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Maritime cultural landscape of fishing communities in Cyprus

Maria M. Michael

Abstract: This chapter examines the interdependent social, economic, cultural, technological and environmental aspects of fishing within the archaeological context of Cyprus. Through this examination, it is possible to understand the human utilisation of maritime space and the relationship between fishers and their maritime cultural landscape on the island of Cyprus from the Neolithic to the Early Christian periods (tenth millennium BC–mid-seventh century AD).

Heretofore, fishing in Cyprus has been neglected from an archaeological perspective. Consequently, the research presented here studies the archaeological evidence of fishing gear with the fishbone assemblages and the iconographic and written sources to determine the establishment and development of fishing in Cyprus diachronically. Environmental and ethnographic data are used to examine how the island's topography and physical Mediterranean environment determine the presence or absence of fishing within its maritime landscape. Through this study, an attempt to recover the mental maps of fishers is conducted by trying to reveal fishers' choices of specific fishing grounds, gear and/or fish species. Consequently, this study attempts to provide a comprehensive understanding of the human daily activity of fishing in Cyprus diachronically. Subsequently, it contributes to understanding the life of fishing communities in Cyprus through maritime archaeology.

Introduction

Being a fisher is not only about having the equipment to catch fish to fulfil the needs of daily subsistence or commercial purposes; rather, it is chiefly a way of living (Mylona 2008: 74). Fishing is not a simple two-way interaction between the fisher and the sea, but rather, an activity whose establishment and development is influenced by technological, social, economic, cultural, biological and environmental factors (Bekker-Nielsen 2010: 187; Cottica and Divari 2010: 363; Marzano 2013: 51–88; Michael 2022: 68–98). As a result, a holistic understanding of the occurrence and nature of fishing in the past can be acquired by considering all these factors/variables together and attempting to perceive fishing as a 'lifestyle' of ancient Cypriot communities.

The research presented here is based on the results developed during the author's PhD research project (Michael 2022), under the supervision of Dr Julian Whitewright, Dr Anna Collar and Dr Jaco Weinstock. According to a substantial literature review, fishing and its subsequent role in the ancient maritime cultural landscape of Cyprus are rarely acknowledged by other scholars (Ohnefalsch-Richter 1913; Frost 1985; Desse and Desse-Berset 1994a: 78–79; Michaelides 1998; Egoumenidou and Michaelides 2000: 12; Ionas 2001: 217; Reese 2007; Keleshis 2013; Lindqvist 2016; Knapp 2018: 151; Michael 2022: 15–66). Consequently, this research is the first attempt to explore and determine the occurrence and nature of fishing in the maritime cultural landscape of Cyprus through time, from the Neolithic to Early Christian periods (tenth millennium BC–mid-seventh century AD).

Through the systematic examination and mapping of the archaeological evidence of fishing gear (harpoons, fish-hooks, traps, stone, clay and lead weights for net or line, fish-ponds) and fishbone assemblages recovered in a variety of archaeological sites in Cyprus, the occurrence, the nature and the regional and temporal distribution of fishing in Cyprus are defined. In addition, the iconographic and written sources, the modern and historical environmental data from modern, archival and ethnographic sources, are a supporting class of evidence which leads to the reconstruction of ancient fishing methods and the understanding of the reasons behind the choice of a specific method, fishing ground or/and fish species.

The chapter emphasises the environmental and cultural aspects of fishing, as it aims to understand how the parallel study of archaeo-ichthyological evidence with the physical Mediterranean environment, the topography of Cyprus and several economic aspects of Cypriot society determined the presence or absence of fishing in the maritime landscape over time. Through the study of three chronological case studies (Neolithic period (9200/9000 BC–4000/3900 BC), Late Bronze Age (1650 BC–1125/1050 BC) and Historic periods (Geometric–Early Byzantine periods: 1050 BC–647 AD) which yield more prominent archaeo-ichtyological evidence, this chapter attempts to comprehend how fishers perceive, value, use

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and move through their landscape and seascape. Thus, a potential explanatory framework for understanding fishers' perceptions and spatial preferences to establish and develop fishing can be proposed. Consequently, this chapter delves into how the concept of the maritime cultural landscape—the human utilisation of space through the daily activity of fishing (Westerdahl 1992: 5)—might be understood and investigated in the archaeological context of Cyprus.

Accessing maritime cultural landscape of fishing communities: theoretical approaches

Fishers are people who interacted with the maritime environment (coast, estuary, sea, ocean) and navigated the seas and coasts to find the best fishing grounds every day. Thus, they developed and nurtured the local maritime knowledge, which can perceptually construct fishers' mental maps of their known maritime environment (McKenna *et al.* 2008: 5; Obied 2016: 157; Michael and Obied 2022: 151–155). Through this knowledge, fishers can decide where and when to fish, whether to create and use a particular gear, whether to choose and use a specific fishing ground and whether to fish a specific fish species. These decisions are also affected by many technological, natural, social, economic, cultural, biological and environmental variables because fishers live and interact within a natural, social, religious, economic, administrative and cultural environment (Figure 3.1).

Meteorological knowledge (currents, winds, temperature), navigational skills, the ability to manufacture and maintain tools and equipment, as well as fishing skills and resource availability, which are some broadly defined variables of the specialised knowledge (mental maps) which fishers have, influence the decisions of a fisher relating to the establishment and development of fishing or the creation and alteration of fishing gear (Figure 1; Morrill 1967; Acheson 1981: 290–291; Wilson 1990: 28; Palsson 1993: 124–129; Sabetian 2002: 22–23: 30; Sosis 2002: 588–591; McNiven 2003: 330–332; Cooney 2004; Westerdahl 2007: 207–208; Morales-Muñiz 2010: 28–29; Duncan 2011: 273; Van Dolah *et al.* 2020: 1757–1758). In addition, fishers acquire a knowledge of ecology (the seabed ground) and more specifically, how fish species behave daily, seasonally and annually in their life cycles, as this assists in understanding the marine environment, where fish species live and fishers interact with them, in order to catch them (O'Sullivan 2003; Duncan 2011; Theodoropoulou 2011; Aswani 2020: 481; Michael 2022: 78). Considering these variables of specialised knowledge (mental maps) which can be chosen, as well as inherited or implicit, is essential because they determine generally where, when and how they established fishing in the past (Bird and Bird 2000: 472–473; Parker 2001: 33–34; Mylona 2008: 67; Michael 2022: 74).

Thus, it is essential in interpreting the archaeology of fishing to start by supposing how fishers interacted with and perceived the physical and cultural space specifically, where they live and fish. In Cyprus, the physical space, where fishing is mainly carried out, is the coast and continental shelf. The continental shelf is defined as the seafloor at water depths shallower than 200 m (Demetropoulos 1985: 70; Department of Fisheries and Marine Research 2012: 2). This environment is generally narrow in the north and wider in the south and at maximum extends about 16 km from the shore. Also, it slopes seawards to very deep water practically from the

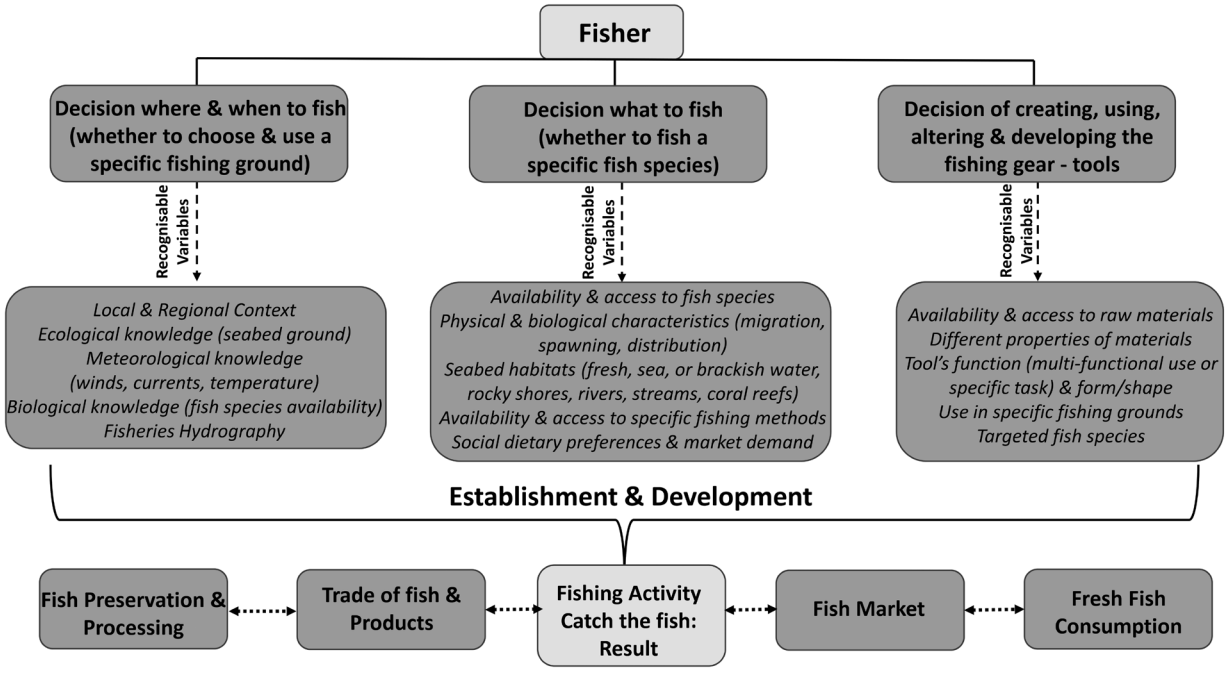

Figure 3.1. Theoretical diagram presenting the tangible and intangible variables affecting the decisions of creating and developing the fishing. Image by the author.

shore (Demetropoulos 1985: 70); as a result, it provides opportunities to exploit pelagic resources at a short distance from the coast. However, the cultural aspect of this space is not tangible in the way its physical aspect is. Consequently, different analytical tools are needed to explore how the human interaction and use of this physical space turns it into a place of culture (Van Dyke and Alcock 2003: 5; Wylie 2007; Obied 2016: 25).

In 1992, Christer Westerdahl (1992: 5) introduced the concept of the maritime cultural landscape in an attempt to observe and interpret the maritime aspect of a landscape, including the sea, the foreshore and the coastline. The term has become a useful analytical tool in the case study of fishing because it comprises the physical and cognitive aspects of terrestrial space (landscape) and a marine space (seascape) for investigating and comprehending the culture of maritime people within a spatial context (Westerdahl 2007: 212–215, 2011; Ford 2011: 4–5; Michael 2022: 78–90, 327–333, 356–360, 399–403).

However, it is difficult for the physical and cognitive aspects of a maritime cultural landscape to be brought into view through the isolated study of the archaeological data alone; as a result, researchers use ethnographic datasets, including folklore, oral histories, contemporary local knowledge and the traditions of a fishing community (Kirch and Dye 1979; Parker 2001: 34; Duncan 2011: 267–268, 275–281; Aswani 2020: 476, 479; Michael 2022: 83–84, 217–254).

Ethnographic sources of human-marine interactions consist of research on human ecology, cultural and societal values, political relations and socio-economic institutions (Aswani 2020: 476; Thurstan 2022: 357). For instance, the use of traditional ecological knowledge, which encompasses the knowledge, practices and beliefs of local communities whose lives depend on the natural environment, can reflect social behaviour and aspects of marine resource use and how the landscapes and seascapes were organised and utilised in the past (Calamia 1999: 3–5; Huntington 2000: 1270; Teixeira *et al.* 2013: 241–242). This knowledge develops across generations and passes down mainly as an oral tradition (Teixeira *et al.* 2013: 241–242). Also, the use of historical knowledge of ecology from historical written materials, imagery and public, private and government archives increases the understanding of the dynamic nature of landscapes and provides a framework for a detailed understanding of the type, scale and consequences of fishing over the past until the present day (Swetnam *et al.* 1999: 1190; Szabó 2015: 1001–1005; Aswani 2020: 475–476; Crumley 2021: 1–2; Thurstan 2022: 351, 353).

Consequently, this methodological approach enables land and sea to be perceived in the way fishers did in the past in order to explore potential interpretations about fishers' thoughts, beliefs and decisions (Palsson 1993; Johnson 1999: 86; Parker 2001: 39; Barber 2004: 444; Cooney 2004: 324; Westerdahl 2007: 214; Westerdahl 2011: 751; Knapp 2018: 31). In other words, it helps in reconstructing the mental map of the space, which fishers have formed to know how to choose the right fishing ground and the most effective fishing method since the earliest human exploitation of the sea (Parker 2001: 33–34).

Although this methodological approach benefits the examination of past fishing, it must be conducted cautiously. Ethnographic sources, historical ecology and archaeological data should be compared only if they come from the same region and share similar technological knowledge or/and social organisation (Wheeler and Jones 1989: 175; Nédélec and Prado 1990; Swetnam *et al.* 1999: 1201; Bekker-Nielsen 2010: 201; Ono 2010: 279; Marzano 2013: 3, 302; Trakadas 2018: 88–89). In the case of Cyprus, ethnographic, archaeological and historical ecological evidence are both from the same geographical and climatic zone. Consequently, an ethnoarchaeological approach, which mainly focusses on the parallel examination of the main indicators of fishing (fish remains and evidence of fishing gear) with ethnographic evidence, seems appropriate for examining past fishing in Cyprus in order to understand and reconstruct the maritime cultural landscape of Cypriot fishing communities.

Methodological approach

As revealed from the discussion, the concepts of the maritime cultural landscape (terrestrial space and marine space–seascape) and historical knowledge of ecology can be analytical frameworks which use an ethnoarchaeological approach to understand fishers' decisions of where and when to develop fishing activity and what to fish. The material, which was examined for the purposes of the current research, has been mainly derived from an intensive desk-based study.

First, an intensive desk-based study of the published final reports of Cypriot archaeological sites and museum inventories was conducted in order to collate the archaeo-ichthyological evidence, which mainly includes artefacts related to fishing methods and fishbone assemblages (Michael 2022: 19–23). The archaeological context of the archaeo-ichthyological evidence was also studied for further information about the social, economic, administrative and cultural processes occurring and potentially impacting the establishment and development of fishing in Cyprus diachronically. Simultaneously, fieldwork focussed on the examination of the excavated archaeological finds was also conducted in order to achieve better and more suitable documentation. All this information was archived in a database (Michael 2022: 127–131, 257–300). Through this systematic recording and visual mapping of archaeological sites where archaeo-ichthyological evidence has been recovered, temporal and spatial patterns were also revealed (Jacobsen 2005: 103; Michael 2022: 406–411). This approach highlights the presence and absence of fishing in different chronological periods or areas.

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The desk-based study also encompassed iconographic and written sources dated in the studied time (Michael 2022: 50–62). Regarding iconographic representations of fishing, their number is extremely limited in Cyprus, and they are not found in all chronological periods (they are mainly found in the Geometric to Roman periods, 1050 BC–330 AD; see Karageorghis and des Gagniers 1974: 50, 229; Karageorghis 2006: 69, 99, 127). As a result, iconographic representations of fishing methods and gear from other areas in the Mediterranean region were considered in reconstructing the fishing methods, especially if they have not preserved in the archaeological records (Ayodeji 2004: 231, 438: Fig. 151; Michael 2022: 121).

Also, the written sources used in the study consisted of the geographical and natural science treatise by Oppian (*Halieutica*) and the agricultural manual of Columella (*De Re Rustica*); these mainly provide information about the Classical and Roman periods (Michael 2022: 123). The information derived from these sources was compared with the ethnographic and historical data in order to reconstruct the ancient fishing methods and understand the reasons for choosing specific methods in specific fishing grounds.

Furthermore, the physical context of Cyprus was examined mainly on historical, modern and ethnographic data in order to understand how fishers adapted to environmental conditions and how this adaptation affected their choice of fishing grounds, gear and/or fish species. The ethnographic data were chiefly derived from 110 interviews with fishers from the community which established fishing in Cyprus during the nineteenth and twentieth centuries. These interviews are deposited in the Archive of Oral Tradition and Folk Study (Cyprus Research Centre). The main sources for the modern marine biological and geomorphological data and the bathymetric data are the publications and archives of the Cypriot Department of Fisheries and Marine Research, which include data since the 1950s. Finally, the geomorphological changes and the impacts of past sea levels on the coast were considered because they might contribute to the alteration or extinction of marine habitats, past fishing grounds and littoral topography.

Main indicators of fishing in the past: Fish remains and evidence of fishing gear

As already mentioned, the current research focusses on the study of the main indicators of fishing, which are distinguished by fish remains and archaeological evidence of fishing gear consumed or used respectively and finally recovered in inland, coastal and underwater archaeological sites in Cyprus (Figure 3.2). Through intensive desk-based study and fieldwork, 74 archaeological sites dating from the Neolithic period to the Early Christian period (tenth millennium BC–mid-seventh century AD) yielded evidence of fishing gear and fish remains (Figure 3.2; Michael 2022: 104–105). The temporal and spatial contexts of some of them could not be determined, and as a result, important contextual information which would help their further interpretation was absent. Consequently, their temporal or/and spatial contexts were characterised as unknown.

The systematic mapping of these archaeological sites demonstrates the extent of this evidence and contributes to the further investigation of the correlations between these data and their maritime environment (landscape and seascape). According to the former definitions and interpretations of the mapping space (landscape and seascape) of Cyprus (Vogiatzakis *et al.* 2017: 7), Cypriots engage more with maritime activities within the area 10 km from the coastline towards the inland part of Cyprus (Figure 3.2). The seascape of Cyprus from the coastline to the sea extends only 15 km (Figure 3.2), which is the area of the continental shelf of the island.

Although the spatial distribution of the main indicators of fishing in Cyprus highlights the fact that the engagement of Cypriots with fishing is mainly along the coastline or/and within the area 10 km from the coastline towards the inland part of the island. However, there are also sites with evidence of fishing beyond the Cypriot defined maritime environment (Figure 3.2). In addition, the identification of evidence of fishing in the same area leads to the hypothesis that Cypriots presumably decided for environmental, cultural or/and economic reasons to engage in fishing in some areas diachronically. Before exploring and identifying the reasons for the presence or absence of fishing in some areas throughout time, it is important to briefly describe the available main indicators of fishing in Cyprus to provide an overview of its nature and inherent issues.

Fish remains

Fish remains are the primary indicator of fishing, fish consumption and preservation and trade within an archaeological context (Casteel 1972: 406–416; Wheeler and Jones 1989: 3, 7, 162–176; Reese 1991; Rose 1994: 448–476; Morales-Muñiz 2010: 31–32). Identified and unidentified fish remains have been recovered from 54 sites distributed throughout Cyprus. There are 12 sites which yielded fishbone assemblages dated to the Neolithic period, four sites to the Chalcolithic period, 21 sites to the Bronze Age, two to the Cypro-Archaic period and six sites to the Hellenistic/Roman periods. There are also some sites which have produced fishbone assemblages from several periods.

Although fishing seems more intense during some periods because of the number of sites, the number of sites is not representative regarding the number of fish remains recovered. The numbers of fish bones from many sites are not provided, or they are mainly very small or/and unquantified; as a result, many fishbone assemblages vary greatly from just one or two bones to over a thousand. This is a result of the non-systematic use of dry and wet sieving in many excavations and the absence of using reference collection to identify fish species. These issues

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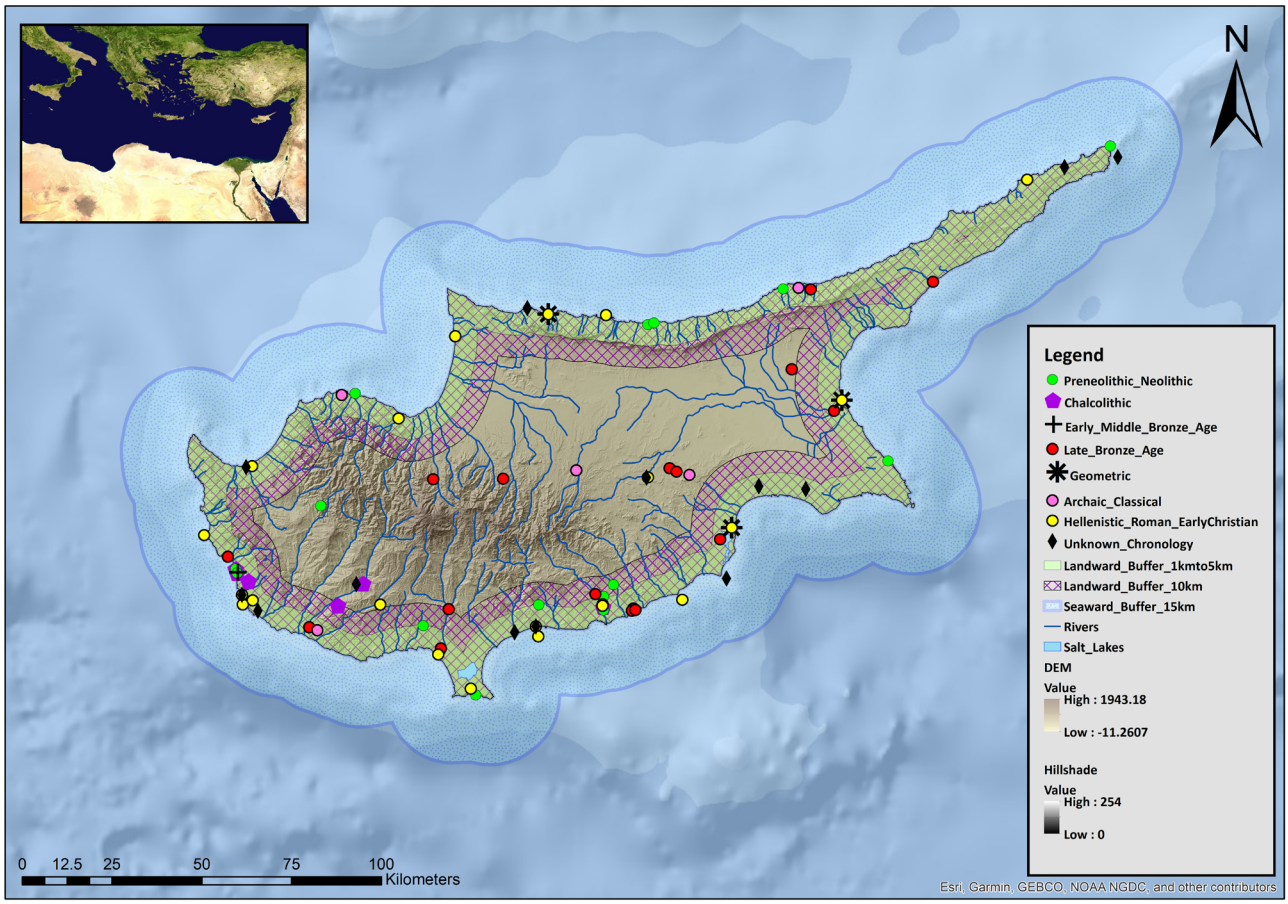

Figure 3.2. The temporal and regional distribution of archaeological sites where archaeo-ichthyological evidence has been recovered. This distribution is presented in relation to the landward and seaward buffers (land and coastal zones of Cyprus), which have been defined based on the generally accepted interpretations of Vogiatzakis *et al.* (2017: Fig. 1). Produced by the author on ArcGIS. Source for layers of Digital Elevation Model, Hillshade Coastline, Rivers and Salt Lakes: Department of Lands and Surveys, Cyprus (DLS Portal); source of the base map: Esri Garmin, NCAA NGDC and other contributors; layer of archaeological sites produced by the author.

cause difficulties in defining the intensity of fishing during the different chronological periods or between different sites. To overcome these issues, each identified species has been considered here as a unique occurrence within the chronological context in which it was recovered, while unidentified fish remains have been simply noted as present (Locker 2007: 144; Trakadas 2018: 53–54; Michael 2022: 107–112).

This approach identified 61 taxa of fish in the archaeological sites of Cyprus through time (Table 1). In addition, it shows that more identified fish remains have been recovered from Neolithic and Bronze Age sites, while sites from later periods demonstrate a lack of identified fish remains (Table 1). The presence of specific fish species within the archaeological record and the study of their different physical characteristics and behaviour can provide information about the availability of fish sources, the process of fish preservation, dietary preferences and market demand (Michael 2022: 76). Although it is difficult to define the aforementioned information, the acquisition of this knowledge can help with the reconstruction of fishing gear/methods.

Evidence of fishing gear

Fishing gear is the other main indicator of fishing in the past. Its study can be characterised as challenging, as it can be often described as multi-use or as miscellaneous objects (Bolger 1988: 91; Vermeule and Wolsky 1990: 73, 94, 130, 146; Swiny *et al.* 2003: 227, 230; Steel 2004: 58; Stewart and Rupp 2004: 163, 167–170; Peltenburg and Christou 2006: 16–17; Bürge and Fischer 2018: 473–485; Mantzourani 2019: 317–318). Consequently, fishing gear can be difficult to recognise and identify.

Despite these limitations, evidence of fishing gear has been recorded at 48 archaeological sites in Cyprus. Nine Neolithic sites, two Chalcolithic sites, 12 Bronze Age sites, two Cypro-Geometric sites, two Cypro-Archaic sites, two Cypro-Classical sites, 18 Hellenistic/Roman/Early Christian sites and one site with an unknown chronological context produced evidence of fishing gear. This evidence mainly consists of fish-hooks and stone and lead weights; their quantity differs from period to period (Figure 3.3; Michael 2022: 257–300). Also, three sites with fish-ponds, which are rock-cut basins built entirely on the coast and

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Table 3.1. Occurrence of identified taxa (species and families) in Cypriot archaeological context through time. Compiled by the author.

Neolithic period (9200/9000–4000/ 3900 BC)	Chalcolithic Period (3900–2500 BC)	Bronze Age (2500–1050 BC)	Geometric period (1050–750 BC)	Archaic period (750–480 BC)	Classical period (480–310 BC)	Hellenistic/Roman/ Early Byzantine periods (310 BC–647AD)
Argyrosomus regius (meagre) ***Balistes carolinensis / Balistes capriscus*** (triggerfish) **Carangidae family** ***Carcharhinus sp.*** (requiem sharks) ***Chrondrichthyes*** (sharks) **Clupeidae family** ***Dentex sp.*** (dentex) **Dasyatidae family** ***Dicentrarchus labrax*** (European seabass) ***Diplodus sp.*** (seabream) ***Epinephelus sp.*** *(grouper)* ***Euthynnus alletteratus*** *(little tunny)* ***Merluccius merluccius*** (European hake) **Mugilidae family** (mullets) ***Muraena helena*** (Mediterranean moray) ***Oblada sp.*** (saddled seabream) ***Pagrus pagrus*** (Red porgy) ***Pagellus sp.*** (Pandora) ***Platichthys flesus*** (European flounder) ***Sarda sarda*** (Atlantic bonito) ***Sarpa salpa*** (salema) ***Sciaena umbra*** (brown meagre)	***Chelon ramada*** *(Lisa ramada)* (Thinlip grey mullet) **Clupeidae family** ***Dicentrarchus labrax*** (European seabass) ***Epinephelus sp.*** *(grouper)* ***Micromesistius poutassou*** (Blue Whiting) ***Muraena helena*** (moray) ***Sardina pilchardus*** (European pilchard) ***Scarus sp.*** (parrotfish) ***Scomber scombrus*** (Atlantic mackerel) **Scombridae family** **Serranidae family** **Sparidae family** (sparids) ***Trachurus trachurus*** (horse mackerel) **Triglidae family** (sea robin) ***Zeus faber*** (John Dory)	***Argyrosomus regius*** (meagre) ***Chelon ramada*** *(Lisa ramada)* (Thinlip grey mullet) ***Chrondrichthyes*** (sharks and rays) **Cichilidae family** ***Cyprinus carpiio*** (Common carp) ***Dicentrarchus labrax*** (European seabass) **Elasmobranchii** (shark/ ray) ***Epinephelus aeneus*** (white grouper) ***Lates niloticus*** (Nilotic perch) **Mugilidae family** (mullets) ***Mugil cephalus*** (Flathead grey mullet) ***Mullus sp.*** (mullet) ***Pagrus pagrus*** (Red porgy) ***Pagellus sp.*** (Pandora) ***Polyprion Americanus*** (Wreckfish) **Serranidae family** **Sparidae family** (sparids) ***Sparisoma cretense*** (parrotfish) ***Sparus aurata*** (gilthead seabream) ***Sparus sp.***	***Chrondrichthyes*** (sharks and rays) ***Clarias sp.*** (catfish) ***Diplodus annularis*** (Annular seabream) ***Epinephelus sp.*** *(grouper)* ***Labrus sp.*** (wrasses) ***Lates niloticus*** (Nilotic perch) ***Lophius Piscatorius*** (Angler) **Mugilidae family** (mullets) ***Pagrus pagrus*** (Red porgy) ***Scorpaena scrofa*** (Red Scorpionfish) **Sparidae family** (sparids) ***Sparus aurata*** (gilthead seabream) ***Thunnus thynnus*** (Bluefin tuna)	**Carangidae family** ***Chrondrichthyes*** (sharks and rays) ***Dentex sp.*** (dentex) **Elasmobranchii** (shark/ ray) ***Epinephelus sp.*** *(grouper)* ***Lates niloticus*** (Nilotic perch) **Sparidae family** (sparids) ***Trachurus trachurus*** (horse mackerel)	***Argyrosomus regius*** (meagre) **Carangidae family** ***Clarias sp.*** (catfish) ***Dentex sp.*** (dentex) ***Dicentrarchus labrax*** (European seabass) ***Epinephelus sp.*** *(grouper)* ***Epinephelus gigas / Epinephelus marginatus*** *(grouper)* ***Lates niloticus*** (Nile perch) **Mugilidae family** (mullets) **Sparidae family** (sparids) ***Sparus aurata*** (gilthead seabream)	***Arius thalassinus / Netuma thalassina*** (giant sea catfish)

Neolithic period (9200/9000–4000/ 3900 BC)	Chalcolithic Period (3900–2500 BC)	Bronze Age (2500–1050 BC)	Geometric period (1050–750 BC)	Archaic period (750–480 BC)	Classical period (480–310 BC)	Hellenistic/Roman/ Early Byzantine periods (310 BC–647AD)
Scomber scombrus (Atlantic mackerel) **Scombridae family** ***Scorpaena scrofa*** (Red Scorpionfish) **Scyliorhinidae family** (shark) ***Scyliorhinus stellaris*** (Nursehound) ***Seriola dumerili*** (amberjack) **Serranidae family** (grouper) **Sparidae family** (sparids) ***Sparus aurata*** (gilthead seabream) ***Sphyraena sphyraena*** (barracudas) ***Thunnus alalunga*** (Albacore) ***Thunnus thynnus*** (Bluefin tuna) ***Trachurus trachurus*** (horse mackerel)		***Sphyraena sp.*** ***Sphyraena sphyraena*** (barracudas) ***Spondylisoma cantharus*** (Black seabream) ***Thunnus thynnus*** (Bluefin tuna) ***Umbrina cirrosa*** (Shi drum)				

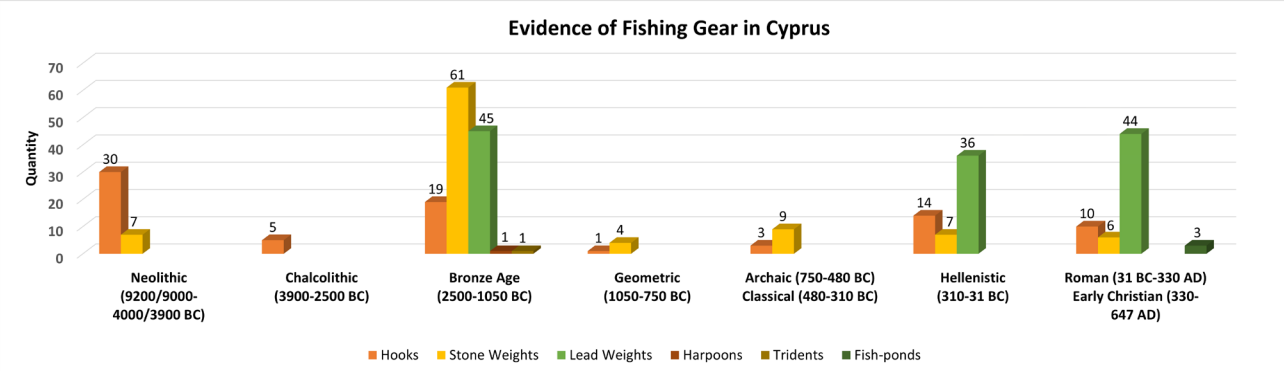

Figure 3.3. Graph presenting the quantity of the identified types of fishing gear and fish-ponds recovered in Cypriot archaeological sites through time. Image by the author.

filled with salt water in which live fish were kept, date to later periods (Roman and Early Christian). As already mentioned, the limited quantity of fishing gear in some periods may be the result of methodological approaches (Michael 2022: 15–66, 163–192).

Regarding fish-hooks, they have different sizes, shapes and materials over time (Figure 3.4). The earliest ones are smaller, made of bone and have a half-circular shape, while the latest ones are bigger, made of copper or bronze and have a 'J' shape. At the top of their shanks, there is usually an eye or groove where the line would be tied, while some of them have a sharp barb. Bone and bronze gorges have also been recovered. The recovery of hooks and gorges indicates the use of fishing lines, while the different sizes and/or shapes of hooks determine if they were used on multiple or single hooked lines and/or used to catch large or small fish (Bernal-Casasola 2010: 89; R. Thomas 2010; Michael 2022: 368–369). In addition, the use of fishing lines is also defined by the recovery of weights with a solid body formed from a lead mass and a groove, a hole or a ring for a line attachment (Figure 3.4; Galili *et al.* 2002: 183–184).

Fishing nets, in comparison, are not generally preserved in the archaeological record because of their perishable materials. Only their clay, stone and lead weights and metal needles are preserved (Michael 2022: 257–300, 375–377). Net weights, which were fastened/fixed on the ground rope of a net to help it to sink, were generally shaped like tubes or folded in one plane, or they are small pebbles with a straight perforation for the rope (Figure 3.4). The most common type of this category is the folded rectangular lead weight, which was bent over the ground line of the net (Figure 3.4; Galili *et al.* 2002: 183–184). Larger stone weights with straight perforations for rope were used on the net edges to anchor it (Figure 3.4).

Furthermore, the comparison of ethnographic data with written and iconographic evidence from Cyprus and the wider region of the eastern Mediterranean reveals that some other fishing methods, including fish poisoning and basket-traps, were used during the Classical and Roman periods, but they did not leave any archaeological trace to establish their use (Michael 2022: 235–240). In addition, through the examination of oral histories about these fishing methods, it is possible to comprehend how fishers carefully observed, adapted and utilised their knowledge of the environment and animal behaviour to their advantage.

Regarding the method of fish poisoning, it is difficult to observe in the archaeological record because the archaeo-botanical analyses did not clarify whether ichthyotoxic plants were available in the past (Michael 2022: 413). On the other hand, the comparison of written sources with ethnographic data from Cyprus highlights that this method was employed during the Roman period in the same way it was employed during the early-modern period in Cyprus (*Hal.* 4.647–693; Michael 2022: 235–236, 413–414); as a result, this method appears to have been used, but the perishable nature of the evidence meant it could not be identified archaeologically.

Finally, the simultaneous study of Classical iconographic representations with the corresponding description in the Roman written sources of traditional Cypriot baited basket-trap demonstrates the ancient use of this fishing method survived in traditional knowledge through time, despite no evidence existing within the archaeological records (*Hal.* 3.414–431, 4.40–74; Ayodeji 2004: 231, 438: Fig. 151; Michael 2022: 237–240, 414). Through the examination of oral histories about this method, it is also possible to distinguish the existence of specialist knowledge about how to exploit individual fish species and their favoured habitat conditions. For instance, modern Cypriot fishers sail to a specific location early in the morning and feed the fish prior to dropping basket-traps in the sea (Keleshis 2013: 63–64; Michael 2022: 239). When a lot of fish gather in the area, they drop the trap, whose design is based on the behaviour of fish to avoid their attempts to escape when they get inside (Figure 3.5). The trap is collected full of fish a few hours later. The same practice is described by the Roman writer Oppian (*Hal.* 3.414–431, 4.40–74); as a result, it seems that Cypriots follow the same practice when they fish by using basket-traps as the Roman fishers, but the perishable

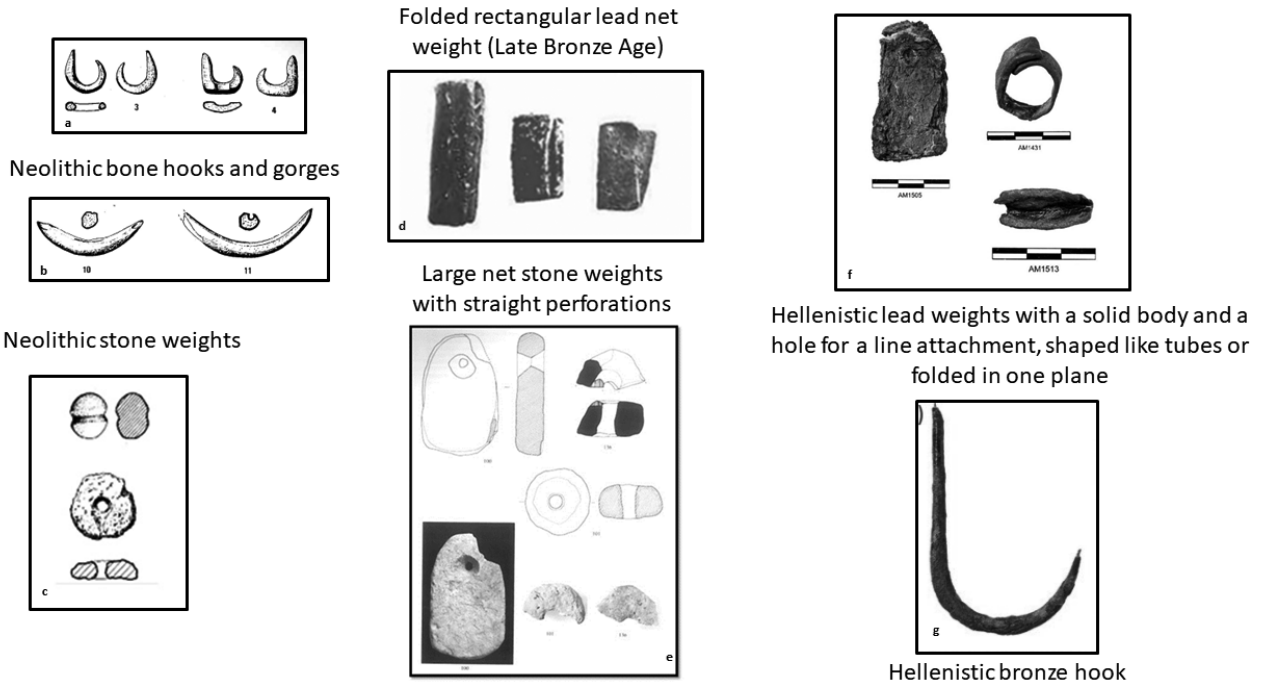

Figure 3.4. Evidence of fishing gear recovered in a variety of archaeological sites dating from the Neolithic to the Early Christian periods (tenth millennium BC–mid-seventh century AD). (a-b) Neolithic bone hooks and gorges from the archaeological site of Cape Apostolos Andreas, Kastros; source: Le Brun 1981: 203, Fig. 56.3–4, 10–11. (c) Neolithic stone weights from the archaeological site of Cape Apostolos Andreas, Kastros; source: Le Brun 1981: 181, Fig. 56.8–9. (d) Folded rectangular lead net weight from the Late Bronze Age site of Athienou; source: Dothan and Ben-Tor 1983: 126, Fig. 57.18–20, 128–129, pl. 47:4. (e) Limestone net weights from the archaeological site of Kition-Bamboula; source: Frost 1985: 173, Fig. 79. (f-g) Hellenistic bronze hook and lead weights from the archaeological site of Amathus; source: Michael 2018: 109, Fig. 4.

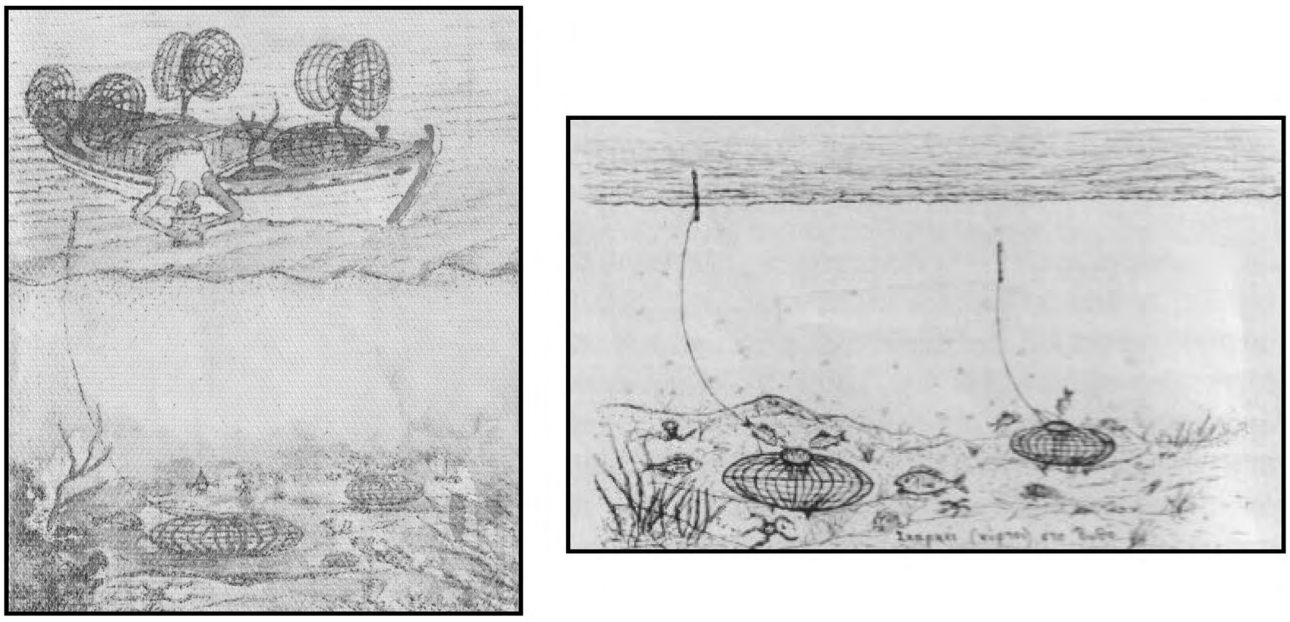

Figure 3.5. Paintings by fisher Andreas Keleshis presenting fish basket-traps with or without a boat. Source: Keleshis 2013: 22.

nature of this method is the main reason it is invisible in the Cypriot archaeological record.

Exploring the maritime cultural landscape of fishing communities in Cyprus: analysis and discussion

As the methodological approaches and the available main indicators of fishing in Cyprus have been presented briefly, some case studies dated in different chronological periods have been chosen to highlight how Cypriot fishers adapted to environmental conditions and how these conditions affect fishers' decisions of establishing and developing fishing in the past. Through this study, it is possible to clarify how the different topographical characteristics of each archaeological site, where main indicators of fishing have been recovered, could affect how Cypriots

comprehended their maritime environment. In turn, this information will assist in hypothesising and understanding how fishers navigated, identified or choose specific fishing grounds and/or fish species to catch.

Case study of the Neolithic period (9200/9000 BC–4000/3900 BC)

The first case study is the Neolithic site of Cape Apostolos Andreas, Kastros (Aceramic Neolithic: 9200/9000–5200/5000 BC). This site is located on the most northeasterly point of the Carpasia Peninsula and combines environmental characteristics from both the south and north coasts of Cyprus (Figure 3.6; Le Brun 1981; Reese 1978: 87–88). On the south side of the peninsula, the morphology of the seabed is mainly soft with sand and gravel or muddy (Department of Fisheries and Marine Research 2012: 39). The north side of the peninsula is rocky and dominated by hard limestone with patches of mixed sediments of coarse sand gravel (Department of Fisheries and Marine Research 2012: 39). Also, on the north side of the peninsula, meadows of Mediterranean tapeweed/seagrass (*Posidonia oceanica*) have been recorded in recent studies about their current distribution in the eastern Mediterranean (Telesca *et al*. 2015: 7: Fig. 4). Consequently, it seems the north side of the peninsula can be characterised as a fertile fishing ground, as meadows of Mediterranean tapeweed/seagrass (*Posidonia oceanica)* are a fundamental source of nutrition in marine environments (Campagne *et al.* 2015: 394; Jackson *et al.* 2015: 900; Kleitou *et al.* 2020: 2). This is supported by oral histories, as many Cypriot fishers mentioned the seabed of the north side of Cyprus is far richer in different fish species in comparison to the southern part, due to its rocky nature and the occurrence of seagrass meadows (Michael 2022: 379–388).

It is nonetheless difficult to confirm whether these meadows of Mediterranean tapeweed/seagrass (*Posidonia oceanica*) existed in this area during the Neolithic period, despite the fact they can live for hundreds to thousands of years (Kleitou *et al.* 2020: 12). The occurrence of fish species such as groupers (*Epinephelus* sp.), porgies (*Diplodus* sp., *Dentex* sp., *Pagellus* sp.), Salema (*Sarpa salpa*), red porgy (*Pagrus pagrus*), gilthead seabream (*Sparus aurata*) and saddled seabream (*Oblada* sp.) within the fishbone assemblage of Cape Apostolos Andreas, Kastros may indicate that Mediterranean tapeweed/seagrass (*Posidonia oceanica*) meadows existed in this area during the Neolithic period, as these species live or migrate in these meadows to find food (Jackson *et al.* 2015: 903; Michael 2022: 330). Consequently, the simultaneous examination of the environmental conditions with archaeo-ichthyological evidence recovered at the site of Cape Apostolos Andreas, Kastros can propose that the distinctive topography of this area could contribute to the growth of a strong relationship between fishers and their environment, which in turn may have affected fishers' decisions of where and how to develop fishing in this area (Michael 2022: 327–333).

Furthermore, more than 6,000 remains of bony fish have been found at this site, 3,888 of which have been anatomically identified (Garnier 1981: 93–94; Desse and Desse-Berset 1994a, 1994b). Although the fish remains are fragmentary and poorly preserved, this fishbone assemblage seems to be a representative assemblage of mixed exploitation of coastal and pelagic resources at

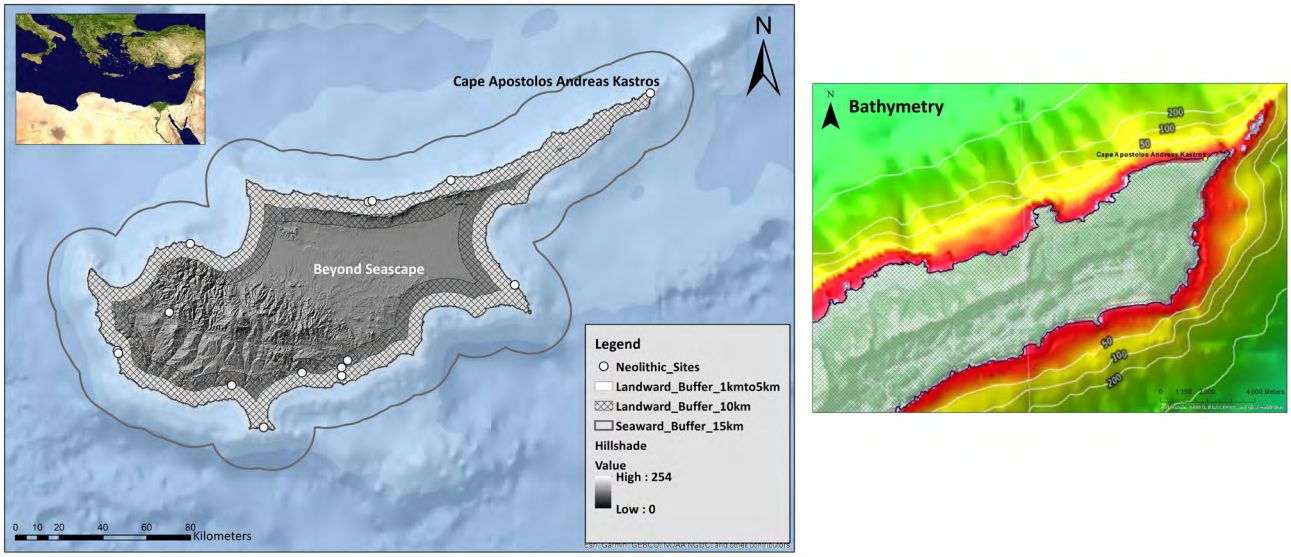

Figure 3.6. Map defining the landward and seaward buffers of Cyprus (land and coastal zones of Cyprus) in relation to the Neolithic sites. The landward and seaward buffers have been defined based on the generally acceptable former interpretations of Vogiatzakis *et al.* (2017: Fig. 1). The site of Cape Apostolos Andreas, Kastros is marked as discussed in the text. A detailed map defining the bathymetry of the site of Cape Apostolos Andreas, Kastros. Bathymetry: red, 50 m depth; yellow, 100 m; green, 200–500 m. Produced by the author on ArcGIS. Source for layers of Hillshade Coastline: Department of Lands and Surveys, Cyprus (DLS Portal); source of the basemap: Esri Garmin, NCAA NGDC and other contributors; source of the bathymetry: EMODnet; layer of archaeological sites produced by the author.

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the subsistence level (Michael 2022: 259, 324–326). It mainly consisted of fish species living at depths of 1–100 m, confirming the continental shelf was the area where fishing was carried out mainly (Figure 3.6; Michael 2022: 327–328). On the other hand, remains of pelagic fish have also been recovered from this context. Most of them migrate close to the coast either seasonally or daily according to currents, temperature differences, spawning season or their marine habitats and age; as a result, their occurrence supports the exploitation of pelagic resources, but at the same time, it is possible they were caught during their migration near the coast (Michael 2022: 325). Consequently, it can be hypothesised the continental shelf could have been the main area of fishing, but the inhabitants of this site may have put more effort into sailing and exploiting the pelagic resources beyond the continental shelf. It has also been noted that sailing in this area was challenging during the Neolithic period, and this may demonstrate the good sailing skills of its inhabitants in exploiting pelagic resources (Bar-Yosef Mayer *et al.* 2015: 426–429).

Case study of the Late Bronze Age (1650 BC–1050 BC)

Moving to the Late Bronze Age period (1650–1050 BC), the site of Hala Sultan Tekke, which is on the southern coast of Cyprus, also highlights how the characteristics of its landscape and seascape affect fishers' decisions of where, when, what and how to fish (Figure 3.7; Michael 2022: 356–360). The present coastline in this area is characterised as lowland, and it is now some distance from the ancient shoreline due to sedimentary infilling (Gifford 1978; Thomas 1981). Based on the relatively recent intensive study of coastal alterations in association with archaeological evidence recovered at the site of Hala Sultan Tekke, a confined lagoon existed and was used as a harbour during the second millennium BC from the site of Hala Sultan Tekke (Gifford 1978: 166–169; Devillers *et al.* 2015: 75–78). This lagoon was finally eroded and silted to form the Larnaca Salt Lakes which exist today (Figure 3.7).

Lagoons offer fertile fishing grounds exploited by human settlements throughout the Mediterranean basin, as seagrass meadows are one of their main characteristics (Rose 1994: 53, 101–102; Broodbank 2013: 158–159; Marzano 2013: 199–205; Crosetti *et al.* 2015: 22, 24, 28; Kleitou *et al.* 2020: 12). Based on studies (Telesca *et al.* 2015: 7: Fig. 4), Mediterranean tapeweed/seagrass (*Posidonia oceanica*) exists along the present coastline of Hala Sultan Tekke. The occurrence of Mediterranean tapeweed/seagrass (*Posidonia oceanica*) may have dated to the Late Bronze Age because the study of the alteration of the coastline showed a Posidonia bed existed when the lagoon was in use as a harbour (Devillers *et al.* 2015: 78). In addition, the recovery of fish species living in lagoon environments such as gilthead seabream (*Sparus aurata*), European seabass (*Dicentrachus labrax*), flathead grey mullet (*Mugil cephalus*) and thinlip grey mullet (Chelon *ramada*) within the fishbone assemblage of the site of Hala Sultan Tekke also supports the exploitation of the coastal lagoon for fishing (Crosetti *et al.* 2015: 30–31; Michael 2022: 357).

In addition, comparisons between modern meteorological information and studies of modelling ancient winds and currents in the region of the eastern Mediterranean show the prevailing current and wind patterns have not changed remarkably since ancient times (Murray 1995; Leidwanger 2020: 31). Consequently, the predominant currents and winds in this area seem to benefit the exploitation of the lagoon (Meteorological Service 1986: 9; Safadi 2016: 353–355, 2018: 229, 259; Michael 2022: 358). The light southerly sea breezes—the predominant features in the area, especially during the winter and summer times—may create southerly currents, which in turn 'force' fish to enter the lagoon to find food; as a result, they would have been easy to catch within the area of the lagoon or along the coast. Consequently, the parallel study of currents along the present south coast with the archaeological evidence indicates the lagoon may have been exploited by the inhabitants of Hala Sultan Tekke. In addition, fishing seems to have been an activity which relied on accumulated knowledge and mental maps of the landscape and seascape of an area for the choice of a fertile fishing ground.

Evidence of fishing gear and fish remains dated to the Late Bronze Age (1650–1050 BC) have been also recovered from inland sites located within an area beyond the theoretical knowledge of the seascape (Figures 3.2, 3.7; Michael 2022: 347–349). More prominent evidence has come from the archaeological site of Apliki-Karamallos, which was a small copper-mining settlement (Figure 3.7; Du Plat Taylor 1952). As lead-folded rectangular fishing sinkers with fish remains have been recovered, the use of fishing nets is attested there (Michael 2022: 270, 348). However, the limited evidence and its location suggest the inhabitants of this site did not directly engage in fishing, but their fish supplies were probably acquired as the result of a local complex exchanging network. This complex exchanging network existed between the several Cypriot Late Bronze Age sites distinguished from primary coastal centres, inland centres, agricultural villages and mining sites (Catling 1963: 144–145; Karageorghis 1982: 61–63; Keswani 1993: 76–80; Georgiou 2018: 82–88). Based on this exchange network, subsistence and utilitarian goods, copper and its products and other essential or prestigious objects were distributed between the sites.

In the case of Apliki-Karamallos, it seems its inhabitants exploited copper and provided it to the inhabitants of a primary coastal centre, most probably the site of Toumba tou Skourou (Figure 3.7), and at the same time, they obtained subsistence and utilitarian goods from this primary coastal centre. Fish may have been included in these goods. Consequently, the examination of fish remains and fishing gear within their topographical and contextual depositions of inland archaeological sites

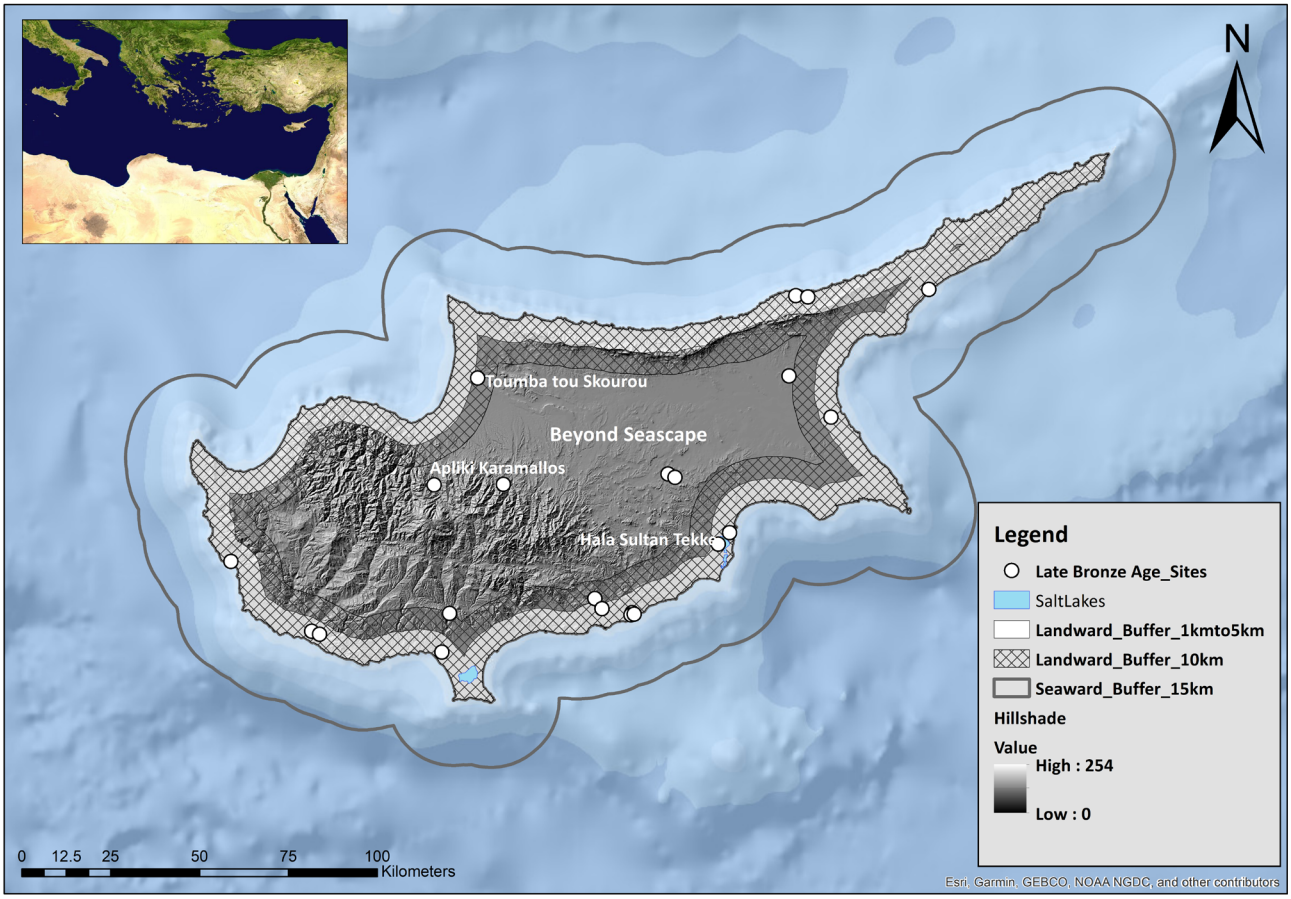

Figure 3.7. Map defining the landward and seaward buffers of Cyprus (land and coastal zones of Cyprus) in relation to the Late Bronze Age sites. The sites of Hala Sultan Tekke, Apliki-Karamallos and Toumba tou Skourou are marked as discussed in the text. The landward and seaward buffers have been defined based on the generally acceptable former interpretations of Vogiatzakis *et al.* (2017: Fig. 1). Produced by the author on ArcGIS. Source for layers of Hillshade Coastline: Department of Lands and Surveys, Cyprus (DLS Portal); source of the basemap: Esri Garmin, NCAA NGDC and other contributors; layer of archaeological sites produced by the author.

suggests their existence in these contexts may be ascribed to local administrative and/or economic factors.

Case study of historic periods (Geometric to Early Byzantine periods: 1050 BC–647 AD)

Moving to later periods, Amathus is also an excellent example of an archaeological site with evidence dated from the Archaic (750–480 BC) to Early Christian periods (330–647 AD) which can highlight the importance of the knowledge of the maritime environment in the growth of fishing. Amathus is located on the south Cypriot coast and it represents evidence related to fishing from both terrestrial and underwater contexts (residential area and harbour) (Figure 3.8; Empereur 2017; Michael 2018a, 2018b).

Although oral traditions understood through fishers' interviews highlight the fact the south Cypriot coast has no fertile fishing grounds, the simultaneous study of Amathus' archaeo-ichthyological evidence with the environmental characteristics of its coast and seabed shows fishers acquired specialised knowledge of their marine environment which enabled them to navigate and identify key fishing grounds (Michael 2022: 218 399–403). This contrast seems to be a result of coastal alterations which happened along the south coast over time because of very severe erosion in conjunction with eustatic sea-level changes and tectonic activity (Thomas 1981; Andreou *et al.* 2017: 201). These changes led to the submergence of Amathus Harbour and the erosion of the coast (Empereur 2017: 111–120). Consequently, these alterations should be considered during the examination of ancient fishing, as places which are now perceived as not being fertile fishing grounds may have been fertile in the past.

The fertility of the fishing ground at Amathus may be a result of specific environmental characteristics found in this area of the south coast. For instance, the upwelling phenomenon, which is strong in this area during the summer months and enriches surface water with nutrients, is possibly the reason for the presence of seagrasses (Figure 3.9; Department of Fisheries and Marine Research 2012: 10–11, fig. 1.8; Demetriou *et al.* 2022: 12). The marine environment of Amathus consists mainly of Mediterranean tapeweed/seagrass (*Posidonia oceanica* and *Cymodocea nodosa*) and green alga (*Caulerpa prolifera*); these seagrasses transfer nutrients to food webs,

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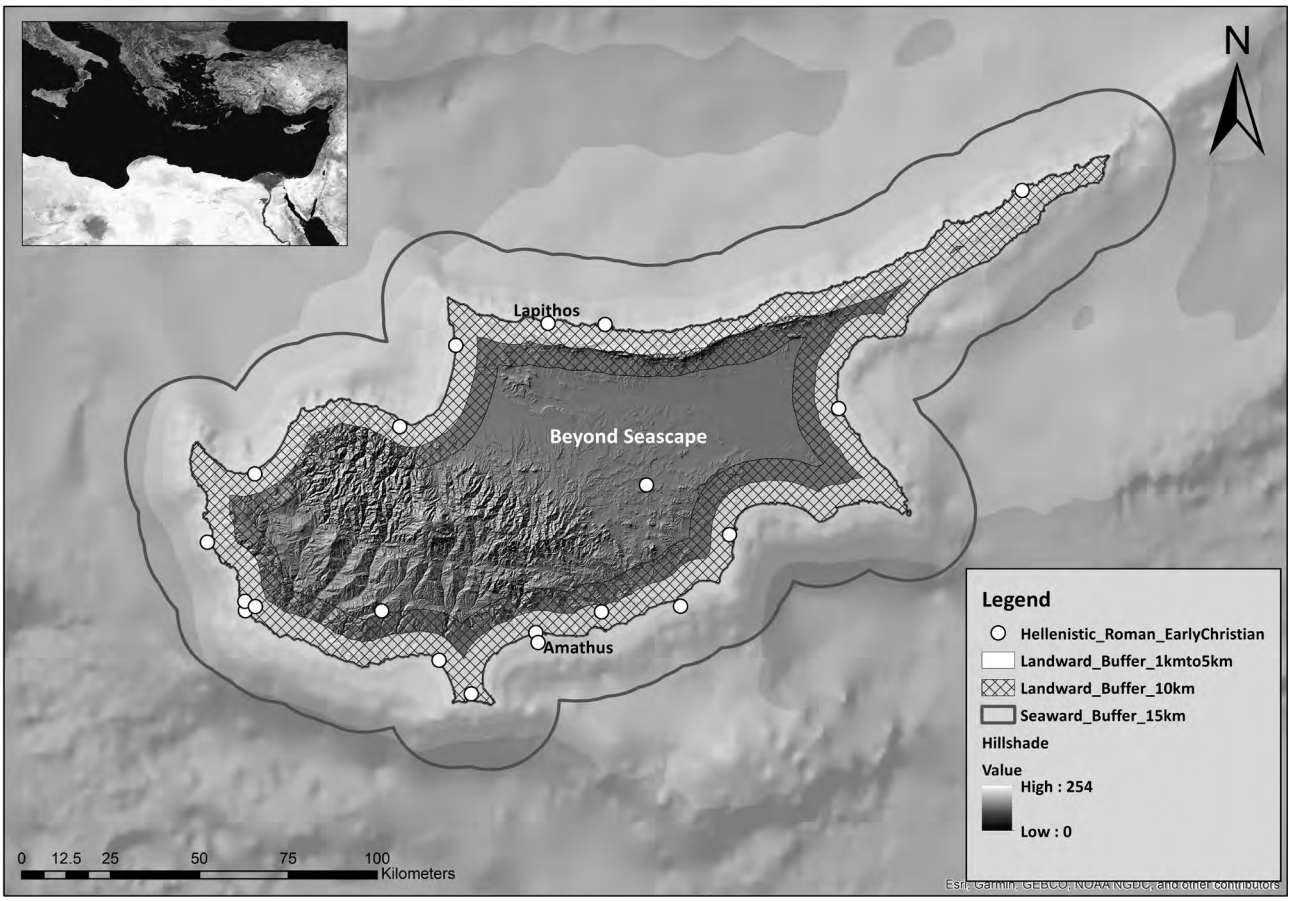

Figure 3.8. Map defining the landward and seaward buffers of Cyprus (land and coastal zones of Cyprus) in relation to the Hellenistic, Roman and Early Christian sites. The sites of Amathus and Lapithos are marked as discussed in the text. The landward and seaward buffers have been defined based on the generally acceptable former interpretations of Vogiatzakis *et al.* (2017: Fig. 1). Produced by the author on ArcGIS. Source for layers of Hillshade Coastline: Department of Lands and Surveys, Cyprus (DLS Portal); source of the basemap: Esri Garmin, NCAA NGDC and other contributors; layer of archaeological sites produced by the author.

provide essential habitat for many species and contribute to fishing (Department of Fisheries and Marine Research 2012: 53–55; Campagne *et al.* 2015: 394, 396; Jackson *et al.* 2015: 900; Kleitou *et al*. 2020: 1–2). These seagrasses may be ancient, as the remains of fish species living mainly in a substrate with seagrass meadows from depths of about 1 to 50 m have been recovered within Amathus' fishbone assemblage (Department of Fisheries and Marine Research: 2012: 53–55; Kleitou *et al.* 2020: 2, 12; Michael 2022: 401–402). Consequently, the presence of seagrass meadows within this area provides a fertile fishing ground which was exploited by the inhabitants of Amathus.

During summer, when the upwelling phenomenon occurs, the local wind patterns, which become predominant features, also favour the growth of fishing in this area. The northerly land breezes developed at night help fishers to sail or row in calm weather offshore, and the light southerly sea breezes developed during the whole day help them return safely to the coast (Meteorological Service 1986: 9; Michael 2022: 158, 401). In addition, the northerly land breezes and light southerly sea breezes are predominant features during the winter time (Meteorological Service 1986: 9); as a result, they create the ideal circumstances for the growth of fishing within this season. Although it is difficult to confirm the seasonality of fishing in this area based on the available evidence, fishers were probably aware of the environmental conditions in this area, and they likely took advantage of them in order to achieve the successful exploitation of their marine supplies.

In addition, the construction of rock-cut fish-ponds along the northern coast of Cyprus is likely a result of the knowledge of the landscape and seascape of Cyprus (Auriemma and Solinas 2009: 136–137; Marzano 2013: 205–233; Morhange and Marriner 2015: 148–150; Evelpidou and Karkani 2018: 3; Michael 2022: 379–388). Their structural arrangement mainly consists of a pond and one or two rock-cut channels used as an entrance from the sea to the pond, while they involved human effort and required unremitting care (*De Re Rus.* 8.1.3). Based on the written sources, the structure of a fish-pond depends on the seabed morphology, sea level, tides, prevailing winds and currents (*De Re Rus.* 8.16.6–8, 8.17). This descriptive information has been confirmed by combining the archaeological remains of the fish-ponds at Lapithos, an archaeological site located on the northern coast of

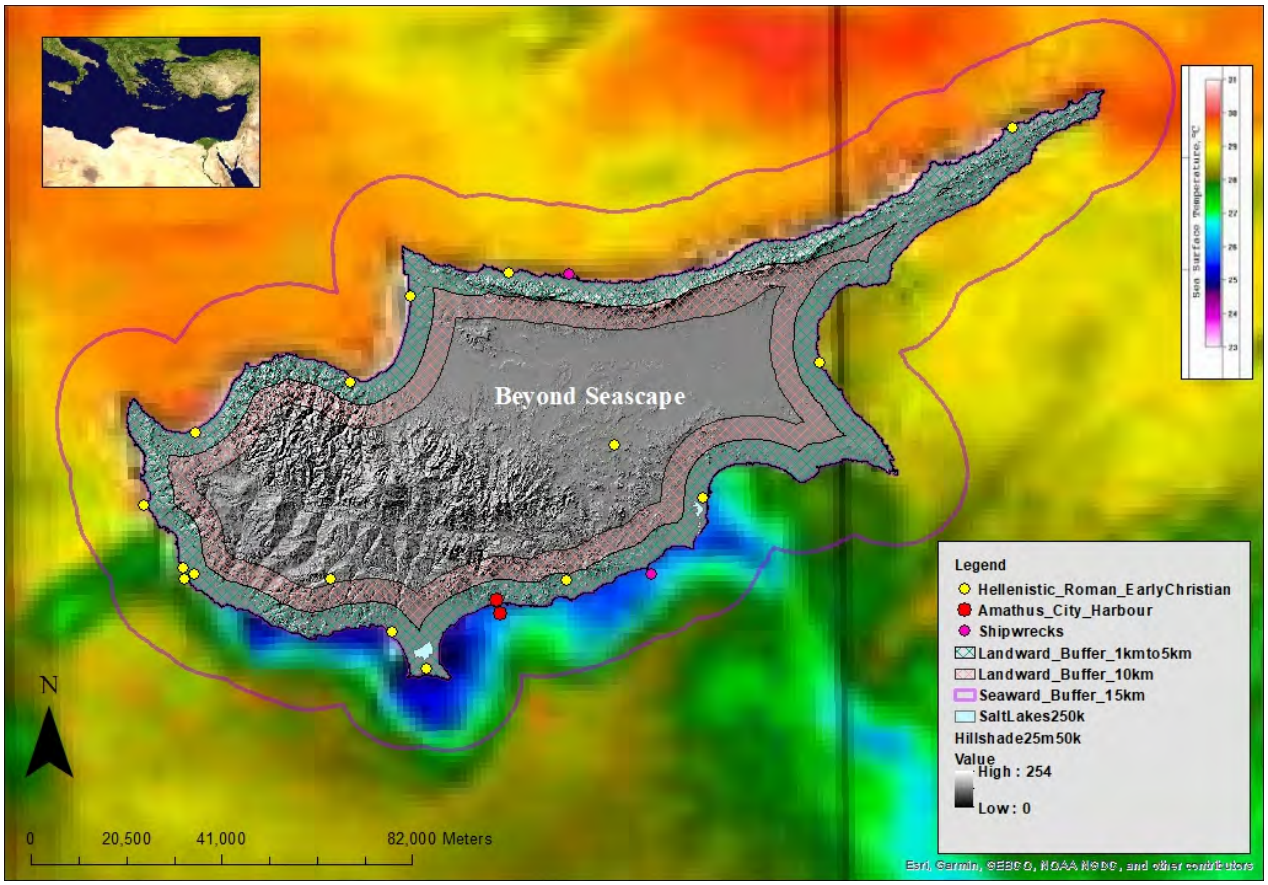

Figure 3.9. Map defining the upwelling phenomenon in relation to the landward and seaward buffers of Cyprus (land and coastal zones of Cyprus) and the Hellenistic, Roman and Early Christian sites. The site of Amathus is marked with a red point as discussed in the text. Produced by the author on ArcGIS. Source for layers of Hillshade Coastline: Department of Lands and Surveys, Cyprus; a single passage NOAA-AVHRR image on 15 August 2011 from the CYCOFOS ground satellite receiving station at the Oceanography Centre of the University of Cyprus is used as basemap. This image shows the upwelling phenomenon and its offshore extension south of Cyprus (Department of Fisheries and Marine Research 2012: 11); layers of archaeological sites produced by the author.

Figure 3.10. A view of the fish-pond at the archaeological site of Lapithos, on the north coast of Cyprus. Photo by the author.

Cyprus (Figures 3.8 and 3.10), with environmental and ethnographic data (Nicolaou and Flinder 1976: 134: Fig. 1; Michael 2022: 381–386, 399).

As already discussed, the seabed of the northern part of Cyprus is more fertile in comparison to the southern part based on oral histories and traditions, while the stability of the north coast to the present sea level benefited the construction and development of fish-ponds in this area (Nicolaou and Flinder 1976; Panayides 2018: 227, 235–237). As a result, the construction of fish-ponds along the north coast of the island was a choice based on the potentially lucrative ground. In addition, the orientation of fish-ponds was intentionally chosen in order to take advantage of the incoming tide of the sea and the predominantly northwesterly to northeasterly winds (Michael 2022: 147, 379, 384). These winds create a current tending towards land, which contributed to the continuous renewal of water within the pond. Consequently, the occurrence of fish-ponds along the north coast of Cyprus is not by chance, while the daily interaction of fishers with their maritime environment led to acquiring a maritime knowledge, which in turn affected the growth of fishing.

To sum up this brief discussion, it seems that Cypriots who decided to become fishers and engaged in fishing also decided to adopt a specific lifestyle. Knowledge of ecology (seabed ground), meteorology (winds, currents, tides, *etc.*) and biology (availability of fish species) was an essential 'tool' for establishing and developing fishing. The only way to acquire this knowledge was to interact daily and systematically with the physical and cognitive aspects of the terrestrial (landscape) and marine space (seascape) in which they lived and worked. Consequently, the understanding of fishing in Cyprus diachronically contributes to understanding an important aspect of the human life of Cypriot maritime communities.

Fishing as a way of living in the field of maritime archaeology

To end this discussion, it is essential to address the question of how the understanding of the human daily activity of fishing in Cyprus diachronically contributes to advancing the field of maritime archaeology as a way of understanding human life. To answer this question precisely, the author returns to the definition of maritime archaeology, which—in general terms—is the study of human interaction with the sea through the archaeological study of material evidence of maritime culture (Delgado 1997: 259; McKinnon 2014). Through the research presented here, the study of material related to fishing demonstrates that fishing communities relied on the accumulated knowledge of their local maritime landscape and seascape to navigate and identify fishing grounds and develop the activity of fishing.

Thus, fishing is not just the engagement of a person with the sea to catch fish; rather, it is a lifestyle because fishers interact with different aspects (*e.g.* environmental, biological, cultural, *etc.*) of their landscape and seascape in order to decide where, when, what and how to catch fish. For instance, the knowledge of the vegetation of a fishing ground, as already discussed, is an important element for the effectiveness of fishing because the presence of Mediterranean tapeweed/seagrass (*Posidonia oceanica*) within a fishing ground may be one of the main factors in the establishment and development of fishing in an area because these seagrasses are a primary source of nutrition in marine environments (Michael 2022: 428).

In addition, the knowledge of the seabed's nature is essential for deciding whether an area is a profitable fishing ground or/and the right point to use a specific fishing gear or/and fish the targeted fish species which fishers want to catch (Acheson 1981: 276–277, 290–291, 307; Aswani 2020: 475–479, 481; Michael 2022: 428). According to the oral Cypriot tradition, fishers used heavy rocks covered on their bottom with animal fat (Michael 2022: 219–220). They threw them on the seabed and after a few minutes pulled them up. If sand stuck on the animal fat, it meant the seabed was sandy and not rocky, so it was a good area for setting up nets. These heavy rocks that Cypriot fishers used to identify the morphology of the seabed seem to be similar to ancient stone or lead sounding weights, which have been mainly found in Israeli waters and can be seen as auxiliary to fishing activity (Oleson 2000, 2008: 120–121; Galili and Rosen 2008: 72; Galili 2010: 133; Galili *et al.* 2013: 154–157; Safadi 2018: 240–241). Only three have been recorded from ancient Cyprus (Oleson 2000: 299, 2008: 146, 154, 157). Although their usage is similar to the stone that Cypriot fishers used, sounding weights are not mentioned as fishing gear, but they are interpreted as navigational tools used to identify the morphology of the seabed during a sailing trip (Oleson 2000: 295–296, 2008: 125–129; Galili and Rosen 2008: 75). Consequently, combining the traditional use of heavy rocks to distinguish the seabed's nature with archaeological evidence of sounding weights from the wider region of the eastern Mediterranean suggests fishers interacted with its marine environment in order to acquire knowledge about the morphology of the seabed.

Finally, fishers, like all seafarers, pay constant attention to some points of orientation to locate their fishing grounds, especially when there are currents or it is windy (Frost 2000; Morton 2001: 203; Obied 2016: 9–11, 36–38, 64, 145–158; Safadi 2018: 239–241; Michael 2022: 218–219). Based on oral traditions, Cypriot fishers watch a fixed landmark or a pair of landmarks—for example, a church, a distinctive elevation or familiar mountaintop and/or promontory—and observe how the landmarks look from their boat to enable them to know their present position (Michael 2022: 429). In the same way, the ancient promontory shrines/temples of Phoenicians, Greeks and Romans would have been visible to seafarers and fishers moving along the coast, acting as key navigational markers in the mental maps of their environment (Semple 1927: 379). In addition, Strabo describes how seafarers used the mountains Amanus, Rhosus and Pieria to sail south along

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the rocky seascape of the Northern Levant (Obied 2016: 148). Consequently, it seems fishers attempt to perceive, interact and use their landscape and seascape in order to acquire knowledge (a mental map) of their landscape and seascape, which is important for establishing and developing fishing.

Thus, the effectiveness of fishing depended on the constant interaction of fishers with their landscape and seascape, while this constant fisher-sea interaction led to the acquisition of knowledge of their landscape and seascape, an intangible aspect revealed through the simultaneous study of archaeo-ichthyological and contemporary/traditional evidence (Michael 2022: 428). Through this systematic and simultaneous examination, it is possible to comprehend the nature and synthesis of fishing and how and why it was established as a social and cultural action in various archaeological contexts over time. Consequently, the contribution of the study of fishing through time is essential to advancing the field of maritime archaeology as a way of understanding human life.

Conclusion

This chapter explores and interprets the human utilisation of space through the daily activity of fishing in the archaeological context of Cyprus through time. Through the concurrent study of archaeo-ichthyological evidence with the environmental and cultural characteristics of their archaeological context, the reconstruction and comprehension of fishers' knowledge of their known local environment (mental map) is accomplished. By using the ethnoarchaeological approach, it is possible to reveal this intangible knowledge, which in turn can determine the occurrence or absence of fishing in the Cypriot maritime landscape and enable hypotheses about the relationship between fishers and their maritime environment in the past.

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4

Ropotamo: an Early Bronze Age pile-dwelling on the Western Black Sea coast

Kalin Dimitrov, Jonathan Adams, Pavel Y. Georgiev, Maria Gurova, Hristina Vasileva and Nadezhda Karastoyanova

Abstract: Ropotamo is a multi-period archaeological site located on the southern Bulgarian Black Sea coast, in a small bay where the Ropotamo River flows into the sea. Due to the unique natural habitat, the site has preserved the stratigraphy left by millennia of human activity in the bay. In 2017, underwater excavations were launched as part of the international Black Sea Maritime Archaeology Project (Black Sea MAP). Over the following seasons to 2020, four trenches were excavated. Documentation was primarily done with a multi-camera rig for high-resolution digital photogrammetry, and interdisciplinary analyses were carried out. At depths between 1.5 and 2.0 m below seabed, artefacts from the Early Bronze Age were discovered: pottery, flint, stone, bone tools and wooden piles of structures. Detailed analysis of the stratigraphy shows that when the sea level was *c*. 6 m lower than the present one, a pile-dwelling settlement was established. The structures were raised on posts near or on a calm freshwater environment such as a river or a lagoon. Radiocarbon dates the site to the very end of the fourth millennium BC. The settlement's inhabitants relied more on hunting than husbandry and were forced to make repairs as the sea level rose, until they eventually abandoned the site.

Introduction

In 1921, when digging for a navigable channel connecting two coastal lakes in the area of Varna, the remains of a prehistoric settlement were found below sea level at a depth of between 3.0 and 4.5 m. In the following decades, the number of known similar settlements increased, and to date, we have data on over 20 underwater prehistoric sites along the Bulgarian Black Sea coast (Ivanov 1993; Draganov 1995, 1998). Most of them date to the Late Chalcolithic and Early Bronze Age (fifth–fourth millennia BC) and are concentrated in two zones: north in the waters of Varna and Beloslav Lakes and in coastal marine bays south of Burgas. Although more than a century has passed since the discovery of the first settlement underwater, only a few of these settlements have been researched archaeologically. Therefore, the study of the archaeological site in the bay in front of the mouth of the Ropotamo River (Figure 4.1) deserves particular attention (Dimitrov *et al.* 2020; Ballmer *et al.* in press).

The Ropotamo River is typical for the southern Bulgarian Black Sea coast: small and almost drying up during summer in the upper reaches but, at the same time, wide and navigable year-round in the last 8.5 km for vessels which draw up to 2.5 m. Typical for Ropotamo and other rivers of the Bulgarian coast (for example: Kamchia, Karaagach and Veleka) is that the estuary is blocked by a sand bank, which closes and opens depending on the winds and the amount of rainfall. These characteristics cause the development of a lasting brackish or freshwater marshy area at the mouths of the rivers, the level of which can rise by more than a metre with a strong east wind and heavy rain in the area.

The bay into which the Ropotamo River flows is about one kilometre wide. From the north, it is closed by a semi-submerged rocky reef with a length of about 200 metres, and from the east by a small sandy and pebbly beach. Due to its specific location, orientation and shape, the bay in front of the mouth of the Ropotamo River is one of the best protected natural harbours on the Bulgarian coast (Figures 4.1.3 and 4.1.4). These exceptional conditions for docking, including wintering, combined with access to the rich and diverse natural resources of the hinterland, have been attracting people to this place since very ancient times.

Underwater archaeological research in the bay at the mouth of the Ropotamo River

Surveys 1973–1989

Underwater studies in the bay began in 1973 and continued with several interruptions until 2020. Until 1989, the leader of the excavation was Prof Ivan Karayotov from the Archaeological Museum in Burgas. In 1989, the last archaeological season directed by Prof Karayotov, an archaeological trench was excavated in a small area; under a layer of mixed archaeological materials (mainly ceramics from Antiquity and the Middle Ages) and a dense mussel layer, prehistoric materials were found: wooden piles fixed in the bottom, burned clay plaster fragments, sharded and whole pottery vessels, grinding stones, bones, flint, stone,

Ilves, Kristin, Veronica Walker Vadillo, and Katerina Velentza. *Delivering the Deep: Maritime Archaeology for the 21st Century: Selected Papers From IKUWA 7.*
E-book, Oxford, UK: BAR Publishing, 2024, https://doi.org/10.30861/9781407361475.