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Exploiting mangroves: Environmental changes and human interference along the northern coast of the Arabian Sea (Pakistan) during the Holocene

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Introduction

The scope of this paper is to overview our knowledge of the prehistory of the northern coast of the Arabian Sea in Lower Sindh and Las Bela in Balochistan, define the chronology of the earliest coastal settlements, and discuss their location, characteristics, and disappearance. Coastal archaeology has greatly improved during the last 30 years¹ thanks to the interest that many archaeologists, palaeoclimatologists and geomorphologists, have paid to this unique field of research. This fact led to the discovery of the earliest traces of coastal navigation,² whose archaeological evidence, in the study region, is marked by the impressive finds excavated at as-Sabiyah in Kuwait, at the westernmost edge of the Persian/Arabian Gulf.³

Almost nothing was known of the presence of archaeological sites along the northern coast of the Arabian Sea until the second half of the 1970s. In those years Professor A. R. Khan of the Department of Geography, Karachi University, carried out a systematic geoarchaeological survey of the entire territory around Karachi. Thanks to his discoveries at present we know that the whole area is very rich in sites of different ages, spanning a long period, from the Middle Palaeolithic to the Buddhist period.⁴

Unfortunately most of the sites discovered by Professor A. R. Khan are still unpublished, and too many of his important discoveries are unknown or unreported by most archaeologists.⁵ However, our knowledge of the archaeology of the northern part of the Arabian Sea has dramatically improved following the results achieved by his surveys.

It is again thanks to the work of the aforementioned author that the Neolithic and Bronze Age shell middens of the Bay of Daun were discovered

in Las Bela in 2000. The sites were systematically surveyed in 2004 and 2008.⁶ Between 2000 and 2014 a few visits were paid also to Capes Gadani and Phuari,⁷ Rehri, along the coastal terraces that extend east of Karachi, the Tharro Hills,⁸ Balakot,⁹ Pir Shah Jurio,¹⁰ and Sonari near Cape Monze (Ras Mauri).¹¹

Even more surprising is that the surveys carried out by other authors before the 1970s along the same coastline as far as Makran, did not yield any trace of the most characteristic sites of the Arabian Sea coast, namely shell middens.¹² This evidence strangely contrasts with the data available from the Sultanate of Oman since the 1960s, and more generally along the western coast of the Arabian Sea.¹³

The shell middens of the Bay of Daun were discovered in January 2000 during a short visit paid to the coast of Las Bela together with Professor A. R. Khan. The main scope of the visit was to collect complete specimens of *Terebralia palustris* mangrove shells, a few samples of which Professor Khan kept in the stores of the Museum of Prehistory and Palaeogeography, Institute of Geography, Karachi University.

Following the discovery of the Daun shell middens, the surveys were extended first to the Indus Delta, in Lower Sindh,¹⁴ and later to the coast of Las Bela, in Balochistan.¹⁵ Both areas yielded an impressive number of archaeological sites, mainly *Terebralia palustris* and *Telescopium telescopium* shell middens, and shell scatters both close to the seaside and well inland. A good series of AMS dates was obtained from these sites, whose scope was

¹ Bailey/Parkington 1988; Erlandson/Fitzpatrick 2006; Rainbird 2007; Erlandson/Rick 2008.

² Bjerck 2017.

³ Carter/Crawford 2010.

⁴ Khan 1979a.

⁵ Wright 2010; Coningham/Young 2015; Kenoyer 2015.

⁶ Biagi et al. 2012.

⁷ Biagi et al. 2013a.

⁸ Majumdar 1934; Piggott 1950; Fairservis 1975.

⁹ Khan 1979c, 75.

¹⁰ Khan 1979a, 3.

¹¹ Biagi/Nisbet 2014.

¹² Stein 1943; Snead 1966; 1969; Dales 1982; Besenval 1992; Dales/Lipo 1992; Hasan 2002.

¹³ Biagi 1988; Cleuziou 2004; Berger et al. 2005; Амирханов 2006.

¹⁴ Biagi 2010.

¹⁵ Biagi 2011; Biagi et al. 2013b.

to achieve a first reliable sequence of the prehistoric settlement and environmental changes that took place in this almost forgotten region of the north Arabian Sea coast since the beginning of the Holocene.

Current and historical mangroves in Pakistan

It is well known that mangroves represent an exceptional environment, perfectly adapted to inter-tidal habitat such as estuaries and deltas.¹⁶ They are so strictly connected to the coast that some authors define mangroves to include the formation below the high tide mark (*tidal forests*), though other mangroves “may occur from far below the level of the lowest to above the level of the highest tides, or on coasts where there are no tides at all”.¹⁷ The fact that they live in areas where both fresh and saline water occur, favour the reconstruction of the coastal variations in those regions, the Indus Delta for instance, where dramatic changes in the landscape, not yet fully understood, took place during the Holocene.¹⁸

Many authors have pointed out the economic importance of mangroves, providing fuelwood,¹⁹ timber, tannin and medicinal products as well as crustaceans and fish for food,²⁰ though no recent gatherings of the most frequent, typical molluscs have ever been mentioned,²¹ as happened in prehistoric times in the Gulf and along the coasts of the Arabian Sea.²²

Fig. 1 Distribution map of the present mangroves along the coasts of Sindh and Balochistan (Pakistan) (topographic map OpenStreet Map; drawing by R. Nisbet)



- ¹⁶ Kathiresan/Rajendran 2005; Schwadron 2013.
¹⁷ Lugo/Snedaker 1974, 43.
¹⁸ Pithawalla 1939; 1976; Wilhelmy 1968, 1986; Flam 1987, 1999; Kevran 1999.
¹⁹ Aitken 1907, 32; Hasan 2002, 10.
²⁰ Tomlison 1986; Hogarth 1999; Ellison 2014.
²¹ Siddiqi 1956; Haas 1959.
²² Biagi 2008; Boivin/Fuller 2009.

Out of Pakistan’s 1000 km coastline, roughly 300 are covered by mangroves. In the case of the Indus Delta, these tidal forests border the numerous creeks extending well inland, at a distance of 30 km or more from the coast, covering a huge territory of ca. 600,000 ha.²³ A much lesser extent have the other four mangrove areas, found at Manora (Karachi),²⁴ Miāni Hor,²⁵ Kalamat Khor and Jiwani (the last three in Balochistan), together forming only 5% of the total Pakistani mangroves endangered by increasing human pressure²⁶ (Fig. 1).

Ancient historians have left some descriptions of mangroves at the borders of the Indian Ocean and the Gulf. Probably the earliest mention is found in Theophrastus who, in his *Historia Plantarum* (305 BC), reports from Aristobulos on the voyage by Nearchos in 325 BC from the Indus Delta to the Persian Gulf. The trees described by Alexander’s admiral would apply to *Rhizophora* sp. and *Avicennia* sp.²⁷ Arrian mentions of mangroves (“These trees were on ground which was left dry by the ebb-tide; but when the water advanced they looked as if they had grown in the sea”: Arrian, *Anabasis*, VI.22.6)²⁸ in his description of Alexander’s voyage are the last one together with that of Pliny’s *Naturalis Historia*, XIII.25.51.²⁹ Apart from early short points in Theophrastus and Strabo, before the 13th century AD observations are reported by the botanist and physician Ibn al-Bitār along the Arabian coasts.³⁰

According to B. Rollet³¹ in the following three centuries no more than five or six descriptions of mangroves in the world botanical literature are found before van Rheedee’s *Hortus malabaricus*,³² broadly referring to Indian Ocean mangroves. Paradoxically, Aitchison’s list of Punjab and Sindh plants reports the presence of *Rhizophora* sp. at the Indus Delta, but not of *Avicennia marina*, by far more common.³³

Even the otherwise always very well informed *Gazetteer of Sind*³⁴ pays no attention to the coastal vegetation between Karachi and the Indus Delta. More details were provided by A. J. Murray (1881), who described some mangrove trees (*Ceriops candoleana*) as common “at the mouth of Indus, and in the salt-water creeks, Kurrachee, and on the coast”,³⁵ which is certainly an overestimation of

- ²³ Snedaker 1984, 256; Qureshi 1990.
²⁴ Baillie 1890, 52-53; Campbell 1999.
²⁵ Saifullah et al. 2002.
²⁶ Hameed-Baloch et al. 2014.
²⁷ Eggermont 1975.
²⁸ Ambaglio 1994, 561.
²⁹ McCrindle 1901; 1972.
³⁰ Ibn al-Bitār 1987.
³¹ Rollet 1981.
³² van Rheedee 1678-1703.
³³ Aitchison 1869.
³⁴ Hughes 1876.
³⁵ Murray 1881, 190.

