Introduction

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1 The Name of the Studied Area

For some, the name "Arabian Seas" looks incorrect as there is only one sea named the Arabian Sea. In this book, the name "Arabian Seas" is used after Barendse (2000) introduced it. It has been chosen as it represents fully the marine areas surrounding the Arabian Peninsula although not all the countries bordering these seas are Arab, with Iran and Israel, are the only non-Arab countries in this region. Barendse (2000) proposed this name to describe the coastlines adjacent to the Arabian Peninsula and the interior of the Red Sea and the Arabian Gulf. In this book, the name "Arabian Seas" is used slightly different from the usage of Barendse (2000) in including the both coasts of the Red Sea, the Arabian Gulf and the Sea of Oman. The chosen name of the Arabian Seas came as an alternative choice in having a name that does not show any territoriality and nationalistic issues.

2 The Geographical and Geological Settings

The countries bordering the marine waters in the Arabian Seas region are, in the Arabian Gulf area and from the north to the south, Iraq, Kuwait, Saudi Arabia, Bahrain, Qatar, United Arab Emirates, and Sultanate of Oman and Iran on the west coast. The coasts of the Sea of Oman are bordered only by Iran on the west and Sultanate of Oman on the east coast. The northwest region of the Arabian Sea is bounded by Sultanate of Oman and the Republic of Yemen in the north and Somalia in the south. There are several countries surrounding both coasts of the Red Sea, and

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these are from the north to the south, Israel, Saudi Arabia, Republic of Yemen, Djibouti, Eretria, Sudan, and Egypt.

The length of the coasts of the Arabian Seas is over 23,000 km (Chiffings 1995). These connected aquatic habitats are known as characteristic marine environments containing an exclusive variety of species and highly composite biological structures (Sheppard et al. 1992).

A general review of the geological history of the Arabian Seas was given by several authors (Beydoun 1966; Kassler 1973; Al-Sayari and Zötl 1978; Krupp 1983; Wolfart 1987; Alsharhan et al. 2001). Brook et al. (2006) have given a detailed explanation for the geological scenario that led to the formation of the Arabian Seas. Here, a short description of this scenario will be given in the following section. The geological formation scenario of this region is included with that of Afro-Arabian mainland mass. In the Precambrian to the Paleogene (Paleocene to Oligocene) periods, the Afro-Arabian mass was uninterrupted sheet. During the Mesozoic time, tectonic activities caused an eastward sloping of the Arabian plate, and by the Cenozoic period, the Arabian Plate drifted away from the African continent along the Red Sea crack. The tertiary crack in the area between African and the Arabian shields caused the formation of the Red Sea fissure. Throughout the Eocene and Oligocene epochs, a division of the Tethys Sea stretched into the northern Red Sea dip, whereas the southern Red Sea split valley enclosed freshwater lakes. The Indian Ocean cracked through the Strait of Bab al-Mandab later in the Pliocene era forming the contemporary Red Sea.

The geological changes that happened in the Yemen and Dhofar regions occurred mostly during the Mesozoic Era, and they can be seen in the formation and the wadis in Yemen and Dhofar. The geological formation of Oman's mountains or Al-Hajar at the southeastern verge of the Arabian Peninsula founded in the Neogene period origin and persistent into current times. The mountains in this area are high and could reach to about 3000 m. This area is full of wadis that drain into the Arabian Gulf, Sea of Oman, the Arabian Sea, or the desert of Rub al-Khali.

The Arabian Gulf is formed in the period of Pliocene to Pleistocene era, and it is a result of the equivalent tectonic actions that happened in the Zagros Mountain formation.

Nearly at the close of the Pliocene era, the basin of the Arabian Gulf took its current shape, but the water height was about 150 m higher than today. The succeeding dropping of sea level caused the development of marine habitats in the eastern side of the Arabian Peninsula. The Arabian Gulf dried up in the Pleistocene glacial period, and a river from Mesopotamia extended further south to the Sea of Oman. The process of reaching to its present level, the Arabian Gulf has begun since 17,000 years ago and the water reached its present level 5000 years ago.

While the sea is uninterrupted in the Arabian Seas area, present of water bodies have been located with peculiar environmental features, mostly owing to their semi-enclosed feature, which has caused the presence of diverse communities and species groupings as well as the separation of some areas in waters nearby to each other (Sheppard et al. 1992).

3 Biodiversity

The weather conditions in most Arabian Seas are categorized by having high temperature for air and water accompanied with high salinities and evaporation during summer time mainly in the Arabian Gulf area (Carpenter 1997; Sanders and Morgan 1989). The freshwater resources are very limited, with less rain. Therefore, with such a harsh environment, the biodiversity needs to be acclaimed to and has a peculiar kind of life.

In spite of the punitive environment and climate, the area is characterized in having high biodiversity. It includes a considerable number of endemic species, particularly in the Red Sea (Head 1987; Sheppard et al. 1992). This is considered factual for some organisms such as fishes, echinoderms, and corals (Ormond and Edwards 1987; Smith et al. 1987; Klausewitz 1989; Price 1982; Sheppard and Sheppard 1991; Sheppard et al. 1992). It is presumed that the occurrence of such elevated number of endemic species is owing to the geological and hydrographical settings of the area and the radical rates of abiotic factors such as high salinity and temperature, particularly in the Red Sea and the Arabian Gulf. Grounded on the level of endemism and other distribution designs, different methods have been made, reliant on the group of animals, to be found in the Arabian area or even parts of it as a sector of the Indo-West Pacific (Knox 1957; Klausewitz 1989; Sheppard and Sheppard 1991; Briggs 1974, 1996).

A distinguishing trait of the Arabian Seas area is its arid coastal zone, containing in utmost areas of a flat coastal plain of changing width, which is frequently bordered inland by widespread mountain ranges. In a few areas, the coastal plain is influenced by huge alluvial fans with seasonal release of freshwater into the sea. Coastal vegetation contains monospecific stands of mangroves. *Avicennia marina* and *Rhizophora mucronata* are the leading species, which are prevalent throughout the region and deliver a range of ecosystem services: their widespread root systems maintain sediments and guard the coastline; they improve the quality of freshwater flowing into the sea; they offer refuge for a collection of animals; and their dead leaves and branches are a source of food for many marine species, such as shrimp. Besides the shore, salt-tolerated plantations found, which ranks into arid–adapted plant association's further inland.

The Gulf of Aden is much broader than the Red Sea and more than 4500 m deep. Like the Arabian Sea and the Gulf of Oman coasts, it is powerfully affected by the upwelling of cool, nutrient-rich waters during the monsoon season. The seas of southern Arabia are also categorized by a dominant high-energy marine climate, posturing restrictions on coral reef development.

4 Faunal Domains

Hayden et al. (1984) have categorized the Somalia, southern Arabian Peninsula, and Arabian Gulf coasts as a single faunal domain (Western Indian Ocean). As to the Pakistani, coasts are deemed the westernmost range of a domain (Indo-Polynesian) that spreads right through to southern China, alongside the northeastern coast of Australia, and around the New Hebrides and New Caledonia. The Red Sea is classed as a distinct domain. Such a distinction of the Red Sea was made by Briggs (1974) based on the information in more recent reviews of the fauna and flora of the Red Sea (in Edwards and Head 1987). However, Crossland et al. (1987) categorized five different regions based on a new data that they obtained and which seem to be mainly constant with the floral and faunal sub-domains known by Crossland et al. (1987).

The consideration that the Arabian Gulf falling in the domain of the Western Indian Ocean by Briggs (1974) might once be suitable. On the bases of the study performed by Price (1982) on echinoderms, he found that the level of endemism in this group is high and could reach that of the Red Sea. Therefore, the Arabian Gulf has been acknowledged as a discrete faunal domain for some researchers (Chiffings 1995). However, it has been noted that subdividing the Arabian Gulf area could be problematic as the biota of this sea have not been dealt with precisely in this manner earlier. Large areas in the Arabian Gulf region, i.e., Kuwait, Saudi Arabia, and Bahrain, were fully explored (Basson et al. 1977; Jones 1986; MEPA 1987; Price et al. 1983, 1987), and still many other localities need to survey fully.

References

Al-Sayari SS, Zötl JG (1978) Quaternary period in Saudi Arabia. Wien, 334 pp

Alsharhan AS, Rizk ZA, Nairn AEM, Bakhit DW, Alhajari SA (2001) Hydrogeology of an arid region: the Arabian Gulf and adjoining areas. Elsevier, New York

Barendse RJ (2000) Trade and state in the Arabian seas: a survey from the fifteenth to the eighteenth century. J World Hist 11:173–225

Basson PW, Burchard JE, Hardy JT, Price ARG (1977) Biotopes of the Western Arabian Gulf. Aramco, Dhahran

Beydoun ZR (1966) Geology of the Arabian Peninsula: Eastern Aden Protectorate and Dhufar. Professional Papers of the United States Geological Survey 560-H:1–49

Briggs JC (1974) Marine zoogeography. McGraw-Hill, New York

Briggs JC (1996) Global biogeography. In: Developments in palaeontology and stratigraphy, vol 14. Elsevier, Amsterdam, 452 pp

Brook MC, Al Shoukri S, Amer KM, Böer B, Krupp F (2006) Physical and environmental setting of the Arabian peninsula and surrounding seas. In: Policy perspectives for ecosystem and water management in the Arabia Peninsula. UNESCO Doha and United Nations University, Hamilton, pp 1–16

Carpenter, K. E. (1997). The living marine resources of Kuwait, eastern Saudi Arabia, Bahrain, Qatar, and the United Arab Emirates. FAO Species Identification Field Guide for Fishery Purposes, FAO, Rome, p 239

Chiffings AW (1995) Arabian Seas. In: Kelleher G, Bleakley C, Wells S (eds) A global representative system of marine protected areas, vol 3. Central Indian Ocean, Arabian Seas, East Africa and East Asian Seas, pp 39–70

Crossland CJ, Dawson SA, Stafford SM,Marshall CJ (1987) The Red Sea Saudi Arabia: analysis of coastal and marine habitats of the Red Sea. MEPA Coastal, and marine management series report no. 1

Edwards AJ, Head SM (eds) (1987) Red Sea. Key environments series (Treherne JE (ed) 441 pp. Oxford)

Hayden BP, Ray GC, Dolan R (1984) Classification of coastal and marine environments. Environ Conserv 11:199–207

Head SM (1987) Introduction. In: Edwards AJ, Head SM (eds) Red Sea. Pergamon, Oxford, pp 1–21, figs 1.1–1.8

Jones DA (1986) A field guide to the seashores of Kuwait and the Arabian Gulf. University of Kuwait, Kuwait

Kassler P (1973) The structural and geomorphic evolution of the Persian Gulf. In: Purser BH (ed) The Persian Gulf. Springer, Berlin, pp 11–33

Klausewitz W (1989) Evolutionary history and zoogeography of the Red Sea ichthyofauna. Fauna Saudi Arabia 10:310–337, 8 figs

Knox GA (1957) Distribution of polychaetes within the Indo-Pacific. In: Proceedings of the 8th science congress, vol 3, pp 403–411

Krupp F (1983) Freshwater fishes of Saudi Arabia and adjacent regions of the Arabian Peninsula. Fauna Saudi Arabia 5:568–636

Meteorological and Environmental Protection Administration (MEPA) (1987) The Arabian Gulf Saudi Arabia: an assessment of biotopes and management requirements for the Saudi Arabian Gulf coastal zone. MEPA Coastal and Marine Management Series Report No. 3

Ormond RFG, Edwards AJ (1987) Red Sea fishes. In: Edwards AJ, Head SM (eds) Red Sea. Pergamon, Oxford, pp 251–287, figs 13.1–13.6

Price ARG (1982) Comparison between echinoderm faunas of Arabian Gulf, SE Arabia, Red Sea and Gulfs of Aqaba and Suez. Fauna Saudi Arabia 4:3–21

Price ARG, Vousden DHP, Ormond RFG (1983) Ecological study of sites on the coast of Bahrain, with special reference to the shrimp fishery and possible impact of the Saudi-Bahrain Causeway under construction. IUCN report to UNEP regional seas program, Geneva

Price ARG, Chiffings AW, Atkinson MA, Wrathall TJ (1987) Appraisal of resources in the Saudi Arabian Gulf. In: Proceedings of the fifth symposium coastal and ocean management. American Society of Civil Engineers

Sanders MJ, Morgan GR (1989) Review of the fisheries resources of the Red Sea and Gulf of Aden. FAO Fisheries Technical Paper 197. Rome

Sheppard CRC, Sheppard ALS (1991) Corals and coral communities of Arabia. Fauna Saudi Arabia 12:3–170, 189 text figs, 16 pls

Sheppard CRC, Price A, Roberts C (1992) Marine ecology of the Arabian seas region: patterns and processes in extreme tropical environments. Academic, London

Smith GB, Saleh M, Sangoor K (1987) The reef ichthyofauna of Bahrain (Arabian Gulf) with comments on its zoogeographic affinities. Arab Gulf J Sci Res B5:127–146

Wolfart R (1987) Late cretaceous through quaternary palaeogeographic evolution of the Middle East. In: Krupp F, Schneider W, Kinzelbach R (eds) Proceedings of the symposium on the fauna and zoogeography of the Middle East, Mainz 1985. Beihefte zum Tübinger Atlas des Vorderen Orients, A vol 28, pp 9–22. Wiesbaden, Ludwig Reich