

Maritime cultural traditions and transitions in the Red Sea

CHIARA ZAZZARO

University of Naples “L’Orientale”

ABSTRACT

The Red Sea is a very diversified maritime cultural space, main differences are among the northern and the southern part of this sea. Maritime cultural variations are seen particularly in the different systems of adaptation to the various environments: in the type of settlements, boat construction and navigation techniques.

Being located in between two wide and important maritime cultural areas — the Mediterranean and the Indian Ocean — maritime traditions in the Red Sea have been strongly influenced or modified by other maritime cultures. Changes are particularly evident in boat technology: in the transitions from one technique of boat construction to another, from one system of propulsion to another, from the use of certain materials of construction to others, or in the adoption of new hull shapes and new decorative elements.

The identification of elements of continuity and tradition in the various expressions of maritime culture in the Red Sea, and particularly in boat technology, is crucial to understand these transitional elements.

KEYWORDS

Red Sea, Indian Ocean, boats, maritime culture, tradition and transition

1. THE DEVELOPMENT OF MARITIME-ORIENTED RESEARCH IN THE RED SEA

Despite its important role in the world's history as hub of long distance trade, encounter of different cultures and religions, with its lands of myth, fertility and pilgrimage, set of conflicts and conquests — until very recently attempts to write a unique depiction of this sea, such as that of the Mediterranean by Fernand Braudel, were not made (Wick 2016). The effort of scholars to center historical analysis on the Red Sea is very recent, so as the study of Red Sea material culture. In the last forty years, archaeological and ethnographical research in the Red Sea increasingly developed provoking an important change in our perception of interconnectivity and technological development in the ancient and modern world.

Earliest research activities in the area were initiated by western explorers and archaeologists, while the involvement of local archaeologists at the beginning was very little, particularly for the lack of such specialisms in the region. According to Seland (2014: 4-5), western scholars started to get interested in the archaeology of the Red Sea as a consequence of earliest archaeological excavations conducted in India in the colonial time, which revealed evidence of long distance trade contacts with the Roman empire. Scholars realised that the investigation of the Indo-Roman trade necessarily had to involve the whole western Indian Ocean area, including adjacent lands, across two continents and stretching from western India to north-eastern Africa through the Arabian Peninsula. Archaeological explorations of the coastal regions on the African side of the Red Sea started at the end of the 19th-early 20th century. An earliest and isolated archaeological excavation on a coastal site, Adulis, took place at the beginning of the 20th century on the Eritrean coast driven by the Italian colonial interests of that time (Paribeni 1907). Other coastal and underwater excavations were conducted only subsequently, in the 1960-70s in Egypt, while systematic ethnographic research (Agius, Cooper and Zazzaro 2014) and archaeological excavations (Seland 2014) initiated mainly at the beginning of the 21st century. The reason for such a delay and exiguity of archaeological research in the area, before this date, was due to both the absence, until recently, of local competences, to the limited access to certain areas, both for political reasons and remoteness, and also for environmental reasons, particularly regarding to the underwater exploration. The constant growth of the coral coastline may cause shipwrecks and their cargoes to be hidden, warm sea water may affect the preservation of organic materials, while better preserved shipwreck sites can be usually found in less accessible depths, in less safer working conditions (Blue 2011).

Archaeological investigations conducted so far in the Red Sea area reflect three main research approaches. The first approach is archaeological and epigraphical, it was developed in Italy by scholars Rodolfo Fattovich, Maurizio

Tosi and Alessandro de Maigret, and had, as aim, that of explaining how circuits of exchange had influenced the development of social complexity in the Red Sea basin. This approach focused mainly on the 7th-2nd millennium BCE (Fattovich 1996). The second approach, which is both archaeological and historical, focuses on the understanding of socio-cultural and economic systems of exchanges in the Red Sea and by extension in the wider Indian Ocean and the Mediterranean mainly through the archaeological evidence. This approach refers in particular to the Hellenistic-Roman period (Sidebotham 2011) and also to the Medieval and early Modern periods (Kawatoko 2005). The third approach is that of maritime archaeology and ethnography which may concern different periods and has, as aim, that of understanding strategies of adaptation to the coastal environment, technologies of water transports, use of marine resources, the social sphere, religion and believes connected to the sea (Blue 2011).

2. MARITIME CULTURAL TRADITIONS AND TRANSITIONS IN THE RED SEA

The identification of elements of continuity and tradition in the various expressions of the Red Sea maritime culture, is crucial to understand transitional elements.

Many evidence of maritime material culture are common to both sides of the Red Sea and had a certain geographical and chronological continuity. The author will only mention some, as examples, among those that she could directly verify. Artificial galleries carved in fossil coral terraces near the seashore, used as shelters and for storing materials, are a common feature of all the three Pharaonic harbours on the Red Sea coast of Egypt, Wadi el-Jarf, Ayn Soukhna (Tallet 2015) and Mersa Gawasis (Bard and Fattovich 2007). The majority of the galleries varies in dimensions from 20-34 metres in length to 2-4 metres in width and maximum 2-2.5 metre high. Entrances were often reinforced/marked by stone blocks and locked by one or more large slabs. Only two of the Gawasis galleries are smaller (Cave 1 and 8), some 7 by 4.5 metres, more similar to a rock-cut chambers interpreted as used for the officials and for administrative purpose rather than for storage (Bard and Fattovich 2010: 5-6). An undated rock-cut chamber very similar to the Gawasis type, also carved in the coral terrace facing the sea has been observed also further south, on the Arabian side of the Red Sea, on the main island of the Farasan archipelago during a survey. The chamber entrance was marked by stone blocks. Slabs around the entrance and inside suggest it was originally locked. Pottery finds outside the entrance suggest it was occupied in antiquity (Cooper and Zazzaro 2014: 166). Literary reference to this type of settlement system is further attested in classical sources referring the exis-

tence of cave dwellers in the Red Sea — the Troglodites — people inhabiting the African side of the Red Sea (Tomber 2005).

More elaborated adaptations to the local environment along the Red Sea coast, consist in the use of fossil coral blocks and limestone block. Constructions made with these materials are attested since the Pharaonic period, but are mainly diffused in Roman ports such as at Myos Hormos (Peacock and Blue 2006) and Berenike (Sidebotham 2011: 57), in Egypt. Modern period constructions made with fossil coral ashlar are attested for example at Suakin old city (Greenlaw 1995), on the island of Massawa (old Massawa) and in the merchant houses of Farasan main island (Cooper and Zazzaro 2014: 161-162).

Other material elements of geographical and chronological continuity are seen in the various strategies adopted by people to collect water in the arid coastal environment typical of the Red Sea. These strategies are mainly based on the exploitation of available underwater sources along the Egyptian coast of the Red Sea and, further south, on the collection of raining water in water storage installations along the Sudanese, Eritrean and Djibouti coasts and islands. Characteristic of this area are cisterns carved in the coral bedrock and covered with plaster or mortar; most of them are undated or they are very difficult to date because, presumably, they have been continuously used since earlier navigations in the Red Sea have started (Zazzaro 2013: 26-30).

Elements of continuity may be also seen in the exploitation of natural marine resources and food provision. *Pinctada* shell, commonly known as pearl oyster, was collected to obtain mother of pearl and pearls in the Red Sea at least since the Roman period, according to recent epigraphic and archaeological evidence (Schörle 2015, Zazzaro in press). Its exploitation continues until the beginning of the 20th century (Agius, Cooper, Semaan, Zazzaro and Carter 2016: 153-162). Archaeological evidence of large concentrations of *chicoreus* shell from one of the landing places near the ancient port of Adulis, in Eritrea, dating to the 1st century CE, suggests that these shells were collected in order to extract the operculum. In contemporary Eritrea, on the Dahlak islands, and in Sudan the operculum of the *chicoreus* shell is employed in the production of perfumes and incense. It is therefore suggested that the exploitation of this shells may date back at least to the Roman period, so as the exploitation of oyster shells in the area (Zazzaro et al. 2015).

3. TRADITION AND TRANSITION IN THE NAUTICAL SPHERE

In spite of these examples of continuity and consistency through time and space, Red Sea societies had also experienced important phenomena of transition in several manifestations of their maritime culture, being exposed to interactions with people coming from different regions and cultures outside the

Red Sea, from the Mediterranean and the Indian Ocean. Interesting phenomena of continuity and transition to which we can give a close look, are seen in the development of boat construction techniques and in the various boat typologies. A part the Mediterranean and the Indian Ocean areas of influence, Red Sea boat construction and features have been also strongly influenced, particularly at the beginning, by boatbuilding traditions firstly developed in a fluvial context: the Nile.

The western Indian Ocean, as a whole, is a wide and diversified area in terms of boatbuilding construction techniques. A typical traditional technique of construction which has been common to the whole area in antiquity and has in part been abandoned in the 16th century but still survives until today in India, is the system of sewing planks together (Pomey 2011, see also below). In the Mediterranean, early boatbuilding construction techniques are even more diversificate than in the Indian Ocean, for what we know today, varying particularly from the Western to the Eastern basin. The system of sewing plank seams and the mortise-and-tenon technique of assembling planks together were adopted at the same time in different regions for a certain period, suggesting that some main changes may have occurred simultaneously in different regions (Pomey and Rieth 2005: 159-165). A more unified tradition of construction is attested all along the Nile and particularly in the Nilotic Egypt, which seems to receive very little influence from the outside world from the beginning to the Roman period (Ward 2000).

A coherent and comprehensive analysis of traditions and transitions in boat construction in the Red Sea and in the wider Indian Ocean is unfortunately limited by the unbalanced number of material evidence distributed in time and space. Paradoxically, we have more numerous and precise archaeological evidence from the Pharaonic period than from the Greco-Roman and the Medieval/Modern period.

3.1 THE PHARAONIC PERIOD

In Egypt, unique boatbuilding characteristics developed, such as the technique of sewing planks across and not along their seams, the use of copper lashings, the hogging truss, the bipod mast, and of long tenons. These characteristics which are not seen anywhere else or are seen in very faraway contexts, prove the particularity of technological innovations developed within a unique boatbuilding tradition.

The Old Kingdom technique of sewing planks across, as seen in the famous Khufu boat, recalls very much the technique of lashing papyrus bundles together as in the earliest water transports employed on the Nile, the papyrus rafts (Pomey 2015: 12-14). This suggests that early wooden boatbuilding construction techniques in Egypt were strongly inspired by local traditions and

that technological transitions consisted in adaptations of earlier techniques to new materials, such as longer cedar planks from Lebanon. Further elements of transitions, from this lashing technique to the mortise-and-tenon system, are seen in later Middle Kingdom seagoing boat remains from the Red Sea port of Ayn Soukhna where lashing channels are associated to mortise-and-tenon joints (Pomey 2015: 18-19).

Despite the system of lashing planks across seems to disappear late after, other elements of continuity and unicity in ancient Egyptian boat construction still survives. Herodotus reports that the way Egyptians build their boats was different from that employed by other Mediterranean people. The assemblage of planks is similar to that of alternating bricks one above the other as in the construction of a wall (Belov 2016). This is explained by the fact that the shortage of wood in the area obliged Egyptian carpenters to use short planks alternating and framing them in order to obtain structural consistency. The locally available wood all along the Nile is acacia, from which short planks can be cut still today for the construction of small working boats which recall very much the ancient types,¹ while to obtain longer planks for larger and special boats, ancient Egyptian had to import cedar wood from Lebanon.

The finding of boat remains from the Pharaonic harbour of Mersa Gawasis provided so much information on how seagoing ships were constructed, to allow the reconstruction of a navigating Pharaonic seagoing ship (Ward 2012). Ship timber remains from Gawasis suggests a certain consistency with contemporary boatbuilding tradition in the Nile but with some adaptation to the maritime environment (Ward and Zazzaro 2009). Among those adaptations archaeologists noticed the use, not systematic and limited to the planks below the waterline, of pegs to lock mortise-and-tenon joints. In fact, locked mortise-and-tenon guarantee a better resistance to planks seam rubbing caused by sea waves. The insertion of copper strips in the seam of planks positioned below the waterline, also attested on Gawasis timbers, also seems to be another adaptation to the maritime environment. Copper is in fact an efficace antifouling which guarantees the protection of the wood from shipworms, particularly in sensitive areas such as, indeed, plank seams below the waterline. The use of caulking to waterproof and to protect the hull seems, so far, not attested on Pharaonic boat remains. Instead, a white substance was found in some spots on the surface of planks originally positioned below the waterline, this is likely to be identified with plaster mixed to animal fat (Zazzaro and Calcagno 2012). This same mixture is in use still today to protect the planks below the waterline on traditional dhows in the southern part of the Red Sea (Agius, Cooper and Zazzaro 2014).

¹ We refer in particular to the *nuggar* type of boat, still built today in Sudan at Omduram (see Agius 2012: 187).

Iconography shows further specific characteristics of ancient Egyptian boats, such as the bipod mast — in use during the Old Kingdom to distribute the weight of the mast on the two sides of the hull, perhaps also a heritage from the fragile hulls of papyrus rafts — and the use of the hogging truss on large cargo boats or on seagoing ships. The hogging truss is a longitudinal thick rope running from bow to stern keeping in tension the two extremities of the hull to improve longitudinal strength (Wachsmann 1998: 14). The use of the hogging truss testifies the effort of ancient Egyptian carpenters to adapt traditions of construction conceived for a Nilotic environment to the sea. In the Red Sea Pharaonic ships required more structural resistance in the hulls to stand sea waves. The use of the hogging truss is, so far, attested only in Pharaonic Egypt and, once again, represents a technological transition developed within a unique boatbuilding tradition in two very different environments.

3.2 THE GRECO-ROMAN PERIOD

Very little is known, in terms of archaeological evidence, on boat construction in the Greco-Roman period in the Red Sea. Recent finds from Alexandria, at Thonis-Heracleion, dating to the Hellenistic period, revealed some continuity and consistency with the previous Nilotic boatbuilding techniques but with some variations which are, once again, unique in the world (see above, and Belov 2014).

Concerning the Red Sea, material remains of boats dating to this period are insufficient to understand what types of boats were in use at that time. Literary sources and iconography compensate this lack of information. In interpreting these data we have to take into account that iconographic sources are local and made by different people that have likely seen for real the boats they represented which may be local or foreigner boats. On the other side, literary sources reflect a knowledge of the Red Sea nautical sphere as interpreted by Greek and Latin authors which in some cases did not directly observed the boats they described.

On the basis of these sources, Patrice Pomey (2012) suggests that three types of boats navigated in the Red Sea in the Greco-Roman period: Indian, Mediterranean and “primitive” local types of boats. He is guided in his analysis mainly by a written source: the *Periplus of the Erythraean Sea*, a guide for merchants navigating along the Red Sea and the Indian Ocean (Casson 1989), but he also uses other literary sources, the iconographic evidence of boat graffiti and ethnographic analogies.

One of the most interesting historical source attests that in the Augustan era (Strabo II.5.12) hundred and twenty ships sailed each year from Myos Hormos to India. Scholars suggested that these were most likely Mediterranean

merchant boats with two masts, as represented on ship graffiti found in the Roman ports of Myos Hormos and Berenike. They appear rather different from the Indian cargo boats which may also have reached the western coasts of the Red Sea sailing up to the Egyptian ports. Indian ships, represented in form of graffiti engraved inside a cave on the Island of Socotra — an important stopping point on the Indo-Roman trade route — reflect large ocean-going vessels, round-shaped.

Archaeological excavations at Myos Hormos delivered remains of sails made of Indian textile, plank remains and brailing rings made of Indian teak but using the same technology employed in the Mediterranean. According to Roberta Tomber these finds may suggest not only that Indian ships reached the Egyptian coasts of the Red Sea, they may also suggest that Roman-style ships were built in India, or that Roman ships were repaired in India, or that, more likely, Indian and Roman ships became technologically more similar through time (Tomber 2008: 73).

In the southern part of the Red Sea local boats are described in classical sources as: simple raft, dugout canoes and boat made with animal skins. Ethnographic comparisons provide a further source of information to better understand the aspect of these types of vessels: simple rafts made by lashing together a few mangrove branches and trunks are seen still today in use along the Yemeni coast of the Red Sea for fishing and they are called *ramas* (Agius, Cooper and Zazzaro 2010: 75). These types of rafts are easily made using the mangrove wood available also elsewhere along the Red Sea coast. Dugout canoe are likely to be compared with the modern *huri*, a type of canoe widespread in the southern Red Sea, East Africa, southern Arabia and India. *Huri* are carved in a unique long trunk of wood usually produced in East Africa or India where long trees grow.²

Vessels made with animal skins are likely to be identified with the type known today as *quffa*, a widespread simple type of vessel in use until the 19th-early 20th century in various regions and made with hides sewn together on a reed or wooden circular frame (McGrail 2004: 66).

The “sewn boats”, also described as “Indian boat types”, are planked vessels fastened with lashings, as opposed to the mortise-and-tenon system which was more common in the contemporary Mediterranean area (see above). These types of boats were in use in the Red Sea at the time of the *Periplus* but also at the time of Procopius (I.19.23-26), in the 6th century CE, employed by Aksumites, Arabs and Indians. In identifying those ships as Indian, Procopius suggests that they were not local in origin. Sewn boats were still attested in India (*kettuvalam*) and in archipelago of Lamu (*mtepe*) and they are rapidly disappearing in Oman (*badan*) and Somalia (*beden*) (Pomey 2012: 18-20).

² For an overview on this type of vessel see Jansen van Rensburg 2010.

It seems that after the Pharaonic period, local, Mediterranean, and Indian Ocean nautical traditional elements coexist in the development of Red Sea boatbuilding techniques, probably with a stronger Indian Ocean influence in the south and a stronger Mediterranean influence in the north as it will also be the case in the subsequent periods and until today (see below).

3.3 THE MEDIEVAL AND MODERN PERIODS

Scattered medieval written sources, iconography and few archaeological finds, suggest that a period of transition from mortise-and-tenon joints to the technique of sewing planks together may perhaps have occurred in large part of the Red Sea. A rare material evidence comes from archaeological excavations conducted at Quseir al Qadim, in Egypt, here, planks made of teak and sewn together using coconut coir, were reused to cover Islamic graves (Blue 2006).

The transition from sewn planks or from the mortise-and-tenon system — if it still survived — to nailed planks may have happened in the 15th century, probably as an effect of the Portuguese and the Mediterranean influence. The passage from lashings to nails is quite significative in the development of the Red Sea maritime culture. In fact, written sources of the Medieval period attests that the nailing technique was certainly known but it was intentionally avoided because the presence of metal elements in the hull would have attracted boats to hit the reefs. Despite it sounds like a superstition, this may also reflect the fact that sewn boats are actually more flexible and therefore more resistant to possible impacts with reefs (Hourani 1995: 87-99).

The earliest material evidence of nailed hull planks in the Red Sea date back to the first half of the 18th century and concerns three shipwrecks of merchantmen carrying products from the Indian Ocean (Raban 1971, Ward 2001, Zazzaro, Loreto and Cocca, in press). Preliminary architectural analysis and wood identification suggests that these ships were built using Mediterranean wood, although it is not excluded that boat builders may have been local or even Indians since very little is known about boat construction from this period. Ottoman archives refer that Indian ships from the port of Suez or Jeddah were preferably to the locally made ships, because more convenient in economic terms, but also more “solid and reliable” (Wick 2012: 411-412). The presence of both local and Indian ships in the Red Sea at this time, is also depicted in the Gujarati map (Sheikh 2009) and in the illustration of the Jeddah coastline in Carsten Niebuhr’s book (Niebuhr 1772, 1774).

In the Mediterranean, the transition from lashing or mortise-and-tenon fastening technique to nailing, generates also a transition from the plank-based or mixed construction sequence to a frame-based sequence, starting from the Late Antique period. This is not the case of the southern Red Sea

where mixed sequences of construction were recorded until recently (Agius, Cooper and Zazzaro 2014: 151-156). Today it is evident that the northern part of the Red Sea is clearly influenced by Mediterranean type of construction, with local adaptations — due to the availability of different materials — while the southern part of the Red Sea was until recently included in the western Indian Ocean tradition of construction.

4. OTHER TECHNOLOGICAL TRANSITION

Other technological transitions in the Red Sea nautical sphere are seen in the propulsion systems. The lateen sail seems to have firstly appeared in the Indian Ocean area, then it was subsequently “imported” through the Red Sea and Egypt in the Mediterranean. The earliest attestation of a lateen sail dates back to the 6th century CE, and it is represented on a graffito from the Egyptian monastery of Kellia (Medas 2004: 202). The earliest use of the lateen sail in the Indian Ocean may be explained by the fact that this type of sail was more suitable to face navigations to India, particularly towards the end of the south-west monsoon, when it was wicker and navigation conditions were safer. The transition from square to lateen sail in the Red Sea must also have much facilitated the navigation up to the northern part of the Red Sea (Whitewright 2011: 10-12).

The transition from sail to engine in the Red Sea occurred progressively starting from the first half of the 20th century. At this time the traditional Arab sailing vessels, known with the name of dhows in Europe,³ were the most common type of boats which were seen sailing in the Red Sea and in the wider western Indian Ocean. They were characterised by elongated hull with upraised stem and stern, sometimes richly decorated by nailed planks and lateen sail. As for the case of the transition to nail fastening, also the richly decorated stems and bridge-house of the ocean-going dhows seem to have been a heritage of the Portuguese presence in the Red Sea and in the Indian Ocean.

The introduction of the engine in the Red Sea is late and rapid comparing to the Mediterranean, as a result of it, engines were firstly adapted and mounted on existing traditional boats. The only structural variation consisted in the transition from the typical symmetric hull shape to a square stern modified in order to host the outboard engine. Similarly, larger dhows did not change their shape and construction methods much, they were only partially modified to host an inboard engine. It is worth to note also that, in the

³ Some types of dhows still survive today, although they are rapidly disappearing, replaced by the modern container ships. See Agius, Cooper, Zazzaro & Jansen van Rensburg 2010.

most recent transition from wood to fiberglass, the general shape of hull did not change (Agius, Cooper and Zazzaro 2014: 146).

5. CONCLUSIONS

Maritime societies are usually conservative, phenomena of transitions in technology may be driven by economic, military or ideological reasons.

In the Pharaonic period, the need to reach the southern regions of the Red Sea to get exotic products, to please gods and to reinforce the display of the royal power, determined innovative technological solutions aimed at adapting systems of construction employed for Nilotic boats on seagoing ships.

The availability of materials and their costs may have also been another reason having determined technological changes: the shifting from the use of mortise-and-tenon system to the use of lashings to join planks in the Medieval period, may have been due to economic constraints. Similarly, the transition from the lashing system of fastening, to nails, was dictated by the need of competing with Portuguese and European ships in the Indian Ocean. The transition in the second half of the 20th century from wood to fiberglass was also dictated by economic reasons.

Ideological reasons may also have lead technical changes: the highly decorated sterns of the large ocean-going dhows may reflect the willing of imitating Portuguese and European ships which were successful in the competitive Indian Ocean trade.

A comparative analysis of conservative and innovative elements in the nautical sphere suggests that, in the processes of technological transitions, some conservative traces are always preserved, in fact boatbuilders in pre-industrial societies adapt to new technologies from the outside world, rather progressively. Therefore, identifying traces of transitional processes in boatbuilding or in certain boat features, can help in better understanding the provenance and the deep significance of innovations.

ACKNOWLEDGEMENTS

The Supreme Council of Antiquities of Egypt, the Saudi Commission for Tourism and National Heritage, the Italian-American Expedition to Mersa/Wadi Gawasis and to the numerous institutions which sponsored the MARES Project (Golden Web Foundation), the FIRB 2012/ATrA and the Giovani Ricercatori “Rita Levi Montalcini” program of the Italian Ministry of University and Research (MIUR) providing substantial support to the archaeological and ethnographical work described here.

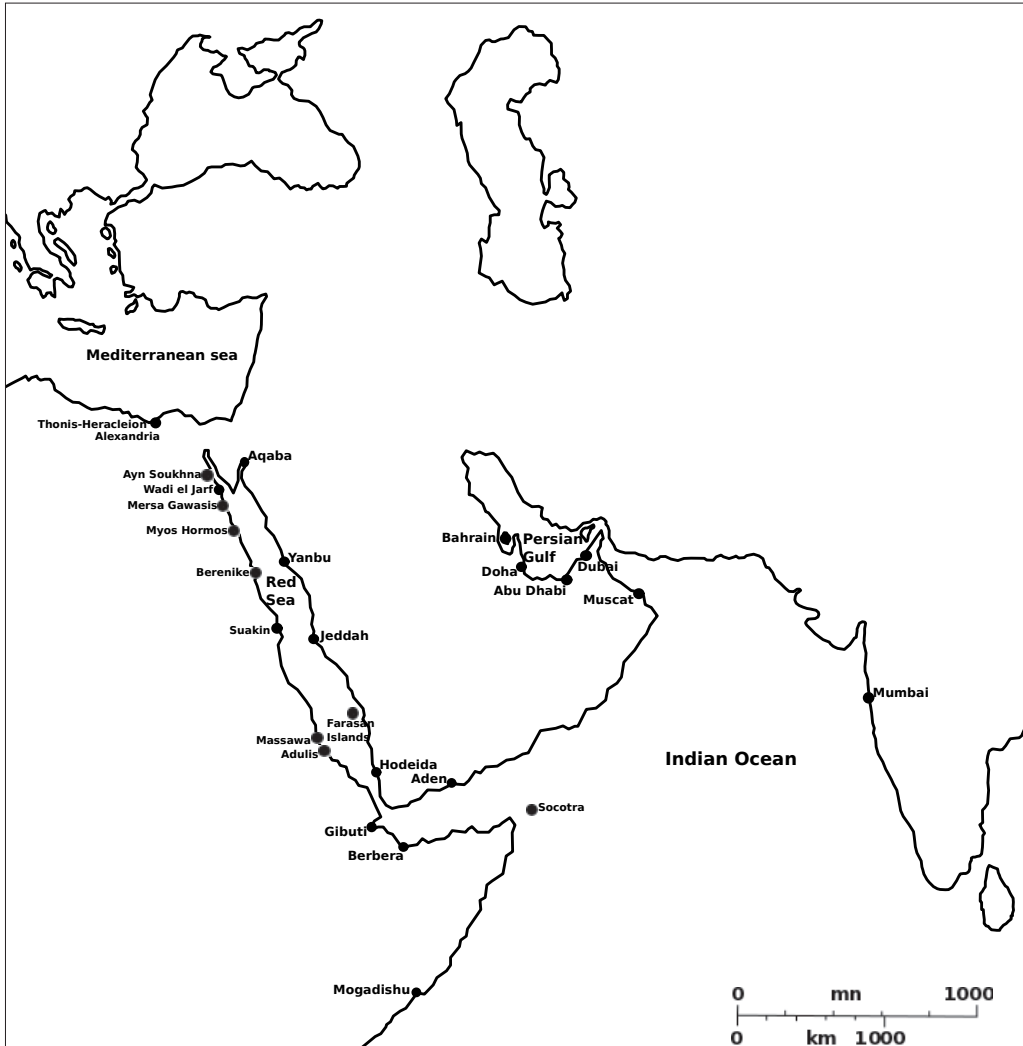


FIGURE 1 – Map of the Red Sea and the western Indian Ocean showing locations mentioned in the texts (Drawing by the author)

REFERENCES

- AGIUS, D.A. (2012), "The Rashayda: Ethnic Identity and Dhow Activity in Suakin on the Red Sea Coast", *Northeast African Studies*, vol. 12.1, pp. 169-216.
- AGIUS, D.A., COOPER, J.P., SEMAAN, L., ZAZZARO, C. (2016), "Remembering the Sea: Personal and Communal Recollections of Maritime Life in Jizan and the Farasan Islands, Saudi Arabia", *Journal of Maritime Archaeology*, vol. 11, pp. 127-177.
- AGIUS, D.A., COOPER, J.P., ZAZZARO, C. (2014), "The maritime heritage of Yemen: a focus on traditional wooden dhows", in Agius D.A., Gambin T., Trakadas A. (eds.), *Ships, Saints, and Sealore: Cultural Heritage and Ethnography of the Mediterranean and the Red Sea*. Oxford: Archaeopress Archaeology, pp. 143-157.
- AGIUS, D.A., COOPER, J.P., ZAZZARO, C. & JANSEN VAN RENSBURG, J. (2010), "The dhow's last redoubt? Vestiges of wooden boatbuilding traditions in Yemen", *Proceedings of the Seminar for Arabian Studies*, vol. 40, pp. 71-84.
- BARD, K. A. and FATTOVICH, R. (2007), *Harbor of the Pharaohs to the Land of Punt*, Archaeological Investigations at Mersa/Wadi Gawasis – Egypt 2001-2005, Naples: Il Torcoliere.
- (2010), "Spatial Use of Twelfth Dynasty Harbor at Mersa/Wadi Gawasis for the Seafaring Expeditions to Punt", *Journal of Ancient Egyptian Interconnections*, vol. 23, pp. 1-13.
- BELOV, A. (2014), "A New Type of Construction Evidenced by Ship 17 of Thonis-Heracleion", *International Journal of Nautical Archaeology*, vol. 43, pp. 314-329.
- (2016), "New light on the construction of the Egyptian baris as per Herodotus' narrative (2.96)", *Egypt and the neighbouring countries* (online journal to be published by the Centre for Egyptological studies of the Russian Academy of Sciences), vol.1, pp. 34-46.
- BLUE, L.K. (2006), "Sewn boat timbers from the medieval islamic port of Quseir al-Qadim on the Red Sea coast of Egypt", in Blue, L.K., Hocker, F. and Englert, A. (eds.), *Connected by the Sea: Proceedings of the Tenth International Symposium on Boat and Ship Archaeology, Denmark 2003. 10th International Symposium of Boat and Ship Archaeology*, pp. 277-283. Oxford: Oxbow.

- (2007), “Locating the Harbour: Myos Hormos/ Quseir al-Qadim: a Roman and Islamic Port on the Red Sea Coast of Egypt”, *International Journal of Nautical Archaeology*, vol. 36.2, pp. 265-281.
- (2011), “The Red Sea” in Catsambia, A., Ford, B., and Hamilton, D.L., *The Oxford Handbook of Maritime Archaeology*, pp. 495–512, Oxford: Oxford University Press.
- CASSON, L. (ed. and tr.) (1989), *The Periplus Maris Erythraei. Text with introduction, translation and commentary*, Princeton: Princeton University Press.
- COOPER, J.P. and ZAZZARO, C. (2014), “The Farasan Islands, Saudi Arabia: towards a chronology of settlement”, *Arabian Archaeology and Epigraphy*, vol. 25.2, pp. 147-174.
- FATTOVICH, R. (1996), “The Afro-Arabian circuit: contacts between the Horn of Africa and southern Arabia in the 3rd-2nd millennia B.C.”, in Krzyzaniak, L., Kroeper, K., Kobusiewicz, M., *Interregional contacts in the later prehistory of Northeastern Africa*, Poznan, pp. 395-402.
- GREENLAW, J.-P. (1995) *The coral buildings of Suakin: Islamic architecture, planning, design and domestic arrangements in a red sea port*, London, New York: Kegan Paul International.
- HOURLANI, G.F. (1995), *Arab Seafaring in the Indian Ocean in Ancient and Early Medieval Times*, Princeton: Princeton University Press.
- JANSEN VAN RENSBURG, J. (2010), “The Hawāri of Socotra, Yemen”, *International Journal of Nautical Archaeology*, vol. 39.1, pp. 99-109
- KAWATOKO, M. (2005), “Multidisciplinary approaches to the Islamic period in Egypt and the Red Sea Coast”, *Antiquity* vol. 79, pp. 844-857.
- MCGRAIL, S. (2004), *Boats of the World*, Oxford: Oxford University Press.
- MEDAS, S. (2004), *De rebus nauticus: l'arte della navigazione nel mondo antico*, Roma: “L'Erma” di Bretschneider.
- NIEBUHR, C. (1994 [1792]), *Travels through Arabia, and Other Countries in the East, performed by M. Niebuhr, I and II. Translated by R. Heron*, Reading: Garnet Publishing reprint.
- PARIBENI, R. (1907), “Ricerche sul luogo dell'antica Adulis (Colonia Eritrea)”, *Monumenti Antichi*, vol. 18, pp. 437-572.
- PEACOCK, D. and BLUE, L. eds. (2006), *Myos Hormos – Quseir al-Qadim: Roman and Islamic ports on the Red Sea 1: Survey and excavations 1999-2003*, Oxford: Oxbow.
- POMEY, P. (2011), “A Comparative Study of Sewn Boats from the Mediterranean, the Red Sea and the Indian Ocean. The Question of Gujarat”, in Varadarajan, L., *Gujarat and the Sea*, pp. 133-146.
- (2012), “À propos des navires de la mer Érythré: découvertes récentes et nouveaux aspects de la question”, *Topoi*, vol. 11, pp. 111-132.
- POMEY, P. and Rieth, É. (2005), *L'Archéologie Navale*, Paris: Éditions Errance.
- PROCOPIUS (1971), *History of the Wars 1*, trans. H.B. Dewing, London: Loeb Classical Library.
- RABAN, A. (1971), “The shipwreck off Sharm-el-Sheikh”, *Archaeology*, vol. 24.2, pp. 146-55.
- SELAND, E.H. (2014), “Archaeology of Trade in the Western Indian Ocean, 300 BC-AD 700”, *Journal of Archaeological Research*, vol. 22, pp. 1-52.
- SCHÖRLE, K. (2015), “Pearls, Power and Profit: Mercantile Networks and

- Economic Considerations of the Pearl Trade in the Roman Empire”, in Maiuro, M. and De Romanis, F. (eds.), *Across the Ocean: Nine Essays on Indo-Mediterranean Trade*, pp. 43-54, Leiden, Boston: Brill.
- SHEIKH, S. (2009), “A Gujarati Map and Pilot Book of the Indian Ocean, c.1750”, *Imago Mundi*, vol. 61.1, pp. 67-83.
- SIDEBOTHAM, S.E. (2011), *Berenike and the Ancient Maritime Spice Route*, Berkeley: University of California Press.
- STRABO (1917-35), *Geography*, vol. I, trans. H.L. Jones, London: Loeb Classical Library.
- TALLET, P. (2015), “Les ports intermittents de la mer Rouge à l’époque pharonique: caractéristiques et chronologie”, in Argemi, B. and Tallet, P., *Entre Nil et mers. La navigation en Égypte ancienne*, NeHeT, vol. 3, pp. 31-72.
- TOMBER, R. (2005), “Troglodites and Trogodites: Exploring interaction on the Red Sea during the Roman period”, in Starkey, J.C.M., *People of the Red Sea: Proceedings of Red Sea Project 2*, pp. 41-49. BAR International Series 1395. Oxford: Archaeopress.
- (2008), *Indo-Roman Trade – from Pots to Pepper*, London: Duckworth.
- WACHSMANN, S. (1998), *Seagoing Ships and Seamanship in the Bronze Age Levant*, London: Chatham Publishing.
- WARD, C. (2000), *Sacred and Secular: Ancient Egyptian Ships and Boats*, Boston: Archaeological Institute of America.
- (2001), “The Sadana Island Shipwreck: An Eighteen-Century AD Merchantman off the Red Sea Coast of Egypt”, *World Archaeology*, vol. 32.3, pp. 368-382.
- . (2012), “Building pharaoh’s ships: Cedar, incense and sailing the Great Green”, *British Museum Studies in Ancient Egypt and Sudan*, vol. 18, pp. 217–32.
- WARD, C. and ZAZZARO, C. (2009), “Evidence for Pharaonic Seagoing Ships at Mersa/Wadi Gawasis, Egypt”, *International Journal of Nautical Archaeology*, vol. 39, pp. 1-17.
- WHITEWRIGHT, J. (2011), “The Potential Performance of Ancient Mediterranean Sailing Rigs”, *International Journal of Nautical Archaeology*, vol. 40, pp. 2-17.
- WICK, A. (2012), “Self-Portrait of the Ottoman Red Sea, 20th of July 1777”, *The Journal of Ottoman Studies*, vol. 40, pp. 399-434.
- WICK, A. (2016), *The Red Sea. In Search of Lost Space*, Berkeley: University of California Press.
- ZAZZARO, C. (2013), “The Ancient Red Sea Port of Adulis and the Eritrean Coastal Region. Previous Investigations and Museums Collections”, *Cambridge Monographs in African Archaeology 85, BAR International Series 2569*, Oxford: Archaeopress.
- (in press), “Goods from the sea: shells, pearls and red coral from the ancient Red Sea port of Adulis (Eritrea)”, *Festschrift for Carmela Baffioni*, Napoli: Università di Napoli “L’Orientale”.
- ZAZZARO, C. and CALCAGNO, C. (2012), “Ship components from Mersa Gawasis: recent finds and their archaeological context”, in Tallet P. and el-Sayed M., *The Red Sea in Pharaonic Times Recent discoveries along the Red Sea coast*, pp. 65-85, Caire: Institut français d’archéologie orientale.
- ZAZZARO, C., LORETO, R. and COCCA, E. (in press), “3D Surveying of

an Eighteenth-Century Merchantman off the Red Sea coast of Saudi Arabia”, *Skyllis*.

ZAZZARO, C., CARANNANTE, A., FLAUX, C., MORHANGE, C. (2015), “Adulis in its Regional Maritime

Context”, *Newsletter di Archeologia CISA*, vol. 6, pp. 279-294.