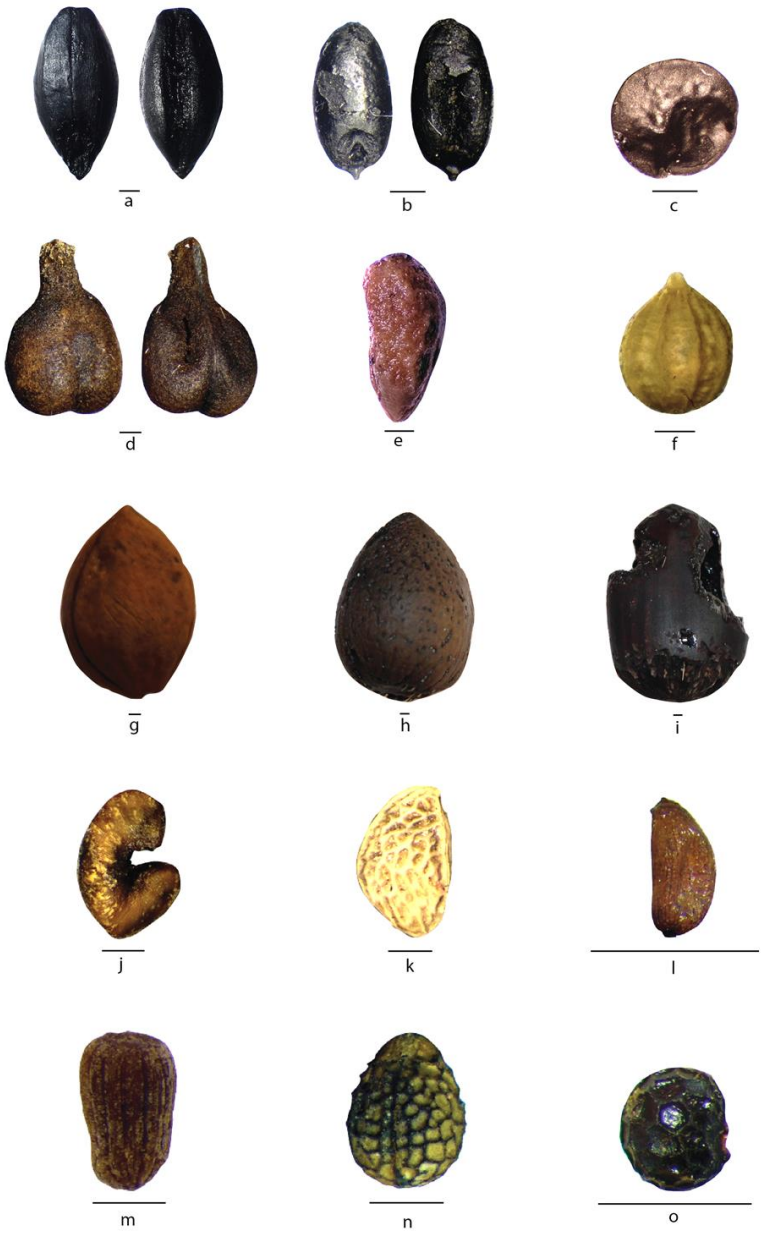

Fig. 3: Carpological remains: a) barley (*Hordeum vulgare* L. subsp. *Vulgare*); b) wheat (*Triticum aestivum/durum*); c) lentil (*Lens culinaris* L.); d) grape (*Vitis vinifera* L.); e) pomegranate (*Punica granatum* L.); f) coriander (*Coriandrum sativum* L.); g) plum (*Prunus domestica* L.); h) almond (*Prunus dulcis* (Mill.) D. Webb); i) hazelnut (*Corylus avellana* L.); j) common myrtle (*Myrtus communis* L.); k) thornless blackberry (*Rubus ulmifolius* Schott.); l) rush (*Juncus* Tourn. ex L.); m) corn marigold (*Glebionis segetum* (L.) Fourr.); n) sun spurge (*Euphorbia helioscopia* L.); o) common poppy (*Papaver rhoeas* L.) (graphic scale 1 mm) (ph. M. Mureddu).