ECOSYSTEMS AND BIODIVERSITY OF THE ARABIAN GULF

SAUDI ARABIAN WATERS

Fifty Years of Scientific Research

A Publication by Saudi Aramco and King Fahd University of Petroleum & Minerals

Chief Editors
Dr. Khaled A. Al-Abdulkader[1], Dr. Ronald A. Loughland[1] and Dr. Mohammed A. Qurban[2]

[1]Environmental Protection Department, Saudi Aramco
[2]Center for Environment & Water, King Fahd University of Petroleum & Minerals

Photography
Applaudo Grupa d.o.o.

Maps Production
Syed Azher Hussain

Publishing Coordination
Meerja Humayun Baig

Production and Direction
Bruno Nicolis

Design and Layout
Roberto Chillon

Printing and Binding
Papergraf - Piazzola sul Brenta (Padova), Italy

ISBN: 978-603-02-7862-6

Dr. Khaled A. Al-Abdulkader, Dr. Ronald A. Loughland, and Dr. Mohammed A. Qurban

ECOSYSTEMS AND BIODIVERSITY OF THE ARABIAN GULF

SAUDI ARABIAN WATERS

Fifty Years of Scientific Research

جامعة الملك فهد للبترول والمعادن
King Fahd University of Petroleum & Minerals

أرامكو السعودية
saudi aramco

Preface

For nearly five decades, the King Fahd University of Petroleum and Minerals (KFUPM) has partnered with Saudi Aramco to document and explore the wondrous ecosystem that exists in the Arabian Gulf. The book before you offers a comprehensive and up to date guide on the fruits of that work and its findings.

Through its pages, marine scientists, decision makers, students and indeed anyone with an interest in marine environmental protection, will have access to a wealth of scientific information.

The Arabian Gulf is environmentally challenged because of the natural stressors of salinity and temperature fluctuations. Rapid population growth and associated developmental activities along its coasts, particularly those related to the urban and industrial development, are adding additional stress on the Arabian Gulf's fragile environment.

The partnership between KFUPM and Saudi Aramco, has resulted in a greater understanding of the Arabian Gulf's natural ecosystems, ensuring greater protection of biodiversity and natural resources. The backbone of this partnership has been the Marine Environmental Sustaining Research Program, which has produced fundamental knowledge on the Arabian Gulf's marine environment. In addition, detailed and in-depth environmental impact assessments have been systematically conducted for proposed development projects as well as environmental monitoring during construction and commencement of operations, all contributing to our knowledge of the ecosystems. This information has contributed to the protection of the ecosystems and the development of a fisheries management framework in the Arabian Gulf.

We are grateful for the collaboration and efforts of the interdisciplinary teams of the Environmental Protection Department of Saudi Aramco and the Marine Studies Section of KFUPM in preparation of this book. A deep and sincere appreciation is extended to each and every person who, for nearly five decades, has played a part in this partnership in marine environment protection. This book is a testament to your hard work and our collective desire to preserve the beautiful ecosystem that flourishes in the Arabian Gulf.

AMIN H. NASSER
Saudi Aramco President & CEO

Foreword

The Arabian Gulf has always been a special component of the Kingdom's economy and culture. Aside from its rich oil and gas resources, it is also an important source of food and water, and is a major transportation point. But not to be undermined or forgotten is the fact that it also supports vital and thriving ecosystems. In its waters are seagrass, coral reefs, salt marshes, and mangroves, as well as intertidal and subtidal sediments and deeper water areas. These interacting habitats provide the essential components for a vibrant and productive marine ecosystem. However impressive this may sound, the Arabian Gulf is also facing natural and human-induced stress, such as elevated seawater temperature and salinity; coupled with coastal urbanization and rapid industrialization. These stresses, if not managed, can impact the long-term ecosystem services currently provided by the Arabian Gulf.

Scientific research on its marine environment is the result of collaboration between industry and academia. It was in 1982 that the Environmental Protection Department of Saudi Aramco and the Marine Studies Section of the King Fahd University of Petroleum and Minerals began joint research into the Arabian Gulf's ecosystem. This partnership involved the development of research programs to study the Arabian Gulf's ecosystem values, interactions, and reduce the impact of stress. Currently, the sixth phase of this sustaining research program is focusing on the biodiversity status across the Arabian Gulf's ecosystems. This book gathers the results and the major scientific findings of this long-term collaborative program and provides a detailed, updated review on the state of the marine ecosystems and biodiversity of the Western Arabian Gulf. For anyone who has an interest in the topic, it serves as the current definitive work, and is a reminder of the importance of marine ecosystems.

Prof. Sahel N. Abduljauwad
Rector of King Fahd University
of Petroleum & Minerals

Contents


1

3.4

Intertidal Mud Habitats

Thadickal V. Joydas[1], Periyadan K. Krishnakumar[1], Mike Pope[2], and Karuppasamy P. Manikandan[1]

Introduction

The intertidal zone is a section of a shoreline between the lowest low tide mark and the highest high tide mark. This habitat is covered with water at high tide and exposed to air at low tide. This is the place where land and sea meet, and therefore, this is considered to be a transition zone. According to substrata, intertidal zones can be divided into rocky, sandy and muddy shores. These habitats differ in levels of abiotic and biotic factors.

Intertidal mud habitats, also called intertidal mud flats, represent shoreline deposits of fine-grained silty or clayey material that accumulates in areas of restricted wave and current action. Intertidal muds cannot exist where there is much wave action, and therefore, the mud flat habitat is limited in its extent. Broad mud flats do not commonly develop in areas of significant shoreline relief because cliff face erosion adds a coarse-grained component to the sediment and the high wave energy along these areas of exposure removes fine particles.

Intertidal mud flats are often thought to be dreary, lifeless and barren yet they are one of the most important coastal biomes, which actually teem with marine life (Jones, 1986). The preservation and conservation of mud flats is critical as they are the larders of the seashore world providing food for a multitude of species. Rotting vegetation is also a part of the mud flats and as a result, the mud is rich in nutrients and is anything but barren, supporting a large diversity of species.

Unlike rocky shores, one of the noteworthy features of the soft sediment habitat is the availability of depth as a habitable dimension and many muddy habitat inhabitants are adapted for burrowing. Mud flats are often layered with a green colored top layer, which is supersaturated with oxygen and is occupied by primary producers. This top layer is covered with a dense microalgal community that is dominated by microbial mats of diatom/cyanobacteria (Hoffman, 1996). In mud flats, oxygen can penetrate only slowly to the interstitial spaces and is not sufficient for the complete oxidation of organic matter. Although organic matter accumulates on the surface, sediment below that is mostly anoxic and usually contains free sulfide.

At low tide, epifaunal organisms undergo intense heating and drying due to significantly reduced water levels and more intense exposure to sunlight and are sometimes exposed to salinity reduction during periods of rainfall. At high tide, these same organisms are exposed to inundation in saline waters with associated changes in temperature and light. Therefore, the organisms living in the intertidal zone have

[1] Research Institute, King Fahd University of Petroleum & Minerals, Dhahran 31261, Kingdom of Saudi Arabia. Email: *tvjoydas@kfupm.edu.sa*.
[2] Block 7, Street 2, Building 12, Salwa, Kuwait.

adapted in a multitude of ways that allow them to survive in this ever-changing environment. These adaptations may be behavioral (i.e., movements or actions), morphological (i.e., characteristics of external body structure), or physiological (i.e., internal functions of cells and organs) (Somero, 2002).

Vertical zonation is a remarkable feature of the intertidal zones. The gradient of climate with tide height leads to patterns of intertidal zonation, with high intertidal species being more adapted to emersion stresses than low intertidal species. Generally, the intertidal zone is divided in to three vertical zones: (1) supra littoral fringe the upper level of the high tide zone that receives regular splashing of the waves during the high tides, (2) mid-littoral zone the major part of the intertidal zone below the high tide mark that is exposed during the normal tidal cycle, and (3) infra littoral fringe the lowest level only exposed during the extreme spring tides; the base of the fringe marks the point of the lowest tide (or the beginning of the marine environment below the tides).

The common fauna seen on the surface of the mud flats are crabs, shrimp, mollusks and some seaweed that may grow on a hard substrate like a pebble or empty shell. Another unique species, which thrives in a healthy mud flat biome, is an amphibious fish known as a Mudskipper, belonging to the family Gobiidae. This unique species has adapted to living in the intertidal or mud flat zone by being able to stay out of water for extended periods.

Both resident and migratory shorebirds are dependent on the fauna living on the surface and in the mud. Each has different leg lengths, a suitable and unique bill (size, shape and length) and a feeding strategy adapted for the specific organisms they feed on, which live in these tidal flats. One of the main sources of food for these avian consumers is the variety of worms that are the primary inhabitants under the mud surface.

One of the notable features of the western Arabian Gulf is its extremely low relief of the seabed. The average slope is only 35 cm per km and this results in an extensive intertidal zone, the width of which in many places can be measured in kilometers.

In the western Arabian Gulf, sheltered bays contain large areas of mud flats, protected from wave action, which become sites of mud deposition. Due to the absence of significant freshwater flow into these bays, they tend to be more hypersaline, experiencing extreme temperature variation (17 °C to 40 °C). Tidal flats in general are considered to be the most productive of all natural ecosystems (Odum, 1971). In spite of the harsh environmental conditions, intertidal mud flats are the highly productive marine biotopes in the western Arabian Gulf (Basson, et al., 1977). The occurrence of mud flats in large areas contributes significantly to the high pelagic and benthic productivity in the Arabian Gulf (Jones, 1986).

Tidal mud flats are mostly characterized by a series of well-defined zones, each occupied by a different community of organisms. According to Basson, et al. (1977) these zones (Figure 3.36), from landward to seaward, are:

1. The marsh grass zone.
2. The halophyte zone.
3. The mangroves.
4. The algal mat zone.
5. The *Macrophthalmus* zone.
6. The *Cerithidae* zone.

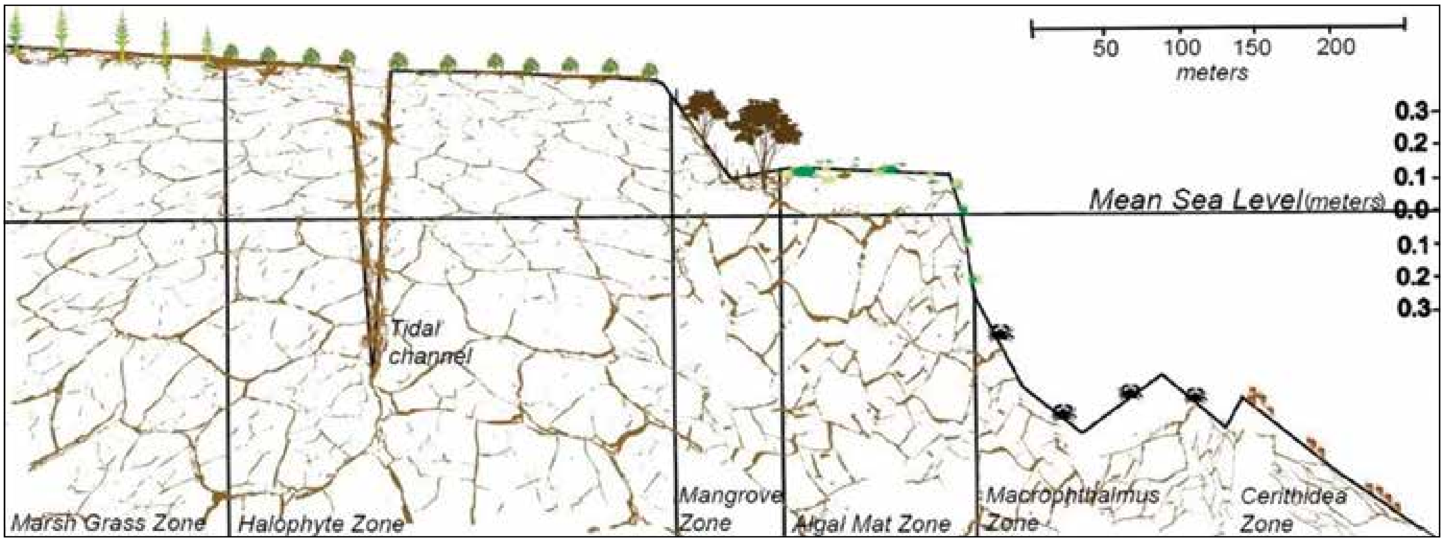

FIGURE 3.36. *Diagram of zonation in the intertidal mud habitats of the Saudi coast of the Arabian Gulf (Modified from Basson, et al., 1977).*

Depending on local factors such as the shoreline topography, sediment properties and the nature of the adjacent terrestrial and marine environment, variation in this zonation pattern may be expected in other areas (Basson, et al., 1977). Subsequently, such variations will usually be limited to the reduction or suppression of one or another of the zones, rather than any drastic change in the sequence.

The intertidal ecosystem, from Kuwait to Abu Ali Island of Saudi Arabia, particularly the sheltered bays, was severely affected by the 1991 Gulf oil spill (Jones, et al., 1998; Price, 1998). Initial studies after the spill revealed complete absence of key species from the littoral fringe of all but mangrove habitats, and between 80% and 100% loss in species diversity in the upper eulittoral zone (Jones and Richmond, 1992; Watt, et al., 1993). Jones, et al. (1994) reported a reduction in tar cover on the upper shores over the period 1991–1992 together with the appearance of algal mat cover on most soft substrate shores. Apart from this major destruction, reclamation of the coastal area is a key threat to the intertidal mud habitats of this region (Loughland, et al., 2012). Large areas of mature and slow growing mangroves have been reclaimed for the urbanization in various parts of the western Arabian Gulf.

This chapter presents the various ecological features of the intertidal mud ecosystem with a special reference to the resident communities. It focuses on the intertidal mud ecosystems other than salt marsh zone and halophyte ecosystem (Chapter 3.3), and mangroves (Chapter 3.6), however, whenever required, features of flora and fauna of the latter ecosystems have been briefly mentioned.

Methods of Obtaining Data

Intertidal habitats were surveyed by a team of biologists driving along the coast. Upon encountering the mud habitat, the biologists measured its length based on the vehicle's odometer and obtained GPS positions at both ends of the habitat. The biologists walking around the habitat made observations on obvious biological characteristics of the site such as the distribution of organisms and the intertidal zonation.

Distribution of Ecosystem

Along the Saudi coast of the Arabian Gulf, the intertidal mud habitats measuring more than 500 m width are prevalent in the sheltered bays situated between Tanajib to Abu Ali. Mud flats together with sand flats and rock flats, occupy 30% to 40% of these bays, while mud flats are the most common habitat. The mud flats are common in the bays of Manifa, Musallamiyah, Khursaniyah, Abu Ali, Tarut Bay and the Gulf of Salwa. In most of the intertidal mud habitats, ecosystems formed by mangroves (e.g., Tarut Bay Dammam, Gurmah Island, Abu Ali Island and Khafji area) and salt marshes (Gulf of Salwa, Abu Ali Island, Musallamiyah Bay, Safaniyah and Ras Al-Mishab) are present. As usual, mangroves and salt marshes are progressively reduced in size toward the low tide mark. Barth (2002) estimated that mud flat with salt marshes occupy about 490 km of the Saudi coast, of which 145 km has a width greater than 15 m and 45 km has a width smaller than 15 m. Mangroves occupied only a 6 km length in this region.

Abiotic Characteristics

The abiotic parameters such as solar radiation, sea surface temperature, salinity, sediment organic load and contaminants evidently influence the distribution of organisms in the intertidal mud habitats. A description of the major parameters of the intertidal mud habitats of the western Arabian Gulf is given next.

Physical Characteristics

Sunlight is vital in the intertidal habitat. Part of the radiation is used in the conversion of inorganic compounds to organic compounds by the coastal marine plant communities and the remainder is responsible for the temperature regime in water (Ahmad and Sultan, 1991). Even though high solar radiation (monthly average of 136 to 271 W m^{-2}) results in extreme temperatures and higher evaporation rates, they support the benthic primary productivity in the mud flats of the western Arabian Gulf (Ahmad and Sultan, 1991). Studies have shown that desiccation is not much affected by the microbial mats in the mud flats of this region (Jones, et al., 1996; Al-Zaidan, et al., 2006).

The composition and distribution of floral and faunal assemblages in the intertidal zone is determined largely by the movement of water. Tidal range, wave action and the slope of the shore are the major factors that determine the vertical extent of the tidal zone. Due to the low topographic relief, a large area is available as the intertidal area in the western Arabian Gulf (KFUPM/RI, 2014). Over most of the Gulf, tidal range is 1 m to 2 m near land, but is reduced to 0.5 m in the south of the Gulf of Salwa (Sheppard, et al., 1992).

Hydrographical Parameters

The sea surface temperature and salinity play pivotal roles in the distribution of flora and fauna in the intertidal zone of the Arabian Gulf. The annual fluctuations in temperature exceed 20 °C in the nearshore waters with a maximum temperature of 36°C (Jones, et al., 1994; KFUPM/RI, 2014). Higher salinity of

56 psu to 74 psu are characteristics of mud flats in this region. The pH in the interstitial water is normally within a range of 6.7 to 8.8 in winter and 6.9 to 8.3 in summer (Al-Bakri and Kittaneh, 1998).

Sediment Characteristics

Due to the sheltered nature, continuous deposition of silt and clay occurs in the mud flat. The finest grained sediment is found at the lower, seaward end and the grain size increases progressively at the more landward areas (KFUPM/RI, 2014). Vertical profile of the substratum indicates that grain size is finest (1.8 Φ) at the surface and increase with depth in the sediment (1.4 Φ at 22 cm deep) (Basson, et al., 1977).

The nutritional quality of sediment measured as organic carbon is one of the important factors determining the community structure of benthic organisms. In mud flats, the total organic carbon (TOC) may have originated from a number of sources such as decay of marine organisms, industrial and domestic effluents, and oil spills. Generally, the levels of TOC in the mud flats are higher than the subtidal areas. Al-Bakri and Kittaneh (1998) recorded TOC values ranging from 0.2% to 3.1% from the mud flats of Kuwait.

Contaminants

Inorganic contaminants include trace metals and nutrients when it exceeds the stipulated limits. The major contributors of inorganic contaminants in the Arabian Gulf include discharges from power and desalination plants, effluents from agriculture and livestock production plants, food and chemical manufacturing, ship ballast water, and seaport activities. Municipal source effluents from sewage outfalls lead to hypoxia, eutrophication, toxic algal blooms and fish kills. As most of these municipals discharge effluents in the intertidal zone, this zone is severely affected, especially in Bahrain, Qatar, Kuwait, the United Arab Emirates (UAE) and Oman, where 63% to 94% of the population is concentrated in the coast (Khan, 2002).

With regard to metals in sediments, KFUPM/RI has conducted several studies, including the analysis of metals in sediments throughout the Saudi coast of the Arabian Gulf and found that most concentrations were below the accepted natural background levels, while localized hotspots were noticed in Bahrain for Cu, Hg, Pb and Zn and the UAE for As, Co, Cr and Ni (De Mora, et al., 2004).

The main source of oil to the intertidal environment could be attributed to historical spills, accidental damage to pipelines, tanker de-ballasting and natural seepages in certain areas (Massoud, et al., 1996). One of the severe impacts on the coastal habitats was by the massive oil spill during the 1991 Gulf War (KFUPM/RI, 1991). The intertidal regions and sheltered bays were severely affected by the spill (Hayes, et al., 1993; KFUPM/RI, 1991). About one year after the spill, the total petroleum hydrocarbon (TPH) concentrations up to 47,000 mg kg^{-1} were reported from the sheltered habitats like tidal flats, marshes and mangroves of Saudi Arabia (Sauer, et al., 1993; KFUPM/RI, 1994). The levels of total polycyclic aromatic hydrocarbons up to 175,000 ng g^{-1} (dry weight) were reported by Fowler, et al. (1993) from the sheltered muddy basins along the Saudi Arabian coast during this period. The results of the post-spill study indicate that spilled oil in the surface layer of the sediment was substantially degraded within a few months of the spill. Consequently, core samples collected more than two years after the 1991 Gulf oil spill reveal a contaminated layer a few centimeters below the sediment surface at many sites in the shallow regions (Price, et al., 1994). Eleven years after the oil spill, the TPH concentrations in subtidal sediments close to the intertidal region of sheltered bays such as Abu Ali and Manifa Bays show high levels of TPH (ND–89,000 mg kg^{-1}) (KFUPM/RI, 2003). The high concentration of TPH was observed at 10 cm to 15 cm below the sediment surface during this period. This suggests that due to the increased sedimentation rate and low wave action in the bays, there has been considerable accumulation of sediments over the years.

Biotic Characteristics

Flora

Plant communities such as common reeds, flowering plants, halophytes, mangroves and algal mats are usually found in the intertidal mud habitats along the Saudi Gulf coast. The distribution of halophytes and mangroves are already covered in detail in separate chapters of this book (Chapters 3.3, 3.5 and 3.6). In this section, microbial mats and macrophytes are briefly discussed.

Microbial Mat

The intertidal muddy area in the western Arabian Gulf supports a dense micro algal community referred to as microbial mat, often dominated by diatom or cyanobacteria (blue-green algae) (Clayton, 1986; Jones, 1986; Hoffman, 1996). Diatoms, and cyanobacteria in the algal mat play important roles in grazing food chains, in carbon dioxide (CO_2) assimilation and also in adding mechanical stability to the muddy substratum (Al-Zaidan, et al., 2006). The cyanobacteria-dominated algal mats in the tidal flats are supposed to be a greater contributor to the primary productivity in the Gulf than are mangroves (Price, et al., 1993). They also fix nitrogen and contribute greatly to overall productivity due to their enormous extent in the western Arabian Gulf. The cyanobacteria are widely distributed in the intertidal zone (from upper to lower intertidal) but never occur above the supratidal zone.

Of the numerous small- and medium-sized diatoms forming the mat, Amphora and Nitzschia are the predominant ones (Al-Zaidan, et al., 2006). The dominant cyanobacteria species reported from the mud flats of the western Arabian Gulf are *Microcoleus chthonoplastes, Oscillatoria nigro-viridis,* and *Lyngbya aestuarii*, *Chrococcus* sp., *Schizothriz* sp. and *Phormidium* sp, (Al-Thukair and Al-Hinai, 1993; Al-Mohanna, et al., 2007). Figure 3.37 shows the algal mat in the intertidal mud habitats of Tarut Island. Further details of the micro algae are provided in Chapter 3.5.

Macrophytes

Macrophytes are prevalent in the salt marsh, halophyte and mangrove zones. The marsh grass zone usually lies above the average high tide level and salt tolerant grass and grass-like plants such as *Phragmites communis* (the common reed), *Aeluropus lagopoides* and *Bienertia cycloptera* grow in this region. These plants usually are found in the coastal belts of the temperate deserts. In the halophyte zone, salt tolerant flowering plants or halophytes are seen in abundance. This zone is usually covered with seawater during only a short period of each tidal cycle. Flowering plants such as *Arthrocnemon macrostacbyum* and *Halocnemon*

FIGURE 3.37. *Green algal mat in the intertidal muddy habitats of Tarut Island, Saudi Arabia.*

Strobilaceum usually grow in this region. The interlacing root system of these halophytes provides a suitable habitat for several marine organisms, including burrowing crabs (Basson, et al., 1977). Depending on other environmental conditions, the next mud flat zones along the Gulf coast are occupied with *Avicennia marina*, the black mangroves (KFUPM/RI, 1994). Often they occur in association with salt marsh halophytes, mainly *Arthrocnemum macrostachyum* and *Salicornia europaea*. The mangroves in the Gulf are poorly developed compared to their counterpart at the Red Sea because of the cold winter temperatures.

Typical for salt marshes is the presence of halophytic plants in the upper eulittoral zone and additionally some flowering herbs and grasses, fringing the coast above the littoral fringe. Such salt marsh halophytes are prevalent along the Gulf coast and often form the only coastal vegetation. Members of the *Zygophyllaceae* and *Chenopodiaceae* are the dominant salt marsh families. The typical vegetation zones controlled by tidal inundation, soil and groundwater salinity are the cyanobacteria zone, the *Salicornia* zone, *Arthrocnemum* zone, *Halocnemum* zone, and landward of the littoral fringe follows the *Limonium* - *Suaeda* - *Seidlitzia* - *Halopeplis* zone (Basson, et al., 1977). A recent study shows that the dominant vascular plants in the mud flats in the sheltered bays of Saudi Arabia are two succulent perennials, *A. macrostachyum* and *H. strobilaceum*, and two succulent annuals, *Salicornia europea* and *Suaeda maritime* (Langman, et al., 2012). Figures 3.38 to 3.40 show some macrophytes found in Rahima, Furayah and Tarut Island.

Fauna

The most abundant and widely distributed faunal components in the intertidal mud habitats of the Arabian Gulf are brachyuran decapods (of the families Ocypodidiae and Grapsidae) and gastropods (family Cerithidae) (Basson, et al., 1977; Apel and Turkay, 1999; Al-Zaidan, et al., 2003; Langman, et al., 2012). Apel and Turkay (1999) reported 21 taxa of ocypode crabs and six species of grapsid crabs from the Arabian Gulf. They found higher numbers of crab species, particularly ocypodes, in the coasts of the UAE (UAE: Ras al-Khaimah and Umm al-Quwain) and Kuwait, 14 and 15 species each, respectively, and lower numbers in Abu Dhabi and Saudi Arabia, 5 to 7 species, respectively. According to Apel and Turkay (1999), salinity is the controlling factor in the distribution of crabs, because the majority of the crabs cannot withstand the higher salinities of the western and southern Gulf (>40 psu) unlike the comparatively lower salinities in the other parts of the UAE and Kuwait (<39 psu). In a review, Sheppard, et al. (2010) by quoting a study of Medio (2006) reported the richness of invertebrates in the intertidal mud habitats of UAE with >800 individuals m^2 for the hermit crab *Diogenes avarus*, sting rays (as much as one *Dasyatis* spp. in each five linear meter) and high densities of juvenile fishes (belonging to more than five families).

FIGURE 3.38. *The common reed,* Phragmites communis *recorded at the intertidal mud habitats of Rahima, Saudi Arabia.*

Figure 3.39. *A common macrophyte,* Arthrocnemon macrostachym *recorded at the intertidal mud habitats of Furayah, Saudi Arabia.*

Figure 3.40. *Scattered mangroves and A. macrostachym and tide pools noticed in the intertidal mud habitats of Tarut Island, Saudi Arabia.*

Although the intertidal communities in the Saudi coasts are comparatively less rich than that of the other parts of the Arabian Gulf, conspicuous communities have been reported from this region. From the intertidal mud habitats of the Tarut Bay, Basson, et al. (1977) reported two distinct faunal communities based on the semi-quantitative studies conducted by Saudi Aramco biologists. The details of these communities are described here:

1. *Macrophthalmus community:* This community is situated between the mangrove belt and the extreme low tide level. Deposit feeding crabs are the major groups in this community and of these crabs, the most abundant is *Macrophthalmus depressus* (up to 3 cm in body width) (Figure 3.41), after which the community is named. Its density was estimated to be about 50 ind. m^{-2}. This crab inhabits in a permanent burrow in the mud, and mostly a male and a female share the same burrow. At low tide they come out for feeding on organic particles on the sediment. The smaller crabs associated with this zone include *Ocypode saratan, Scopimera crabricauda, Cleistostoma dotilliforme, Paracleistostoma* sp. and *Scopimera* spp. The community also occasionally includes the largest of the mud flat crabs *Eurycarcinus* sp. (body width over 5 cm), which is a predator, feeding on other smaller crabs.
2. *Cerithidae community:* This zone is located between the *Macrophthalmus* zone and the level of the lowest spring tides. A snail *Cerithidae cingulata* (Figure 3.42) is the dominant species, having density up to 2,100 ind. m^{-2}. A gradual transition occurs between *Macrophthalmus* and *Cerithidae* zones. Because

FIGURE 3.41. *A dominant crab, Macrophthalmus depressus, recorded in the intertidal mud habitats of Gurmah Island, Saudi Arabia.*

FIGURE 3.42. *Mud creeper* Cerithidea cingulate *along with algal mat and mangrove pneumatophores in Abu Ali, Saudi Arabia.*

of this, both the communities co-exist in some places. The other members of this community are predatory snails *Murex kusterianus*, echiuroid *Ikeda taenioides* and a number of burrowing bivalves.

Thirteen species of macrofauna have been recorded from the intertidal mud habitats of Abu Ali (KFUPM/RI, 1988, 1994). A large number of *C. cingulata* and *M. depressus* were observed at the mid-intertidal stretch about 500 m from the shoreline in this region. In a review, Barth (2002) reported the dominance of crab *Cleistostoma dotilliforme* in the upper eulittoral zone of the mud flats of the Saudi coast of the Arabian Gulf. This crab lives in the burrows excavated by it in the mud (up to 50 cm deep). A distinct mound around the entrance of the burrow can be seen due to the piling up of excavated material. In the Saudi Arabian shores, up to 40 burrows per m^2 are common. Another crab *Metopograbsus messor,* is occasionally seen, which does not build burrows, but seeks shelter in open burrows of other crabs.

Recent studies from the Saudi coast showed that the crustacean community's main constituent were *Nasima dotilliforme*, with *Macrophthalmus* sp. and the predatory *Metopograpsus messor*, *Metaplax indica*, and

Eurycarcinus orientalis appearing sporadically (Langman, et al., 2012). Other invertebrates included the snails *Pirinella conica* and *Nodilittorina* sp., and numerous burrowing polychaetes and amphipods.

Nevertheless, polychaetes have been reported as the most numerically dominant infaunal groups in the intertidal soft bottom habitats, including mud flats of the western Arabian Gulf (Prena, 1996). Generally, it is assumed that elevated salinity favors the abundance of a few salt tolerant species resulting in significantly lower total species diversity in the muddy shore. Jones, et al. (1994) noted that the greatest diversity and abundance of fauna occurs in the lower eulittoral of muddy shores.

In the intertidal mud flats of Kuwait, C. *cingulata* is abundant in areas between the mean highest high water and below area of mean lowest low water, and *M. depressus* between the water table and the lowest annual tide (Jones, 1986; Al-Zaidan, et al., 2003). *Meretrix meretrix* was also common at the sea level down to the lowest annual tide in this region. From the northern region of Kuwait, along with C. *cingulata* and crabs, Al-Bakri, et al. (1997) reported oyster *Saccostrea* cucullata, and fish mud skipper as the common organisms. This province is also a significant nursery ground for fish and shrimps.

In the intertidal mud habitats of Bahrain, *C. cingulate* and numerous Brachyuran crabs are common (Al-Sayed, et al., 2008). A recent study conducted in the intertidal mud habitats of Duwhat Arad Bay, Bahrain, shows the predominance of molluscs (88%) followed by polychaetes (11%) and crustaceans (1%) (Al-Sayed, et al., 2008). The dominance of molluscs is attributed to large numbers of grazer gastropods (mainly *Potamides conicus* that contributed to 35% of the molluscs) that feed on the widespread algal mats in the bay. Al-Sayed, et al. (2008) are of the opinion that the lower abundance of polychaetes compared to molluscs can be due to intensive feeding of birds on polychaetes. This is because, in the Duwhat Arad Bay, dominant birds, Black-headed Gull (a winter visitor to the Region) and Common Ringed Plover (passage migrant) prefer polychaetes as the main food (Moreira, 1995; Perez-Hurtado, et al., 1997). The common invertebrates recorded from the intertidal mud habitats of the western Arabian Gulf are summarized in Table 3.9.

Generally, the fauna associated with the cyanobacterial mat are microscopic and includes gastropods, ostracods, copepods, flatworms, nematodes, and oligochaete worms (Barth, 2003). Larger animal life is usually absent in the mud flat areas where cyanobacterial mats are established. Where a mat is established, crabs have difficulties in tunneling and fail to become established. In other areas, the crab *M. depressus* and gastropods such as *C. scabridum* and *Pirinella conica* keep the substrate constantly bioturbated and the mud surface churned up, preventing the cyanobacteria from forming a mat.

Shorebirds

The term "shorebird" or "wader" refer to any bird that relies on beaches or wetlands for feeding, roosting and nesting habitat. Around the world, the tidal flats are key staging habitats for tens of millions of migratory shorebirds. Many shorebirds breed in the Northern Hemisphere and migrate to the Southern Hemisphere to escape harsh winters. They begin to arrive in the Arabian Gulf from mid-August and depart by mid-October. On their return migration, these shorebirds begin to arrive back to the Arabian Gulf from

Table 3.9. *List of common invertebrate taxa recorded from the intertidal mud habitats of the western Arabian Gulf.*

Species	Species
Ascidacea (Sea Squirts)	*Tylodiplax indica*
Polyclinum sp.*	*Cleistostoma dotilliforme**
Sponges	*Paracleistostoma* sp.*
*Dictyoceratida**	Xanthidae (Family)
Hadromerida	*Medaeus* sp.*
Malacostraca (Crabs)	Pilumnidae (Family)
Grapsidae (Family)	*Eurycarcinus* sp.*
*Metopograpsus messor**	**Cirripedia (Infra class)**
*Metaplax indicus**	*Euraphia* sp.
*Ilyograpsus paludicola**	**Bivalvia**
Parasesarma plicatum	*Brachidontes* sp.*
Chiromantes boulengeri	*Meretrix meretrix**
Ocypodoidea (Super Family)	*Pinctada radiate**
*Macrophthalmus depressus**	*Trapezium* sp.*
*Macrophthalmus sulcatus**	*Saccostrea cucullata*
Macrophthalmus dentipes	*Dosinia hepatica*
Uca annulipes iranica	*Solen vagina*
Uca sindensis	*Macrocallista umbonella*
*Ocypode rotundata**	**Gastropoda**
Ocypode saratan	*Cerithidea cingulata**
*Nasima dotilliformis**	*Nassarius* sp.*
Leptochyseus kuwaitense	*Trochus* sp.*
*Manningis arabicum**	*Nodilittorina* sp*
*Scopimera crabricauda**	*Pirinella conica**
Scopimera sp.*	*Potamides conicus*
Dotilla blanfordi	*Mitrella blanda*
*Ilyoplax frater**	**Polychaeta**
*Ilyoplax stevens**	**Amphipoda**

Source: Basson, et al. (1977); KFUPM/RI (1988, 1994); Jones, et al. (1994); Apel (1994a, 1994b); Al-Bakri, et al. (1997); Apel and Turkay (1999); Al-Sayed, et al. (2008).
* Recorded from the Saudi coast of the Arabian Gulf.

the southern wintering grounds in mid-March and depart by mid-May to reach their northern breeding grounds in June. Migratory birds are seen in Khursaniyah, Jubail, Abu Ali, Rahima, Saihat, Dammam, al-Khobar and the Gulf of Salwa of the Saudi coast of the Arabian Gulf (Gregory and Al-Suhaibany, 2011). The tidal flats in the Arabian Gulf act as the last refueling stopover for thousands of migrants coming from the Northern Hemisphere breeding grounds to their Southern Hemisphere wintering grounds before crossing the Arabian Desert. These tidal flats again provide a stopover for when these migrants fly back north to commence breeding at their sites back in the Northern Hemisphere. The tidal flats provide both the necessary foraging (= fat loading) and roosting (= energy sparing) sites for migrants before they continue their long migratory journeys (Medio, 2006; Gregory and Al-Suhaibany, 2011).

The mud flats are rich and abundant with worms and amphipods that make up the bulk of the diet of migratory shorebirds. Shorebird behavior follows the tides, not the sun. At high tide, they will be generally resting on the high tide roosts and at low tide they will be out on the tidal flats feeding.

A typical shorebird has a slender bill, long legs and long pointed wings and many have specific habitat requirements for feeding and roosting (Figure 3.43). Many species of shorebirds appear confusingly similar, although they typically have differences in bill shapes and sizes. The variety of bill shapes and sizes are indicative of their different feeding strategies and food preferences. The examples of waders that find their food in mud flats and salt marshes include plovers, avocets, godwits, sandpipers, stints, oystercatchers and curlews.

For some birders, shorebirds include the most spectacular of migratory species that come in a variety of shapes and sizes and do not have webbed feet. Charadriiformes shorebirds are conspicuous members of coastal avifauna during spring and autumn migration and are a diverse order of small to medium-large birds. It includes about 350 species and has members in all parts of the world. Most Charadriiformes live near water and eat invertebrates or other small animals; however, in intertidal ecosystems, it is not just

FIGURE 3.43. *Marsh Sandpiper, a typical shorebird characterized by its long legs, bill, wings and a streamlined body.*

shorebirds that are reliant on this unique habitat for food and rest, as a wide variety of birds utilize this organism rich habitat. Other coastal and aquatic birds that are found in and use this habitat for both feeding and roosting include flamingos, ducks, herons, egrets, gulls, pratincoles and terns.

Feeding strategies is another mechanism of classifying shorebirds and these are split into two broad categories, namely probers and gleaners. Probers use long beaks to probe down into the sand for buried clams, worms and other animals, while gleaners scurry back and forth along the beach feeding on invertebrates they find on the sandy surface.

The majority of these migratory species eat a wide variety of small invertebrates picked out of mud or exposed soil. Different lengths of bills enable different species to feed in the same habitat, particularly on the coast, without direct competition for food. Many waders have sensitive nerve endings at the end of their bills, which enable them to detect prey items hidden in mud or soft soil and some species also use their feet to detect prey or disturb the surface to expose prey. Because the migratory birds have a very high metabolic rate they have to eat vast quantities compared to their body weight, often doubling the amount of fat in their body tissues, which is fuel for long migratory flights.

Although not considered a true shorebird, one of the iconic species of intertidal zones is the large and elegant Greater Flamingo, which gather in large flocks in shallow intertidal water. What makes this species unusual is that it is a filter feeder. They feed with their heads upside down in the water, which is why their bills have such a unique shape. This filter traps crustaceans, mollusks and insects not more than an inch in length. This bill is different in another way in that the upper jaw is not rigidly fixed to the skull, allowing the upper bill, rather than the lower bill, to move up and down. Part of the filter feeding is accomplished by the bird simply swinging its head back and forth and letting water flow through the bill. The tongue sucks water in through the filter as it is pulled back and forces water out from the beak as it is pushed forward this happens up to four times a second.

Table 3.10 shows a typical selection of shorebirds that utilize the intertidal mud flats of the western Arabian Gulf. Table 3.11 shows a typical selection of other bird species that can be recorded on the intertidal mud flats of the western Arabian Gulf.

The predators of shorebirds on migration in the Arabian Gulf include some mammals (Arabian red fox, feral cats), and other birds, such as Jaegers and larger Gulls, Kites and Harriers.

Discussion

Ecosystem Goods and Services of Intertidal Mud Habitats in the Western Arabian Gulf

At a very fundamental level, all ecosystem goods and services are underpinned by biodiversity. Carbon, oxygen, nutrient cycling and decomposition of dead matter or waste materials are the important processes driven by the biodiversity (Snelgrove, et al., 1997; Austen, et al., 2002).

TABLE 3.10. *List of typical shorebirds that can be expected on the intertidal mud flats of the western Arabian Gulf.*

Species		
Eurasian Oystercatcher *(Haematopus ostralegus)*		Marsh Sandpiper *(Tringa stagnatilis)*
Crab-plover *(Dromas ardeola)*		Common Greenshank *(Tringa nebularia)*
Black-winged Stilt *(Himantopus himantopus)*		Wood Sandpiper (Tringa glareola)
Pied Avocet *(Recurvirostra avosetta)*		Terek Sandpiper (Xenus cinereus)
Grey Plover *(Pluvialis squatarola)*		Common Sandpiper (Actitis hypoleucos)
Kentish Plover *(Charadrius alexandrines)*		Ruddy Turnstone (Arenaria interpres)
Common Ringed Plover *(Charadrius hiaticula)*		Sanderling (Calidris alba)
Greater Sand Plover *(Charadrius leschenaultia)*		Little Stint (Calidris minuta)
Lesser Sand Plover *(Charadrius atrifrons)*		Curlew Sandpiper (Calidris ferruginea)
Black-tailed Godwit *(Limosa limosa)* – Near Threatened		Dunlin (Calidris alpine)
Bar-tailed Godwit *(Limosa lapponica)*		Broad-billed Sandpiper (Limicola falcinellus)
Whimbrel *(Numenius phaeopus)*		Ruff (Philomachus pugnax)
Eurasian Curlew *(Numenius arquata)* – Near Threatened		Red-necked Phalarope (Phalaropus lobatus)
Common Redshank *(Tringa tetanus)*		

TABLE 3.11. *List of other species that can be expected on the intertidal mud flats and beaches of the western Arabian Gulf.*

Species
Greater Flamingo *(Phoenicopterus roseus)*
Lesser Flamingo *(Phoeniconaias minor)*
Grey Heron *(Ardea cinerea)*
Western Great Egret *(Ardea alba)*
Western Reef Heron *(Egretta g. schistacea)*
Little Egret *(Egretta garzetta)*
Striated Heron? *(Butorides striata)*
Eurasian Spoonbill *(Platalea leucorodia)*
Black Stork *(Ciconia nigra)*
Great White Pelican
Great *(Phalacrocorax carbo)* and Socotra *(Phalacrocorax nigrogularis)* Cormorants
Cream-colored Courser *(Cursorius cursor)*
Great Crested *(Podiceps cristatus)* and Black-necked *(Podiceps nigricollis)* Grebes
Mallard *(Anas platyrhynchos)* and Common Shelduck *(Tadorna tadorna)*
Slender-billed (*Chroicocephalus genei*), Common Black-headed (*Chroicocephalus ridibundus*), Great Black-headed (*Larus ichthyaetus*), Caspian (*Larus cachinnans*), Armenian (*Larus armenicus*) and Baltic (*Larus f. fuscus*) (including Heuglin's (*Larus f. heuglini*) and Steppe (*Larus f. barabensis*)) Gulls
Gull-billed (*Gelochelidon nilotica*), Caspian (*Hydroprogne caspia*), Little (*Sternula albifrons*), Saunders (*Sternula albifrons saundersi*), Whiskered (*Chlidonias hybrida*), White-winged (*Chlidonias leucopterus*) and Black (*Chlidonias niger*) Terns
Others less so; Swift (*Sterna bergii*), Lesser Crested (*Sterna bengalensis*), White-cheeked (*Chlidonias leucopterus*), Bridled (*Onychoprion anaethetus*), Arctic (*Sterna paradisaea*) and Common (*Sterna hirundo*) Terns
Western Osprey *(Pandion haliaetus)* and Black Kite *(Milvus migrans)*

The ecosystem services provided by or derived from intertidal mud habitats may be divided into four categories: provisioning, regulating, cultural and supporting services (Millennium Ecosystem Assessment, 2005; Beaumont, et al., 2007; Foster, et al., 2013 (Table 3.12).

Provisioning Services

They are the products obtained from the intertidal mud habitats. Unlike in the other parts of the world, the mud flats in the western Arabian Gulf have not been exploited for agricultural and horticultural purposes. In this region, they are important nursery grounds for fish and other marine organisms, which provide food for humans and other animals. Mud flats in the western Arabian Gulf also provide feeding grounds for thousands of migrant birds coming from Northern Hemisphere breeding grounds on route to their Southern Hemisphere wintering grounds and again the return journey back to their breeding sites (Medio, 2006).

Production of fuel wood from the intertidal mud habitats, including mangroves, may not be significant in the western Arabian Gulf due to the better living standard of the society. Consequently, a vast area of intertidal mud habitats in this region has been reclaimed to provide land expanding urbanization and for

TABLE 3.12. *Goods and services provided by or derived from intertidal mud habitats in the western Arabian Gulf.*

Services	Comments and Examples
Provisioning	
Food	Production of fish and feeding ground for migratory birds
Fiber and fuel	Production of logs and fuel wood
Raw material	Extraction of medicines and other materials from biota
Regulating	
Gas and climate regulation	Source of and sink for greenhouse gases; influence local and regional temperature, precipitation, and other climatic processes
Bioremediation of waste	Retention, recovery, and removal of excess nutrients and other pollutants
Disturbance prevention	Retention of soils and sediments, flood control, storm protection
Cultural	
Recreational	Opportunities for recreational activities
Educational	Opportunities for formal and informal education and training
Supporting	
Biodiversity	Provision of habitat for resident and transient species, including important bird species
Soil formation	Sediment retention and accumulation of organic matter
Nutrient cycling	Storage, recycling, processing, and acquisition of nutrients by organisms

(Based on Millennium Ecosystem Assessment, 2005; Beaumont, et al., 2007; Foster, et al., 2013.)

oil-related industrial developments upon which humans depend for materials and fuel (Allen and Pye, 1992; Doody, 1992; Foster, et al., 2013).

A wide variety of raw materials are provided by marine biodiversity for a variety of different uses, for example, seaweed for industry and fertilizer, fishmeal for aquaculture and farming, pharmaceuticals and ornamental goods such as shells (Beaumont, et al., 2007). Subsequently, any such utilization of the mud flat ecosystem, either commercially or experimentally, has so far not started in this region.

Regulating Services

They are the benefits obtained from the regulation of mud flat. One important regulating service is the gas and climate regulation. The organisms in the mud flats play a significant role in climate control through their regulation of carbon fluxes, by acting as a reserve or sink for CO_2 in living tissue and by facilitating burial of carbon in the sediment (Beaumont, et al., 2007). The changes in marine biodiversity can affect the capacity of marine environment to act as a carbon sink.

Another regulatory service that mud flats provide is the removal of pollutants through storage, burial and recycling. This is important as far as the western Arabian Gulf is concerned, which is known for high level of human pressures, and the release of oil and heavy metals in to the marine environment. The sediment in the mud flats adsorbs many organic compounds and metals during the flood tide. The bioturbation activity (reworking and mixing of sediments) of mega- and macrofaunal organisms within the seabed can bury, sequester and process waste material through assimilation and/or chemical alteration. The slow passage of water through the mud flat provides time for pathogens to lose their viability or be consumed by other organisms in the system (Millennium Ecosystem Assessment, 2005).

Intertidal mud habitat may be a natural and sustainable form of coastal erosion protection (Foster, et al., 2013). Algal mats in the mud flats, halophytes in the salt marshes and mangrove forest stabilize the sediments and can prevent the impact of tidal surges, storms and floods (Beaumont, et al., 2007).

Cultural Services

They are the nonmaterial benefits people obtain through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences associated with intertidal mud habitats. For example, the biodiversity in the intertidal mud habitats provides the basis for some recreational activities, such as shorebird watching, walking and sport fishing.

Academics value intertidal mud habitats as dynamic natural environments, in which the interaction of natural physical, chemical and biological processes can be observed, monitored and demonstrated for teaching purposes (Allen and Pye, 1992). The marine diversity can provide a long-term record of environmental resilience and stress (Beaumont, et al., 2007). Understanding the diversity, community composition and standing stock of flora and fauna are important for assessing and monitoring changes in the habitat by human impact. The fossil record can provide an insight into how the environment has changed in the past, enabling us to determine how it will change in the future (Beaumont, et al., 2007).

Supporting Services

Supporting services are those that are necessary for the production of all other mud flat services. One important supporting service is the provision of habitat for resident and transient species, including nationally and internationally important bird species and stocks of flora adapted to survive on extreme saline conditions and worth protecting for their intrinsic value (McMullon, 2008). The mud flats in the western Arabian Gulf provide an essential breeding and nursery space for plants and animals, which are particularly important for the continued recruitment of commercial and/or subsistence species. Living habitat plays a critical role in species' interactions and regulation of population dynamics, and is a prerequisite for the provision of many goods and services (Beaumont, et al., 2007). It has been documented that establishing natural protected areas is one means of protecting coastal and marine environments and preventing degradation of their ecosystems (Krupp, 2002). The Jubail area of Saudi Arabia has experienced rapid coastal development since the establishment of the Royal Commission in 1975. The 1991 Gulf oil spill severely affected the Jubail area and in response to this catastrophe, the Saudi Government established the "Jubail Marine Wildlife Sanctuary" on the eastern seaboard of Saudi Arabia, which covers an area of more than 2,000 km^2. Marine protected areas contribute significantly to both preservation and conservation of genetic characteristics, species, and habitats in marine environments (Kelleher and Phillips, 1999). Different protected areas have been established in other parts of the western Arabian Gulf, for example, in Bahrain, Duwhat Arad a tidal mud flat was designated as a natural marine protected area in 2003 due to its importance as a feeding and roosting ground for important shorebirds (Al-Zayani, 2003) and in Kuwait, the northern part of Bubiyan Island was designated as a marine protected area.

Being a less dynamic environment, mud flats contribute heavily to soil formation through accumulation of fine sediments and organic biomass. Intertidal mud habitats act as both a nutrient sink and source, through the accumulation of minerals in soil, and the provision of minerals that plants take from the soil and air, which are returned again when they or their consumers die. The storage, cycling and maintenance of a supply of essential nutrients, for example, nitrogen, phosphorus, sulfur and metals, are crucial for life. There is a transfer of organic matter from mud flats to the pelagic ecosystem. As discussed earlier, the low energy intertidal mud habitats in the western Arabian Gulf are very productive and accumulate an excess of organic matter. The sediment dwelling organisms get energy from the degradation of organic matter by bacteria. A major share of this energy is transferred to the water column by the tidal action. This may be rated as important as about 190 km of coastline of the Saudi coast along the Arabian Gulf with an average width of ca. 200 m to 300 m has mud flats. Subsequently, because of the absence of concerted studies in this field, an estimate of the transfer is so far not known.

Human Pressures on Intertidal Mud Habitats

Human pressures experienced on the intertidal region are in the form of oil-related activities and urbanization. Nevertheless, the single incident that severely affected the intertidal habitats was the 1991 Gulf oil spill. The intentional release of oil by the Iraqi military happened in Kuwait in January 1991. The spilled oil moved slowly southwards and accumulated on the north coast of Saudi Arabia, endangering fragile coastal ecosystems. By December 1991, it was established that the oil had been deposited on the intertidal areas, essentially between the high water springs mark and the high water neaps (Jones and Richmond, 1992). Total mortality of the intertidal biota occurred at higher shores and diversity was reduced on the lower shores in 1991, up to Abu Ali Island (Jones, et al., 1998). In some areas such as the shoreline along Dauhat ad-Dafi and Dauhat al-Musallamiya, about 22% of salt marshes were covered with dead, tar-sealed plants, and in some 380 hectares of salt marshes, less than 1% of plants survived (Warnken, 1996). Studies based on quantitative surveys of intertidal areas between Ras al-Khair and Abu Ali reported 50% to 100% mortality of biota on their upper shores (Jones, et al., 1998).

The plants and animals of the seafloor, which are the basis of the food chain, were destroyed and this had a direct impact on the fish and shrimp nurseries. This consequently impacted the multimillion dollar fisheries industry in this region. On muddy shores, over 90% reductions in the original oil cover had occurred by the first half of 1995 (Jones, et al., 1998). On Abu Ali Island, large numbers of marine birds were killed as there were no procedures in place to save and rehabilitate the oiled birds. According to the World Wildlife Fund, UAE, an estimated 30,000 marine birds were killed by the oil spill.

The first stage in the recovery of the Gulf shores from oil impact was indicated by the appearance and colonization of upper shore tar by algal mats. In the sheltered mud flats of Abu Ali area, one and a half years after the spill, initial colonization of a blue-green algal mat was observed (Watt, et al., 1993). Here, the combination of blue-green algal mat and the tar layer delayed the settlement of burrowing fauna (Barth, 2003). The mangrove tree *Avicennia marina*, largely survived the pollution and its seedlings observed in the Qurma Island two years after the oil spill indicated the tolerance of these plants to oil pollution (Boer, 1994). Regarding intertidal fauna, by the end of 1992, intertidal mud habitats witnessed the initial colonization of polychaete *Perinereis vancaurica* and crab *Cleistostoma dotilliforme* (Watt, et al., 1993). By 1995, 92% of the typical species had returned to the top and 83% to the lower part of the intertidal mud habitats and during this period heavy settlement of polychaete *Owenia* sp. and bivalve *Dosinia hepatica* were also observed (Jones, et al., 1998). About 95% of the salt marshes were oiled in 1991. Only 20% of these could be considered as fully recovered in 2001, whereas about 25% were still completely dead without any sign of regeneration (Barth, 2002). A more recent study by Bejarano and Michel (2010) on the large-scale risk assessment of polycyclic aromatic hydrocarbons in shoreline sediments from Saudi Arabia, 12 years after the oil spill, revealed around 67% of the samples had ESBTU (FCV, 43) >1 indicating potential adverse effects as per benthic sediment toxicity tests. Sediments from the 0 cm to 30 cm layer from tidal flats and the >30 cm to <60 cm layer from the heavily oiled halophytes and mangroves had high frequency of categorizing into high risk samples. Sediments south of Tanajib were likely to pose adverse ecological effects as compared to the north of Safaniyah.

Currently, oil pollution is not the most harmful ecological disturbance in this region (Sheppard, et al., 2010). The combination of coastal dredging and conversion of mud flats into land presently represents a much more serious threat (Al-Ghadban and Price, 2002; Loughland, et al., 2012). Many mud flat areas important for nursery ground for fishes and shrimp have been reclaimed for the construction of corniche roads, buildings or other invasive coastal infrastructure, which are unlikely to become biologically productive again (Sheppard, et al., 1992; Costanza, et al., 1997; Krupp, et al., 2006; Beaumont, et al., 2008; Al-Yamani, et al., 2008; Loughland, et al., 2012). The oil-related activities comprise of dredging/trenching for the installation of pipelines and cables in the shore access portion; however, in most cases, such removal of habitats will be minimal and the habitat may be restored quickly.

Conclusions

In spite of the harsh environmental conditions, intertidal mud habitats of the western Arabian Gulf are highly productive. The 1991 Gulf oil spill impacted these habitats, particularly in the sheltered bays, more than any other habitats of the western Arabian Gulf. Although oil spills are not serious issues in the present time, human pressures continue to happen in the form of reclamation as part of the urbanization and oil-related constructional activities, which include trenching and dredging. The intertidal mud habitats play a major role in the overall functioning of the marine environment and provide feeding grounds and staging areas for internationally important migratory birds. Therefore, conservation strategies have been planned by designating some of these habitats as protected areas in various parts of the western Arabian Gulf. Future studies may focus on updating the biodiversity and the valuation of the ecosystem services provided by the organisms in the various intertidal mud habitats of this region.

References

Abayachi, J.K., Darmoinan, S.A. and DouAbul, A.A.Z. 1988. The Shatt al-Arab River: A nutrient salt and organic matter source to the Arabian Gulf. *Hydrobiologia* 166: 217–224.

Abbas, J. 2006. Economic halophytes of Bahrain, pp. 113–120, in Khan, M.A., Boer, B., Kust, G.A. and Barth, H-J. (eds.). Sabkha ecosystems. Vol. II: West and Central Asia. Springer.

Abbas, J.A. 2002. Coastal vegetation of Bahrain Island. *Arab Journal of Scientific Research* 20: 87–91.

Abbas, J.A. 2002. Plant communities bordering the Sabkhat of Bahrain Island, pp. 51-62, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Abbas, J.A. and Al-Saleh, F.S. 2002. Medicinal plants of Bahrain. University of Bahrain Publications, 290 p.

Abdelly, C., Debez, A., Smaoui, A. and Grignon, C. 2010. Halophyte-Fodder species association may improve nutrient availability and biomass production of the sabkha ecosystem, in Öztürk, M., Böer, B., Barth, H.J., Clüsener-Godt, M., Khan, M. and Breckle, S.W. (eds.). Sabkha ecosystems. Tasks for vegetation science, Vol. 46. Springer, Dordrecht.

Abdel-Moati, M. 2006. Coral reef conservation in Qatar Marine Conservation Forum. EWS WWF, Abu Dhabi, UAE.

Abdelrahman, S.M. and Ahmad, F. 1993. The residual currents at mooring positions in the inner sea of the ROPME Sea Area, pp. 165-188, in ROPME/IOC (UNESCO)/UNEP/NOAA/EPC (KUWAIT). Final report of the scientific workshop on the results of the R/V *Mt. Mitchell* Cruise in the ROPME Sea Area, Vol. 1, Annex II.

Abdel-Razik, M.S. 1991. Population structure and ecological performance of the mangrove Avicennia marina (Forsk.) Vierh. on the Arabian Gulf coast of Qatar. *Journal of Arid Environments* 20: 331–338.

Abdul Aziz, P.K., Al-Tisan, I., Al-Daili, M., Green, T. and Ba-Mardouf, K. 2003. Marine macrofouling: A review of control technology in the context of an *on-line* experiment in the turbine condenser water box of Al-Jubail Phase-1 power/MSF plants. *Desalination* 154: 277–290.

Abdul Aziz, P.K., Al-Tisan, I., Al-Daili, M., Green, T.N., Abdul Ghani, I.D. and Javeed, M.A. 2000. Effects of environment on source water for desalination plants on the eastern coast of Saudi Arabia. *Desalination* 132: 29-40.

Abdul Aziz, P.K., Al-Tisan, I.A., Daili, M.A., Green, T.N., Dalvi, A.G.I. and Javeed, M.A. 2003. Chlorophyll and plankton of the Gulf coastal waters of Saudi Arabia bordering a desalination plant. *Desalination* 154: 291–302.

Abdulaziz, H.A. and Krupp, F. 1994. The Arabian Gulf environment and the consequences of the 1991 oil spill. The Status of coastal and marine habitats two years after the Gulf War oil spill. *Cour. Forsch. Inst. Senckenberg, Frankfurt* 166: 3–10.

Abdulqader, E.A.A. 1999. The role of shallow waters in the life cycle of the Bahrain penaeid shrimps. *Estuarine. Coastal and Shelf Sciences* 49: 115–121.

Abdulqader, E.A.A. 2001. Bahrain shrimp fishery and the marine environment, in Tropical shrimp fisheries and their impact on living resources. FAO Fisheries Circular. No. 974. Rome, FAO, 378 p.

Abdulqader, E.A.A. 2001. Gillnet selectivity experiments in Bahrain waters on the Spanish Mackerel, Scomberomorus commerson (Lacepede) fishery. *Arab Gulf Journal of Scientific Research* 19: 66–71.

Abdulqader, E.A.A. 2002. The finfish bycatch of Bahrain shrimp trawl fisheries. *Arab Gulf Journal of Scientific Research* 20: 165–174.

Abdulqader, E.A.A. 2006. National fisheries resources survey. An extension of MARGIS II. Bahrain Center for Studies and Research, 425 p.

Abdulqader, E.A.A. 2010. Turtle captures in shrimp trawl nets in Bahrain. *Journal of Aquatic Ecosystem Health and Management* 133: 307–318.

Abdulqader, E.A.A. and Miller, J. 2012. Marine turtle mortalities in Bahrain territorial waters. *Journal of Chelonian Conservation and Biology* 11: 133–138.

Abdulqader, E.A.A. and Naylor, E. 1995. Bionomics and migration patterns of the green tiger prawn, Penaeus semisulcatus De Haan, in Bahrain waters. *Fisheries Research* 21: 395–407.

Abdulqader, E.A.A. 1999. The role of shallow waters in the life cycle of the Bahrain penaeid shrimps. *Estuarine, Coastal and Shelf Science* 49: 115–121.

Abdulqader, E.A.A. and Miller, J. 2012. Marine turtle mortalities in Bahrain territorial waters. *Chelonian Conservation and Biology* 11: 133–138.

Abideen, Z., Ansari, R. and Khan, M.A. 2011. Halophytes: Potential source of ligno-cellulosic biomass for ethanol production. *Biomass Bioenerg* 5: 1818–1822.

Abideen, Z., Ansari, R., Gul, B. and Khan, M.A. 2012. The place of halophytes in Pakistan's biofuel industry. *Biofuels* 2: 211–220.

AboEl-Nil, M.M. 2001. Growth and establishment of mangrove (Avicennia marina) on the coastline of Kuwait. *Wetlands Ecology and* Management 9: 421–428.

Abulfaith, H.A. 2002. Mangroves and their associated salt marshes in Qatar, pp. 25-35, in Javed, S. and de Souza, A.G. (eds.). Research and management options for mangrove and saltmarsh ecosystems. ERWDA, Abu Dhabi, UAE.

Aburto, M.O., de los Angeles Carvajal, M., Barr, B., Barbier, E.B., Boesch, D.F., Boyd, J., Crowder, L.B., Cudney-Bueno, R., Essington, T. and Ezcurra, E. 2012. Ecosystem-based management for the oceans. Island Press.

Abuzinada, A.H. and Krupp, F. (eds.). 1994. The status of coastal and marine habitats two years after the Gulf War oil spill. *Cour. Forsch. Inst. Senckenberg* 166: 80.

Abuzinada, A.H., Barth, H., Krupp, F., Böer, B. and Al Abdessalaam, T.Z. (eds.). 2008. Protecting the Gulf's marine ecosystems from pollution. Birkhäuser, Basel, 285 p.

Abuzinada, A.H. and Krupp, F. (eds.). 1994. The status of coastal and marine habitats two years after the Gulf oil spill. *Courier Forsch. Inst. Senckenberg* 166. Commission of the European Communities, Brussels. National Commission for Wildlife and Development, Riyadh, pp. 1–76.

Ackerman, J.D. 2006. Seagrass reproduction of seagrasses: Pollination in the marine context, pp. 89-109, in Larkum, A.W.D., Orth, R.J. and Duarte, C.M. (eds.). Seagrasses: Biology, ecology and their conservation. Springer, London.

Ackerman, R.A. 1997. The nest environment and the embryonic development of sea turtles, pp. 83-106, in Lutz, P. and Musick, J. (eds.). The biology of sea turtles. CRC Press.

Adams, D.J., Alewood, P.F., Craik, D.J., Drinkwater, R.D. and Lewis, R.J. 1999. Conotoxins and their potential pharmaceutical applications. *Drug Development Research* 46(3-4): 219-234.

Adams, S.M. 2005. Assessing cause and effect of multiple stressors on marine systems. *Mar. Poll. Bull.* 51: 649-657.

Agardy, T. 1999. Ecosystem-based management: A marine perspective, pp. 44-46, in Maltby, E., Holdgate, M., Acreman, M. and Weir, A. (eds.). Ecosystem management-questions for science and society. RHIER, University of London, Egham.

Agardy, T. 2000. Information needs for marine protected areas: Scientific and societal. *Bulletin of Marine Science* 66(3): 875-888.

Ahmad, F. and Sultan, S.A.R. 1991. Annual mean surface heat fluxes in the Arabian Gulf and the net heat transport through the Strait of Hormuz. *Atmosphere Ocean* 29(1): 54-61.

AI-Mudaffar, N., Fawzi, N.O. and Al-Edanee, J. 1990. Hydrocarbons in the surface sediments and bivalves from Shatt Al-Arab and its rivers, Southern Iraq. *Oil Chemical Pollut.* 7: 17-28.

Airoldia, L., Balata, D. and Beck, M. 2008. The Gray Zone: Relationships between habitat loss and marine diversity and their applications in conservation. *Journal of Experimental Marine Biology and Ecology* 366: 8-15.

Akili, W. and Torrance, J.K. 1981. The development and geotechnical problems of sabkha, with preliminary experiments on the static penetration resistance of cemented sands. *Q.J. Eng. Geol. London* 14: 59-73.

Aksakal, A. and Rehman, S. 1999. Global solar radiation in northeastern Saudi Arabia. *Renewable Energy* 17: 461-472.

Al Rashidi, M., Shobrak, M., Al-Eissa, M.S. and Székely, T. 2012. Integrating spatial data and shorebird nesting location to predict the potential future impact of global warming on coastal habitats: A case study on Farasan Islands, Saudi Arabia. *Saudi Journal of Biological Sciences* 19(3): 311-315.

Al Shaikh, N.Y. 2003. Excavations at Thaj, Dilmun. *J. Bahrain Hist. Archaeol. Soc.* 21: 56-65.

Al Shaikh, N.Y. 2004. Almuntiqah alsharqiyah fi asur ma qibla altarikh. *Al Waha* 33: 6-21.

Al Shehhi, M.R., Gherboudj, I. and Ghedira, H. 2014. An overview of historical harmful algae blooms outbreaks in the Arabian Seas. *Marine Pollution Bulletin* 86(1): 314-324.

Al Suweidi, A., Wilson, K., Healy, T. and Vanneyre, L. 2012. First contemporary record of green turtle chelonia mydas nesting in the United Arab Emirates. *Marine Turtle Newsletter* 133: 16-17.

Al-Abdulkader, K.A. 1991. Phytoplankton ecology of the western Arabian Gulf, M.S. Thesis, pp. 1-76, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

Al-Abdulkader, K.A. and El-Sayed, S.Z. 1992. Phytoplankton ecology of the Western Arabian Gulf (Persian Gulf), in Falkowski, P.G., Woodhead, A.D. and Vivirito, K. (eds.). Primary productivity and biogeochemical cycles in the sea. Environmental Science Research, Vol. 43. Springer, Boston, MA, USA.

Al-Abdulkader, K. and Loughland, R.A. 2011. Conservation of marine and coastal habitats, p. 455, in Loughland, R.A. and Al-Abdulkader, K. (eds.). Marine Atlas of the Western Arabian Gulf. Saudi Aramco, Dhahran, Saudi Arabia.

Al-Abdulkader, K.A. and El-Sayed, S.Z. 1992. Phytoplankton ecology of the Western Arabian Gulf (Persian Gulf), pp. 505-506, in Primary productivity and biogeochemical cycles in the sea. Springer, U.S.

Al-Abdulkader, K.A., Loughland, R.A. and Wyllie, A. 2011. Conservation of natural coastal marine resources, pp. 340-359, in Abdulkader, K.A. and Loughland, R.A. (eds.). Marine Atlas of the Saudi Arabian Waters of the Arabian Gulf. Saudi Aramco, Dhahran, Saudi Arabia.

Al-Abdulrazzak, D. and Pauly, D. 2014. Managing fisheries from space: Google Earth improves estimates of distant fish catches. *ICES Journal of Marine Science* 71(3): 450-454.

Al-Abdulrazzak, D., Moniri, N.R., Moniri, N.R., Zeller, D., Zylich, K., Belhabib, D., Pauly, D. and Tesfamichael, D. 2013. From dhows to trawlers: A recent history of fisheries in the Gulf countries, 1950 to 2010. Report for the Fisheries Center at the University of British Columbia, Vancouver, Canada, p. 69.

Al-Abdulrazzaq, S., Khalaf, F., Al-Bakri, D., Shublaq, W., Al-Sheikh, Z., Kittaneh, W., Al-Ghadban, A. and Al-Saleh, S. 1982. Marine sedimentology and benthic ecology of Kuwait marine environment. Kuwait Institute of Scientific Research, Kuwait, Vols. I-II.

Al-Aidaroos, A.M. 1993. Planktonic decapoda from the western coast of the Gulf. *Mar. Pollut. Bull.* 27: 245-249.

Alam, I.A.H., Al-Arfaj, A.A. and Sadiq, M. 1998. Metal concentrations in sediment samples collected during Umitaka-Maru Cruises in 1993-1994, pp. 149-159, in Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. (eds.). Offshore environment of the ROPME Sea Area after the war-related oil spill. Terra Scientific Publishing Co. TERRAPUB, Tokyo, Japan.

Alam, I.H. 1993. The 1991 Gulf War oil spill — Lessons from the past and a warning for the future. *Mar. Poll. Bull.* 27: 358-360.

Al-Amoudi, O.S.B., Abduljauwad, S.N., Rasheeduzzafar and Maslehuddin, M. 1992. Effect of chloride and sulfate contamination in soils on corrosion of steel and concrete. *Transportation Research Record* (1345): 67-73.

Al-Amoudi, O.S.B. 1994. Chemical stabilization of sabkha at high moisture contents. *Engineering Geology* 36(3-4): 279-291.

Al-Arfaj, A.A. and Alam, I.A. 1993. Chemical characterization of sediments from the Gulf area after the 1991 Oil Spill. *Marine Pollution Bulletin* 27: 97-101.

Alawadhi, A.A. 1997. Pretreatment plant design — Key to a successful reverse osmosis desalination plant. *Desalination* 110(1-2): 1-10.

Al-Bakri, D. and Kittaneh, W. 1998. Physico-chemical characteristics and pollution indicators in the intertidal environment of Kuwait. *Environmental Management* 22: 415-424.

Al-Bakri, D., Behbehani, M. and Khuraibet, A. 1997a. Quantitative assessment of the intertidal environment of Kuwait I: Integrated environment classification. *Environmental Management* 51: 321-332.

Al-Bakri, D., Behbehani, M. and Khuraibet, A. 1997b. Quantitative assessment of the intertidal environment of Kuwait II: Controlling factors. *Environmental Management* 51: 333-341.

Al-Bakri, D., Khuraibet, A. and Behbehani, M. 1997. Quantitative assessment of the intertidal environment of Kuwait I: Integrated environmental classification. *Journal of Environmental Management* 51: 321-332.

Alder, J., Zeller, D., Pitcher, T. and Sumaila, R. 2002. A method for evaluating marine protected area management. *Coastal Management* 30: 121-131.

Aleem, A.A. 1979. A contribution to the study of seagrasses along the Red Sea coast of Saudi Arabia. *Aquatic Botany* 7: 71-78.

Al-Eisawi, D.M. 2002. Status and threats to mangrove and salt marsh ecosystems in Bahrain, pp. 16-24, in Javed, S. and de Souza, A.G. (eds.). Research and management options for mangrove and saltmarsh ecosystems. ERWDA, Abu Dhabi, UAE.

Alfreydah, K.A. and Alhusayn, W.A. 1998. Al Uqair. Port of Hajer and South of Najd. Al Janadriya, Dammam.

Al-Furaih, A.A.F. 1984. Maastrichtian ostracodes from Wadi al-Atj, Saudi Arabia. *Arab Gulf Journal of Scientific Research* 2: 495-503.

Al-Ghadban, A.N, Jacob, P.G. and Abdali, F. 1994. Total organic carbon in the sediments of the Arabian Gulf and need for biological productivity investigations. *Marine Pollution Bulletin* 28: 356-362.

Al-Ghadban, A.N., Al-Dousari, A.M., Al-Kadi, A., Behbehani, M. and

Caceres, P. 1998. Mineralogy, genesis and sources of surficial sediments in ROPME Sea Area, pp. 65-88, in Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. (eds.). Offshore environment of the ROPME Sea Area after the war-related oil spill — Results of the 1993-94 Umitaka-Maru Cruises. Terra Sci. Publ. Co., Tokyo, Japan.

Al-Ghadban, A.N., Al-Yamani, F., Al-Samma, A., Al-Hassam, R., Behbehani, M., Al-Hassan, J., Al-Rushaid, R., Al-Shemmari, H., Al-Matrouk, K., Al-Khabaz, A. and Bahloul, M. 2007. Environmental stress of Kuwait's coastal area due to the 1991 oil slick. *International Journal of Oceans and Oceanography* 2(1): 25-50.

Al-Ghadban, A.N. and Price, A.R.G. 2002. Dredging and infilling, pp. 207-218, in Khan, N.Y., Munwar, M. and Price, A.R.G. (eds.). The Gulf ecosystem, health and sustainability. Backhuys, Leiden, the Netherlands.

Al-Ghadban, A.N., Karam, H. and Al-Wayel, H. 1993. Textural characteristics of ROPME Sea Area bottom sediments, pp. 95-115, in ROPME/IOC (UNESCO)/ UNEP/NOAA/EPC (KUWAIT). Final report of the scientific workshop on the results of the R/V *Mt. Mitchell* Cruise in the ROPME Sea Area, Vol. 1, Annex II.

Al-Ghadban, A.N., Massoud, M.S. and Abdali, F. 1996. Bottom sediments of the Arabian Gulf. 1. Sedimentological characteristics. *J. Univ. Kuwait, Sci*. 23(1): 71-88.

Al-Habshi, A., Youssef, T., Aizpuru, M. and Blasco, F. 2007. New mangrove ecosystem data along the UAE coast using remote sensing. *Aquatic Ecosystem Health & Management* 10: 309-319.

Al-Haimi, Y. 2007. Sustainable development and business management — QAFCO's experience. 20th AFA International Annual Technical Conference, Tunisia.

Al-Hajari, M. and Al-Saif, Z. 1989. Preliminary report on Al-Defi excavations. *Atlal* 12: 29-37.

Al-Harmi, L. 1988. Sources of oil pollution in Kuwait and their inputs in the marine environment. Final Report-EES-125. Kuwait Institute of Scientific Research, Kuwait.

Al-Hasan, R.H. and Jones, W.E. 1989. Marine algal flora and seagrasses of the coast of Kuwait. *Journal of the University of Kuwait (Science)* 16: 289-340.

Al-Hasash, A.M. 2006. Brief report on the excavations at Thaj. *Atlal* 19: 15-19.

Al-Hashash, A., Saif, Z.A., Hwyje, S.A., Hamady, M.A., Turky, S.A., Habram, A., Harby, M.A., Rashidy, F.A. and Shaikh, N.A. 2005. Report on the excavation of Thaj (1421 A.H./2001 A.D.). *Atlal* 18: 19-21.

Al-Hashash, A.M., Al-Saif, Z.A., Al-Sanna, S.H. and Al-Abduljabbar, N. 2002. The archaeological works at the site of Thaj 1420 A.H./1999 A.D. *Atlal* 17: 17-21.

Al-Hashash, A.M., Al-Zayer, W., Al-Saif, Z.A., Al-Hajri, M., Al-Sanna, S. and Al-Shaikh, N. 2001. Report on the archaeological excavations at Thaj Tel al Zayer. *Atlal* 16: 23-26.

Al-Hashimi, A.H. and Salman, H.H. 1985. Trace metals in the sediments of the northwestern coast of the Arabian Gulf. *Mar. Poll. Bull.* 16: 118-120.

Al-Hassan, J.M., Afzal, M., Rao, C.V.N. and Fayad, S. 2000. Petroleum hydrocarbon pollution in sharks in the Arabian Gulf. *Bulletin of Environmental Contamination and Toxicology* 65: 391-398.

Ali A., Alfarhan, A., Robinson, E. and Altesan, W. 2009. Soil quality of die off and die back mangrove grown at Al-Jubail area (Saudi Arabia) in the Arabian Gulf. *American Journal of Applied Sciences* 6: 498-506.

Ali, A.H. 2013. First record of six shark species in the territorial marine waters of Iraq with a review of cartilaginous fishes of Iraq. *Mesopotamian Journal of Marine Science* 28: 1-16.

Al-Jaloud, A.A. and Hussain, G. 2006. Sabkha ecosystem and halophyte plant communities in Saudi Arabia, pp. 1-7, in Khan, M.A., Boer, B., Kust, G.A. and Barth, H-J. (eds.). Sabkha ecosystems. Vol. II: West and Central Asia.

Al-Kaisi, K.A. 1976. On the phytoplankton of the Arabian Gulf. 2nd Joint Oceanography Assembly, September 13-24, Edinburgh, U.K.

AL-Kalali, N. and Subasing, W. 2008. Coastal and marine development principles and major issues in the Gulf. Proceedings of the PIANC-COPEDEC VII conference, February 24-28, 2008, Dubai, Paper No. Keynote 02.

Al-Kandari, M., Al-Yamani, F. and Al-Rifaie, K. 2009. Marine phytoplankton atlas of Kuwait's waters. Kuwait Institute for Scientific Research. Safat, Kuwait.

Al-Khabbaz, M. and Fahmi, A.M. 1998. Distribution of copepoda in the ROPME Sea Area 1994, pp. 303-318, in Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. (eds.). Offshore environment of the ROPME Sea Area after the war-related oil spill — Results of the 1993-94 Umitaka-Maru Cruises. Terra Scientific Publishing Company, Tokyo, Japan.

Al-Khayat, J.A. 2005. Some macrobenthic invertebrates in the Qatari waters, Arabian Gulf. *Qatar University Science Journal* 25: 126-136.

Al-Khayat, J.A. 2008. Molluscs of the State of Qatar. *Qatar Biodiversity Newsletter* 2(1): 5.

Al-Khayat, J.A. and Al-Ansi, M.A. 2008. Ecological features of oyster beds distribution in Qatari waters, Arabian Gulf. *Asian Journal of Scientific Research* 1(6): 544-561.

Al-Khayat, J.A. and Al-Maslamani, I.A. 2001. Fouling in the pearl oyster beds of the Qatari waters, Arabian Gulf. *Egypt Journal of Aquatic Biology and Fisheries* 5(4): 145-163.

Al-Kindi, A.Y.A., Brown, J.A. and Waring, C.P. 2000. Endocrine, physiological and histopathological responses of fish and their larvae to stress with emphasis on exposure to crude oil and various petroleum hydrocarbons. *Sultan Qaboos Journ. Sci. Res. Scie. & Technol.* (Special rev. ed.): 1-30.

Alkolibi, F.M. 2002. Possible effects of global warming on agriculture and water resources in Saudi Arabia: Impacts and responses. *Climatic Change* 54(1-2): 225-245.

Allard, M.W., Miamoto, M.M., Bjorndal, K.A., Bolten, A.B. and Bowen, B.W. 1994. Support for natal homing in green turtles from mitochondrial DNA sequences. *Copeia* 1994(1): 34-41.

Allen, E.A., Fell, P.E., Peck, M.A., Gieg, J.A., Guthke, C.R. and Newkirk, M.D. 1994. Gut contents of common mummichogs, Fundulus heteroclitus L., in A restored impounded marsh and in natural reference marshes. *Estuaries* 17(2): 462-471.

Allen, J.R.L. and Pye, K. (eds.). 1992. Coastal salt marshes: Their nature and importance. Salt marshes, morphodynamics, conservation and engineering significance, pp. 1-18. Cambridge University Press, Cambridge, U.K.

Aller, R.C., Aller, J.Y. and Kemp, P.F. 2001. Effects of particle and solute transport on rates and extent of remineralization in bioturbated sediments, pp. 315-333, in Aller, J.Y., Woodin, S.A. and Aller, R.C. (eds.). Organism-sediment interactions. Belle W. Baruch Library in Marine Science: 21. University of South Carolina Press.

Allgeier, J.E., Yeager, L.A. and Layman, C.A. 2013. Consumers regulate nutrient limitation regimes and primary production in seagrass ecosystems. *Ecology* 94: 521-529.

Allison G.W., Lubchenco, J. and Carr, M.H. 1998. Marine reserves are necessary but not sufficient for marine conservation. Ecological Application. *Ecosystem Management for Sustainable Marine Fisheries* 8(1) Supplement: S79-S92.

Al-Lihaibi, S.S. and Al-Omaran, L. 1996. Petroleum hydrocarbons in offshore sediments from the Gulf. *Marine Pollution Bulletin* 32: 65-69.

Al-Lihaibi, S.S. and Ghazi, S.J. 1997. Hydrocarbon distributions in sediments of the open area of the Arabian Gulf following the 1991 Gulf War oil spill. *Marine Pollution Bulletin* 34(11): 941-948.

Allsopp, M., Walters, A., Santillo, D. and Johnston, P. 2006. Plastic debris in the world's oceans. Greenpeace. http://www.unep.org/regionalseas/ marinelitter/ publications/ docs/plastic_ ocean_report.pdf.

Al-Mahmood, A.M. 1993. Distribution of heavy metals in sediment of

Abu Ali and Tanajib area of Saudi Arabia coastline during March 1992, pp. 74-84, in ROPME/IOC (UNESCO)/UN, EP/NOAA/EPC(KUWAIT), Final report of the scientific workshop on the results of the R/V *Mt. Mitchell* Cruise in the ROPME Sea Area, Vol. 2, Annex IV.

Al-Mansour, A.H. 2001. Desalination industry development in the last two decades and its effect on production cost. Proceedings of the IDA World Conference. Manama, Bahrain.

Al-Maslamani, I., LeVay, L., Kennedy, H. and Jones, D.A. 2007. Feeding ecology of the grooved tiger shrimp Penaeus semisulcatus De Haan Decapada: Penaeidae in inshore waters of Qatar. *Arabian Gulf. Marine Biology* 150: 627-637.

Almazroui, M. 2011. Calibration of TRMM rainfall climatology over Saudi Arabia during 1998-2009. *Atmospheric Research* 99: 400-414.

Almazroui, M., Islam, M.N., Jones, P.D., Athar, H. and Ashfaqur, R.M. 2012. Recent climate change in the Arabian Peninsula: Seasonal rainfall and temperature climatology of Saudi Arabia for 1979-2009. *Atmospheric Research* 111: 29-45.

Al-Merghani, M., Miller, J.D., Al-Mansi, A., Khushaim, O. and Pilcher, N.J. 1996. The marine turtles of the Arabian Gulf. NCWCD Studies 1991-1994, pp. 351-359, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Al-Merghani, M., Miller, J.D., Pilcher, N. and Al-Mansi, A. 2000. The green and hawksbill marine turtles in the Kingdom of Saudi Arabia: Synopsis of nesting studies 1989-1997. *Fauna of Arabia* 18: 369-384.

Al-Mohanna, S.Y. and George, P. 2009. The biology of sea turtles and their environment in Kuwait. Phase II: Nesting population and phylogeny, final report for project 1999-1207-02. Kuwait Foundation for the Advancement of Sciences, Kuwait.

Al-Mohanna, S.Y. and Meakins, R.H. 2000a. First record of the Leatherback Turtle, Dermochelys coriacea, from Kuwait. *Zoology in the Middle East* 21: 27-29.

Al-Mohanna, S.Y. and Meakins, R.H. 2000b. Recent records of marine turtles Chelonia mydas, Caretta caretta, and Eretmochelys imbricata in Kuwait. *Zoology in the Middle East* 20: 33-36.

Al-Mohanna, S.Y., George, P. and Subrahmanyam, M.N.V. 2007. Benthic microalgae on a sheltered intertidal mud flat in Kuwait Bay of the Northern Arabian Gulf. *Journal of Marine Biological Association of India* 49: 27-34.

AI-Mudaffar, N., Fawzi, N.O. and Al-Edanee, J. 1990. Hydrocarbons in the surface sediments and bivalves from Shatt Al-Arab and its rivers, Southern Iraq. *Oil Chemical Pollut*. 7: 17-28.

Al-Mughanam, A. 1993. Sassanid dirhams from the island of Tarut, pp. 409-422, in Al-Khalifa, A.K. and Rice, M. (eds.). Bahrain through the ages: The history. Kegan Paul, London.

Al-Mughanam, A. 2000. A preliminary report on the excavation of al-uqair, north-west of Abu Zahmul in Al-Hasa Region. *Atlal* 15: 45-86.

Al-Muzaini, S., Beg, M.U., Al-Mutari, M. and Al-Mullalhah, A. 1995. Seawater quality at industrial effluents discharge zone. *Water Science and Technology* 32: 21-26.

Al-Naser, R.K., Al-Abbasi, M.W. and Elewi, A.H. 2010. Some recent gastropoda from Khor Al-Zubair, northwest of Arabian Gulf. *Iraqi Journal of Earth Sciences* 10(1): 19-30.

Al-Nomazi, M.A. 2009. A study on marine biofouling in the intake and discharge zones of the Jubail desalination and power plants. M.S. Thesis, King Fahd University of Petroleum and Minerals, 78 p.

Al-Osairi, Y., Imberger, J. and Falconer, R. 2011. Mixing and flushing in the Persian Gulf (Arabian Gulf). *J. Geophys. Res.* 116: C03029.

Al-Rukaibi, D. 2010. Water resources of GCC countries. www.ce.utexas.edu/prof/mckinney/ce397/Topics /Gulf/ Gcc_2010.pdf.

Al-Rumaidh, M.J. 2002. The biology, population dynamics and fishery management of the blue swimming crab, Portunus pelagicus (Linnaeus, 1758), in Bahraini waters: (Crustacea: Decapoda; Brachyura; Portunidae). Ph.D. Thesis, University of Wales, Bangor, U.K., 546 p.

Al-Saffar, A. and Al-Tamimi, H. 2006. Conservation of coral reefs in Kuwait, Marine Conservation Forum. EWS-WWF, Abu Dhabi, UAE.

Alsaffar, A.H. and Lone, K.P. 2000. Reproductive cycles of Diadema sotesum and Echinometra mathei (Echinoidea: Echinodermata) from Kuwait (Northern Arabian Gulf). *Bulletin of Marine Science* 67(2): 845-856.

Al-Saleh, E., Drobiova, H. and Obuekwea, C. 2009. Predominant culturable crude oil degrading bacteria in the coast of Kuwait. *Int. Biodet. Biodeg.* 63: 400-406.

Al-Sayed, H. and Zainal, K. 2005. The occurrence of Anostracans-Fairy shrimp Branchipus schaefferi in vernal pools of Bahrain. *Journal of Arid Environments* 61: 447-460.

Al-Sayed, H., Al-Rumaidh, M. and Nayar, N. 1997. Spat settlement and growth of yearling of the pearl oyster Pinctada radiata in Bahrain water. *Arabian Gulf Journal of Scientific Research* 15(2): 467-480.

Al-Sayed, H., Naser, H. and Al-Wedaei, K. 2008. Observations on macrobenthic invertebrates and wader bird assemblages in a protected marine mudflat in Bahrain. *Aquatic Ecosystem Health & Management* 11(4): 450-456.

Al-Shaibani, A. 2013. Economic potential of brines of Sabkha Jayb Uwayyid, Eastern Saudi Arabia. *Arabian Journal of Geoscience* 6: 2607-2618.

Al-Suwaidi, A. 1994. Finance of international trade in the gulf. Cornwall: Hartnolls Ltd.

Al-Suwailem, A.M. 2001. Mangroves marine habitats, pp. 31-95, in Mangrove rehabilitation in the Arabian Gulf, 5th Technical Report submitted to the Islamic Development Bank.

Al-Tammemi, A.Y. 1972. Carbonate bottom sediments of the Arabian Gulf in relation to environment parameters. Unpublished M.S. Thesis, Pennsylvania State Univ.

Al-Thukair, A.A. and Al-Hinai, K. 1993. Preliminary damage assessment of algal mats sites located in the western Gulf following the 1991 oil spill. *Marine Pollution Bulletin* 27: 229-238.

Al-Thukair, A.A., Khan, M.A. and Al-Hinai, K.G. 1995. Monitoring of coastline and habitat changes of Tarut Bay, Saudi Arabia using satellite images, in Proceedings of ASCE-SAS Second Regional Conference and Exhibition, "Save Environment," November 16-18, 1995, Beirut, Lebanon.

Al-Tisan, I.A. and Saeed, M.O. 2014. Effect of discharges from desalination plants on coastal environments in Saudi Arabia. 5th Joint KFUPM-JCCP Environment Symposium, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, March 3-5, 2014.

Al-Yahya, H., El-Gendy, A.H., Al-Farraj, S. and El-Hedeny, M. 2011. Evaluation of heavy metal pollution in the Arabian Gulf using the clam Meretrix meretrix Linnaeus, 1758. *Water Air & Soil Pollution* 214: 499-507.

Al-Yamani, F.Y. and Prusova, I. 2003. Common copepods of the Northwestern RSA: Identification guide. Kuwait Institute of Scientific Research, Technical Report. 190 p.

Al-Yamani, F. 2008. Importance of the freshwater influx from the Shatt Al-Arab River on the Gulf marine environment, pp. 207-222, in Abuzinada, A.H., Barth, H.J., Krupp, F., Böer, B. and Al Abdessalaam, T.Z. (eds.). Protecting the Gulf's marine ecosystem from pollution. Basel, Birkhäuser.

Al-Yamani, F., Boltachova, N., Revkov, N., Makarov, M., Grintsov, V., Kolesnikova, E. and Murina, G.V. 2009. Winter species composition, diversity and abundance of macrozoobenthos in Kuwait's waters, Arabian Gulf, in Neubert, E., Amr, Z., Taiti, S. and Gümüs, B. (eds.). Animal biodiversity in the Middle East. Proceedings of the 1st Middle

Eastern Biodiversity Congress, Aqaba, Jordan, October 20-23, 2008. *ZooKeys* 31: 17-38.

Al-Yamani, F., Polikarpov, I., Skryabin, V., Bishop, J., Al-Rifaie, K., Al-Mansouri, H., Al-Enezi, M., Lennox, A., Al-Kandari, M., Behbehani, M., Al-Ghunaim, A. and Ismail, W. 2008. Assessment of the effects of the Shatt Al-Arab's altered discharge regimes on the ecology of the northern Arabian Gulf — Phase II. KISR Final Report 9061.

Al-Yamani, F.Y., Ismail, W.A. and Fahmi, A.M. 1995. Copepods from Kuwaiti coastal waters of the RSA. Kuwait Institute of Scientific Research, Technical Report, 235 p.

Al-Yamani, F.Y., Rifaie, K., Al-Mutairi, H. and Ismail, W. 1998. Post-spill spatial distribution of zooplankton in the ROPME Sea Area, pp. 193-202, in Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. (eds.). Offshore environment of the ROPME Sea Area after the war-related oil spill — Results of the 1993-94 Umitaka-Maru Cruises. Terra Scientific Publishing Company, Tokyo, Japan.

Al-Yamani, F.Y., Rifaie, K. and Ismail, W. 1993. Post-spill zooplankton distribution in the NW RSA. *Mar. Pollut. Bull.* 27: 239-243.

Al-Yamani, F.Y., Skryabin, V., Boltachova, N., Revkov, N., Makarov, M., Grintsov, V. and Kolesnikova, E. 2012. Illustrated atlas on the zoobenthos of Kuwait. Kuwait Institute for Scientific Research, Kuwait.

Al-Yamani, F.Y., Skryabin, V., Khvorov, S. and Prusova, I. 2011. Marine zooplankton practical guide for the northwestern Arabian Gulf, Vol. 1. Kuwait Institute for Scientific Research, Kuwait, 196 p.

Al-Zahrani, K.H. 2010. Water demand management in the Kingdom of Saudi Arabia. *The International Journal of Arts & Sciences* 2(3): 68-76.

Al-Zaidan, A.S.Y., Jones, D.A., Al-Mohanna, S.Y. and Meakins, R. 2003. Endemic macrofauna of the Sulaibikhat Bay salt marsh and mud flat habitats, Kuwait: Status and need for conservation. *Journal of Arid Environments* 54: 115-124.

Al-Zaidan, A.S.Y., Kenned, H., Jones, D.A. and Al-Mohanna, S. 2006. Role of microbial mats in Sulaibikhat Bay (Kuwait) mudflat food webs: Evidence from δ13C analysis. *Marine Ecology Progress Series* 308: 27-36.

Al-Zayani, A. 2003. The selection of marine protected areas: A model for the Kingdom of Bahrain. Ph.D. Thesis. Center for Environmental Sciences, University of Southampton, U.K.

Ambrose, W.G. 1993. Effects of predation and disturbance by ophiuroids on soft-bottom community structure in Oslofjord: Results of a mesocosm study. *Marine Ecology Progress Series* 97(3): 225-236.

Anchor Environmental. 2003. Literature review of effects of re-suspended sediments due to dredging operations. Prepared for Los Angeles Contaminated Sediments Task Force Los Angeles, by Anchor Environmental, California, 84 p.

Anderson, P.K. 1986. Dugongs of Shark Bay, Australia: Seasonal migration, water temperature and forage. *National Geographic Research* 2(4): 473-490.

Anderson, R.C. and Simpfendorfer, C.A. 2005. Regional overview: Indian Ocean, in Fowler S.L., Cavanagh, R.D., Camhi, M., Burgess, G.H., Cailliet, G.M., Fordham, S.V., Simpfendorfer, C.A. and Musick, J.A. (eds.). Sharks, rays and chimaeras: The status of the chondrichthyan fishes. Status survey. IUCN SSC Shark Specialist Group, Cambridge.

Anon. 1992. An assessment of biotopes and coastal zone management requirements for the Arabian Gulf. MEPA Technical Report, Saudi Arabia, No. 5.

Anvar Batcha, S.M. 1997. Studies on the intertidal and benthic macrofauna of Dammam Corniche and Half Moon Bay beaches of the Arabian Gulf. *Journal of Marine Biology Association, India* 39(1 & 2): 40-43.

Apel, M. 1994a. Effects of the 1991 oil spill on the crab fauna (Crustacea: Decapoda: Brachyura) of intertidal mud flats in the western Arabian Gulf. *Courier Forschungsinstitut Senckenberg* 166: 40-46.

Apel, M. 1994b. Biology, ecology and taxonomy of Brachyuran and Paguridean Crustacea, pp. 406-437, in Feltkamp, E. and Krupp, F. (eds.). Establishment of a marina habitat and wildlife sanctuary for the Gulf region. Final report of phase II. Jubail, Frankfurt aM, Germany.

Apel, M. 1996. Ecological observations on crab communities (Crustacea: Decapoda: Brachyura) on intertidal mud flats in the Western Arabian Gulf and the effect of the 1991 oil spill, pp. 327-338, in Krupp, F., Abuzinada, H.A. and Nader, I.A. (eds.). A marine sanctuary for the Arabian Gulf. Senckenbergische Nat.forschende Gesellschaft, Frankfurt, Germany.

Apel, M. and Turkay, M. 1999. Taxonomic composition, distribution and zoogeographic of the Grapsid and Ocypodid crab fauna of intertidal soft bottoms in the Arabian Gulf. *Estuarine, Coastal and Shelf Science* 49 (Supplement A): 131-142.

Aragones, L. 1996. Dugongs and green turtles: Grazers in the tropical seagrass ecosystem. Ph.D. Thesis. James Cook University of North Queensland, Townsville, Australia.

Aragones, L. 2000. A review of the role of the green turtle in tropical seagrass ecosystems, pp. 69-85, in Pilcher, N. and Ismail, G. (eds.). Sea turtles of the Indo-Pacific, research management and conservation. University of Malaysia, Sarawak, ASEAN Academic Press, London.

Aragones, L.V., Lawler, I.R., Foley, W.J. and Marsh, H. 2006. Dugong grazing and turtle cropping: grazing optimization in tropical seagrass systems? *Oecologia* 149: 635-647.

Arakawa, H., Hirawake, T. and Morinaga, T. 1998. Distribution of turbidity in the ROPME Sea Area, pp. 49-63, in Otsuki, A., Abdulraheem M.Y. and Reynolds, R.M. (eds.). Offshore environment of the ROPME Sea Area after the war-related oil spill — Results of the 1993-94 Umitaka-Maru Cruises. Terra Sci., Tokyo, Japan.

Arkema, K.K., Abramson, S.C. and Dewsbury, B.M. 2006. Marine ecosystem-based management: From characterization to implementation. *Frontiers in Ecology and the Environment* 4: 525-532.

Arnold, E.N. 1986. A key and annotated checklist to the lizards and amphisbaenas of Arabia. *Fauna of Saudi Arabia* 8: 385-435.

Arnold, E.N. 1987. Zoogeography of the reptiles and amphibians of Arabia, pp. 245-256, in Krupp, F., Schneider, W. and Kinzelbach, R. (eds.). Proceedings of the symposium on the fauna and zoogeography of the Middle East, Mainz 1985. BeihefrezumTübinger Atlas des Vorderen Orients (A) 28.

Arrian. 1884. The Anabasis of Alexander or the history of the wars and conquests of Alexander the Great. Hodder and Stoughton, London.

Aspinall, S.J. 1996. Status and conservation of the breeding birds of the United Arab Emirates. Hobby, Dubai.

Aspinall, S.J. 2002. Birds in sabkha environments, pp. 311-314, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Austen, M.C., Lambshead, P.J.D., Hutchings, P.A., Boucher, G., Snelgrove, P.V.R., Heip, C., King, G., Koike, I. and Smith, C. 2002. Biodiversity links above and below the sediment-water interface that may influence community stability. *Biodiversity and Conservation* 11: 113-136.

Averett, D.E., Hayes, D.F. and Schroeder, P.R. 1999. Estimating contaminant losses during dredging. Proc. of World Dredging Association, 19th Technical Conference.

Azam, M., Elshorbagy, W., Tetsuya, I., Tomohiko, T. and Koichi, T. 2006. 3D application to study the residual flow in the Arabian Gulf. ASCE/J. *Water Way Port Coastal Ocean Eng.* 132(5): 388-400.

Azis, P.K.A., Al-Tisan, I.A., Daili, M.A., Green, T.N., Dalvi, A.G.I. and Javeed, M.A. 2003. Chlorophyll and plankton of the Gulf coastal waters of Saudi Arabia bordering a desalination plant. *Desalination* 154: 291-302.

Badawi, H.K. 1975. On maturation and spawning in some penaeid prawn of the Arabian Gulf. *Marine Biology* 32: 1-6.

Bailey, G. 2007. In the land of the Ichthyophagi: Modelling fish exploitation in the Arabian Gulf and Gulf of Oman from the 5th millennium BC to the late Islamic period by Mark Beech. Review. *Bull. Soc. Arab. Stud.* 12: 48-49.

Bak, R.P.M. 1990. Patterns of echinoid bioerosion in two Pacific coral reef lagoons. *Mar. Ecol. Prog. Ser.* 66: 267-272.

Bak, R.P.M. 1994. Sea urchin bioerosion on coral reefs: Place in the carbonate budget and relevant variables. *Coral Reefs* 13(2): 99-103.

Baker, A.C. 2003. Flexibility and specificity in coral-algal symbiosis: Diversity, ecology, and biogeography of symbiodinium. *Annual Review of Ecology, Evolution, and Systematics* 34: 661-689.

Baker, A.C., Glynn, P.W. and Riegl, B. 2008. Climate change and coral reef bleaching: An ecological assessment of long-term impacts, recovery trends and future outlook. *Estuarine, Coastal and Shelf Science* 80(4): 435-471.

Baker, A.C., Starger, C.J., McClanahan, T.R. and Glynn, P.W. 2004. Coral reefs: Corals' adaptive response to climate change. *Nature* 430: 741.

Baker, M. and Hosny, C.F.H. 2005. Zooplankton diversity and abundance in Half Moon Bay, Saudi coastal waters. RSA. *Sci. J. King Faisal Univ. (Basic Appl. Sci.)* 26: 1-30.

Baldwin, R. 2005. Marine Mammals, pp. 335-343, in Hellyer, P. and Aspinall, S. (eds.). The Emirates. A natural history. London.

Baldwin, R. and Gardner, D. 2005. Marine reptiles, pp. 243-251, in Hellyer, P. and Aspinall, S. (eds.). The Emirates. A natural history. London.

Baldwin, R.M., Collins, M., Van Waerebeek, K. and Minton, G. 2004. The Indo-Pacific humpback dolphin of the Arabian region: A status review. *Aquatic Mammals* 30(1): 111-124.

Baldwin, R.M., Gallagher, M. and Waerebeek, K. 1999. A review of cetaceans from waters off the Arabian Peninsula, pp. 161-189, in Fisher, M., Ghazanfar, S.A. and Spalton, A. (eds.). The natural history of Oman, A Festchrift for Michael Gallagher. Leiden.

Balletto, E., Cherchi, M.A. and Gasperetti, J. 1985. Amphibians of the Arabian Peninsula. *Fauna of Saudi Arabia* 7: 318-392.

Ballorain, K., Ciccione, S., Bourjea, J., Grizel, H., Enstipp, M. and Georges, J.Y. 2010. Habitat use of a multispecific seagrass meadow by green turtles Chelonia mydas at Mayotte Island. *Marine Biology* 157(12): 2581-2590.

Banat, I.M., Hassan, E.S., El-Shahawi, M.S. and Abu-Hilal, A.H. 1998. Post-Gulf-War assessment of nutrients, heavy metal ions, hydrocarbons, and bacterial pollution levels in the United Arab Emirates coastal waters. *Environment International* 24: 109-116.

Banse, K. and McCain, C.R. 1986. Winter blooms of phytoplankton in the Arabian Sea as observed by coastal zone color scaner. *Mar. Ecol. Prog. Ser.* 34: 201-211.

Barber, B.J. and Behrens, P.J. 1985. Effects of elevated temperature on seasonal in situ leaf productivity of Thalassia testudinum Banks ex König and Syringodium filiforme Kützing. *Aquat. Bot.* 22: 61-69.

Barbier, E.B., Hacker, S.D., Kennedy, C., Koch, E.W., Stier, A.C. and Silliman, B.R., 2011. The value of estuarine and coastal ecosystem services. *Ecological monographs* 81: 169-193.

Barnes, R.D. 1974. Invertebrate zoology (3rd edition), W.B. Saunders Company, Philadelphia, PA, USA.

Barros, A., Álvarez, D. and Velando, A. 2014. Long-term reproductive impairment in a seabird after the prestige oil spill. *Biology Letters* 10(4): DOI: 10.1098/rsbl.2013.1041.

Barth, H-J. 2002. The coastal ecosystems 10 years after the 1991 Gulf War oil spill. Preliminary Report (unpublished). University of Regensburg, Department of Physical Geography, pp. 1-11. http://www.uni-r.de/Fakultaeten/phil_Fak_III/Geographie/phygeo/downloads/barthcoast.pdf.

Barth, H-J. and Khan, N.Y. 2008. Biogeophysical setting of the Gulf, pp. 1-21, in Abuzinada, A.H., Barth, H-J., Krupp, F., Böer, B. and Al Abdessalaam, T.Z. (eds.). Protecting the Gulf's marine ecosystems from pollution. Birkhäuser Basel, Springer.

Barth, H-J. 2003. The influence of cyanobacteria on oil polluted intertidal soils at the Saudi Arabian Gulf shores. *Marine Pollution Bulletin* 46: 1245-1252.

Barth, H-J. 2007. Crab induced salt marsh regeneration after the 1991 Gulf War oil spill. *Aquatic Ecosystem Health and Management* 10(3): 327-334.

Barth, H-J. and Böer, B. (eds.). 2002. Sabkha ecosystems. Kluwer Academic Publishers, 354 p.

Basaham, A.S. and Al-Lihaibi, S.S. 1993. Trace elements in sediments of the Western Gulf. *Mar. Poll. Bull.* 27: 103-107.

Basson, P.W. 1979a. Marine algae of the Arabian Gulf coast of Saudi Arabia (first half). *Botanica Marina* 22: 47-64.

Basson, P.W. 1992. Checklist of marine algae of the Arabian Gulf. *Journal of the University of Kuwait (Science)* 19(2): 217-229.

Basson, P.W., Burchard, J.E., Hardy, J.T. and Price, A.R.G. 1977. Biotopes of the western Arabian Gulf: Marine life and environments of Saudi Arabia. Aramco Department of Loss Prevention and Environmental Affairs, Dhahran, Saudi Arabia.

Basson, P.W., Mohamed, S.A. and Arora, D.K. 1989. A survey of the benthic algae of Bahrain. *Botanica Marina* 32: 27-40.

Batanouny, K.H. 1987. Current knowledge of plant ecology in the Arab Gulf countries. *Catena* 14: 291-315.

Batanouny, K.H. 1993. Ecophysiology of Halophytes and their traditional use in the Arab World, in Halophyte utilization in Agriculture. Tecnomack Bari, Italy.

Bayani, N. 2016. Ecology and environmental challenges of the Persian Gulf. *Iranian Studies* 49: 1047-1063.

Beasley, C.R., Fernandes, C.M., Gomes, C.P., Brito, B.A., Lima dos Santos, S.M. and Tagliaro, C.H. 2005. Molluscan diversity and abundance among coastal habitats of northern Brazil. *Ecotropica* 11: 9-20.

Beaumont, N.J., Austen, M.C., Atkins, J.P., Burdon, D., Degraer, S., Dentinho, T.P., Derous, S., Holm, P., Horton, T., van Ierland, E., Marboe, A.H., Starkey, D.J., Townsend, M. and Zarzycki, T. 2007. Identification, definition and quantification of goods and services provided by marine biodiversity: Implications for the ecosystem approach. *Marine Pollution Bulletin* 54: 253-265.

Beech, M. 2000. Preliminary report on the faunal remains from an 'Ubaid-related settlement on Dalma Island, Abu Dhabi Emirate, United Arab Emirates, pp. 68-78, in Mashkour, M., Choyke, A.M., Buitenhuis, H. and Poplin, F. (eds.). Archaeozoology of the Near East IV. ARC Publications, Groningen, the Netherlands.

Beech, M. 2002. Fishing in the 'Ubaid: A review of fish-bone assemblages from early prehistoric coastal settlements in the Arabian Gulf. *J. Oman Stud.* 12: 25-40.

Beech, M. 2003. The development of fishing in the UAE: A zooarchaeological perspective, pp. 289-308, in Proceedings of the First International Conference on the Archaeology of the UAE.

Beech, M., Cuttler, R., Moscrop, D., Kallweit, H. and Martin, J. 2005. New evidence for the Neolithic settlement of Marawah Island, Abu Dhabi, UAE, pp. 37-56, in Proceedings of the Seminar for Arabian Studies, Archaeopress, London.

Beech, M., Elders, J. and Shepherd, E. 2000. Reconsidering the 'Ubaid of the Southern Gulf: New results from excavations on Dalma Island, UAE, pp. 41-47, in Proceedings of the Seminar for Arabian Studies, Brepols, Belgium.

Beech, M., Hogarth, P. and Phillips, C. 2008. Zooarchaeological evidence for trade in marine resources in Southeast Arabia, pp. 329-335, in Olijdam, E. and Spoor, R. (eds.). Intercultural relations between south and southwest Asia. Studies in commemoration of E.C.L. During Caspers (1934-1996). British Archaeological Reports International Series. Archaeopress, Oxford.

Beech, M. and Kallweit, H. 2001. A note on the archaeological and environmental remains from site JH 57, a 5th to 4th millennium BC shell midden in Jazirat al-Hamra, Ra's al-Khaimah. *Tribulus* 11: 17-20.

Beech, M.J. 2004. In the Land of the Ichthyophagi: Modelling fish exploitation in the Arabian Gulf and Gulf of Oman from the 5th millennium BC to the Late Islamic period. Abu Dhabi Islands

Archaeological Survey Monograph 1. British Archaeological Reports International Series S1217.

Begg, G.A. and Waldman, J.R. 1999. An holistic approach to fish stock identification. *Fish. Res.* 43: 35–44.

Behairy, A.K.A., El-Sayed, M.K. and Durgaprasda Rao, N.V.N. 1985. Eolian dust in the coastal area north of Jiddah, Saudi Arabia. *J. Arid Environ* 8: 89–98.

Bejarano, A.C. and Michel, J. 2010. Large-scale risk assessment of polycyclic aromatic hydrocarbons in shoreline sediments from Saudi Arabia: Environmental legacy after 12 years of the Gulf War oil spill. *Environ Pollut.* 158: 1561–1569.

Bell, J.D. and Pollard, D.A. 1989. Ecology of fish assemblages and fisheries associated with seagrasses, pp. 565–609, in Larkum, A.W.D., McComb, A.J. and Shepherd, S.A. (eds.). Biology of seagrasses. A treatise on the biology of seagrasses with special reference to the Australian Region. Aquatic Plant Studies 2, Elsevier, Amsterdam.

Bellard, C., Bertelsmeier, C., Leadley, P., Thuiller, W. and Courchamp, F. 2012. Impacts of climate change on the future of biodiversity. *Ecol Lett.* 15(4): 365–377.

Bellwood, D.R., Hughes, T.P., Folke, C. and Nystrom, M. 2004. Confronting the coral reef crisis. *Nature* 249: 827–833.

Belnap, J. 2002. Biological soil crusts of Arabian Sabkhat, pp. 227–237, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Belnap, J. and Gardner, J.S. 1993. Soil microstructure of the Colorado Plateau: The role of cyanobacterium Microcoleus vaginatus. *Great Basin Naturalist* 53: 40–47.

Beltagy, I. 1980. Workshop on combatting marine pollution from oil exploration and transport in the Kuwait action plan region. IMCO/UNEP, December 6–10, 1980, Bahrain.

Bengtsson, J. 1998. Which species? What kind of diversity? Which ecosystem function? Some problems in studies of relations between biodiversity and ecosystem function. *Applied Soil Ecology* 10: 191–199.

Bernhardt, J.R. and Leslie, H.M. 2013. Resilience to climate change in coastal marine ecosystems. *Annual Review of Marine Science* 5: 371–392.

Bertelli, C.M. and Unsworth, R.K.F. 2013. Protecting the hand that feeds us: Seagrass (Zostera marina) serves as commercial juvenile fish habitat. *Marine Pollution Bulletin.* DOI: 10.1016/j.marpolbul.2013.08.011.

Bibby, T.G. 1973. Preliminary survey in East Arabia 1968. Reports of the Danish archaeological expedition to the Arabian Gulf. Jutland Archaeological Society Publications, Copenhagen.

Biber, P.D., Paerl, H.W., Gallegos, C.L. and Kenworthy, W.J. 2005. Evaluating indicators of seagrass stress to light, pp. 193–209, in Bartone, S. (ed.). Proceedings of the Estuarine indicator Workshop. Boca Raton, Florida, CRC Press.

Biles, C.L., Solan, M., Isaksson, I., Paterson, D.M., Emes, C. and Raffaelli, D.G. 2003. Flow modifies the effect of biodiversity on ecosystem functioning: An in situ study of estuarine sediments. *Journal of Experimental Marine Biology and Ecology* 285-286: 165–177.

BirdLife International. 2010. Threats, stresses and impacts. Available at: http://www. birdlife.org/datazone/species/terms/threats.Html.

BirdLife International. 2009. Important bird area factsheet: Gulf coral islands, Saudi Arabia. (www.birdlife.org).

BirdLife International. 2014. Country profile: Saudi Arabia. Available from: http://www.birdlife.org/datazone/ country/saudi-arabia. Checked: 2014-05-16.

Bishop, J.M. 2002. Fishing and mariculture, pp. 253–278, in Khan, N.Y., Munawar, M. and Price, A.R.G. (eds.). The Gulf ecosystem, health and sustainability. Backhuys Pub., Leiden, the Netherlands.

Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles, pp. 199–231, in Lutz, P.L. and Musick, J.A. (eds.). The biology of sea turtles. CRC Press, New York.

Bjorndal, K.A. and Jackson, J.B. 2003. Roles of sea turtles in marine ecosystems: Re-constructing the past, pp. 259–273, in Musick, P. and Wyneken, J. (eds.). The biology of sea turtles, Vol. II. CRC Press, New York.

Blasco, F., Saenger, P., Auda, Y., Aizpuru, M., Loughland, R.A. and Youssef, A.M.M. 2004. Mapping main coastal habitats and mangroves, in Loughland, R.A., Al Muhairi, F.S., Fadel, S.S., Al Mehdi, A.M. and Hellyer, P. (eds.). Marine Atlas of Abu Dhabi, Emirates Heritage Club, Abu Dhabi, pp. 70–93.

Blegvad, H. 1944. Danish scientific investigations in Iran. Part III. Fishes of the Iranian Gulf, Einar Munksgaard, Copenhagen.

Block, B.A., Dewar, H., Blackwell, S.B., Williams, T.D., Prince, E.D., Farwell, C.J., Boustany, A., Teo, S.L., Seitz, A., Walli, A. and Fudge, D. 2001. Migratory movements, depth preferences, and thermal biology of Atlantic bluefin tuna. *Science* 293: 1310–1314.

Boer, B. 1994. Status and recovery of the intertidal vegetation after the 1991 Gulf War oil spill, pp. 22–26, in *Courier Forschungsinstitut Senckenberg* 166, Frankfurt aM, Germany.

Böer, B. 1994. Status, environmental factors and recovery of the intertidal and terrestrial vegetation between Ras az Zaur and Abu 'Ali Island after the Gulf War oil spill, pp. 229–253, in Establishment of a marine habitat and wildlife sanctuary for the Gulf region. Final report for phase II, Jubail and Frankfurt, CEC/NCWCD.

Böer, B. 1996. Plants as soil indicators along the Saudi coast of the Arabian Gulf. *Journal of Arid Environments* 33: 417–423.

Boer, B. 2002. The coastal sabkha flora of the United Arab Emirates, pp. 303–309, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Boer, B. and Al-Hajiri, S. 2002. The coastal and sabkha flora of Qatar: An introduction, pp. 63–70, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Böer, B. and Warnken, J. 1992. Qualitative analysis of the coastal and inland vegetation of the Dawhat ad-Dafi and Dawhat al-Musallamiya region, pp. 81–101, in Establishment of a marine habitat and wildlife sanctuary for the Gulf region. Final report for phase I. Jubail and Frankfurt, CEC/NCWCD.

Böer, B. and Warnken, J. 1996. Flora of the Jubail marine ildlife sanctuary, Saudi Arabia, pp. 290–295, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A Marine Wildlife Sanctuary for the Gulf. Environmental Research and Conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Boere, G.C. and Stroud, D.A. 2006. The flyway concept: What it is and what it isn't, pp. 40–47, in Boere, G.C., Galbraith, C.A. and Stroud, D.A. (eds.). Waterbirds around the world. The Stationery Office, Edinburgh, U.K.

Boerema, L.K. 1969. The shrimp resources in the Gulf between Iran and the Arabian Peninsula. *FAO Fisheries Circular* 310: 1–29.

Bohm, A. 1931. Peridineen aus dem persischen Golf und dem Golf von Oman. *Archiv fur Orotestenkunde* 74: 188–197.

Bohnsack, J.A. 1993. Marine reserves: They enhance fisheries, reduce conflicts, and protect resources. *Oceanus* 36: 63–71.

Bolam, S.G. and Fernandes, T.F. 2002. Dense aggregations of tube-building polychaetes: Response to small-scale disturbances. *Journal of Experimental Marine Biology and Ecology* 269: 197–122.

Bolten, A.B. 2003. Variation in sea turtle life history patterns: neritic vs. oceanic developmental stages, pp. 243–257, in Lutz, P.L. and Musick, J.A. and Wyneken, J. (eds.). The biology of sea turtles. Vol. II. CRC Press, New York.

Bonnet, B., Payri, C. and Guerere, M. 1985. Ecological and physiological significance of algal feeding by the Green Sea Turtle Chelonia mydas L. in the coral reefs of La Réunion and Tromelin Islands, Abstract. p. 37, in Gabrie, C., Toffat, J.L. and Salvat B. (assoc. eds.). Proceedings of the 5th International Coral Reef Congress Antenne Museum-EPHE, Tahiti, French Polynesia 2.

Booth, D.T. and Evans, A. 2011. Warm water and cool nests are best. How global warming might influence hatchling green turtle swimming performance. *PLoS ONE* 6: 8: e23162.

Borja, A., Franco, J. and Muxika, I. 2004. The biotic indices and the Water Framework Directive: The required consensus in the new benthic monitoring tools. *Marine Pollution Bulletin*: 48: 405-408.

Borja, A., Franco, J. and Perez, V. 2000. A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. *Marine Pollution Bulletin* 40(12): 1100-1114.

Borja, A., Miles, A., Occhipinti-Ambrogi, A. and Berg, T. 2009. Current status of macroinvertebrate methods used for assessing the quality of European marine waters: Implementing the water framework directive. *Hydrobiologia* 633: 181-196.

Borsani, R. and Ghiazza, E. 2001. MSF desalination units over 15 MIGD is becoming a reality and start a new age for the old technology. Proceedings of the IDA World Congress, Manama, Bahrain.

Bosire, J., Kirui, B.K., Kairo, J.G., Langat, J., Onduso, G. and Obinga, A. 2012. Mangrove ecosystem recovery at Mwache Mombasa. Unpublished.

Bostock, J. and Riley, H. 1855. The natural history. Pliny the elder. Taylor & Francis, London.

Both, C., Van Turnhout, C.A.M., Bijlsma, R.G., Siepel, H., Van Strien, A.J. and Foppen, R.P.B. 2010. Avian population consequences of climate change are most severe for long-distance migrants in seasonal habitats. *Proceedings of the Royal Society B* 277: 1259-1266.

Bouchard, S.S. and Bjorndal, K.A. 2000. Sea turtles as biological transporters of nutrients and energy from marine to terrestrial ecosystems. *Ecology* 818: 2305-2313.

Boulos, L. 1985. The Middle East, pp. 129-185, in Goodin, J.R. and Northington, D.K. (eds.). Plant resources of arid and semiarid lands: A global perspective. Academic Press.

Bowen, W.D. 1997. Role of marine mammals in aquatic ecosystems. *Marine Ecology Progress Series* 158: 267-274.

Boyd, C.E. 2010. Perspective on seawater desalination and the environment. A presentation at the Arab Water Desalination and Exhibition Conference. Riyadh, Saudi Arabia, April 2010.

Boynton, W.R., Kemp, W.M. and Keefe, C.W. 1982. A comparative analysis of nutrients and other factors influencing estuarine phytoplankton production, pp. 69-90, in Kennedy, V.S. (ed.). Estuarine comparisons. Academic Press, New York.

Brampton, A.H. 1992. Engineering significance of British salt marshes, pp. 115-122, in Allen, J.L.R. and Pye, K. (eds.). Salt marshes morphodynamics, conservation and engineering significance. Cambridge University Press, Cambridge.

Brannon, J.M. 1978. Evaluation of dredge material pollution potential. Synthesis of research results. Dredge Material Research Program. U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi Technical Report DS-78-6.

Braulik, G.T., Ranjbar, S., Owfi, F., Aminrad, T., Mohammad, S., Dakhteh, H., Kamrani, E. and Mohsenizadeh, F. 2010. Marine mammal records from Iran. *J. Cetacean Res. Manage.* 111: 49-63.

Bray, R.N., Bates, A.D. and Land, J.M. 1997. Dredging — A handbook for engineers. 2nd edition Arnold, London.

Bremner, J., Rogers, S.I. and Frid, C.L.J. 2003. Assessing functional diversity in marine benthic systems: A comparison of approaches. *Marine Ecology Progress Series* 254: 11-25.

Brewer, P.G. and Dyrssen, D. 1985. Chemical oceanography of the Persian Gulf. *Prog. Oceanog.* 14: 41-55.

Brewer, P. and Dyrssen, D. 1984. Chemical oceanography of the Persian Gulf. Essays on oceanography: A tribute to John Swallow. *Woods Hole Oceanogr. Inst.* 14: 41-55.

Brewer, P., Fleer, A., Kadar, S., Shafer, D. and Smith, C. 1978. Chemical oceanographic data from the Persian Gulf and Gulf of Oman. Woods Hole Oceanographic Institution Technical Report, WHOI-78-37, pp. 1-105.

Bron, F. 2002. Languages and writing, pp. 153-157, in Simpson, S.J. (ed.). Queen of Sheba. Treasures from ancient Yemen. British Museum Press, London.

Brown, A.C. and McLachlan, A. 2002. Sandy shore ecosystems and the threats facing them: Some predictions for the year 2025. *Environmental Conservation* 29(1): 62-77.

Brown, B.E. 1997. Adaptations of reef corals to physical environmental stress, pp. 221-299, in Blaxter, J.H.S. and Southward, A.J. (eds.). *Advances in Marine Biology* 31. Academic Press, London.

Brown, G. 2006. The sabkha vegetation of the United Arab Emirates, pp. 37-51, in Khan, M.A., Boer, B., Kust, G.A. and Barth, H-J. (eds.). Sabkha ecosystems. Vol. II: West and Central Asia, Springer.

Brown, G., Böer, B. and Sakkir, S. 2008. The coastal vegetation of the western and southern Gulf — Characterisation and conservation aspects, pp. 23-44, in Abuzinada, A.H., Barth, H-J., Krupp, F., Boer, B. and Al Abdessalaam, T.Z. (eds.). Protecting the Gulf's marine ecosystems from pollution. Birkhauser Verlag/Switzerland.

Brown, J.J., Cybulska, I., Chaturvedi, T. and Thomsen, M.H. 2014. Halophytes for the production of liquid biofuels, pp. 67-72, in Khan, M.A., Böer, B., Öztürkm M., Al-Abdessalam, T.Z., Clusener-Godt, M. and Gul, B. (eds.). Sabkha ecosystems: Vol. IV: Cash crop Halophyte and biodiversity conservation, *Tasks for Vegetation Science* 47, Springer.

Brown, R.W. 1986. The content and nature of Arabian Gulf seawater. *Emirates Natural History Group Bulletin* 29: 5-12.

Bryden, M., Marsh, H. and Shaughnessy, P. 1998. Dugongs, whales, dolphins and seals: A guide to the sea mammals of Autralasia. Allen and Unwin, Australia.

Bulthuis, D.A. 1987. Effects of temperature on photosynthesis and growth of seagrasses. *Aquat. Bot.* 27: 27-40.

Bundy, G., Connor R.J. and Harrison C.J.O. 1989. Birds of the Eastern Province of Saudi Arabia. Witherby. London, U.K.

Bu-Olayan, A.H. and Thomas, B.V. 2005. Validating species diversity of benthic organisms to trace metal pollution in Kuwait Bay, off the Arabian Gulf. *Applied Ecology and Environmental Research* 3: 93-100.

Buqis, A.S. and Abdulqader, E.A.A. 1993. Identification and some morphometric measurements of penaeid prawns collected during Leg IV of the *Mt. Mitchell* cruise in the ROPME sea area. Paper presented at the scientific workshop on results of the R/V *Mt. Mitchell* cruise, Kuwait, January 24-28, 1993..

Burchard, J.E. 1979. Coral fauna of the eastern Arabian Gulf. Aramco Dept. of Environmental Affairs, Dhahran, Saudi Arabia, 129 p.

Burd, A.B. and Dunton, K.H. 2001. Field verification of a light-driven model of biomass changes in the seagrass Halodule wrightii. *Mar. Ecol. Prog. Ser.* 209: 85-98.

Burkholder, G. 1972. Ubaid sites and pottery in Saudi Arabia. *Archaeology* 25: 264-269.

Burns, G. and Heatwole, H. 1998. Home range and habitat use of the Olive Sea Snake, Aipysurus laevis, on the Great Barrier Reef, Australia. *Journal of Herpetology* 32: 350-358.

Burns, K.A., Ehrhardt, M.G., Howes, B.L. and Taylor, C.D. 1993. Subtidal benthic community respiration and production near the heavily oiled Gulf coast of Saudi Arabia. *Marine Pollution Bulletin* 27: 199-205.

Burns, K.A., Villeneuve, J.P., Anderlini, V.C. and Fowler, S.W. 1982. Survey of tar, hydrocarbon and metal pollution in the coastal waters of Oman. *Mar. Poll. Bull.* 7: 240-247.

Burstein, S.M. 1989. Agatharchides of Cnidus. On the Erythraean Sea. Hakluyt Society, London.

Burt, J., Bartholomew, A., Bauman, A., Saif, A. and Sale, P.F. 2009a. Coral recruitment and early benthic community development on several materials used in the construction of artificial reefs and breakwaters. *Journal of Experimental Marine Biology and Ecology* 373: 72e78.

Burt, J., Bartholomew, A., Usseglio, P., Bauman, A. and Sale, P.F. 2009b.

Are artificial reefs surrogates of natural habitats for corals and fish in Dubai, United Arab Emirates? *Coral Reefs* 28: 663e675.
Burt, J.A., 2014. The environmental costs of coastal urbanization in the Arabian Gulf. *City* 18: 760-770.
Burt, J.A., Al-Khalifa, K., Khalaf, E., Alshuwaikh, B. and Abdulwahab, A. 2013. The continuing decline of coral reefs in Bahrain. *Marine Pollution Bulletin* 72: 357-363.
Bush, P. 1973: Some aspects of the diagenetic history of the sabkha in Abu Dhabi, Persian Gulf, pp. 395-406, in Purser, B.H. (ed.). The Persian Gulf. Springer, New York.
Bush, P.R. 1970. Chloride rich brines from sabkha sediments and their possible role in ore formation. Inst. *Mining Metallurgy, Trans., (sec. B.)* 79: 137-144.
Busharb, A. 1993. The contribution of Portuguese sources and documents in recording the history of Bahrain in the first half of the 16th century, pp. 144-154, in Al Khalifa, A.K. and Rice, M. (eds.). Bahrain through the ages, the history. Kegan Paul, London.
Butayban, N. 2005. Assessment of the state of the environment in the ROPME Sea Area relevant to the GPA source categories. Document prepared for UNEP/GPA as input into UNEP 2006.
Butler, G.P. 1969. Modern evaporite deposition and geochemistry of co-existing brines, the sabkha, Trucial Coast, Arabian Gulf. *J. Sed. Petrology* 39: 70-89.
Butler, G.P., Kendall, C.G., Kinsman, D.J., Shearman, D.J. and Skipwith, S.P. 1965. Recent anhydrite from the Trucial coast of the Arabian Gulf. *Geol. Soc. London Circ.* 120: 3.
Butler, G.P., Krouse, R.H. and Mitchell, R. 1973. Sulphur isotope geochemistry of an arid, supratidal evaporite environment, Trucial Coast, p. 471, in Purser, B.H. (ed.). The Persian Gulf. Springer-Verlag, New York.
Cabaco, S., Santos, R. and Duarte, C.M. 2008. The impact of sediment burial and erosion on seagrasses: A review. *Estuarine Coastal and Shelf Science* 79: 354-366.
Calbet, A. 2008. The trophic roles of microzooplankton in marine systems. *ICES Journal of Marine Science* 65: 325-331.
Calbet, A. and Landry, M.R. 2004. Phytoplankton growth, microzooplankton grazing, and carbon cycling in marine systems. *Limnology and Oceanography* 49: 51-57.
Calleja, M.L., Barrón, C., Hale, J.A., Frazer, T.K. and Duarte, C.M. 2006. Light regulation of benthic sulfate reduction rates mediated by seagrass (Thalassia testudinum) Metabolism. *Estuaries and Coasts* 29: 1255-1264.
Camp, E., Suggett, D.J., Gendron, G., Jompa, A., Manfrino, C. and Smith, D.J. 2016. Mangrove and seagrass beds provide different biogeochemical services for corals threatened by climate change. *Front. Mar. Sci* 3: 52.
Campbell, A. and Dawes, J. 2005. Encyclopedia of underwater life (1st edition). Oxford University Press, London.
Campbell, A., Kapos, V., Scharlemann, J.P.W., Bubb, P., Chenery, A., Coad, L., Dickson, B., Doswald, N., Khan, M.S.I., Kershaw, F. and Rashid, M. 2009. Review of the literature on the links between biodiversity and climate change impacts, adaptation and mitigation. *CBD Technical Series* 42, 124 p.
Campbell, J.E., Lacey, E.A., Decker, R.A., Crooks, S. and Fourqurean, J.W. 2015. Carbon storage in seagrass beds of Abu Dhabi, United Arab Emirates. *Estuaries and Coasts* 38: 242-251.
Campbell, J.L., Mitchell, M.J., Groffman, P.M., Christenson, L.M. and Hardy, J.P. 2005. Winter in northeastern North America: A critical period for ecological processes. *Front. Ecol. Environ* 3: 314-322.
Carlson Jr., P.R., Yarbro, L.A., Peterson, B.J., Ketron, A., Arnold, H. and Madley, K.A. 2002. The influence of sediment sulfide on the structure of south Florida seagrass communities, pp. 215-217, in Greening, H.S. (ed.). Proceedings, seagrass management: It's not just nutrients! Tampa Bay Estuary Program, St. Petersburg, Florida, 246 p.
Carpenter, K., Krupp, F., Jones, D.J. and Zajonz, U. 1996. FAO Species indentification guide for fishery purposes. The Living Marine Resources of Kuwait, Eastern Saudi Arabia, Bahrain, Qatar and the United Arab Emirates. FAO.
Carpenter, K.E., Harrison, P.L., Hodgson, G., Alsaffar, A.H. and Alhazeem, S.H. 1997. The corals and coral reef fishes of Kuwait. Kuwait Institute for Scientific Research, Kuwait, 166 p.
Carpenter, K.E., Krupp, F., Jones, D.A. and Zajonz, U. 1997. FAO species identification field guide for fishery purposes. The living marine resources of Kuwait, Eastern Saudi Arabia, Bahrain, Qatar, and the United Arab Emirates. FAO species identification field guide for fishery purposes. The living marine resources of Kuwait, Eastern Saudi Arabia, Bahrain, Qatar, and the United Arab Emirates.
Carr, A.F. 1986. Rips, FADs and little loggerheads. *BioScience* 236: 92-100.
Carr, A.F. 1987. New perspectives on the pelagic stage of sea turtle development. *Conservation Biology* 1: 103-121.
Carr, M. 2000. Marine protected areas: Challenges and opportunities for understanding and conserving coastal marine ecosystems. *Environmental Conservation*, 27(2): 106-109.
Carruba, R.W. and Bowers, J.Z. 1982. Englebert Kaempfer's first report of the torpedo fish of the Persian Gulf in the late 17th century. *Journal of the History of Biology* 15: 263-274.
Carson, H.S., Colbert, S.L., Kaylor, M.J. and McDermid, K.J. 2011. Small plastic debris changes water movement and heat transfer through beach sediments. *Marine Pollution Bulletin* 62: 1708-1713.
Carter, R. 2005. The history and prehistory of pearling in the Persian Gulf. *J. Econ. Soc. Hist. Orient* 48: 139-209.
Carter, R.A. 2006. Boat remains and maritime trade in the Persian Gulf during 6th and 5th millennia BC. *Antiquity* 80: 52-63.
Castro, J.I. 1996. Biology of the blacktip shark, Carcharhinus limbatus, off the southeastern United States. *Bulletin of Marine Science* 59: 508-522.
Cathleen, B. 2011. Ichthyology at the Florida Museum of Natural History. Florida Museum of Natural History.
Cava, F.M., Robinson, J.H. and Earle, S.A. 1993. Should the Arabian (Persian) Gulf become a marine sanctuary? *Oceanus* 36: 53-62.
CDE. 1984. Environmental analysis, Qatif Home Ownership Project. Final draft environmental report prepared for Consulting and Design Engineering by Saudi Arabian Tetra Tech. for the Arabian American Oil Company.
Center for Environment and Water, King Fahd University of Petroleum and Minerals, Research Institute. 2007. Study of Al-Khafji seawater quality and marine habitats. Technical Report, 214 p.
Chalker, B.E. and Barnes, D.J. 1990. Gamma densitometry for the measurement of skeletal density. *Coral Reefs* 9: 11-23.
Chan, E.H. 2013. A report on the first 16 years of a long-term marine turtle conservation project in Malaysia. *Asian Journal of Conservation Biology* 2(2): 129-135.
Chang, H.H., 1979. Minimum stream power and river channel patterns. *Journal of Hydrology* 41: 303-327.
Chao, S-Y., Kao, T.W. and Al-Hajri, K.R. 1992. A numerical investigation of circulation in the Arabian Gulf. *J. Geophys. Res*. 97(C7): 11219-11236.
Chapagain, A.K. and Hoekstra, A.Y. 2004. Water footprints of nations, Vol. 1: Main Report. Value of Water Research Report Series Number 16, UNESCO-IHE Institute of Water Education, Delft, the Netherlands.
Chapman, A.D. 2009. Numbers of living species in Australia and the World. (2nd edition). Commonwealth of Australia, Australia.
Chapman, P.M. 2001. Utility and relevance of aquatic oligochaetes in ecological risk assessment. *Hydrobiologia* 463: 149-169.
Chapman, R.W. 1978. General information on the Arabian Peninsula, pp. 4-30, in Al-Sayyari, S.S. and Zotl, J.G. (eds.). Quaternary Period in Saudi Arabia. Springer Verlag. Vienna.
Chen, W., Almatar, S., Alsaffar, A. and Yousef, A. 2013. Retained and discarded bycatch from Kuwait's shrimp fishery. *Aquatic Science and Technology* 1: 86-100.
Cheung, W.W.L., Lam, V.W.Y., Sarmiento, J.L., Kearney, K., Watson, R. and

Pauly, D. 2009. Projecting global marine biodiversity impacts under climate change scenarios. *Fish and Fisheries* 10: 235-251.

Cicin-Sain, B. and Knecht, R.W. 1998. Integrated coastal and ocean management: Concepts and practices. Island Press, Washington, D.C., 499 p.

Chilvers, B.L., Delean, S., Gales, N.J., Holley, D.K., Lawler, I.R., Marsh, H. and Preen, A.R. 2004. Diving behaviour of dugongs, Dugong dugon. *Journal of Experimental Marine Biology and Ecology* 304: 203-224.

Chisti, Y. 2007. Biodiesel from microalgae. *Biotechnol Adv.* 25: 294-306.

Church, J.A., Gregory, J.M., Huybrechts, P., Kuhn, M., Lambeck, K., Nhuan, M.T., Qin, D. and Woodworth, P.L. 2001. Changes in sea level in climate change 2001: The scientific basis, pp. 641-693, in Houghton, J.T., Ding, Y., Griggs, D.J., Noguer, M., van der Linden, P., Dai, X., Maskell, K. and Johnson, C.I. (eds.). Contribution of Working Group I to the 3rd assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge.

Claereboudt, M.R. 2006. Reef corals and coral reefs of the Gulf of Oman. Al-Roya Publishing, Muscat.

Clark, A.H. and Le Baron Bowen Jr., R. 1949. Echinoderms of Tarut Bay and vicinity, Saudi Arabia with notes on their occurrence. *American Museum Novitiates, New York* 1390: 1-20.

Clarke, D.G., Homziak, J., Lazor, R., Palermo, M.R., Banks, G.E., Benson, H.A., Johnson, B.H., Smith-Dozier, T., Revelas, G. and Dardeau, M.R. 1990. Engineering design and environmental assessment of dredged material overflow from hydraulically filled hopper barges in Mobile Bay, Alabama. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper D-90-4.

Clarke, M.W.H. and Keij, A.S. 1973. Organisms as producers of carbonate sediment and indicators of environment in the southern Persian Gulf beaches, pp. 32-56, in Purser, B.H. (ed.). The Persian Gulf. Springer-Verlag, New York.

Clayton, D. and Pilcher, C. 1983. Kuwait's natural history: An introduction. Kuwait Oil Company, Ahmadi, Kuwait.

Clayton, D.A. 1986. Ecology of mud flats with particular reference to those of the northern Arabian Gulf, pp. 83-96, in Halwagy, R., Clayton, D.A. and Behbehani, M. (eds.). Proceedings of First Arabian Gulf Conference on Environment and Pollution, Kuwait, February 7-9, 1982, Alden Press, Oxford.

Clerk, O.D. and Coppejans, E. 1996. Marine algae of the Jubail Marine Wildlife Sanctuary, Saudi Arabia, pp. 199-289, in Krupp, F., Abuzinada, A.H. and Nader L.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyad and Senckenberg Research Institute, Frankfurt, Germany.

Cloern, J.E. 2001. Our evolving conceptual model of the coastal eutrophication problem. *Marine Ecology Progress Series* 210: 223-253.

Coles, S.L. 1988. Limitations of reef coral development in the Persian Gulf: Temperature or algal competition? *Proceedings of the 6th International Coral Reef Symposium* 3: 211-216.

Coles, S.L. 2003. Coral species diversity and environmental factors in the Arabian Gulf and the Gulf of Oman: A comparison to the Indo-Pacific region. *Atoll Res. Bull.* 507: 1-19.

Coles, S.L. and Gunay, N. 1989. Tar pollution on Saudi Arabian Gulf beaches. *Marine Pollution Bulletin* 01/1989; DOI: 10.1016/0025-326X(89)90433-5.

Coles, S.L. and Fadlallah, Y.H. 1991. Cold induced reef coral mortality in the Arabian Gulf: New lower temperature limits to coral survival. *Coral Reefs* 9: 231-237.

Coles, S.L. and Fadlallah, Y.H. 1991. Reef coral survival and mortality at low temperatures in the Arabian Gulf: New species-specific lower temperature limits. *Coral Reefs* 9(23): 1-237.

Coles, S.L. and McCain, J.C. 1990. Environmental factors affecting benthic infaunal communities of the western Arabian Gulf. *Mar. Environmental Res* 29: 289-315.

Coles, S.L. and Tarr, A.B. 1990. Reef fish assemblage in the western Arabian Gulf: A geographically isolated population in an extreme environment. *Bulletin of Marine Science* 47: 696-720.

Collenette, S. 1985. An illustrated guide to the flora of Saudi Arabia. Scorpion Publishing Ltd., London.

Conner, W.G. and Simon, J.L. 1979. The effects of oyster shell dredging on an estuarine community. *Estuarine and Coastal Marine Sci.* 9: 749-758.

Connor, R.C., Richards, A.F., Smolke, R.A. and Mann, J. 1996. Patterns of female's attractiveness in Indian Ocean bottlenose dolphins. *Behaviour* 133(37-69).

Cookson, P., Shoji, T. and Jupp, B.P. 2002. A review of 10 years of scientific studies on mangroves in Oman, pp. 58-65, in Javed, S. and de Souza, A.G. (eds.). Research and management options for mangrove and saltmarsh ecosystems. ERWDA, Abu Dhabi.

Córdoba, R. and Vargas J.A. 1996. Temperature, salinity, oxygen and nutrient profiles a 200 m deep station in Golfo Dulce, Pacific coast of Costa Rica. *Rev. Biol. Trop.* 44(Suppl. 3): 233-236.

Cormack, C.D., Hale, J.A., Gabriel, J.J. and Langman, O. 2011. Nasima and oil — Do they mix? Assessing crab survival in oiled sediments. Proceedings of the 2011 International Oil Spill Conference, American Petroleum Institute, 11 p.

Cornes, M.D. and Cornes, C.D. 1989. The wild flowering plants of Bahrain. An illustrated field guide. Immel Publishing, London.

Cornwall, P.B. 1946. Ancient Arabia: Explorations in Hasa, 1940-1941. *Geogr. J.* 107: 28-50.

Cortes, E. 2002. Incorporating uncertainty into demographic modeling: Application to shark populations and their conservation. *Conservation Biology* 16: 1048-1062.

Costanza, R., d'Arge, R., deGroot, R., Farber, S., Grasso, M., Hannon, B., Limberg, K., Noeem, S., O'Neill, R., Paruelo, J., Raskin, R.G., Sutton, P. and Vanden Belt, M. 1997. The value of the world ecosystem services and natural capital. *Nature* 387: 253-260.

Coull, B.C. and Bell, S.S. 1979. Perspectives of marine meiofaunal ecology, pp. 189-216, in Livingston, R.J. (ed.). Ecological processes in coastal and marine ecosystems. Plenum Press, New York.

Courtneay, W.R., Harig, B.C. and Loisel, G.R. 1972. Ecological monitoring of two beach nourishment projects in Broward County, Florida. *Shore and Beach* 40(2): 8-13.

COWI. 2008. http://www.cowi.com/menu/service/WaterandEnvironment/Waterandnaturalresourcesmanagement/Integratedwaterresourcesmanagement/Documents/EIA_QatarBahrainCauseway.pdf.

Crossland, C.J. 1981. Seasonal growth of Acropora cf formosa and Pocillopora damicornis on a high latitude reef (Houtman Abrolhos, Western Australia). Proceedings of the 4th International Coral Reef Symposium, Vol. 1, pp. 663-667.

Cullen-Unsworth, L. and Unsworth, R. 2013. Seagrass meadows, ecosystem services, and sustainability, environment. *Science and Policy for Sustainable Development* 55(3): 14-28.

Culotta, W.A. and Pickwell, G.V. 1993. The venomous sea snakes: A comprehensive bibliography. Krieger Publishing Company, Malabar, Florida, USA.

Curtis, R., Evans, G., Kinsman, D.J. and Shearman, D.J. 1963. Association of dolomite and anhydrite in the recent sediments of the Persian Gulf. *Nature* 197: 679-680.

Dalla Via, J., Sturmbauer, C., Schonweger, G., Sotz, E., Mathekowitsch, S., Stifter, M. and Rieger, R. 1998. Light gradients and meadow structure in Posidonia oceanica: Ecomorphological and functional correlates. *Mar. Ecol. Prog. Ser.* 163: 267-278.

Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D. and Yan, J. 2007. The impact of sea level rise on developing countries: A comparative analysis. World Bank Policy Research Working Paper 4136.

Dauvin, J.C. 1998. The fine sand Abra alba community of the Bay of Morlaix twenty years after the Amoco Cadiz oil spill. *Marine Pollution Bulletin* 36: 669-676.

Davenport, J. 1997. Temperature and the life-history strategies of sea turtles. *Journal of Thermal Biology* 22(6): 479–88.

Davis, F.M. 1925. Quantitative studies on the fauna of the sea bottom. No. 2. Results of the investigations in the Southern North Sea. 1921–24. Fisheries Investigation. Series II(8): 1–50.

Davis, J.M. and Payne, P. 1984. Supply of organic matter to the sediment in the North Sea during a spring phytoplankton bloom. *Marine Biology* 78: 315–324.

Dawoud, M.A. and Al-Mulla, M.M. 2012. Environmental impact of seawater desalination: Arabian Gulf case study. *International Journal of Environment and Sustainability* 1(3): 22–37.

De Clerck, O. and Coppejans, E. 1996. Marine algae of the Jubail marine wildlife sanctuary, Saudi Arabia, pp. 199–286, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf: Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt, Germany.

De Grave, S., Pentcheff, N.D., Ahyong, S.T., Chan, T., Crandall, K.A., Dworschak, P.C., Felder, D.L., Feldmann, R.M., Fransen, C.H.J., Goulding, L.Y.D., Lemaitre, R., Low, M.E.Y., Martim, J.W., Ng, P.K.L., Schweitzer, C.E., Tan, S.H., Tshudy, D. and Wetzer, R. 2009. A classification of living and fossil genera of Decapod Crustaceans. *Raffles Bulletin of Zoology* 21: 1–109.

De Groot, S.J. 1986. Marine sand and gravel extraction in the North Atlantic and its potential environmental impact, with emphasis on the North Sea. *Ocean Management* 10: 21–36.

De Jong, R., van Gelderen, P., Lindo, M. and Fernandez, J. 2005. Duabai's extreme reclamations. CEDA Dredging Days 2005 Conference, November 2–4, 2005, Rotterdam, the Netherlands.

de la Torre-Castro, M. 2006. Humans and seagrasses in East Africa — A social-ecological systems approach. Ph.D. Thesis submitted to Department of Systems Ecology, Stockholm University, Sweden.

de la Torre-Castro, M. and Ronnback, P. 2004. Links between humans and seagrasses An example from tropical East Africa. *Ocean and Coastal Management* 47(7–8): 361–387.

de Mora, S., Fowler, S.W., Wyse, E. and Azemard, S. 2004. Distribution of heavy metals in marine bivalves, fish and coastal sediments in the Gulf and Gulf of Oman. *Marine Pollution Bulletin* 49: 410–424.

de Mora, S., Tolosa, I., Fowler, S.W., Villeneuve, J.P., Cassi, R. and Cattini, C. 2010. Distribution of petroleum hydrocarbons and organochlorinated contaminants in marine biota and coastal sediments from the ROPME Sea area during 2005. *Marine Pollution Bulletin* 60: 2323–2349.

de Silva, A. 1994. An account of the sea snakes Serpentes: Hydrophiidae of Sri Lanka. Chapter 8, pp. 234–249, in Gopalakrishnakone, P. (ed.). Sea snake toxinology. National University of Singapore, Singapore.

De Troch, M., Mees, J., Papadopoulos, I. and Wakwabi, E.O. 1996. Fish communities in a tropical bay (Gazi bay Kenya): Seagrass beds vs. unvegetated areas. *Netherland Journal of Zoology* 46(3–4): 236–252.

Dean, H.K. 2008. The use of polychaetes (Annelida) as indicator species of marine pollution: A review. *Revista de Biología Tropical* 56(4): 11–38.

Defense Mapping Agency, USA. 1975. Sailing directions for the Persian Gulf: Defense Mapping Agency. Hydrographic Center, Washington, D.C., 352 p.

Deil, U. 1998. Coastal and sabkha vegetation, pp. 209–228, in. Ghazanfar, S.A. and Fisher, M. (eds.). Vegetation of the Arabian Peninsula.

del Hoyo, J., Elliott, A. and Sargatal, J. (eds.). 1996. Handbook of the birds of the world. Vol. 3. Barcelona: Lynx Edicions, 821 p.

Den Hartog, C. 1970. The sea grasses of the world. North Holland Publishing Company, Amsterdam. London, 275 p.

DeNicola, E., Aburizaiza, O., Siddique, A., Khwaja, H. and Carpenter, D. 2015. Climate change and water scarcity: The case of Saudi Arabia. *Annals of Global Health* 81 (3): 342–353.

Dennison, W.C., Orth, R.J., Moore, K.A., Stevenson, J.C., Carter, V., Kollar, S., Bergstrom, P.W. and Batiuk, R.A. 1993. Assessing water quality with submersed aquatic vegetation. *Bioscience* 43: 86–94.

Department of Marine Fisheries. 2010. Fisheries statistics of Saudi Arabia. Ministry of Agriculture, Department of Marine Fisheries.

Desprez, M. 1992. Bilan de dix annees de suivi de l'impact biosedimentaire de l'extraction de graves marins au large de Dieppe. Comparaison avec d'autres sites. Rapport Groupe d'tude des Milieux Estuariens et Littoraux GEMEL. St Valery/Somme. (Cited in Report of the working group on the effects of extraction of marine sediments on fisheries. ICES Report No. CM 1993/E:7 Marine Environmental Quality Committee, 51–67).

Devlin, M.J. and Brodie, J. 2005. Terrestrial discharge into the Great Barrier Reef lagoon: Nutrient behaviour in coastal waters. *Marine Pollution Bulletin* 51: 9–22.

Diaz, R.J. 1994. Response of tidal fresh water macrobenthos to sediment disturbance. *Hydrobiologia* 278: 201–212.

DiGiano, F.A., Miller, C.T. and Yoon, J. 1995. Dredging Elutriate Test Development. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Contract Report D–95–1.

Dodd Jr., C.K. 1988. Synopsis of the biological data on the loggerhead sea turtle Caretta caretta Linnaeus 1758. *U.S. Fish Wildl. Serv. Biol. Rep*. 88: 110.

Dodd, R.S., Blasco, F., Rafii, Z.A. and Torquebiau, E. 1999. Mangroves of the United Arab Emirates: Ecotypic diversity in cuticular waxes at the bioclimatic extreme. *Aquatic Botany* 63: 291–304.

Dodson, N.J. 2005. Geomorphology, sediment sources, and accumulation rates on Arabian intertidal flats: Determined from an oil spill along the northeast coast of Saudi Arabia. M.S. Thesis, University of South Carolina, Columbia, SC, USA, 113 p.

Doney, S.C., Ruckelshaus, M., Duffy, J.E., Barry J.P., Chan, F., English, C.A., Galindo, H.M., Grebmeier, J.M., Hollowed, A.B., Knowlton, N., Polovina, J., Rabalais, N.N., Sydeman, W.J. and Talley, L.D. 2011. Climate change impacts on marine ecosystems. *Annu. Rev. Mar. Sci*. 4: 11–37.

Doody, J.P. 1992. Sea defense and nature conservation: Threat or opportunity: Aquatic conservation. *Marine and Freshwater Ecosystems* 2(3): 275–283.

Dorgham, M.M. 2013. Plankton research in the ROPME Sea Area, achievements and gaps. *International Journal of Environmental Research* 7(3): 767–778.

Dorgham, M.M., Abdel-Aziz, N.E. and El-Sherbiny, M.O. 2008. Zooplankton in the ROPME Sea Area, Winter 2006. Report to ROPME, Safat, Kuwait, 259 p.

Dorgham, M.M., El-Samra, M.I. and Moustafa, T.H. 1987. Phytoplankton in an area of multi-polluting factors west of Alexandria, Egypt. *Qatar Univ. Sci. Bull*. 7: 393–419.

Downing, N. 1985. Coral reef communities in an extreme environment: The northwestern Arabian Gulf. Proceedings of the 5th International Coral Reef Congress, Vol. 6, pp. 343–348.

Downing, N. 1988. The coral reefs and coral islands of Kuwait. Proc. ROPME Workshop Coastal Area Devel. GC-5/006, pp. 74–77.

Downing, N. 1992. Kuwait's coral reefs: What future after the Gulf war? 7th International Coral Reef Symposium, *Guam 2*: 959–968.

Downing, N. and Roberts, C. 1993. Has the Gulf War affected coral reefs of the Northwestern Gulf? *Marine Pollution Bulletin* 27: 149–156.

Downing, N. and El-Zahr, C.R., 1987. Gut evacuation and filling rates in the rock-boring sea urchin, Echinometra mathaei. *Bull. Mar. Sci*. 41: 579–584.

Downs, C.A., Richmond, R.H., Mendiola, W.J., Rougee, L. and Ostrander, G.K. 2006. Cellular physiological effects of the MV Kyowa Violet fuel-oil spill on the hard coral, Porites lobata. *Environ Toxicol Chem* 25: 3171–3180.

Drechsler, P. 2011. Places of contact, spheres of interaction: The 'Ubaid phenomenon in the central Gulf area as seen from a first season of reinvestigations at Dosariyah (Dawsariyyah), Eastern Province, Saudi Arabia. Proc. Semin. *Arab. Stud.* 41: 69–82.

Duarte, C.M. 1990. Seagrass nutrient content. *Mar. Ecol. Progr. Ser.* 67: 201–207.

Duarte, C.M. 1992. Nutrient concentration of aquatic plants: Patterns across species. *Limnology and Oceanography* 37: 882–889.

Duarte, C.M. 1995. Submerged aquatic vegetation in relation to different nutrient regimes. *Ophelia (Dinamarca)* 41: 87–112.

Duarte, C.M. 2002. The future of seagrass meadows. *Environmental Conservation* 29: 192–206.

Duarte, C.M. 2010. Marine biodiversity and ecosystem services: An elusive link. *Journal of Experimental Marine Biology and Ecology* 250: 117–131.

Duarte, C.M. and Chiscano, C.L. 1999. Seagrass biomass and production: A reassessment. *Aquatic Botany* 65: 159–174.

Duarte, C.M., Losada, I.J., Hendriks, I.E., Mazarrasa, I. and Marbà, N. 2013. The role of coastal plant communities for climate change mitigation and adaptation. *Nature Climate Change* 3: 961–968.

Duarte, C.M., Marbà, N., Gacia, E., Fourqurean, J.W., Beggins, J., Barrón, C. and Apostolaki, E.T. 2010. Seagrass community metabolism: Assessing the carbon sink capacity of seagrass meadows, *Global Biogeochemical Cycles* 24(4).

Duarte, C.M., Middelburg, J.J. and Caraco, N. 2005. Major role of marine vegetation on the oceanic carbon cycle. *Biogeosciences* 2(1): 1–8.

Duffy, J.E. 2006. Biodiversity and the functioning of seagrass ecosystems. *Marine Ecology Progress Series* 311: 233–250.

Dunson, W.A. 1975. The biology of sea snakes. University Park Press, Baltimore.

Dunson, W.A. and Ehlert, G.W. 1971. Effects of temperature, salinity, and surface water flow on distribution of the sea snake Pelamis. *Limnology and Oceanography* 16: 845–853.

Dunton, K.H. 1990. Production ecology of Ruppia maritima L. s.l. and Halodule wrightii Aschers. in two subtropical estuaries. *J. Exp. Mar. Biol. Ecol.* 143: 147–164.

Durako, M.J., Kenworthy, W.J., Fatemy, S.M.R., Valavi, H. and Thayer, G.W. 1993. Assessment of the toxicity of Kuwait crude oil on the photosynthesis and respiration of seagrasses of the Northern Gulf. *Marine Pollution Bulletin* 27: 223–227.

Ealey, T.A., Holmes, P., Abu Sitta, H., Kelly, P. and Williams, I. 1999. Lagoon residential and recreational developments case study 1: Al Khaleej Village, Saudi Arabia. *Environmental Studies* 3: 615–633.

Eapen, P.K. 1982. Fisheries of Saudi Arabia. Ministry of Agriculture and Water, Agriculture Research Department.

Eckert, K.L., Wallace, B.P., Frazier, J.G., Eckert, S.A. and Pritchard, P.C.H. 2012. Synopsis of the biological data on the leatherback sea turtle (Dermochelys coriacea). U.S. Fish and Wildlife Service, Biological Technical Publication. BTP-R4015-2012, Washington, D.C.

Edmunds, P.J. and Carpenter, R.C. 2001. Recovery of Diadema antillarum reduces macroalgal cover and increases abundance of juvenile corals on a Caribbean reef. *Proc Natl Acad Sci USA* 98: 5067–5071.

Eftekhar, M., Savari, A., Rezia, H., Mahoori, A.R. and Zare, R. 2011. Temporal and spatial distribution of Urochordata around Hormuz Island, the RSA. Iran. *Scient. Disher. J.* 20: 159–166.

Eghtesadi-Araghi, P. 2011. Coral reefs in the Persian Gulf and Oman Sea: An integrated perspective on some important stressors. *Journal of Fisheries and Aquatic Science* 6: 48.

Einoder, L.D. 2009. A review of the use of seabirds as indicators in fisheries and ecosystem management. *Fisheries Research* 95: 6–13.

Eisler, R. 2000. Handbook of chemical risk assessment health hazards to humans, plants, and animals. Vol. 1-3, CRC Press, Boca Raton, Florida, USA.

El Samra, M.I. 1988. Chemical observations in the Arabian Gulf and the Gulf of Oman. *Arab Gulf Journal of Scientific Research. Special publication* 6(2): 205–215.

El Samra, M.I., Emara, H.I. and Shunbo, E. 1986. Dissolved petroleum hydrocarbon in the northwestern Arabian Gulf. *Mar. Poll. Bull.* 17: 65–68.

El-Amry, M. 1998. Population structure, demography and life tables of Avicennia marina (Forsk.) Vierh. at sites on the eastern and western coasts of the United Arab Emirates. *Marine and Freshwater Research* 49: 303–308.

El-Ghonemy, A.A. 1985. Ecology and flora of Al Ain region. Vol. 1: Ecology and monocotyledons Al Ain. The University of the United Arab Emirates Al-Wahda Printing Press.

El-Gindy, A.A.H. and Dorgham, M.M. 1992. Interrelations of phytoplankton, chlorophyll and physicochemical factors in Arabian Gulf of Oman during summer. *Ind. J. Mar. Sci.,* 21: 251–267.

Elhakeem, A., Elshorbagy, W. and Bleninger, T. 2015. Long-term hydrodynamic modeling of the Arabian Gulf. *Marine Pollution Bulletin* 94(1–2): 19–36.

El-Raey, M. 2009. Coastal Areas, pp. 47–62, in Tolba, M.K. and Saab, N.W. (eds.). Arab environment: Climate change. Impact of climate change on Arab countries. Arab Forum for Environment and Development (AFED).

El-Serehy, H.A. 1999. Species composition and community structure of zooplankton in the Emirates coastal water on the RSA. *J. Union Arab Biol.* 12: 113–125.

Elshorbagy, W., Azam, M.H. and Taguchi, K. 2006. Hydrodynamic characterization and modelling of the Arabian Gulf. *ASCE J. Water Way Ports Coastal Ocean Eng.* 132: 47–56.

Emery, K.O. 1956. Sediments and water of the Persian Gulf. *Bulletin of the American Association of Petroleum Geologists* 40: 2354–2383.

Engler, R.E. 2012. The complex interaction between marine debris and toxic chemicals in the ocean. *Environmental Science and Technology* 46: 12302–12315.

Enomoto, Y. 1971. Oceanographic survey and biological study of shrimp in the waters adjacent to the eastern coasts of the State of Kuwait. *Bulletin of Tokai Regional Fisheries Research Laboratory* 66: 1–74.

Enríquez, S., Agustí, S. and Duarte, C.M. 1994. Light absorption by marine macrophytes. *Oecologia* 98: 121–129.

Erftemeijer, P.A. and Lewis, R.R.R. 2006. Environmental impacts of dredging on seagrass: A review. *Mar. Pollut. Bull.* 52: 1553–1572.

Erftemeijer, P.L., Riegl, B., Hoeksema, B.W. and Todd, P.A. 2012. Environmental impacts of dredging and other sediment disturbances on corals: A review. *Marine Pollution Bulletin* 64: 1737–1765.

Erftenmeijer, P.L.A. and Shuail, D.A. 2012. Seagrass habitats in the Arabian Gulf: Distribution, tolerance thresholds and threats. *Aquatic Ecosystem Health and Management* 15: 73–83.

Eskoubi, K.M. and Al Aila, A. 1985. Thaj excavations, second season, 1404/1984. *Atlal* 9: 41–53.

Essen, M. 1996. A survey of the fisheries in the Jubail marine wildlife sanctuary, pp. 459–479, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Euzen, O. 1987. Food habits and diet composition of some fish of Kuwait. *Kuwait Bulletin of Marine Science* 9: 65–85.

Evans, G., Murray, J.W., Biggs, H.E.J., Bate, R. and Bush, P.R. 1973. The oceanography, ecology, sedimentology and geomorphology of the Trucial Coast barrier island complex, Persian Gulf, pp. 233–277, in Purser, B.H. (ed.). The Persian Gulf. Springer-Verlag, New York.

Evans, G. and Kirkham, A. 2002. The Abu Dhabi sabkhat. Distribution of sabkhat in the Arabian Peninsula and adjacent countries, p. 353, in Barth, H-J. and Böer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Evans, G., Kendall, C.G. and Skipwith, P.A. 1964. Origin of the coastal flats, the sabkha of the Trucial Coast, Persian Gulf. *Nature* 202(4934): 759–761.

Evans, G., Kirkham, A. and Carter, R.A. 2002 Quaternary development of the United Arab Emirates coast: New evidence from Marawah Island, Abu Dhabi. *GeoArabia* 7(3): 441–458.

Evans, M.I. (ed.). 1994. Important bird areas of the Middle East. BirdLife Conservation Series No. 2, BirdLife International, Cambridge, U.K.

Evans, M.I., Symens, P. and Pilcher, C.W.T. 1993. Short-term damage to coastal bird's populations in Saudi Arabia and Kuwait following the 1991 Gulf War. *Marine Pollution Bulletin* 27: 157–161.

Evans-Roberts, D.J. 1979. Tides in the Persian Gulf. *Consulting Engineer* 43(6): 46–48.

EVS. 1997. Release of contaminants from resuspended particulate matter. White Paper, EVS.

Fabi, G., Grati, F., Puletti, M. and Scarcella, G. 2004. Effects on fish community induced by installation of two gas platforms in the Adriatic Seaf. *Mar. Ecol. Prog. Ser.* 273: 187–197.

Fabry, V.J., Seibel, B.A., Feely, R.A. and Orr, J.C. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. *ICES Journal of Marine Science* 65: 414–432.

Facey, W. 1994. The story of the Eastern Province of Saudi Arabia. Stacey International, London.

Fadlallah, Y.H. and Lindo, R.T. 1988. Contrasting cycles of reproduction in Stylophora pistillata from the Red Sea and the Arabian Gulf, with emphasis on temperature. Proceedings of the 6th International Coral Reef Symposium, August 8–12, 1988, Townsville, Australia, Vol. 3, pp. 225–230.

Fadlallah, Y.H., Allen, K.W. and Estudillo, R.A. 1995. Mortality of shallow reef corals in the western Arabian Gulf following aerial exposure in winter. *Coral Reefs* 14: 99–107.

Fadlallah, Y.H., Eakin, M., Allen, K., Rahim, R., Reaka-Kudla, M. and Earle, S. 1993. Reef coral distribution and reproduction, community structure, and reef health (Qatar, Bahrain, Saudi Arabia, Kuwait): Results of the RIV *Mt. Mitchell* Cruise. Proceedings of the Scientific Workshop on the Results of the *Mt. Mitchell* Cruise in the ROPME Sea Area. January 1993, Kuwait, pp. 1–26.

FAO. 1982. Assessment of the shrimp stocks of the west coast of the Gulf between Iran and the Arabian Peninsula. Fisheries Development in the Gulf. FI:DP/RAB/80/015.

FAO. 2004. Fishery and aquaculture country profiles. Saudi Arabia, in FAO Fisheries and Aquaculture Department (online).

FAO. 2006. Review of the state of world marine capture fisheries management: Indian Ocean. FAO Fisheries Technical Paper. No: 488, 458 p.

Farooque, A.M., Jamaluddin, A.T.M., Al-Reweli, A.R., Jalaluddin, P.A.M., Al-Marwani, S.M., Al-Mobayed, A.A. and Qasim, A.H. 2008. Parametric analyses of energy consumptions and losses in SWCC SWRO plants utilizing energy recovery devices. *Desalination* 219: 137–159.

Fath, H., Sadik, A. and Mezhera, T. 2013. Present and future trend in the production and energy consumption of desalinated water in GCC countries. *Int. J. of Thermal and Environmental Engineering* 5(2): 155–165.

Fauvelot, C. and Borsa, P. 2011. Patterns of genetic isolation in a widely distributed pelagic fish, the narrow-barred Spanish mackerel (Scomberomorus commerson). *Biological Journal of the Linnean Society* 104: 886–902.

Faye, B. 1993. Mangrove, sécheresse et dromadaire. *Sécheresse* 4: 47–55.

Feary, D.A., Burt, J.A., Bauman, A.G., Usseglio, P., Sale, P.F. and Cavalcante, G.H. 2010. Fish communities on the world's warmest reefs: What can they tell us about the effects of climate change in the future? *Journal of Fish Biology* 77: 1931–1947.

Feary, D.A., Burt, J.A. and Bartholomew, A. 2011. Artificial marine habitats in the Arabian Gulf: Review of current use, benefits and management implications. *Ocean and Coastal Management* 54: 742–749.

Feary, D.A., Burt, J.A., Bauman, A.G., Al Hazeem, S., Abdel-Moati, M.A., Al-Khalifa, K.A., Anderson, D.M., Amos, C., Baker, A. and Bartholomew, A. 2013. Critical research needs for identifying future changes in Gulf coral reef ecosystems. *Marine Pollution Bulletin* 72: 406–416.

Fenaux, R. 1973. Appendicularia from the Indian Ocean, the Red Sea and the Persian Gulf, pp. 409–414, in Zeirtzschel, B. (ed.). Ecological studies, analysis and synthesis. Vol. 3. Biology of the Indian Ocean. Springer Verlag, Berlin.

Fenchel, T. 1969. The ecology of marine macrobenthos. IV. Structure and function of the benthic ecosystem, its chemical and physical factors and the microfauna communities with special reference to the ciliated protozoa. *Ophelia* 6: 1–182.

Fergusson, I.K., Compagno, L.J.V. and Marks, M. 2000. Predation by white sharks Carcharodon carcharias (Chondrichthyes: Lamnidae) upon chelonians, with new records from the Mediterranean Sea and a first record of the ocean sunfish Mola mola (Osteichthyes: Molidae) as stomach contents. *Environmental Biology of Fishes* 58: 447–453.

Fernandez-Tajes, J., Florez, F., Pereira, S., Rabade, T., Laffon, B. and Mendez, J. 2011. Use of three bivalve species for biomonitoring a polluted estuarine environment. *Environmental Monitoring and Assessment* 177(1–4): 289–300.

Fernández-Torquemada, Y., Gónzalez-Correa, J.M. and Sánchez-Lizaso, J.L. 2012. Echinoderms as indicators of brine discharge impacts. *Desalination and Water Treatment* 51(1–3): 567–573.

Feyrer, F., Newman, K., Nobriga, M. and Sommer, T. 2010. Modeling the effects of future outflow on the abiotic habitat of an imperiled estuarine fish. *Estuaries and Coasts.* Published online. September 2010.

Ficetola, G.F. 2008. Impacts of human activities and predators on the nest success of the hawksbill turtle, Eretmochelys imbricata, in the Arabian Gulf. *Chelonian Conservation and Biology* 7(2): 255–257.

Ficetola, G.F. 2007. The influence of beach features on nesting of the hawksbill turtle Eretmochelys imbricata in the Arabian Gulf. *Oryx* 41: 402–405.

Field, C.B., Behrenfeld, M.J., Randerson, J.T. and Falkowski, P. 1998. Primary production of the biosphere: Integrating terrestrial and oceanic components. *Science* 281(5374): 237–240.

Field, R.F. 2005. Reef fishes: UAE and Gulf of Oman. Motivate Publishing.

Fischlin, A., Midgley, G.F., Price, J., Leemans, R., Gopal, B., Turley, C., Rounsevell, M., Dube, O., Tarazona, J. and Velichko, A. 2007. Ecosystems, their properties, goods and services, pp. 211–272, in Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the 4th Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.

Fish, M.R., Cote, I.M., Gill, J.A., Jones, A.P., Renshoff, S. and Watkinson, A.R. 2005. Predicting the impact of sea level rise on Caribbean Sea turtle nesting habitat. *Conservation Biology* 19(2): 482–491.

Fishelson, L. 1973. Ecology of coral reefs in the Gulf of Aqaba (Red Sea) influenced by pollution. *Oecologia* 12: 55–67.

Fonseca, M.S. 1989. Sediment stabilisation by Halophila decipiens in comparison to other seagrasses. *Estuarine Coastal and Shelf Science* 17: 367–380.

Fonseca, M.S. and Fisher, J.S. 1986. A comparison of canopy friction and sediment movement between four species of seagrasses with reference to their ecology and restoration. *Marine Ecology Progressive Series* 29: 15–22.

Fookes, P.G., French, W.J. and Rice, M.N. 1985. The influence of ground and ground water geochemistry on construction in the Middle East. *Quarterly Journal of Engrg. Geology* 18: 101–128.

Forcada, J., Hammond, P.S. and Aguilar, A. 1999. Status of the Mediterranean monk seal Monachus monachus in the western Sahara and the implications of a mass mortality event. *Marine Ecology Progress Series* 188: 249–261.

Ford, E. 1923. Animal communities of the level sea bottom in the waters adjacent to Plymouth. *Journal of the Marine Biological Association of the United Kingdom* 13: 164–224.

Forster, S. and Graf, G. 1995. Impact of irrigation on oxygen flux into the sediment: Intermittent pumping by Callianassa subterranea and "piston pumping" by Lanice conchilega. *Marine Biology* 123: 246–335.

Foster, N.M., Hudson, M.D., Bray, S. and Nicholls, R.J. 2013. Intertidal mud flat and salt marsh conservation and sustainable use in the U.K.: A review. *Journal of Environmental Management* 126: 96–104.

Fouda, M.M. 1995. Status of mangrove resources in the Sultanate of Oman. *Journal of the Faculty of Science, UAE University* 8: 149–168.

Fowler, S.W. 1985. Coastal baseline studies of pollutants in Bahrain, UAE and Oman, pp. 155–180, in Proceedings of a regional symposium for the evaluation of the marine pollution monitoring and research programmes, ROPME/GC-4/2, Al-Ain, UAE.

Fowler, S.W. 1993. Pollution in the Gulf: Monitoring the marine environment. *IAEA Bull.* 35: 9–13.

Fowler, S.W. and Knauer, G.A. 1986. Role of large particles in the transport of elements and organic compounds through the oceanic water column. *Progress in Oceanography* 16: 147–194.

Fowler, S.W., Readman, J.W., Oregioni, B., Villeneuve, J.P. and Mckay, K. 1993. Petroleum hydrocarbons and trace metals in nearshore Gulf sediments and biota before and after the 1991 War: An assessment of temporal and spatial trends. *Marine Pollution Bulletin* 27: 171–182.

Franks, J. 2000. A review: Pelagic fishes at petroleum platforms in the Northern Gulf of Mexico; diversity, interrelationships, and perspective, in: Pêche Thonière et Dispositifs de Concentration de Poissons, Caribbean-Martinique, October 15–19, 1999, pp. 502–515.

Frazzetta, T.H. 1994. Feeding mechanisms in sharks and other elasmobranchs, pp. 31–57, in Bels, V.L., Chardon, M. and Vandewalle, P. (eds.). Biomechanics of feeding in vertebrates. Springer Berlin Heidelberg.

Frisk, M.G., Miller, T.J. and Fogarty, M.J. 2001. Estimation and analysis of biological parameters in elasmobranch fishes: A comparative life history study. *Canadian Journal of Fisheries and Aquatic Science* 58: 969–981.

Froese, R. and Pauly, D. (eds.). 1999. FishBase 99: Concepts, design and data sources. ICLARM, Manila.

Frontier, S. 1963. Zooplankton récolté en Mer d'Arabie, golfe Persique et golfe d'Aden (3° campagne océanographique du "Commandant Robert Giraud") : 1ère partie : données générales, répartition quantitative. Cah. ORSTOM. *Série Océanographie* 6: 17–29.

Frost, T.M., Carpenter, S.R., Ives, A.R. and Kratz, T.K. 1995. Species compensation and complementarity in ecosystem function, pp. 224–239, in Jones, C. and Lawton, J. Linking species and ecosystems. Chapman and Hall, New York.

Fry, G.C., Milton, D.A. and Wassenberg, T.J. 2001. The reproductive biology and diet of sea snake bycatch of prawn trawling in northern Australia: Characteristics important for assessing the impacts on populations. *Pacific Conservation Biology* 7: 55–73.

Fuentes, M.M.P.B., Limpus, C.J. and Hamann, M. 2011. Vulnerability of sea turtle nesting grounds to climate change. *Global Change Biology* 17(1): 140–153.

Furnestin, M.L. and Codaccioni, J.C. 1968. Chaetognathes du Nord-Ouest de l'Océan Indien (golfe d'Aden, Mer d'Arabie, golfe d'Oman, golfe Persique). Cahiers ORSTOM. *Série Océanographie* 6(1): 143–171.

Gab-Alla, A.A-F.A. 2008. Distribution of the sea squirt Ecteinascidia thurstoni Herdman, 1890 (Ascidiacea: Perophoridae) along Suez Canal and Egyptian Red Sea coasts. *Oceanologia* 50: 239–253.

Gallagher, M.D., Scott, D.A., Ormond, R.F.G., Connor, R.J. and Jennings, M.C. 1984. The distribution and conservation of seabirds breeding on the coasts and islands of Iran and Arabia. *ICBP Technical Publication* 2: 421–456.

Gallegos, C.L., Correll, D.L. and Pierce, J.W. 1990. Modeling spectral diffuse attenuation, absorption, and scattering coefficients in a turbid estuary. *Limnol. Oceanogr.* 35: 1486–1502.

Garrison, D.L., Gowing, M.M., Hughes, M.P., Campbell, L., Caron, D.A., Dennett, M.R., Shalapyonok, A., Olson, R.J., Landry, M.R., Brown, S.L., Liu, H.B., Azam, F., Steward, G.F., Ducklow, H.W. and Smith, D.C. 2000. Microbial food web structure in the Arabian Sea: A US JGOFS study. *Deep Sea Research II* 47: 1387–1422.

Gasperetti, J. 1988. Snakes of the Arabia, pp. 169–450, in Büttiker, W. and Krump, F. (eds.). Fauna of Saudi Arabia. Vol. 9. National Commission for Wildlife Conservation and Development, Riyadh, Saudi Arabia.

Gasperetti, J., Stimson, A., Miller, J.D., Ross, J.P. and Gasperetti, P. 1993. Turtles of Arabia, pp. 170–367, in Büttiker, W. and Krump, F. (eds.). Fauna of Saudi Arabia. Vol. 13. National Commission for Wildlife Conservation and Development, Riyadh, Saudi Arabia.

Gattuso, J-P., Gentili, B., Duarte, C.M., Kleypas, J.A., Middelburg, J.J. and Antoine, D. 2006. Light availability in the coastal ocean: Impact on the distribution of benthic photosynthetic organisms and their contribution to primary production. *Biogeosciences* 3: 489–513.

Gavish, E. 1974. Geochemistry and mineralogy of a recent sabkha along the coast of Sinai, Gulf of Suez. *Sedimentology* 21: 397–414.

Gazdar, M., Potts, D.T. and Livingstone, A. 1984. Excavations at Thaj. *Atlal* 8: 55–108.

George, J. and John, D. 2000. The coral reefs of Abu Dhabi, United Arab Emirates: Past, present and future, in Proc 2nd Arab Int Conf Exhib Environment Biotechnol (Coastal Habitats), Abu Dhabi, UAE.

George, J.D. 2012. Reef-associated macroinvertebrates of the SE Gulf, pp. 253–308, in Riegl, B.M. and Purkis, S.J. (eds.). Coral reefs of the Gulf — Adaptation to climatic extremes. Springer, New York.

Geraci, J.R. and St. Aubin, J. (eds.). 1988. Synthesis of effects of oil on marine mammals. OCS Study, MMS 88-0049. Minerals Management Service, Atlantic OCS Region, 142 p.

Gerdes, G., Spira, J. and Dimentman, C. 1985. The fauna of the Gavish Sabkha and the Solar Lake — A comparative study, pp. 322–345, in Friedman, G.M. and Krumbein, W.E. (eds.). Hypersaline ecosystems. The Gavish Sabkha, *Ecological Studies* 53, Springer Verlag.

Gerges, M.A. 1993. On the impacts of the 1991 Gulf War on the environment of the region: General observations. *Marine Pollution Bulletin* 27: 305–314.

Gerlach, S.A. 1971. On the importance of marine meiofauna for benthos communities. *Oecologia* 6: 176–190.

Gesteira, J.L.G. and Dauvin, J.C. 2000. Amphipods are good bioindicators of the impact of oil spills on soft bottom macrobenthic communities. *Marine Pollution Bulletin* 40: 1017–1027.

Getter, C.D., Ballou, T.G. and Dahlin, J.A. 1983. Preliminary results of laboratory testing of oil and dispersants on mangroves. Proc. 1983 Oil Spill Conf., San Antonio, Texas. *American Petroleum Institute* 4356: 535–540.

Getter, C.D., Ballou, T.G. and Koons, C.B. 1985. Effects of dispersed oil on mangroves — Synthesis of a seven year study. *Marine Pollution Bulletin* 16: 318–324.

Ghazanfar, S.A. 1998. Plants of economic importance, pp. 241–264, in Ghazanfar, S.A. and Fisher, M. (eds.). Vegetation of the Arabian Peninsula. Kluwer Acadimic Publishers. Geobotany 25.

Ghazanfar, S.A. 2002. The Sabkha vegetation of Oman, pp. 99–107, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Ghazanfar, S.A. 2006. Sabkhat regions of Iraq, pp. 211–217, in Khan, M.A., Boer, B., Kust, G.A. and Barth, H-J. (eds.). Sabkha ecosystems. Vol. II: West and Central Asia. Springer.

Ghazvineh, L., Valinassab, T., Savari, A. and Ghobadiyan, F. 2012. Reproductive biology of the pharaoh cuttle Sepia pharaonis in the Persian Gulf. *World Journal of Fish and Marine Sciences* 4(3): 313–319.

Ghobashy, A.F.A., Noue El-Din, N.M. and El-Sadah, S. 1994. On zooplankton in Qatari waters. *Journal of Egyptian and German Society. Zoopl.* 15: 325–345.

Giangranade, A., Licciano, M. and Musco, L. 2005. Polychaetes as environmental indicators revisited. *Marine Pollution Bulletin* 50: 1153–1162.

Gibson, V.R., Grice, G.D. and Graham, S.J. 1980. Zooplankton investigations in Gulf waters North and South of the Strait of Hormuz. Proceedings of a symposium on coastal and marine environment of the Red Sea, Gulf of Aden and Tropical Western Ocean, Vol. 3: 17-30.

Gillett, M. and Gillett, P. 2002. A winter survey of insects and other terrestrial invertebrates on Marawah Island, Abu Dhabi. *Tribulus* 12(2): 12-19.

Glaser, M. 2003. Interrelations between mangrove ecosystem, local economy and social sustainability in Caeté Estuary, North Brazil. *Wetlands Ecology and Management* 11: 265-272.

Gleick, P.H. 2009. The world's water 2008-2009. Pacific Institute for Studies in Development, Environment and Security. Inland Press, Washington, D.C.

Glodek, G.S. and Voris, H.K. 1982. Marine snake diets: Prey composition, diversity and overlap. *Copeia* 1982: 661-666.

Glynn, P.W. 1990. Feeding ecology of selected coral-reef macroconsumers: Patterns and effects on coral community structure. *Ecosystems of the World* 25: 365-400.

Glynn, P.W., Wellington, G.M. and Birkeland, C. 1979. Coral reef growth in the Galapagos: Limitation by sea urchins. *Science* 203(4375): 47-49.

Goatley, C., Hoey, A. and Bellwood, D. 2012. The role of turtles as coral reef macroherbivores. *PLoS ONE* 7(6): e39979.

Gopalakrishnakone, P. 1994. Sea snake toxinology. Singapore University Press, Singapore.

Goubanov, E.P. and Shleib, N.A. (eds.). 1980. Sharks of the Arabian Gulf. Ministry of Public Works, Agricultural Department, Fisheries Divisions, Kuwait.

Grabe, S.A., Price, W.W., Abdulqader, E.A.A. and Heard, R.W.J. 2004. Shallow water Mysida (Crustacea: Mysidacea) of Bahrain (RSA): Species composition, abundance and life history characteristics of selected species. *J. Nat. Hist.* 28: 2315-2329.

Graham, J.B., Rubinoff, I. and Hecht, M.K. 1971. Temperature physiology of the sea snake Pelamis platurus: An index of iits colonization potential in the Atlantic Ocean. *Proceedings of the National Academy of Sciences* 68: 1360-1363.

Grandcourt, E.M. 2012. Reef fish and fisheries in the Gulf, in Riegl, B.M. and Purkis, S.J. (eds.). *Coral Reefs of the Gulf* 3: 127-161. Springer, the Netherlands.

Grandcourt, E.M., Al Abdessalaam, T.Z., Francis, F. and Al Shamsi, A.T. 2005b. Population biology and assessment of the orange-spotted grouper, Epinephelus coioides (Hamilton 1822), in the southern Arabian Gulf. *Fisheries Research* 74: 55-68.

Grandcourt, E.M., Al Abdessalaam, T.Z., Francis, F. and Al Shamsi, A.T. 2005a. Preliminary assessment of the biology and fishery for the narrow-barred Spanish mackerel, Scombomorus commerson (Lacépède, 1800), in the southern Arabian Gulf. *Fisheries Science* 76: 277-290.

Grasshoff, K. 1976. Review of hydrographic and productivity conditions in the Gulf region. UNESCO Tech. Pap. *Marine Sci.* 26: 39-62.

Grasshoff, K., Kremling, K. and Ehrhardt, M. (eds.). 1999. Methods of sea water analysis. 3rd edition, 600 p., WILEY-VCH Verlag GmbH, Germany.

Grech, A., Chartrand-Miller, K., Erftemeijer, P., Fonseca, M., McKenzie, L., Rasheed, M., Taylor, H. and Coles, R. 2012. A comparison of threats, vulnerabilities and management approaches in global seagrass bioregions. *Environ. Res. Lett.* 7(2): 024006.

Green, E.P. and Short, F.T. 2003. World atlas of seagrasses. Prepared by the UNEP World Conservation Monitoring Centre, University of California Press, Berkeley, CA, USA, 298 p.

Green, T.N., Mahmoodurrahman, M. and Al-Tisan, I. 2009. Investigation of the cause of dead fish trapped in intake travelling screen and pollutants in MSF/SWRO intake water, Al-Jubail desalination plants. SWCC Saline Water Desalination Research Institute's Technical Report 3805/090001, 27 p.

Green, T.N., Mahmoodurrahman, M., Al-Tisan, I. and Al-Nomazi, M. 2010. Plankton blooms affect desalination processes in Al-Jubail SWCC plants. Proceedings of the 9th Gulf Water Conference, Sultanate of Oman, March 22-25, 11 p.

Greenlee, L.F., Lawler, D.F., Freeman, B.D., Marrot, B. and Moulin, P. 2009. Reverse osmosis desalination: Water sources, technology, and today's challenges. *Water Research* 43(9): 2317-2348.

Gregory, G. and Al-Suhaibany, A. 2011. Chapter 10. Marine and coastal birds, pp. 17-32, in Abdulkader, K.A. and Loughland, R.A. (eds.). Marine atlas of the Saudi Arabian waters of the Arabian Gulf. Published by Saudi Aramco, Dhahran, Saudi Arabia.

Gregory, M. 2009. Environmental implications of plastic debris in marine settings Entanglement, ingestion, smothering, hangers on, hitch-hiking and alien invasions. *Philos. Trans. R. Soc. Lond. B Biol. Sci.* 364(1526): 2013-2025.

Greve, T.M. and Binzer, T. 2004. Which factors regulate seagrass growth and distribution. European seagrasses: An introduction to monitoring and management. Monitoring and Managing of European Seagrasses Project (M&MS), pp. 19-23.

Griffin, G.M. 1975. Dredging in the Florida Keys. Case history of a typical dredge fill project in the northern Florida Keys. Effects on water clarity, sedimentation rates and biota. Pub. 33. pp. 1-87. Harbor Branch Foundation, Florida.

Grimwood, C. 1983. Effects of dredging on adjacent water. *ASCE Journal of Environmental Engineering* 109(1): 47-65.

Groom, N. 1982. Gerrha — A "lost" Arabian city. *Atlal* 6: 97-108.

Guidetti, P., Modena, M., Mesa, G.L. and Vacchi, M. 2000. Composition, abundance and stratification of macrobenthos in the marine area impacted by tar aggregates derived from the Haven oil spill (Ligurian Sea, Italy). *Marine Pollution Bulletin* 40: 1161-1166.

Gunderson, L.H. 2001. Managing surprising ecosystems in southern Florida. *Ecological Economic* 37: 371-378.

Günther, A. 1874. A contribution to the fauna of the River Tigris. *Annals and Magazine of Natural History* 4: 36-38.

Gutiérrez, J.L., Jones, C.G., Byers, J.E., Arkema, K.K., Berkenbusch, K., Commito, J.A., Duarte, C.M., Hacker, S.D., Lambrinos, J.G., Hendriks, I.E., Hogarth, P.J., Palomo, M.G. and Wild, C. 2011. Physical ecosystem engineers and the functioning of estuaries and coasts, pp. 53-81, in Wolanski, E. and McLusky, D.S. (eds.). *Treatise on Estuarine and Coastal Science*, Vol. 7, Academic Press, Waltham.

Gutterman, Y. 1993. Seed germination in desert plants. Springer-Verlag.

Haapkyla, J., Ramade, F. and Salvat, B. 2007. Oil pollution on coral reefs: A review of the state of knowledge and management needs. *Vie et Milieu* 57: 95-111.

Habbashi, B.B., Najeeb, F. and Faraj, M. 1992. Distribution of phytoplankton cell abundance of chlorophyll with certain environmental factors in the ROPME Sea Areas. Scientific Workshop on Results of the R/V *Mt. Mitchell* Cruise, January 24-28. Kuwait.

Ul-Hassan, H. 1992. Immigration of Metapenaeus stebbingi, Metapenaeus affinis and Metapenaeus monoceros juveniles in the creeks and backwaters near Karachi. *Pakistan Journal of Scientific and Industrial Research* 35 (5): 190-194.

Hale, J.A., Cormack, C.D., Cotsapas, L., Montello, T.M., Langman, O., Gabriel, J.J. and Michel, J. 2011. Relationships between key indicators of environmental condition and degrees of oiling in sediments in salt marsh habitats: A balance between contamination and ecological recovery by natural processes. Proceedings of the 2011 International Oil Spill Conference, 12 p.

Hall, S.J. 1994. Physical disturbance and marine communities: Life in unconsolidated sediments. *Oceanography and Marine Biology: An Annual Review*, 32: 179-239.

Halwagy, R. and Halwagy, M. 1977. Ecological studies on the desert of Kuwait. III. The vegetation of the coastal salt marshes. *Journal of the University of Kuwait Science* 4: 33-74.

Hamann, M., Limpus, C.J. and Owens, D.W. 2003. Reproductive cycles of males and females, pp. 135-161, in Lutz, P., Musick, J. and Wyneken, J. (eds.). The biology of sea turtles, Vol. II. CRC Press, New York.

Hamed, O.A. 1992. Thermal assessment of a multiple effect boiling (MEB) desalination system. *Desalination* 86: 325-339.

Hamed, O.A. 2008. Energy efficiency assessment of power/water cogeneration systems. Proceedings of the SWCC 4th Acquired Experience Symposium, 2008/Al-Khobar, Saudi Arabia, June 5-7.

Hamed, O.A. 2014. Evolutionary developments of thermal desalination plants in the Arab Gulf region. Proceedings of the 3rd International Water Conference, 2014/Beirut, Lebanon.

Hamed, O.A. 2005. Overview of hybrid desalination systems — Current status and future prospects. *Desalination* 186: 207-214.

Hamed, O.A., Akiya, T., Miyamura, H., Kannari, T. and Harada, K. 2011. Development of 7 MIGD MED-TVC distiller within the context of tri-hybrid NF/RO/MED configuration. Proceedings of the International Desalination Association World Congress on Desalination and Water Reuse, 2011/Perth, Australia, September 4-9.

Hamed, O.A., Al-Sofi, M.A.K., Mustafa, G.M., Bamardouf, K. and Al-Washmi, H. 2001. Power/Water cogeneration cycles. Proceedings of the IDA World Congress on Desalination and Water Reuse, Manama, Bahrain.

Hamer, I. 1988. Hymenoptera highlights V. *Emirates Natural History Bulletin* 35: 6-12.

Hammond, P.S., Bearzi, G., Bjørge, A., Forney, K., Karczmarski, L., Kasuya, T., Perrin, W.F., Scott, M.D., Wang, J.Y., Wells, R.S. and Wilson, B. 2008a. "Tursiops aduncus." IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2, www.iucnredlist.org.

Hammond, P.S., Bearzi, G., Bjørge, A., Forney, K., Karczmarski, L., Kasuya, T., Perrin, W.F., Scott, M.D., Wang, J.Y., Wells, R.S. and Wilson, B. 2008b. "Tursiops truncatus." IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2, www.iucnredlist.org.

Hampel, H., Elliot, M. and Cattrijsse, A. 2009. Macrofaunal communities in the habitats of intertidal marshes along the salinity gradient of the Shelde estuary. *Estuarine, Coastal and Shelf Science* 84: 45-53.

Hannan, L., Roth, J., Ehrhart, L. and Weishampel, J. 2007. Dune vegetation fertilisation by nesting sea turtles. *Ecology* 88(4): 1053-1058.

Harrison, P.L., Alhazeem, S.H. and Alsaffar, A.H. 1997. The ecology of coral reefs in Kuwait and the effects of stressors on corals. Kuwait Institute for Scientific Research, Kuwait. Report No. KISR 4994, 43 p.

Harvell, C., Kim, K., Burkholder, J., Colwell, R., Epstein, P.R., Grimes, D., Hofmann, E., Lipp, E., Osterhaus, A. and Overstreet, R.M. 1999. Emerging marine diseases — climate links and anthropogenic factors. *Science* 285: 1505-1510.

Harwood, J. 2001. Marine mammals and their environment in the 21st century. *Journal of Mammalogy* 82(3): 630-640.

Hasan, A.K. 1994. A taxonomic review of the bivalve and gastropod mollusc fauna along the Saudi intertidal zone of the Arabian Gulf. *Journal of King Abdulaziz University — Marine Sciences* 7: 245-253.

Hasanean, H. and Almazroui, M. 2015. Rainfall: Features and variations over Saudi Arabia, A review. *Climate* 3: 578-626

Hashimoto, S., Tsujimoto, R., Maeda, M., Ishimaru, T., Yoshida, J., Takasu, Y., Koike, Y., Kamatani, A. and Otsuki, A. 1998. Distribution of nutrients, nitrous oxide, and chlorophyll a of RSA: Extremly high ratios of nitrite to nitrate in whole water column, pp. 99-124, in Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. (eds.). Offshore environment of the ROPME Sea Area after the war-related oil spill — Results of the 1993-94 Umitaka-Maru Cruises. Terra Scientific Publishing Company, Tokyo, Japan.

Hassan, A.M. 1978. Shrimps of the coastal waters of Iraq and Kuwait with the description of two new species of the genus Metapenaeus (Crustacea, Decapoda, Penaeidae). *Zoologicheskij Zhurnal* 57(3): 385-390.

Hastenrath, S. and Lamb, P.J. 1979. Climatic atlas of the Indian Ocean: Part I, Surface climate and atmospheric circulation. Part II. The ocean heat budget. Univ. of Wisconsin Press. pp. 116 and 110.

Hawkes, L.A., Broderick, A.C., Godfrey, M.H. and Godley, B.J. 2007. Investigating the potential impacts of climate change on a marine turtle population. *Global Change Biology* 13(5): 923-932.

Hawkes, L.A., Broderick, A.C., Godfrey, M.H. and Godley, B.J. 2009. Climate change and marine turtles. *Endangered Species Research* 7(2): 137-54.

Hay, M.E. 1997. The ecology and evolution of seaweed-herbivore interactions on coral reefs. *Coral Reefs* 16(1): S67-S76.

Hay, M.E. and Taylor, P.R. 1985. Competition between herbivorous fishes and urchins on Caribbean reefs. *Oecologia* 65: 591-598.

Hayes, M., Michel, J., Montello, T., Aurand, D., Al-Mansi, A., Al-Moamen, A., Sauer, T.C. and Thayer, G. 1993. Distribution of weathering of shoreline oil one year after the Gulf War oil spill. *Marine Pollution Bulletin* 27: 135-142.

Hayes, M.O. and Baird, W.F. 1993. Shoreline erosional/ depositional patterns in Oman, pp. 144-158, in Hughes, S.A. (ed.). Coastal engineering considerations in coastal zone management. American Society of Civil Engineers, NY.

Hayes, M.O. and Michel, J. 2014. Sand beaches of the northeast coast of Saudi Arabia. Posted in Beach of the Month, Features.http://coastalcare.org/2014/04/sand-beaches-of-the-northeast-coast-of-saudi-arabia/. Accessed June 2015.

Hayes, M.O., Gundlach, E.R. and Getter, C.D. 1980. Sensitivity ranking of energy port shorelines, pp. 697-709, in Kraman, M.A. (ed.). Proceedings of the Specialty Conference Ports '80. American Society of Civil Engineers, Norfolk, VA, USA.

Hayes, M.O., Michel, J., Al-Mansi, A.M., Jensen, J.R., Narumalani, S., Aurand, D.V., Al-Momen, A.H. and Thayer, G.W. 1993. Distribution of oil from the Gulf War spill within intertidal habitats — One year later. Proceedings of the international oil spill conference, Florida, USA, pp. 373-379.

Hayward, P. and Yonow, N. 1997. Miscellaneous phyla, pp. 322-325, in Richmond, M.D. (ed.). A guide to the seashores of eastern Africa and the western Indian Ocean Islands. Sida/Department for Research Cooperation, SAREC.

Haywood, M.D.E., Vance, D.J. and Loneragan, N.R. 1995. Seagrass and algal beds as nursery habitats for tiger prawns (Penaeus semisulcatus and P. esculentus) in a tropical Australian estuary. *Marine Biology* 122: 213-223.

Heatwole, H. 1981. Role of the saccular lung in the diving of the sea krait, Laticauda colubrina Serpentes: Laticaudidae. *Australian Journal of Herpetology* 1: 11-16.

Heatwole, H. 1975a. Sea snakes found on reefs in the southern Coral Sea: Saumarez, Swains, Cato Island, pp. 163-171, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore, MD, USA.

Heatwole, H. 1975b. Predation on sea snakes, pp. 233-249, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore.

Heatwole, H. 1978. Adaptations of sea snakes. *American Scientist* 66: 594-604.

Heatwole, H. 1997. Marine snakes: Are they a sustainable resource? *Wildlife Society Bulletin* 25: 766-772.

Heatwole, H. 1999. Sea snakes. The New South Wales University Press, Kensington, NSW, Australia.

Heatwole, H. and Cogger, C. 1994. Sea snakes of Australia, pp. 167-205, in Gopalakrishnakone, P. (ed.). Sea snake toxinology. Singapore University Press, Singapore.

Heatwole, H. and Cogger, H. 2013. Provenance errors and vagrants: Their role in underestimating the conservation status of sea kraits Elapidae: Laticaudinae. *Pacific Conservation Biology* 19(3/4): 295-302.

Heatwole, H. and Cogger, H. 1993. Family Hydrophiidae, pp. 310-318, in Glasby, C.J., Ross, G.J.B. and Beesley, P.L. (eds.). Fauna of Australia. Vol. 2A. Amphibia and reptilia. Canberra, Australian Government Publishing Service.

Heatwole, H. and Powell, J. 1998. Resistance of eels Gymnothorax to the venom of sea kraits Laticauda colubrina: A test of coevolution. *Toxicon* 36: 619-625.

Heatwole, H. and Seymour, R. 1975. Diving physiology, pp. 289-327, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore, MD, USA.

Heatwole, H. and Seymour, R. 1976. Respiration of marine snakes, pp. 375-389, in Hughes, G.M. (ed.). Respiration of amphibious vertebrates. Academic Press, London.

Heatwole, H., Grech, A., Monahan, J.F., King, S. and Marsh, H. 2012. Thermal biology of sea snakes and sea kraits. *Integrative and Comparative Biology* 52: 257-273.

Heatwole, H., Minton Jr., S.A., Taylor, R. and Taylor, V. 1978. Underwater observations on sea snake behaviour. *Records of the Australian Museum* 31: 737-761.

Heck Jr., K.L., Hays, G. and Orth, R.J. 2003. Critical evaluation of the nursery role hypothesis for seagrass meadows. *Marine Ecology Progress Series* 253: 123-136.

Heil, C.A., Glibert, P.M., Al-Sarawi, M.A., Faraj, M., Behebehani, M. and Husain, M. 2001. First record of a fish-killing Gymnodinium sp. bloom in Kuwait Bay, Arabian Sea: Chronology and potential causes. *Mar. Ecol. Progr. Ser.* 214: 15-23.

Hein, L., Koppen, K.V., de Groot, R.S. and Ierland, E.C. 2006. Spatial scales, stakeholders, and the valuation of ecosystem services. *Ecological Economics* 57: 209-228.

Heithaus, M.R., Vaudo, J.J., Kreicker, S., Layman, C.A., Krützen, M., Burkholder, D.A., Gastrich, K., Bessey, C., Sarabia, R., Cameron, K., Wirsing, A., Thomson, J.A. and Dunphy-Daly, M.M. 2013. Apparent resource partitioning and trophic structure of large-bodied marine predators in a relatively pristine seagrass ecosystem. *Mar Ecol Prog Ser* 481: 225-237.

Heithaus, M.R., Frid, A., Wirsing, A.J., Bejder, L. and Dill, L.M. 2005. Biology of sea turtles under risk from tiger sharks at a foraging ground. *Marine Ecology Progress Series* 288: 285-294.

Helfrich, P., Ball, J., Berger, A., Bienfang, P., Cattell, S.A., Foster, M., Fredholm, G., Gallagher, B., Guinther, E., Krasnick, G., Rakowicx, G. and Valencia, M. 1973. The feasibility of brine shrimp production on Christmas Island. Sea Grant Technical Report, UNIHI-SEAGRANT-TR-73-02. University of Hawaii, Honolulu, HI, USA.

Hemminga, M.A. and Duarte, C.M. 2000. Seagrass ecology. Springer, Cambridge, U.K., 298 p.

Henaidi, A.K. 1984. Preliminary report on drifting buoy movements MEPA, Gulf Area Oil Companies Mutual Aid Organization Doc. No. GO-86/87-07.

Hendey, N.I. 1970. Some littoral diatoms of Kuwait. Nova Hedwigia, supplement: *Diatomacea* II: 110-167.

Henthrone, L. 2009. Desalination — A critical element of water solutions for the 21st century, in Förare, Jonas (ed.). Drinking water — Sources, sanitation and safeguarding. The Swedish Research Council Formas.

Heppell, S.S., Snover, M.L. and Crowder, L.B. 2003. Sea turtle population ecology, pp. 275-306, in Lutz, P., Musick, J. and Wyneken, J. (eds.). The biology of sea turtles, Vol. II, CRC Press, New York.

Heron, S.F., Willis, B.L., Skirving, W.J., Eakin, C.M., Page, C.A. and Miller, I.R. 2010. Summer hot snaps and winter conditions: Modelling white syndrome outbreaks on Great Barrier Reef Corals. *PLoS ONE* 5(8): e12210. DOI: 10.1371/journal.pone.0012210.

Heubeck, M., Camphuysen, K., Bao, R., Humple, D., Sandoval Rey, A., Cadiou, B., Brager, S. and Thomas, T. 2003. Assessing the impact of major oil spills on seabird populations. *Marine Pollution Bulletin* 46: 900-902.

Heupel, M.R., Carlson, J.K. and Simpfendorfer, C.A. 2007. Shark nursery areas: Concepts, definition, characterization and assumptions. *Marine Ecol. Progress Series* 337: 287-297.

Hibbard, E. 1975. Eyes and other sense organs of sea snakes, pp. 355-382, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore.

Hidalgo-Ruz, V. and Thiel, M. 2013. Distribution and abundance of small plastic debris on beaches in the SE Pacific (Chile): A study supported by a citizen science project. *Marine Environmental Research* 2013: 1-7.

Higgins, P.J. and Davies, S.J.J.F. 1996. Handbook of Australian, New Zealand and Antarctic birds. Vol. 3: Snipe to pigeons. Oxford University Press, Oxford.

Hillebrand, H., Dürselen, C.D., Kirschtel, D., Pollingher, U. and Zohary, T. 1999. Biovolume calculation for pelagic and benthic microalgae. *Journal of Phycology* 35(2): 403-424.

Hillman, K., Walker, D.I., Larkum, A.W. and McComb, A.J. 1989. Productivity and nutrient limitation, in Larkum, A.W.D., McComb, A.J. and Shepherd S.A. A treatise on the biology of seagrasses with special reference to the Australian region. Elsevier, New York.

Hilton, D.J., Brady, A.K., Spaho, S.A. and Vize, P.D. 2012. Photoreception and signal transduction in corals: Proteomic and behavioral evidence for cytoplasmic calcium as a mediator of light responsivity. *Biol. Bulletin* 223: 291-299.

Hingston Quiggin, A. 1949. A survey of primitive money, the beginnings of currency. Methuen & Co. Ltd., London.

Hinirichen, D. 1996. Living on edges: Coasts in crisis. Island Press.

Hinrichsen, D. and Wells, S.M. 1998. Creating a sea change: The WWF/IUCN marine policy. World Conservation Union.

Hirst, J.M. and Aston, S.R. 1983. Behavior of copper, zinc, iron and manganese during experimental resuspension and reoxidation of polluted anoxic sediments. *Estuar. Coast. Shelf Sci.* 16: 549-558.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle Chelonia mydas Linnaeus 1758. Biological Report 97. U.S. Fish and Wildlife Service, Washington, D.C.

Hodgson, A. 2011. Marine mammals, pp. 243-263, in Loughland, R.A. and Al-Abdulkader, K. (eds.). Marine Atlas Western Arabian Gulf. Saudi Aramco Environmental Protection Pubs. Dhahran, KSA.

Hodgson, A.J. (2004). Dugong behaviour and responses to human influences. Ph.D. Thesis, School of Tropical Environment Studies and Geography. James Cook University, Townsville, Australia.

Hodhan, A.H. 2013. Effective evaluation of existing thermal power and desalination plants. Proceedings of the International Desalination Association World Congress on Desalination and Water Reuse 2013/Tianjin, China, 31 p.

Hoegh-Guldberg, O. 1999. Climate change, coral bleaching and the future of the world's coral reefs. *Mar. Freshwater Res.* 50: 839-866.

Hoegh-Guldberg, O. and Bruno, J.F. 2010. The impact of climate change on the world's marine ecosystems. *Science* 328: 1523-1528.

Hoepner, T. and Lattemann, S. 2002. Chemical impact from seawater deslination plants — A case study of the northern Red Sea. *Desalination* 152: 133-140.

Hoffman, L. 1994. Distribution and status of intertidal blue-green algal mats, pp. 281-296, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Hoffmann, L. 1994. Distribution, species composition and status of the intertidal blue-green algal mats. *Courier Forschungsinstitut Senckenberg* 166: 16-17.

Hoffmann, L. 1996. Recolonisation of the intertidal flats by microbial mats after the Gulf War oil spill, pp. 96-115, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A Marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Hogarth, P.J. and Tigar, B.J. 2002. Ecology of sabkha arthropods, pp. 267-282, in Barth, H.J. and Böer, B. (eds.). Sabkha ecosystems — Vol. I:

The Arabian Peninsula and adjacent countries. Tasks for vegetation sciences, Vol. 36. Kluwer Academic Publishers, Dordrecht.

Hoolihan, J.P. 2003. Sailfish movement in the Arabian Gulf: A summary of tagging efforts. *Marine and Freshwater Research* 54: 509-513.

Hoolihan, J.P., Anandh, P. and van Herwerden, L. 2006. Mitochondrial DNA analyses of narrow-barred Spanish mackerel (Scomberomorus commerson) suggest a single genetic stock in the ROPME sea area (Arabian Gulf, Gulf of Oman, and Arabian Sea). *ICES Journal of Marine Science* 63: 1066-1074.

Hoolihan, J.P. and Luo, J. 2007. Determining summer residence status and vertical habitat use of sailfish (Istiophorus platypterus) in the Arabian Gulf. *ICES Journal of Marine Science* 64: 1791-1799.

Hoolihan, J.P., Premanandh, J., D'Aloia-Palmieri, M.A. and Benzie, J.A.H. 2004. Intraspecific phylogeographic isolation of Arabian Gulf sailfish Istiophorus platypterus inferred from mitochondrial DNA. *Marine Biology* 145: 465-475.

Hoostens, K. and Mees, J. 1999. The mysid-feeding guild of demersal fishes in the brackish zone of the Westerschelde estuary. *Journal of Fish Biology* 55: 704-719.

Horton, C., Clifford, M., Cole, D., Schmitz, J., Kantha, L., 1992. Operational modeling semienclosed basin modeling at the Naval Oceanographic Office. *Oceanography* 5(1): 69-72.

Horton, C., Clifford, M., Schmitz, J. and Hester, B. 1994. SWAFS: Shallow water analysis and forecast system: Overview and status report. Naval Oceanographic Offshore office, Stennis Space Center, Mississippi, 53 p.

Hosny, C.F.H. 2007. Population dynamics of Penaeus semisulcatus De Haan, exploited by the industrial fleet off Manifa, Saudi Arabia, Arabian Gulf. *Journal of King Abdulaziz University for Marine Sciences* 18: 3-24.

Houbolt, J.J.H.C. 1957. Surface sediments of the Persian Gulf near the Qatar Peninsula. Unpublished Ph.D. Dissertation, University of Utrecht, 113 p.

Houde, E.D., Almatar, S., Leak, J.C. and Dowd, C.E., 1986. Ichthyoplankton abundance and diversity in the Western Arabian Gulf. *Kuw. Bull. Mar. Sci.* 8: 107-393.

Howarth, R.W., Boyer, E.W., Pabich, W.J. and Galloway, J.N. 2002. Nitrogen use in the United States from 1961-2000 and potential future trends. *Ambio* 31: 88-96.

Hsü, K.J. and Siegenthaler, C. 1969. Preliminary experiments on hydrodynamic movement induced by evaporation and their bearing on the dolomite problem. *Sedimentology*, Vol. 12: 11-25.

Hsu, K.J. and Schneider, J. 1973. Progress report on dolomitization-hydrology of Abu Dhabi sabkhas, Arabian Gulf, in Purser, B.H. (ed.). The Persian Gulf. Springer, Berlin-Heidelberg-New York.

Heubeck, M., Camphuysen, K.C.J., Bao, R., Humple, D., Rey, A.S., Cadiou, B., Bräger, S. and Thomas, T. 2003. Assessing the impact of major oil spills on seabird populations. *Marine Pollution Bulletin* 46(7): 900-902.

Hudson, I.R. and Wigham, B.D. 2003. In situ observations of predatory feeding behaviour of the galatheid squat lobster Munida sarsi using a remotely operated vehicle. *Journal of the Marine Biological Association of the United Kingdom* 83(3): 463-464.

Hughes, P. and Hunter, J.R. 1979. Physical oceanography and numerical modeling of the Kuwait action plan region. Report MARINE, 278, UNESCO Division of Marine Sciences, 106 p.

Hughes, P. and Hunter, J.R. 1979. A Proposal for a physical oceanography program and numerical modeling of the KAP Region. UNESCO, Div. Mar. Sci., Paris, MARINF/27, October 16, 1979, 102 p.

Hughes, T.P., Graham, N.A., Jackson, J.B., Mumby, P.J. and Steneck, R.S. 2010. Rising to the challenge of sustaining coral reef resilience. *Trends in Ecology & Evolution* 25: 633-642.

Hulings, N.C. 1979. The ecology, biometry and biomass of the seagrass Halophila stipulacea along the Jordanian coast of the Gulf of Aqaba. *Botanica Marina* 22: 425-430.

Hulings, N.C. and Kirkman, H. 1982. Further observations and data on seagrasses along the Jordanian and Saudi Arabian coasts of the Gulf of Aqaba. *Tethys* 10: 218-220.

Hull, L.E. 1979. Arabian Gulf demersal trawl resources. Fisheries Development Project of Saudi Arabia. Final Report, 45 p.

Human and Environmental Risk Assessment on Ingredients of Household Cleaning Products. 2013. LAS: Linear alkylbenzene sulphonate (CAS No. 68411-30-3). http://www.heraproject.com/files/HERALAS%20revised%20April%202013%20Final1.pdf.

Hume, B., Angeloa, C.D., Burtb, J., Bakerc, A.C., Riegld, B. and Wiedenmann, J. 2013. Corals from the Persian/Arabian Gulf as models for thermo tolerant reef builders: Prevalence of clade C3 Symbiodinium, host fluorescence and ex situ temperature tolerance. *Marine Pollution Bulletin* 7: 313-322.

Hunter, J.R. 1982. An appraisal of the physical oceanography of Kuwaiti waters: Existing knowledge and future research needs. *Kuwait Inst. Sci. Res.* 40.

Hunter, J.R. 1983a. A review of the residual circulation and mixing process in the KAP region, with reference to applicable modeling techniques, pp. 37-45, in El-Sabh, M.I. (ed.). Oceanographic Modeling of the Kuwait Action Plan Region, UNESCO Report, *Mar. Sci.* 28.

Hunter, J.R. 1983b. Aspects of the dynamics of the residual circulation of the Arabian Gulf, pp. 31-42, in Gade, H.G., Edwards, A. and Svendsen, H. (eds.). Coastal Oceanography, Plenum, New York.

Hunter, J.R. 1984. A review of the residual circulation and mixing process in the KAP region, with reference to applicable modeling techniques, pp. 37-45, in El-Sabh, M.I. (ed.). Oceanographic modeling of the Kuwait action plan region. UNESCO Report in *Marine Science*, Vol. 28.

Hunter, J.R. 1986. The physical oceanography of the Arabian Gulf: A review and theoretical interpretation of previous observations, pp. 1-23, in Halwagy, R., Clayton, D. and Behbehani, M. (eds.). Marine environment and pollution. Proc. First Arabian Gulf Conference on Environment and Pollution, (Kuwait Foundation for the Advancement of Science).

Hunter, J.R. 1982. The physical oceanography of the Arabian Gulf: A review and theoretical interpretation of previous observations. Paper presented at the First Gulf Conference on Environment and Pollution, Kuwait. February 7-9, 1982, 23 p.

Hussain, M., 2011. Origin of water and solutes in inland and coastal sabkhas of Eastern Saudi Arabia, M.S. Thesis, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, 126 p.

Hutchings, P. 1998. Biodiversity and functioning of polychaetes in benthic sediments. *Biodiversity and Conservation* 7: 1133-1145.

Hyrenbach, K.D. and Veit, R.R. 2003. Ocean warming and seabird communities of the California Current System: Response at multiple temporal scales. *Deep-Sea Research II* 50(14-16): 2537-2565.

ICES (International Council for the Exploration of the Sea). 2013. Report of the Workshop to Review and Advise on Seabird Bycatch (WKBYCS), October 14-18, 2013, Copenhagen, Denmark. ICES CM 2013/ACOM 77: 1-79.

ICES. 2000. Zooplankton methodology manual. Harris, R., Wiebe, P.H., Lenz, J., Skjoldal, H.R. and Huntley, M. (eds.). Publ. Academic Press, 684 p.

IDA Desalination Year Book. 2014-2015. Water Desalination Report. Media Analytics Ltd., Oxford, U.K.

Ieno, E.N., Solan, M., Batty, P. and Pierce, G.J. 2006. How biodiversity affects ecosystem functioning: Roles of infaunal species richness, identity and density in the marine benthos. *Marine Ecology Progress Series* 311, pp. 263-271.

Intergovernmental Panel on Climate Change (IPCC) AR4. 2007. Summary for policymakers, pp. 1-18, in Solomon, S. and Manning, M. (eds.). Climate change 2007: The physical science basis. Contributions of Working Group 1 to the 4th Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

International Desalination Association (IDA). 2011. Desalination and the environment blue paper, special publication, 20 p.

International Maritime Organisation (IMO). 2002. MARPOL 73/78, consolidated edition.

IPCC (Intergovernmental Panel on Climate Change). 2002. Climate change and biodiversity. IPCC Technical Paper V. United Nations Convention on Biological Diversity.

IPCC. 2007. Contribution of Working Group I to the 4th assessment report of the intergovernmental panel on climate change, Cambridge University Press, 996 p.

IPCC. 2007. Fourth assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge and New York.

IPCC. 2007b. Summary for Policymakers, pp. 7-22, in Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the 4th Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, U.K.

IPCC. 2007a. Climate change 2007: The physical science basis, p. 996, in Contribution of Working Group I to the 4th Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, U.K. and New York, NY.

Ismail, A.M. and El-Ghazaly, G.A. 1990. Phenological studies on Zygophyllum qatarense Hadid from contrasting habitats. *Journal of Arid Environments* 18: 195-205.

IUCN (International Union for Conservation of Nature and Natural Resources). 2007. Species Extinction — the facts. CMS.IUCN.org/ downloads/species_extinction_ 05 _2007.pdf. Accessed September 2014.

IUCN. 2004. IUCN Evaluation of nominations of natural and mixed properties to the World Heritage List. Report to the World Heritage Committee 28th session June 28-July 7, 2004 — Suzhou, China Convention Concerning the Protection of the World Cultural and Natural Heritage. WHC-04/28.COM/INF.14B.

IUCN. 1987a. The Red Sea, Saudi Arabia: An analysis of coastal and marine habitats of the Saudi Arabian Red Sea. Report to MEPA, Jiddah.

IUCN. 1987b. The Arabian Gulf, Saudi Arabia: An assessment of biotopes and management requirements for the Saudi Arabian Gulf coastal zone. Report to MEPA, Jiddah.

IUCN. 1988. Coral reefs of the world, Indian Ocean, Red Sea and Gulf. IUCN/UNEP, Vol. 2.

IUCN, 2010. IUCN Environmental Policy and Law Paper No. 81. Guidelines for Protected Areas Legislation. Barbara Lausche. IUCN, Gland, Switzerland in collaboration with the IUCN Environmental Law Centre, Bonn, Germany.

IUCN. 2012. The IUCN Red List of Threatened Species. Species accounts. viewed April 2013, <http://www.iucnredlist.org>.

IUCN. 2014. Chelonia mydas. http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T4615A110 37468.en.

IUCN. 2015. Red List of Threatened Species. Version 2015-3. Individual Species Accounts <www.iucnredlist.org>. Accessed April 2015.

IUCN/MEPA. 1987. Arabian Gulf. Saudi Arabia: An assessment of biotopes and coastal zone management requirements for the Arabian Gulf. MEPA Coastal and Marine Management Series, Report No. 5, IUCN, Gland.

IUCN/UNEP. 1985. The management and conservation of renewable marine resources in the Indian Ocean region in the Kuwait Action Plan Region. UNEP Regional Seas Reports and Studies No. 63, 63 p.

IUCN/UNEP. 1988. Coral reefs of the world. Vol. II: Indian Ocean, Red Sea and Gulf. IUCN/UNEP.

Izumo, T., Montegut, C.D., Luo, J.J., Behera, S.K., Masson, S. and Yamagata, T. 2008. The role of the Western Arabian Sea upwelling in Indian monsoon rainfall variability. *J. Clim.* 21: 5603-5623.

Jackson, J.B.C., Cubit, J.D., Keller, B.D., Batista, V., Burns, K., Caffey, H.M., Caldwell, R.L., Garrity, S.D., Getter, C.D., Gonzalez, C., Guzmán, H.M., Kaufman, K.W., Knap, A.H., Levings, S.C., Marshall, M.J., Steger, R., Thompson, R.C. and Weil, E. 1989. Ecological effects of a major oil spill on Panamanian coastal marine communities. *Science* 243: 37-44.

Jackson, J.B.C., Kirby, M.X., Berger, W.H., Bjorndal, K.A., Botsford, L.W., Bourque, B.J., Bradbury, R.H., Cooke, R., Erlandson, J., Estes, J.A., Hughes, T.P., Kidwell, S., Lange, C.B., Lenihan, H.S., Pandolfi, J.M., Peterson, C.H., Steneck, R.S., Tegner, M.J. and Warner, R.R. 2001. Historical overfishing and the recent collapse of coastal ecosystems. *Science* 293: 629-638.

Jackson, S., Maqubela, S. and Govender, P. 2002. Investigation into the relationship between chlorine levels in final effluents and toxic effects in the receiving water. Proceedings of the Biennial Conference of the Water Institute of South Africa, Durban, South Africa, May 19-22.

Jackson, M., Eadsforth, C., Schowanek, D., Delfosse, T., Riddle, A. and Budgen, N. 2016. Comprehensive review of several surfactants in marine environments: Fate and ecotoxicity. *Environmental Toxicology and Chemistry* 35(5): 1077-1086.

Jacob, P.G. 1979. Report on chlorophylla, phytoplankton and zooplankton investigations in the coastal waters of Kuwait. Kuwait Institute of Scientific Research, Technical Report, 49 p.

Jacob, P.G. and Al-Muzaini, S. 1990. Marine plants of the Arabian Gulf: A literature review: Technical report. Safat, Kuwait: Kuwait Institute for Scientific Research.

Jacob, P.G. and Al-Muzaini, S. 1995. Marine plants of the Arabian Gulf and effects of oil pollution. *Mahasagar* 28(1-2): 83-101.

Jacob, P.G., Zarba, M.A. and Anderlini, V. 1979. Hydrography, chlorophyll and plankton of the Kuwaiti coastal waters. *Indian J. Mar. Sci.* 8: 150-154.

Jacobs, R.P.W.M. and Dicks, B. 1985. Seagrasses in the Zeit Bay area and at Ras Gharib (Egyptian Red Sea coast). *Aquatic Botany* 23: 137-147.

Jain, S.P. and Polman, W. 2003. A handbook for trainers on participatory local development: The Panchayati Raj model in India. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand.

James, A. and Little, A.L. 1994. Geotechnical aspects of sabkha at Jubail, Saudi Arabia. *Q.J. Eng. Geol. London* 27: 83-121.

Jameson, S.C., McManus, J.W. and Spalding, M.D. 1995. State of the reefs: Regional and global perspectives. International Coral Reef Initiative Executive Secretariat Background Paper, United States Department of State.

Jansson, B.O. 1967. The significance of grain size and pore water content for the interstitial fauna of sandy beaches. *Oikos* 18: 311-322.

Jawad, L.A. 2006. Fishing gear and methods of the lower Mesopotamian plain with reference to fishing management. *Marina Mesopotamica Online* 1: 1-39.

Jefferson, T.A. and Karzemarski, L. 2001. "Sousa chinensis." *Mammalian Species* 655: 1-9.

Jeffreys, R.M., Wolff, G.A. and Cowie, G.L. 2009. Influence of oxygen on heterotrophic reworking of sedimentary lipids at the Pakistan margin. *Deep-Sea Research II* 56: 358-375.

Jennings, M.C. 2010. Atlas of the breeding birds of Arabia, in Büttiker, W., Krupp, F., Nader, I. and Schneider, W. (eds.). Fauna of Arabia, Vol. 25. National Commission for Wildlife Conservation and Development, Riyadh, Pro Entomologia, c/o National History Museum, Basle, Switzerland and Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt aM, Germany.

Jewett, S.C., Dean, T.A, Smith, R.O. and Blanchard, A. 1999. *Exxon Valdez* oil spill: Impacts and recovery in the soft-bottom benthic community in and adjacent to eelgrass beds. *Marine Ecology Progress Series* 185: 59-83.

JICA/MEPA. 1999. Environmental assessment and monitoring of Arabian Gulf in the Kingdom of Saudi Arabia. Chiyoda-Dames and Moore Co., Japan.

Johannes, R.E., Wiebe, W.J., Crossland, C.J., Rimmer, D.W. and Smith, S.V. 1983. Latitudinal limits on coral reef growth. *Marine Ecol. Prog. Ser.* 11: 105-111.

John, D. and George, D. 2006. The shore and shallow seas, pp. 123-131, in Hellyer, P. and Aspinall, S. (eds.). The Emirates: A natural history. Trident Press, Environment Agency, Abu Dhabi.

John, D.M. 2002. Macroalgae associated with Sabkha, pp. 239-245, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

John, D.M. 2012. Marine algae (seaweeds) associated with coral reefs in the Gulf, pp. 309-336, in Riegl, B.M. and Purkis, S.J. (eds.). Coral reefs of the Gulf — Adaptation to climatic extremes. Springer, New York.

John, V., Coles, S. and Abozed, A. 1990. Seasonal cycles of temperature, salinity and water masses of the western Arabian Gulf. *Oceanologica Acta* 13(3): 273-281.

Johns, W.E, Jacob, G.A., Kindle, J.C., Murray, S.B. and Carron, M. 1999. Arabian marginal seas and gulfs, in University of Miami RSMAS Technical Report 2000-01, Report of a workshop held at Stennic Space Centre, May 11-13, Mississippi, USA.

Johnsgard, P.A. 1993. Cormorants, darters, and pelicans of the World. Smithsonian Institution Press, Washington, D.C., 445 p.

Johnson, A.U. and Babcock, R.C. 1994. Temperature and the larval ecology of the crown-of-thorns starfish Acanthaster planci. *Biological Bulletin* 187(3): 304-308.

Johnson, D.H., Kamal, M.R., Pierson, G.O. and Ramsay, J.B. 1978. Sabkhahs of Eastern Saudi Arabia, p. 334, in Al-Sayari, S.S. and Zotl, J.G. (eds.). Quaternary period in Saudi Arabia. Springer-Verlag, New York.

Johnson, R.G. 1977. Vertical variation in particulate matter in the upper 20 centimeters of marine sediments. *Journal of Marine Research* 35: 273-282.

Johnstone, I. and Hudson, B.E.T. 1981. The dugong diet: Mouth sample analysis. *Bull Mar Sci*. 31: 681-690.

Jokiel, P.L. and Coles, S.L. 1974. Effects of heated effluent on hermatypic corals at Kahe Point, Oahu. *Pac. Sci*. 28: 1-18.

Jokiel, P.L. and Coles, S.L. 1977. Effects of temperature on the mortality and growth of Hawaiian reef corals. *Marine Biology* 43: 301-208.

Jokiel, P.L. and Maragos, J.E. 1978. Reef corals of Canton Island. *Atoll Res. Bulletin* 221: 71-97.

Jones, D.A. 1986. A field guide to the sea shores of Kuwait and the Arabian Gulf, pp. 1-192, Blanford Press, London.

Jones, D.A. and Richmond, M.D. 1992. Intertidal and subtidal. Marine habitat surveys, pp. 134-160, in Krupp, F. (ed.). Establishment of a marine habitat and wildlife sanctuary for the Gulf Region, Final report for phase 1, Jubail and Frankfurt.

Jones, D.A., Ealey, T., Baca, B., Livesey, S. and Al-Jamali, F. 2007. Gulf desert developments encompassing a marine environment, a compensatory solution to the loss of coastal habitats by infill and reclamation: The case of the Pearl City Al-Khiran, Kuwait. *Aquatic Ecosystem Health and Management* 10: 268-276.

Jones, D.A., Plaza, J., Watt, I. and Al Sanei, M. 1998. Long-term (1991-1995) monitoring of the intertidal biota of Saudi Arabia after the 1991 Gulf War oil spill. *Mar. Pollution Bull.* 36(6): 472-489.

Jones, D.A., Price, A.R.G. and Hughes, R.N. 1978. Ecology of the high saline lagoons Dawhat as Sayh, Arabian Gulf, Saudi Arabia. *Estuarine and Coastal Marine Science* 6: 253-262.

Jones, D.A., Price, A.R.G., Al-Yamani, F. and Al-Zaidan, A. 2002. Coastal and marine ecology, pp. 65-103, in Khan, N.Y., Munawar, M. and Price, A.R., (eds.). The Gulf ecosystem: Health and sustainability. Backhuys Publishers, Leiden, the Netherlands.

Jones, D.A., Watt, I., Plaza, J. and Woodhouse, T.D. 1996. Natural recovery of the intertidal biota within the proposed marine habitat and wildlife sanctuary for the Gulf (Saudi Arabia) after the 1991 Gulf War oil spill, pp. 138-158, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt, Germany.

Jones, D.A., Watt, I., Woodhouse, T.D. and Richmond, M.D. 1994. Intertidal recovery in the Dawhat ad-Dafi and Dawhat al-Musallamiya region (Saudi Arabia) after the Gulf War oil spill. *Courier Forschungsinstitut Senckenberg* 166: 27-33.

Jones, G.P., Ferrell, D.J. and Sale, P.F. 1991. Fish predation and its impact on the invertebrates of coral reefs and adjacent sediments, pp. 156-179, in Sale, P.F. (ed.). The ecology of fishes on coral reefs. Academic Press, San Diego, CA, USA.

Jones, H. 1932. Strabo: Geography. Loeb Classical library, Harvard.

Jones, N.S. 1950. Marine bottom communities. *Biological Reviews* 25: 283-313.

Joydas, T.V., Krishnakumar, P.K., Qurban, M.A., Ali, S.A., Al-Suwailem, A. and Al-Abdulkader, K. 2011. Status of macrobenthic community of Manifa-Tanajib Bay System of Saudi Arabia based on a once-off sampling event. *Marine Pollution Bulletin* 62: 1249-1260.

Joydas, T.V., Qurban, M.A., Al-Suwailem, A., Krishnakumar, P.K., Nazeer, Z. and Cali, N.A. 2012. Macrobenthic community structure in the northern Saudi waters of the Gulf, 14 years after the 1991 oil spill. *Marine Pollution Bulletin* 64: 325-335.

Joydas, T.V., Qurban, M.A., Manikandan, K.P., Ashraf, T.T.M., Ali, S.M., Al-Abdulkader, K., Qasem, A. and Krishnakumar, P.K. 2015. Status of macrobenthic communities in the hypersaline waters of the Gulf of Salwa. *Arabian Gulf. Journal of Sea Research* 99: 34-46.

Juillie, Y. and Sherwood, D.E. 1986. Improvement of Sabkhas soil of the Arabian Gulf coast, pp. 781-788.

Junemann, J.V., Lamboeuf, M., Simmonds, E.J., Scheffers, W.J. and Sivasubramaniam, K. 1981. Pelagic resources of the Gulf and Gulf of Oman. Report to the FAO, Rome, Italy, 157 p.

Jupp, B.P., Durako, M.J., Kenworty, W.J., Thayer, G.W. and Schillak, L. 1996. Distribution, abundance, and species composition of seagrasses at several sites in Oman. *Aquatic Botany* 53: 199-213.

Kaiser, M.J., Collie, J.S., Hall, S.J., Jennings, S. and Pioner, I.R. 2002. Modification of marine habitat by trawling activities: Prognosis and solution. *Fish and Fisheries* 3: 114-136.

Kaluza, P., Kölzsch, A., Gastner, M. and Blasius, B. 2010. The complex network of global cargo ship movements. *Journal of the Royal Society Interface* 7(48): 1093-1103.

Kamdan, A. 2000. Review of the marine kills events in the ROPME Sea Area. Workshop on Harmful Algal Bloom (Red Tide) in ROPME Sea Area. Regional Organization for the Marine Environment, Kuwait.

Kämpf, J. and Sadrinasab, M. 2006. The circulation of the Persian Gulf: A numerical study. *Ocean Sci*. 2: 27-41.

Kaniewska1, P., Campbell, P.R., Fine, M. and Hoegh-Guldberg, O. 2009. Phototropic growth in a reef flat acroporid branching coral species. *J. Exp. Biol*. 212: 662-667.

Kaplan, R.H., Welker, J.R., Kraus, M.G. and McCourt, S. 1975. Some factors affecting the colonisation of a dredged channel. *Marine Biology* 32: 193-204.

Karczmarski, L. 1999. Group dynamics of humpback dolphins (Sousa chinensis) in the Algoa Bay region, South Africa. *Journal of Zoology* 249: 283-293.

Karczmarski, L., Cockcroft, V.G. and McLachlan, A. 2000. Habitat use and preferences of Indo-Pacific humpback dolphins Sousa chinensis in Algoa Bay, South Africa. *Marine Mammal Science* 16(1): 65-79.

Katakura, N., Jokadar, Z., Katsui, H., Lenehan, S., Plowman, M. and Takayama, Y. 2008. Research on seagrass growth and its transplantation in subtropical water area. Proceedings of the PIANC-COPEDEC VII Conference, February 24-28, 2008, Paper No. 224, Dubai, UAE.

Kay, R.C. and Alder, J. 2005. Coastal planning and management. London, E&F Spon., 380 p.

Keck, R., Maurer, D. and Watling, L. 1973. Tidal stream development and its effect on the distribution of the American oyster. *Hydrobiology* 42: 369–379.

Keith, M., Peddemors, V.M., Bester, M.N. and Ferguson, J.W.H. 2002. Population characteristics of Indo-Pacific humpback dolphins at Richards Bay, South Africa: Implications for incidental capture in shark nets. *South African Journal of Wildlife Research* 32(2): 153–162.

Kelleher, G. and Phillips, A. 1999. Guidelines for marine protected areas. World Commission on protected areas of IUCN. The World Conservation Union, Switzerland.

Kemp, A.L.W. 1971. Organic carbon and nitrogen in the surface sediments of Lake Ontario, Eric and Huron. *Journal of Sediment Petrology* 4: 537–548.

Kemp, W.M., Boynton, W.R., Adoli, J.E., Boesch, D.F., Boicourt, W.C., Brush, G., Cornwell, J.C., Fisher, T.R., Glibert, P.M., Hagy, J.D., Harding, L.W., Houde, E.D., Kimmel, D.G., Miller, W.D., Newell, R.I.E., Roman, M.R., Smith, E.M. and Stevenson, J.C. 2005. Eutrophication of Chesapeake Bay:historical trends and ecological interactions. *Marine Ecology Progress Series* 303: 1–19.

Kendall, C.G. and Skipwith, S.P. 1968. Recent algal mats of a Persian Gulf lagoon. *J. Sed. Petrology* 38: 1040–1058.

Kennedy, H., Beggins, J., Duarte, C.M., Fourqurean, J.W., Holmer, M., Marbà, N. and Middelburg, J.J. 2010. Seagrass sediments as a global carbon sink: Isotopic constraints. *Global Biogeochemical Cycles* 24, DOI: 10.1029/2010GB003848.

Kennelly, S.J. 1995. The issue of bycatch in Australia's demersal trawl fisheries. *Review in Fish Biology and Fisheries* 5: 213–234.

Kennett, D.J. and Kennett, J.P. 2007. Influence of holocene marine transgression and climate change on cultural evolution in southern Mesopotamia, pp. 229–264, in Anderson, D.G., Maasch, K.A. and Sandweiss, D.H. (eds.). Climate change and cultural dynamics: A global perspective on mid-holocene transitions. Elsevier.

Kenny, A.J. and Rees, H.L. 1994. The effects of marine gravel extraction on the macrobenthos: Early post dredging recolonization. *Mar Poll Bull.* 28(7): 442–447.

Kenny, A.J. and Rees, H.L. 1996. The effects of marine gravel extraction on the macrobenthos: Results, 2 Years Post-Dredging. *Mar Poll Bull.* 32: 615–622.

Kenworthy, W.J., Durako, M.J., Fatemy, S.M.J., Valavi, H. and Thayer, G.W. 1993. Ecology of seagrasses in northeastern Saudi Arabia one year after the Gulf War oil spill. *Marine Pollution Bulletin* 27: 213–222.

Kassler, P. 1973. The structural and geomorphic evolution of the Persian Gulf, in Purser, B.H. (ed.). The Persian Gulf. Springer, Berlin, Heidelberg.

KFUPM/RI. 1982. Final report. Trace metals in marine sediments and water columns in Saudi Arabian coastal areas of the Arabian Gulf. Prepared for the Arabian American Oil Company by Water and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24011.

KFUPM/RI. 1983. Trace metals in marine sediments and water columns in Saudi Arabian coastal areas of the Arabian Gulf. Prepared by the Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. 24011.

KFUPM/RI. 1984. Saudi Aramco sustaining research project — Marine environmental studies I, 1984–1990. No. 24079.

KFUPM/RI. 1986. Aramco sustaining research project — Environmental studies. First Annual Report 1984/85. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1987. Northern area biological study 1985/86. Final report prepared for Arabian American Oil Company Environmental Unit, Dhahran, Saudi Arabia. Project No. 24059.

KFUPM/RI. 1987a. Aramco sustaining research project — Environmental studies, second annual report 1985/86. Prepared for the Arabian Oil Company by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. 187 p. and Appendices.

KFUPM/RI. 1987b. Aramco sustaining research project: Environmental studies, Appendices, Vol. II — Oceanography 1986/87. Third annual report to the Arabian American Oil Company by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1987b. Currents, temperature, conductivity and salinity data obtained at Safaniyah and temperature data from Manifa pier. Prepared for the Arabian American Oil Company by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

KFUPM/RI. 1987c. Aramco sustaining research project: Environmental studies, Vol. I — Tarut Bay biotopes investigation 1986/87. Third annual report to the Arabian American Oil Company by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1987. Aramco sustaining research project: Environmental studies. Vol. I — Tarut Bay biotopes investigation 1986/87. Third annual report prepared for Arabian American Oil Company by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. 24079.

KFUPM/RI. 1988. MEPA/ROPME Pilot research and monitoring program, Vol. III — Coral reef studies. Final report to the Australian Trade Commission by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24066.

KFUPM/RI. 1988. Aramco sustaining research project — Environmental studies. Third Annual Report 1986/87. Vol. I, Tarut Bay biotopes investigation. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079, 209 p. and Appendices.

KFUPM/RI. 1988. Aramco sustaining research project — Environmental studies. Third annual report 1986/87. Vol. II: Oceanographic investigation. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, 209 p. and Appendices.

KFUPM/RI. 1988. Marine monitoring and baseline survey, Vol. II: Offshore benthos studies, prepared for Meteorology and Environmental Protection Administration of Saudi Arabia and the Regional Organization for the Protection of the Marine Environment, prepared by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. 24066.

KFUPM/RI. 1988. MEPA/ROPME Pilot research and monitoring program, Vol. VI: Zooplankton and intertidal studies. Final report to the Australian Trade Commission by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24066.

KFUPM/RI. 1988a. Marine environmental effects of the Abu Ali-Berri Causeway Extension. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24108.

KFUPM/RI. 1988a. Final report. Marine monitoring and baseline survey, Vol. IV, Oceanographic studies. Prepared for the Australian Trade Commission by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24066.

KFUPM/RI. 1988b. Aramco sustaining research project — Environmental studies. Third annual report 1986/87. Vol. I, Tarut Bay biotopes investigation. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079, 209 p. and Appendices.

KFUPM/RI. 1988b. MEPA/ROPME pilot research and monitoring program, Vol. III, Coral reef studies. Final report to the Australian Trade Commission by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24066.

KFUPM/RI. 1988c. Aramco sustaining research project — Environmental studies. Third annual report 1986/87. Vol. II, Oceanographic investigation. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1988d. Marine environmental effects of the Abu Ali-Berri Causeway Extension. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24108.

KFUPM/RI. 1988d. Aramco sustaining research project — Environmental studies. Third annual report 1986/87. Vol. II, Oceanographic Investigation. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, 209 p. and Appendices.

KFUPM/RI. 1990b. Final report: Aramco sustaining research project — Environmental studies, Vol. I, Overview summary and conclusions. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990a. Final report: Aramco sustaining research project — Environmental studies, Vol. II, Tarut Bay biotopes investigation Seagrass and sand benthos. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990b. Final report: Aramco sustaining research project — Environmental studies, Vol. III, Tarut Bay biotopes investigation Plankton and fisheries. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990c. Final report: Aramco sustaining research project — Environmental studies, Vol. IV, Tarut Bay biotopes investigation Mangrove communities. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990a. Final report: Aramco sustaining research project — Environmental studies, Vol. V, Oceanographic investigation — Coastal bay and offshore circulation. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990b. Final report: Aramco sustaining research project — Environmental studies, Vol. VI, Oceanographic investigation — Coastal and offshore hydrography. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990c. Final report: Aramco sustaining research project — Environmental studies, Vol. VII, Hydrodynamic models for wind-driven and tidal circulation in the Arabian Gulf. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990d. Final report: Aramco sustaining research project — Environmental studies, Vol. VIII, Simulation models of pollutant fate and transport in the Arabian Gulf. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990e. Final report: Aramco sustaining research project — Environmental studies, Vol. IX, Offshore meteorology — Manifa and Zuluf. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990f. Final report: Aramco sustaining research project — Environmental studies, Vol. X, Oceanographic investigation — Waves and tides. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990d. Final report: Aramco sustaining research project — Environmental studies, Vol. X, Oceanographic investigation Waves and tides. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990k. Final report: Aramco sustaining research project — Environmental studies, Vol. XI, Biogeochemical investigations. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1990. Aramco sustaining research project — Environmental studies — Tarut Bay biotopes investigation: Seagrass and sand benthos. Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

KFUPM/RI. 1990. Saudi Aramco sustaining research project — Marine environmental studies II, 1990-1994. No. 24131.

KFUPM/RI. 1990g. Final report: Environmental impact assessment for the proposed installation of the offshore Safaniyah GOSP-4 and associated facilities, Vol. I, Text. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24129.

KFUPM/RI. 1991. Gulf oil spill 1991 — Arabian Gulf oil spill research program. Prepared for the Meteorology and Environmental Protection Administration by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24138.

KFUPM/RI. 1991. Aramco sustaining research project — Environmental studies. Vol. I, Overview: summary and conclusions. Prepared for the Arabian American Oil Company by Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24079.

KFUPM/RI. 1991a. Annual progress report: Sustaining research project — Marine environmental studies. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1991b. Interim report: Gulf oil spill 1991 — Arabian Gulf oil spill research program. Prepared for the Meteorology and Environmental Protection Administration by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24138.

KFUPM/RI. 1992. Annual progress report: Sustaining research project — Marine environmental studies. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1993. Ras Tanura refinery upgrade program: Marine environmental impact assessment. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24142.

KFUPM/RI. 1994. Final report: Aramco sustaining research project — Marine environmental studies, Vol. II, Dredging impact investigations. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994a. Final report: Aramco sustaining research project — Marine environmental studies, Vol. II, Dredging impact investigations. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994b. Final report: Aramco sustaining research project — Marine environmental studies, Vol. III, Abu Ali Causeway Impact Investigations. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994. Final report: Aramco sustaining research project — Marine environmental studies. Vol. V. Coral reef investigations. Prepared for Saudi Aramco, by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994c. Final report: Aramco sustaining research project — Marine environmental studies, Vol. VI, Outfall Investigations. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994d. Final report: Aramco sustaining research project — Marine environmental studies, Vol. VII, Platform investigations. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994e. Final report: Aramco sustaining research project — Marine environmental studies, Vol. VIII, Hydrodynamic models for tidal, Wind-driven, and density-driven circulation in the Arabian Gulf. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994f. Final report: Aramco sustaining research project — Marine environmental studies, Vol. IX, Pollutant and sediment transport models. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI. 1994g. Final report: Aramco sustaining research project — Marine environmental studies, Vol. X, Thermal and brine models for the Arabian Gulf. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24131.

KFUPM/RI 1994. Sustaining research project — Marine environmental studies. Final report prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW24131.

KFUPM/RI. 1994. Sustaining research project — Marine environmental studies, Final Report prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW24131.

KFUPM/RI. 1996. Annual progress report: Sustaining research project — Marine environmental studies. First annual report. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24154.

KFUPM/RI. 1997. Annual progress report: Sustaining research project — Marine environmental studies. Second annual report. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24154.

KFUPM/RI. 1998. Annual progress report: Sustaining research project — Marine environmental studies. Third annual report. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24154.

KFUPM/RI. 1999. Annual progress report: Sustaining research project — Marine environmental studies. Fourth annual report. Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24154.

KFUPM/RI. 2000. Final report. Development of Red Sea biotope maps using Remote sensing imagery. Prepared for Saudi Aramco Environmental Protection Department by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24164.

KFUPM/RI. 2001. Final report: Sustaining research project — Marine environmental studies. Phase III, Vol IV, Sustaining research investigation Biological investigations: Coral reef monitoring, primary productivity, mangrove transplantation. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24154.

KFUPM/RI. 2001a. Final report: Sustaining research project — Marine environmental studies. Phase III, Vol I, Sustaining research investigation — Monitoring of cooling water discharges [RT Refinery, Safaniyah GOSP-4] — Sediment Transport [Abu Ali Bay]. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. 24154.

KFUPM/RI. 2001b. Final report: Sustaining research project — Marine environmental studies. Phase III, Vol II, Sustaining research investigation — Environmental impact assessment of offshore produced water. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. 24154.

KFUPM/RI. 2001c. Final report: Sustaining research project — Marine environmental studies. Phase III, Vol. III, Sustaining research investigation — Impacts of offshore drill cuttings disposal. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. 24154.

KFUPM/RI. 2001d. Final report: Sustaining research project — Marine environmental studies. Phase III, Vol. IV, Sustaining research investigation — Biological investigations: Coral reef monitoring, primary productivity, mangrove transplantation. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 24154.

KFUPM/RI. 2001e. Final report. Duba terminal permanent berth [BI-8232] Prelimniary environmental assessment. Prepared for Lummus Alireza Ltd. Co. by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. CEW 2224.

KFUPM/RI. 2001f. Final report. Environmental impact assessment for Abu Safah Offshore AM producing [300 MBCD] facilities project [BI-3028]. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. CEW2236.

KFUPM/RI. 2002. Investigation of pollutant problems in Dammam Corniche water. Prepared for the Directorate of Dammam by Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, Report Project.

KFUPM/RI. 2002a. Environmental impact assessment for the master plan for marine works and coastal reclamation in the Al Khafji joint operations concession area. Prepared for the Environmental Health and Safety QTP Department, Al Khafji Joint Operations, Jiddah, Saudi Arabia by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2255.

KFUPM/RI. 2002b. Final report: Sustaining research project — Marine environmental studies. Phase IV. Vol. 1–V. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. 24154.

KFUPM/RI. 2003a. Final report: Coral reef survey in support of the marine and coastal damage assessment (OSDA). Prepared for the Presidency for Meteorology and Environment, by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2257.

KFUPM/RI. 2003b. Final report: Oceanographic survey in support of the marine and coastal damage assessment OSDA). Prepared for the Presidency for Meteorology and Environment by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2256.

KFUPM/RI. 2004a. Final report: Offshore MP facilities Qatif 15 KV Cable BI-8294) Environmental impact assessment. Prepared for the Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2278.

KFUPM/RI. 2004b. Duba Marine Terminal BI-8232) — Environmental impact assessment for the construction and removal of temporary roads. Prepared for the Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2259.

KFUPM/RI. 2005. Final report: Environmental impact assessment for Manifa field development (nafd/l-001-06): Causeway construction. Prepared for the Arabian American Oil Company by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

KFUPM/RI. 2005a. Environmental assessment of the breakwaters in the Aziziyah area. Prepared for the Saad Trading and Contracting Company, Al-Khobar, Saudi Arabia. Prepared by the Center for Environment and Water, KFUPM/RI, July 2005. Project No. CEW2304.

KFUPM/RI. 2005b. Final report: Environmental impact assessment North Safaniyah artificial lift [BI-10-00047]. Prepared for the Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2285.

KFUPM/RI. 2006. Environmental impact assessment for Manifa field development (Nafd/L-001-06): Causeway construction and dredging. Prepared for Saudi Aramco, Dhahran, Saudi Arabia.

KFUPM/RI. 2006a. Final report: Environmental impact assessment for Manifa field development (NAFD/L-001-06): Causeway construction and dredging. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2328.

KFUPM/RI. 2006a. Section 2: Physical oceanography. pp. 25-97. In: Oceanographic survey in support of the marine and coastal damage assessment (Project Number CEW2256), Final report, Vol. 1. Prepared for Presidency of Meteorology and Environment (Dammam, Saudi Arabia) by the Center for Environment and Water, King Fahd University of Petroleum and Minerals. Submitted through Saudi Company for Environmental Works Ltd. (Al-Khobar, Saudi Arabia), Dhahran.

KFUPM/RI. 2006a. Study of Al-Khafji seawater quality and marine habitats (Project No. CEW2293). Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

KFUPM/RI. 2006b. Study of Al-Khafji seawater quality and marine habitats. Prepared for Al-Khafji joint operations by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2293.

KFUPM/RI. 2006a. Study of Al-Khafji seawater quality and marine habitats. Final report prepared for Al-Khafji joint operations by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2293.

KFUPM/RI. 2006b. Environmental impact assessment for Manifa field development (NAFD/L-001-06): Causeway construction recommended causeway configuration for engineering design scoping (Project No. CEW2328). Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

KFUPM/RI. 2006b. Section 3: Chemical oceanography, pp. 98-180, in: Oceanographic survey in support of the marine and coastal damage assessment (Project Number CEW2256), Final report, Vol. 1. Prepared for Presidency of Meteorology and Environment (Dammam, Saudi Arabia) by the Center for Environment and Water, King Fahd University of Petroleum and Minerals. Submitted through Saudi Company for Environmental Works Ltd. (Al-Khobar, Saudi Arabia), Dhahran.

KFUPM/RI. 2006c. Environmental risk and damage assessment of small scale oil spill off the Al-Jubail coast, Arabian Gulf. Prepared for Saudi Aramco Shell Refinery Company SASREF) by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2301.

KFUPM/RI. 2006c. Section 5.3: Phytoplankton, pp. 280-343. In: Oceanographic survey in support of the marine and coastal damage assessment (Project No. CEW2256), Final report, Vol. 1. Prepared for Presidency of Meteorology and Environment (Dammam, Saudi Arabia) by the Center for Environment and Water, King Fahd University of Petroleum and Minerals. Submitted through Saudi Company for Environmental Works Ltd. (Al-Khobar, Saudi Arabia), Dhahran.

KFUPM/RI. 2006d. Preliminary environmental assessment of marine ecology at the Qurayyah seawater treatment plant. Prepared for the SNC-Lavalin Inc. by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2327.

KFUPM/RI. 2006e. Final report: Environmental baseline survey for proposed central processing facilities at Khurais Prepared for Saudi Company for Environmental Works Ltd. Al-Khobar by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2321.

KFUPM/RI. 2006f. Final report: Duba marine terminal permanent berth (BI-8232) Marine environmental impact assessment and monitoring study. Prepared for Saudi Company for Environmental Works Ltd. Al-Khobar by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2259.

KFUPM/RI. 2006g. Environmental impact assessment of decommissioning a portion of the breakwaters at Aziziyah, Arabian Gulf. Prepared for Saad Trading and Contraction Company by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2304.

KFUPM/RI. 2006h. Environmental impact assessment for the BerRI. Causeway and associated drill site landfilling. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2303.

KFUPM/RI 2006b. Environmental impact assessment for Manifa Field development (NAFD/L-001-06): Causeway construction recommended Causeway configuration for engineering design scoping. Final report prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2328.

KFUPM/RI. 2007. Final report on "Oceanographic survey in support of the marine and coastal damage assessment (II): Fisheries, ecosystem analysis, databases and references." Prepared for Presidency of Meteorology and Environment, Dammam, Saudi Arabia. Report Project No. CEW2256.

KFUPM/RI. 2007b. Environmental impact assessment for Manifa field development (NAFD/L): Causeway construction and dredging. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2338.

KFUPM/RI. 2007c. Environmental impact assessment for Manifa field development: platforms, pipelines and submarine cables (BI-10-00452 and BI-10-00453). Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2338.

KFUPM/RI. 2007d. Environmental baseline survey: Manifa central processing facilities (MCPF). Prepared for A. Al-Saihati, A. Fattani and O. Al Othman Consulting Engineering Co., Al-Khobar, Saudi Arabia by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2341.

KFUPM/RI. 2007e. Environmental impact assessment for Tanajib channel and basin dredging. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2350.

KFUPM/RI. 2007. Sustaining research project, marine environmental studies — Phase IV, Chapter II, Arabian Gulf coral reef monitoring. Final report prepared for Saudi Aramco, by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2233.

KFUPM/RI. 2007f. Final report: Study of Al-Khafji seawater quality and marine habitats. Prepared for Al-Khafji Joint Operations, Al-Khafji, Saudi Arabia by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2293.

KFUPM/RI. 2007a. Final report. Environmental impact assessment for the New Arabia-Bahrain pipeline (BI-10-01110). Prepared for the Arabian American Oil Company by Water and Environment Division, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. CEW 2331.

KFUPM/RI. 2008. Final report: Sustaining research project — Marine environmental studies. Phase IV, Vol. I, Sustaining research investigation — Study of water quality and eutrophication in Saudi Gulf coastal waters. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. CEW2233.

KFUPM/RI. 2008. The marine capture fisheries of the Saudi Arabian Gulf. White, S.T., Al-Suwailem, A.M. and Vivekanandan, E.V. (eds.). Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

KFUPM/RI. 2008. Environmental impact assessment for Karan platforms, power (Bi-10-00579) and pipelines (Bi-10-00580) construction. Final report submitted to Saudi Aramco, Dhahran, by Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project Number CEW 2357.

KFUPM/RI. 2008a. Environmental impact assessment for Karan platforms, power (BI-1-00579) and pipelines (BI-10-00580). Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2357.

KFUPM/RI. 2008b. Final report. Saudi Aramco/KFUPM-RI sustaining research project — Marine environmental studies — Phase IV — Arabian Gulf coral reef monitoring. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. 2233.

KFUPM/RI. 2009a. Environmental impact study for channel dredging at Safaniyah. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2360.

KFUPM/RI. 2009b. Environmental impact assessment for the Ras Tanura refinery expansion project — Landfilling and dredging. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2370.

KFUPM/RI. 2009c. Environmental impact assessment and monitoring for drill cutting disposal at Manifa: Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2359.

KFUPM/RI. 2009a. Environmental impact assessment for the Ras Tanura integrated project — Dredging. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2365.

KFUPM/RI. 2009f. Environmental impact assessment for the upgrade of crude gathering and power supply facilities phase I — Safaniyah field. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2373.

KFUPM/RI. 2009e. Environmental impact study for the Ras Tanura integrated project — Dredging: Prepared for Kellogg Brown and Root Saudi Limited Co. by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2361.

KFUPM/RI. 2009d. Development of operational marine modeling system: Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2325.

KFUPM/RI. 2009g. Environmental impact assessment for the Ras Tanura refinery expansion project — Landfilling and dredging. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2370.

KFUPM/RI. 2009h. Marine environmental monitoring of the New Khursaniyah 30" dia. pipeline (BI-10-08022) project. Prepared for the Environment Protection Department, Saudi Aramco, by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2336.

KFUPM/RI. 2010a. Environmental impact assessment for the Ras Tanura refinery expansion project — Dredging and landfilling. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Final Report, Project No. CEW2370.

KFUPM/RI. 2010b. Marine environmental monitoring of the New Khursaniyah 30" dia. pipeline (B1-10-08022) project. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Final Report, Project No. CEW2336.

KFUPM/RI. 2010c. Marine environmental monitoring of the Manifa causeway. Final report. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2342.

KFUPM/RI. 2010d. Environmental impact assessment for the upgrade of crude gathering and power supply facilities phase 1 — Safaniyah field. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Final Report, Project No. CEW2373.

KFUPM/RI. 2010e. Environmental impact assessment for upgrade of the fire protection system, Ju'aymah offshore platform. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2381.

KFUPM/RI. 2010f. Environmental impact assessment for environmental impact assessment for Arabiyah-Hasbah platforms, power (BI-10-00916) and subsea pipelines (BI-10-00917). Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2382.

KFUPM/RI. 2010e. Environmental impact assessment for installing instrument scrapping facilities at Zuluf and Marjan oil fields. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2379.

KFUPM/RI. 2010g. Environmental impact assessment for environmental impact assessment for Arabiyah-Hasbah platforms, power (BI-10-00916) and subsea pipelines (BI-10-00917). Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2382.

KFUPM/RI. 2011. Environmental impact assessment for Arabiyah-Hasbah platforms, power (BI-10-00916) and subsea pipelines (BI-10-00917). Prepared for Saudi Aramco by the Water Resources and Environment Division, Research Institute, King Fahd University Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. CEW02382.

KFUPM/RI. 2012. Environmental assessment for the Tarut Bay pipelines and structural support system. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2390.

KFUPM/RI. 2013. Final report. Saudi Aramco/KFUPM-RI sustaining research project — Marine environmental studies — Phase V — Arabian Gulf coral reef monitoring. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. 2244.

KFUPM/RI. 2013b. Final report — Environmental impact assessment for the expansion of two drill sites on the BerRI Causeway. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2400.

KFUPM/RI. 2013c. Final report — Environmental impact assessment for dredging (category III) for upgrade of electrical power supply to Abu Ali plants. Prepared for Zuhair Fayez Partnership by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2399.

KFUPM/RI. 2013e. Final report — Environmental impact assessment for maintenance dredging to the existing Ras Tanura West pier basin and channel. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2411.

KFUPM/RI. 2013f. First annual report — Monitoring and assessing the marine environment in the vicinity of Saudi Aramco offshore facilities in the Arabian Gulf. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2416.

KFUPM/RI. 2013g. Final report. Saudi Aramco/KFUPM-RI. sustaining research project — Marine environmental studies — Phase V — Arabian Gulf coral reef monitoring. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. 2244.

KFUPM/RI. 2013a. Monitoring and assessing the marine environment in the vicinity of Saudi Aramco offshore facilities in the Arabian Gulf. Final report prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2416.

KFUPM/RI. 2013a. Final report — Offshore environmental baseline survey in the Kingdom of Saudi Arabia sector for the Dorra oil field development. Prepared for WorleyParsons Europe Ltd. Middlesex, United Kingdom by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2398.

KFUPM/RI. 2014a. Second annual report — Monitoring and assessing the marine environment in the vicinity of Saudi Aramco offshore facilities in the Arabian Gulf. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2416.

KFUPM/RI. 2014b. Final report — Environmental impact assessment for the new replacement Safaniyah Trunklines Tl-12 and Tl-13. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2414.

KFUPM/RI. 2014b. Status assessment and monitoring of the Saudi Arabian waters of the Arabian Gulf. Final Report prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2416.

KFUPM/RI. 2014. Sustaining research project marine environmental studies. Final report prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2344.

KFUPM/RI. 2014. Aramco sustaining research project — environmental studies. Fifth Final Report. Prepared for Saudi Aramco by Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Unpublished.

KFUPM/RI. 2015. Sustaining research project: Marine environmental studies, phase V. Final report submitted to the Arabian American Oil Company by the Marine Studies Section, Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report Project No. 2344.

KFUPM/RI. 2015. Marine environmental monitoring of the Manifa Causeway — Post-construction. Annual report prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2410.

KFUPM/RI. 2015a. Final report: Sustaining research project — Marine environmental studies. Phase V. Investigations on marine environmental conditions in Saudi Arabian waters of the Arabian Gulf. Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Report No. 2344.

KFUPM/RI. 2015b. Final Report. Environmental Impact Assessment for the Hasbah offshore gas facilities increment II (BI-10-01902). Prepared for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2429.

KFUPM/RI. 2016. Fisheries program — Assessment and management of essential fish habitats in Saudi Arabian waters. Draft final report under preparation for Saudi Aramco by the Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Project No. CEW2375.

Khalaf, E., Literathy, P. and Anderlini, V. 1981. Vanadium as a tracer of chronic oil pollution in the sediments of Kuwait. Proceedings of the 2nd International Symposium on Interaction between Sediment and Freshwater, June 14–18, 1981, Kingston, Ontario, Canada.

Khaleghi Ghadiri, M. and Gorki, A. 2004. Natural remedies for impotence in medieval Persia. *International Journal of Impotence Research* 16: 80–83.

Khan, M.A. and Al-Homaid, N.A. 2003. Remote sensing study on mangrove depletion Tarut Bay, Saudi Arabia, pp. 227–233, in Alsharan, A.S., Wood, W.W., Goudie, A.S., Fowler, A.R. and Abdellatif, E.M. (eds.). Desertification in the 3rd Millenium. A.A. Balkema: Rotterdam.

Khan, M.A. and Kumar, A. 2009. Impact of "urban development" on mangrove forests along the West Coast of the Arabian Gulf. *Earth Science India* 2: 159–173.

Khan, M.A., Boer, B., Kust, G.A. and Barth, H-J. 2006. Sabkha ecosystems. Vol. II: West and Central Asia. Springer, 259 p.

Khan, M.A., Böer, B., Öztürkm M., Al-Abdessalam, T.Z., Clusener-Godt, M. and Gul, B. 2014. Sabkha ecosystems: Vol. IV: Cash crop halophyte and biodiversity conservation. *Tasks for Vegetation Science* 47: 339, Springer.

Khan, N.N.Y., Munawar, M. and Price, A.R. 2002. The Gulf ecosystem: Health and sustainability. Backhuys.

Khan, N.Y. 2007. Multiple stressors and ecosystem-based management in the Gulf. *Aquatic Ecosystem Health and Management* 103: 259–267.

Khan, N.Y., Munawar, M. and Price, A.R.G. 2002. Environmental trends and integrated management of the Gulf, pp. 483–494, in Khan, N.Y., Munwar, M. and Price, A.R.G. (eds.). The Gulf ecosystem: Health and sustainability. Backhuys Publishers, Leiden.

Kiani, M.S., Iqbal, P., Siddiqui, P.J.A. and Moazzam, M. 2013. First records of the striped dolphin (Stenella coeruleoalba) and rough-toothed dolphin (Steno bredanensis) in Pakistani waters: a review of occurrence and conservation status in the Indian Ocean. *Pakistan Journal of Zoology* 45(4): 1113–1123.

Kikuchi, T. and Peres, J.M. 1977. Consumer ecology of seagrass beds, pp. 147–193, in McRoy, C.P. and Helfferich, C. (eds.). Seagrass ecosystems. Marcel Dekker Inc., New York.

Killick, R. and Moon, J. (eds.). 2005. The early dilmun settlement at Saar. Archaeology International in association with London-Bahrain Archaeological Expedition, Ludlow.

Kimor, B. 1973. Plankton relationships of the Red Sea, Persian Gulf, and Arabian Sea, pp. 221–232, in Zeirtzschel, B. (ed.). Ecological studies, analysis and synthesis. Vol. 3. Biology of the Indian Ocean. Springer Verlag, Berlin.

King, H. 2004. Communal behaviour of Socotra cormorant, Bahrain. *Phoenix* 20: 25–28.

Kinsey, D.W. 1991. The coral reef: An owner-built, high density, fully serviced, self-sufficient, housing estate in the desert: Or is it? *Symbiosis* 10: 1–22.

Kinsman, D.J. 1964. Recent carbonate sedimentation near Abu Dhabi, Trucial Coast, Persian Gulf, Ph.D. Thesis, Univ. London.

Kinsman, D.J. 1967. Huntite from a carbonate-evaporite environment. *Amer. Mineralogist* 52: 1332–1340.

Kinsman, D.J. 1969. Modes of formation, sedimentary associations, and diagnostic features of shallow-water and supratidal evaporites. *Amer. Assoc. Petrol. Geologists Bull.* 53: 830–840.

Kinsman, D.J.J. 1964. Reef coral tolerance of high temperatures and salinities. *Nature* 202: 1280–1282.

Kinunen, W. and Walczak, P. 1970. Persion Gulf sea turtle nesting surveys. Report of the sport fisheries and marine biology Persian Gulf sea turtles job completion report.

Kinzie, R.A. and Hunter, T. 1987. Effect of light quality on photosynthesis of the reef coral Montipora verrucosa. *Marine Biology* 94: 95–109.

Kinzie, R.A., Jokiel, P.L. and York, R. 1984. Effects of light of altered spectral composition on coral zooxanthellae associations and on zooxanthellae in vitro. *Marine Biology* 78: 239–248.

Kiorbe, T., Mohlenberg, F. and Nohr, O. 1981. Effect of suspended bottom material on growth and energetics in Mytilus edulis. *Marine Biology* 61: 283–288.

KISR. 1985. Marine Monitoring Research Programs in the State of Kuwait. Proc. ROPME Symposium on Regional Marine Monitoring and Research Programs, UAE University, Al-Ain, United Arab Emirates. Kuwait Institute for Scientific Research.

Kiszka, J. 2012. Bycatch assessment of vulnerable megafauna in coastal artisanal fisheries in the southwest Indian Ocean. Final report to South West Indian Ocean Fisheries Project (SWIOFP), 113 p.

Koch, E.W. 2001. Beyond light: Physical, geological and geochemical parameters as possible submersed aquatic vegetation habitat requirements. *Estuaries* 24: 1–17.

Koch, E.W. and Gust, G. 1999. Water flow in tide and wave dominated beds of the seagrass Thalassia testudinum. *Marine Ecology Progress Series* 184: 63–72.

Koch, M.S., Schopmeyer, S.A., Kyhn-Hansen, C., Madden, C.J. and Peters, J.S. 2007. Tropical seagrass species tolerance to hypersalinity stress. *Aquatic Botany* 86: 14–24.

Kock, D. and Nader, I.A. 1996. Terrestrial mammals of the Jubail marine wildlife sanctuary, pp. 421–437, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Konyuhov, A.I. and Maleki, B. 2006. The Persian Gulf basin: Geological history, sedimentary formations, and petroleum potential. *Lithology and Mineral Resources* 41(4): 344-361.

Kott, P. 1981. The ascidians of the reef flats of Fiji. *Proceedings of the Linnaean Society, New South Wales* 105: 147-212.

Kovalev, A.V. 1988. Structure of zooplankton communities and its changes in the offshore Atlantic and in the Mediteranean basin. Diss. of Doctor of Biol. Sciences. *Sevestopol*: 1-454 (in Russian).

Krishnakumar, P.K., Miller, J.D. and Ashraf, T.T. Chapter 2. The physical environment of the Arabian Gulf, in Al-Abdulkader, K., Loughland, R.A. and Qurban, M.A. (eds.). Ecosystems of the Western Arabian Gulf: 40 years of marine research — A book for managers, planners and researchers. Environmental Protection Department, Saudi Aramco.

Krishnakumar, P.K., Qurban, M.A., Lindo, R., Joydas, T.V., Lin, J.Y., Al-Abdulkader, K., McCain, J.C. and Roa-Ureta, R. (unpublished). The present status of coral reefs in the Western Arabian Gulf. (Manuscript under preparation.)

Kropach, C. 1975. The yellow-bellied sea snake, Pelamis, in the eastern Pacific, pp. 185-213, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore, MD, USA.

Krupp, F. 2002. Marine protected areas, pp. 447-473, in Khan, N., Munawar, M. and Price, A.R.G. (eds.). The Gulf ecosystem: Health and sustainability, Backhuys Publishers, Leiden, the Netherlands.

Krupp, F. and Jones, D.A. 1993. The creation of a marine sanctuary after the 1991 Gulf War oil spill. *Marine Pollution Bulletin* 27: 315-323.

Krupp, F. and Müller, T. 1994. The status of fish populations in the northern Arabian Gulf two years after the 1991 Gulf War oil spill. *Courier Forschungsinst Senckenb* 166: 67-75.

Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). 1996. A Marine wildlife sanctuary for the Arabian Gulf — Environmental research and conservation following the 1991 Gulf War oil spill. National Commission for Wildlife Conservation and Development/ Senckenbergische Naturforschende Gesellschaft, Riyadh/Frankfurt, 502 p., plus appendices.

Krupp, F., Al-Muftah, A., Jones, D.A. and Hoolihan, J. 2006. Marine and coastal ecosystem management requirements in the Arabian Peninsula with special regard to water resources, pp. 73-87, in Amer, K.M., Böer, B., Brook, M.C., Adeel, Z., Clüsener-Godt, M. and Saleh, W. (eds.). Policy perspectives for ecosystem and water management in the Arabian Peninsula. United Nations University, Ontario, Canada.

Kuo, J. and den Hartog, C. 2006. Seagrass morphology, anatomy, and ultrastructure, pp. 51-87, in Larkum, A.W.D., Orth, R.J. and Duarte, C.M. (eds.). Seagrasses: Biology, ecology and their conservation. Springer, London.

Kuronuma, K. 1974. Arabian Gulf fishery — oceanographic survey by the Umitaka Maru, training research vessel, Tokyo University of Fisheries with collaboration of Kuwait Institute for Scientific Research.

Kwan, D. 2002. Toward a sustainable indigenous fishery for dugongs in Torres Strait: A contribution of empirical data and process. Ph.D. Thesis, School of Tropical Environment Studies and Geography. James Cook University, Townsville, Australia.

Lai, H.C., Lim, K-H. and Lim, C.P. 1984. Effects of oil on mangroves in field conditions, pp. 123-138, in Lai, H.C. and Feng, M.C. (eds.). Fate and effects of oil in the mangrove environment. Univ. Sains Malaysia, Penang.

Laist, D.W. 1997. Impacts of marine debris: Entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records, pp. 99-139, in Coe, J.M. and Rogers, D.B. (eds.). Marine debris sources, impacts and solutions. Springer-Verlag, New York.

Lal, A., Arthur, R., Marbà, N., Lill A. and Alcoverro, T. 2010. Implications of conserving an ecosystem modifier: Increasing green turtle Chelonia mydas densities substantially alters seagrass meadows. *Biological Conservation* 143: 2730-2738.

Lambeck, K. 1996. Shoreline reconstructions for the Persian Gulf since the last glacial maximum. *Earth and Planetary Science Letters* 142: 43-57.

Lambert, G. 2001. A global overview of ascidian introductions and their possible impact on the endemic fauna, pp. 249-257, in Sawada, H., Yokosawa, H. and Lambert, C.C. (eds.). The biology of ascidians. Springer-Verlag, Tokyo.

Lambert, G. 2005. Ecology and natural history of the protochordates. *Canadian Journal of Zoology* 83: 34-50.

Lancaster, W. 1986. Preliminary reports, Dhahran, Saudi Arabia, 1983-1986 (unpublished).

Langman, O.C., Hale, J.A., Cormack, C.D., Risk, M.J. and Madon, S.P. 2012. Developing multimetric indices for monitoring ecological restoration progress in salt marshes. *Marine Pollution Bulletin* 64: 820-835.

Lanyon, J.M. 1991. The nutritional ecology of the dugong Dugong dugon in tropical north Queensland. Unpublished Ph.D. Thesis dissertation, Monash University, Victoria, Australia, 337 p.

Lanyon, J.M., Limpus, C.J. and March, H. 1989. Dugongs and turtles: Grazers in the seagrass system, pp. 610-634, in Larkum, A.W., McComb, A.J. and Shepherd, S.A. (eds.). Biology of seagrasses. Elsevier, Amsterdam, the Netherlands.

Lardner R.W., Lehr, W.J., Fraga, R.J. and Sarhan, M.A. 1988. A model of residual currents and pollution transport in the Arabian Gulf. *Applied Mathematical Modelling* 12: 379-390.

Lardner, R.W., Belen, M.S. and Cekige, H.M. 1982. Finite difference model for tidal flows in the Arabian Gulf. *Comp. Maths. Appls.* 8(6): 425-444.

Lattemann, S. 2005. Seawater desalination — Environmental impact. http://www.paua.de/ Impacts.htm#cleaning.

Lattemann, S. 2010. Development of environmental impact assessment and decision support system for seawater desalination plants. Ph.D. Dissertation, CRC Press/Balkema, 276 p.

Lattemann, S. and Höpner, T. 2008. Environmental impact and impact assessment of seawater desalination. *Desalination* 220: 1-15.

Laurans, Y., Pascal, N., Binet, T., Brander, L., Clua, E., David, G., Rojat, D. and Seidl, A. 2013. Economic valuation of ecosystem services from coral reefs in the South Pacific: Taking stock of recent experience. *Journal of Environmental Management* 116: 135-144.

Layman, C.A., Allgeier, J.E., Yeager, L.A. and Stoner, E.W. 2013. Thresholds of ecosystem response to nutrient enrichment from fish aggregations. *Ecology* 94: 530-536.

Le Provost, C. 1983. Models for tides in the KAP region, pp. 37-45, in El-Sabh, M.I. (ed.). Oceanographic modelling of the Kuwait action plan region. UNESCO Reports in *Marine Sciences*, Vol. 28.

Lee Long, W.J., Mellors, J.E. and Coles, R.G. 1993. Seagrasses between Cape York and Hervey Bay, Queensland, Australia. *Aust. J. Mar. Freshw. Res* 44: 19-31.

Lee, K-S. and Dunton, K.H. 1996. Production and carbon reserve dynamics of the seagrass Thalassia testudinum in Corpus Christi Bay, Texas, USA. *Mar. Ecol. Prog. Ser.* 143: 201-210.

Lee, R.F., Sauerheber, A. and Dobbs, G.H. 1972. Uptake, metabolism and discharge of polycyclic aromatic hydrocarbons by marine fish. *Mar. Biol.* 17: 201-208.

Lehr, W.J. 1983. A brief survey of oceanographic modeling and oil spill studies in the region. Symposium/Workshop on iceanographic modeling of the Kuwait action plan region, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, October 15-17, 1983.

Lehr, W.J. 1984. A brief survey of oceanographic modeling and oil spill studies in the KAP region, pp. 4-11, in El-Sabh, M.I. (ed.). Oceanographic modeling of the Kuwait action plan region. UNESCO Reports in Marine Sciences, Paris.

Lenz, J. 2000. Introduction, in Harris, R.P., Wiebe, P.H., Lenz, J., Skjoldal, H.R. and Huntley, M. (eds.). ICES Zooplankton methodology manual. Academic Press, London.

Les, D.H., Cleland, M.A. and Waycott, M. 1997. Phylogenetic studies in the Alismatidae, II: Evolution of the marine angiosperms (seagrasses) and hydrophily. *Systematic Botany* 22: 443-463.

Leslie, H.M. and McLeod, K.L. 2007. Confronting the challenges of implementing marine ecosystem-based management. *Frontiers in Ecology and the Environment* 5: 540-548.

Leviton, A.E., Anderson, S.C., Adler, K. and Minton, S.A. 1992. Handbook to Middle East amphibians and reptiles. Society for the study of Amphibians and Reptiles, Ithaca, New York, USA, 252 p.

Limpus, C. 2006. Impacts of climate change on marine turtles: A case study, pp. 34-40, in Vagg, R. and Hepworth, H. (eds.). Migratory species and climate change: Impacts of a changing environment on wild animals. UNEP/CMS Convention on Migratory Species and DEFRA, Bonn, Germany.

Limpus, C.J. and Nicholls, N. 1988. The southern oscillation regulates the annual numbers of green turtles Chelonia mydas breeding around northern Australia. *Aust. J. Wildlife Research* 15: 157-161.

Limpus, C.J., Cooper, P.J. and Read, M. 1994a. The green turtle, Chelonia mydas, in Queensland: Population structure in a warm temperate feeding area. *Memoirs of the Queensland Museum* 35: 139-154.

Limpus, C.J., Cooper, P.J. and Read, M. 1994b. The loggerhead turtle, Caretta caretta, in Queensland: Population structure in a warm temperate feeding area. *Memoirs of the Queensland Museum* 37: 195-204.

Limpus, C.J., Miller, J.D., Parmenter, C.J., Reimer, D., McLachlan, N. and Webb, R. 1992. Migration of green Chelonia mydas and loggerhead Caretta caretta turtles to and from Australian rookeries. *Wildlife Research* 19: 347-358.

Linden, O., Abdulraheem, M.Y., Gerges, M.A., Alam, I.M., Behbehani, M., Borhan, A. and Al-Kassab, F. 1990. State of the marine environment in the ROPME Sea Area. UNEP Regional Seas Reports and Studies No. 112, Rev. 1, UNEP.

Lindén, O., Jernelöv, A. and Egerup, J. 2004. The environmental impacts of the Gulf War 1991. Interim Report IR-04-019. International Institute for Applied Systems Analysis, Laxenburg, Austria, 94 p.

Lipkin, Y. 1975. Food of the Red Sea Dugong (Mamrnalia: Sirenia) from Sinai. *Isr J Zoo1* 24: 81-98.

Lirman, D. and Cropper Jr., W.P. 2003. The influence of salinity on seagrass growth, survivorship, and distribution within Biscayne Bay, Florida: Field, experimental, and modeling studies. *Estuaries* 26: 131-141.

Literathy, P. 1993. Considerations for the assessment of environmental consequences of the 1991 Gulf War. *Marine Pollution Bulletin* 27: 349-356.

Literathy, P., Khan, N.Y. and Linden, O. 2002. Oil and petroleum industry, pp. 127-156, in Khan, N.Y., Munawar, M. and Price, A.R.G. (eds.). The Gulf ecosystem: Health and sustainability. Ecovision World Monograph Series. Backhuys Publishers, Leiden, the Netherlands.

Livett, B.G., Gayler, K.R. and Khalil, Z. 2004. Drugs from the sea: Conopeptides as potential therapeutics. *Current Medicinal Chemistry* 11: 1715-1723.

Lohmann, K.J., Witherington, B.E., Lohmann M.F. and Salmon, M. 1997. Orientation, navigation, and natal beach homing in sea turtles, pp. 107-135, in Lutz, P. and Musick, J. (eds.). The biology of sea turtles. CRC Press, New York.

Lokiec, F. 2013. Sustainable desalination: Environmental approaches. Proceedings of the International Desalination Association Congress on Desalination and Water Reuse — Tianjin, China, 16 p.

Lombard, P. 1999. The last centuries of Dilmun, pp. 130-133, in Bahrain, the civilization of the two seas: From Dilmun to Tylos. Institut du Monde Arabe, Paris.

Longstaff, B.J. and Dennison, W.C. 1999. Seagrass survival during pulsed turbidity events: The effects of light deprivation on the seagrasses Halodule pinifolia and Halophila ovalis. *Aquat. Bot.* 65: 105-121.

Loop, K.A., Miller, J.D. and Limpus, C.J. 1995. Nesting by the hawksbill turtle (Eretmochelys imbricata) on Milman Island, Great Barrier Reef, Australia. *Wildlife Research* 22(2): 241-251.

Lorenzen, C.J. 1966. A method for the continuous measurement of in vivo chlorophyll concentration. *Deep-Sea Res.* 13: 223-227.

Lough, J.M. 2000. 1997-98: Unprecedented thermal stress to coral reefs? *Geophys Res Lett* 27: 3901-3904.

Lough, J.M. and Barnes, D.J. 2000. Environmental controls on growth of the massive coral Porites. *J Exp Marine Biology Ecol* 245: 225-243.

Lough, J.M., Devereux, M.J. and Barnes, D.J. 2003. Porites coral growth records from the Arabian Gulf. Australian Institute of Marine Science, Townsville, Australia, pp. 1-55.

Loughland, R.A., Al-Abdulkader, K., Wyllie, A. and Burwell, B. 2012. Anthropogenic induced geomorphological change along the western Arabian Gulf coast. 10.5772/28330.

Loughland, R.A. and Miller, J. 2003. Beach temperatures and the potential impact of global warming on marine turtle nesting in the United Arab Emirates. Poster presented at 26th Annual Conference on Sea Turtle Conservation and Biology, April 2006, Crete, Greece.

Loughland, R.A. and Cunningham, P.L. 2002. Vertebrate fauna of Sabkhat from the Arabian Peninsula: A review of mammalia, reptilia and amphibia, pp. 255-266, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Loughland, R.A. and Saenger, P. 2001. Report to the Public Works Department of Abu Dhabi on the methods for the development of mangrove plantations in Abu Dhabi Emirate. Department of Environmental Research, Emirates Heritage Authority, Abu Dhabi, UAE.

Loughland, R.A. and Saji, B. 2007. Remote sensing: A tool for managing marine pollution in the Gulf, in Barth, H-J. and Böer, B. (eds.). Gulf ecosystems. Kluwer Academic Publishers, pp. 131-145.

Loughland, R.A., Al-Abdulkader, K.A., Wyllie, A. and Burwell, B.O. 2012. Anthropogenic induced geomorphological change along the western Arabian Gulf coast, pp. 191-218, in Piacentini, T. (ed.). Studies on environmental and applied geomorphology. InTech Europe, 51000 Rijeka, Croatia.

Loughland, R.A. and Abdukader, K.A. (eds.). 2011. Marine Atlas: Western Arabian Gulf. Saudi Aramco Environmental Publication, 2nd edition.

Loughland, R.A., Qasem, A.M., Burwell, B. and Prihartato, P.K. 2016. Coastal Sabkha (Salt Flats) of southern and western Arabian Gulf, in Finlayson, C.M., Milton, R., Prentice, C. and Davidson, N.C. (eds.). The Wetland book, DOI: 10.1007/978-94-007-6173-5_185-3.

Loughland, R.A., Wyllie, A. and Al-Abdulkader, K. 2011. Anthropogenic induced changes along the Gulf coast of KSA from 1967-2010, p. 333, Piacentinj, T. (ed.). Geomorphology Intech, Croatia.

Lowe, C.G., Wetherbee, B.M., Crow, G.L. and Tester, A.L. 1996. Ontogenetic dietary shifts and feeding behavior of the tiger shark, Galeocerdo cuvier, in Hawaiian waters. *Environmental Biology of Fishes* 47: 203-211.

Lukoschek, V., Beger, M., Ceccarelli, D., Richards, Z. and Pratchett, M. 2013. Enigmatic declines of Australia's sea snakes from a biodiversity hotspot. *Biological Conservation* 166: 191-202.

Lutcavage, M.E., Plotkin, P., Witherington, B. and Lutz, P.L. 1997. Human impacts on sea turtle survival, pp. 387-410, in Lutz, P. and Musick. J. (eds.). The biology of sea turtles, Vol. I. CRC Press, Boca Raton, FL, USA.

Lutz, P.L. and Musick, J.A. (eds.). 1997. The biology of sea turtles, Vol. I. CRC Press, Boca Raton, FL, USA, 448 p.

Lutz, P.L., Musick, J.A. and Wyneken, J. (eds.). 2003. The biology of sea turtles, Vol. II. CRC Press, Boca Raton, FL, USA, 455 p.

Macauley, J.M., Clark, J.R. and Price, W.A. 1988. Seasonal changes in the standing crop and chlorophyll content of Thalassia testudinum Banks ex König and its epiphytes in the northern Gulf of Mexico. *Aquat. Bot.* 31: 277-287.

Madhi, W. 2009. Saudi "slow to act on climate change." *The National*, April 1, 2009.

Madhupratap, M., Kumar, S.P., Bhattathiri, P.M.A., Kumar, M.D., Raghukumar, S., Nair, K.K.C. and Ramaiah, N. 1996. Mechanism of the biological response to winter cooling in the northeastern Arabian Sea. *Letters to Nature* 384: 549-552.

Madon, S.P. 2008. Fish community responses to ecosystem stressors in coastal estuarine wetlands: A functional basis for wetlands management and restoration. *Wetlands Ecol Manage* 16: 219-236.

Madon, S.P., Williams, G.D., West, J.M. and Zedler, J.D. 2001. The importance of marsh access to growth of the California killifish, F. parvipinnis, evaluated through bioenergetics modeling. *Ecol. Modeling* 135: 149-165.

Madsen, J.D., Chambers, P.A., James, W.F., Koch, E.W. and Westlake, D.F. 2001. The interaction between water movement, sediment dynamics and submersed macrophytes. *Hydrobiologia* 444: 71-84.

Maghsoudlou, A., Araghi, P.E., Wilson, S., Taylor, O. and Medio, D. 2008. Status of coral reefs in the ROPME sea area (The Persian Gulf, Gulf of Oman, and Arabian Sea), pp. 79-90, in Wilkinson, C. (ed.). Status of coral reefs of the world Global Coral Reef Monitoring Network and Reef and Rainforest Research Center, Townsville, Australia.

Mahasneh, I.A., Al-Thani, R.F. and Brown, G. 2006. The micro-organisms of sabkhat in Qatar, pp. 89-97, in Khan, M.A., Boer, B., Kust, G.A. and Barth, H-J. (eds.). Sabkha ecosystems. Vol. II: West and Central Asia, Springer.

Mahmoodur Rahman, M., Al-Sulami, S., Al-Muaili, F. and Kither, N. 2009. Carbohydrazide vs. Hydrazine: A comparative study. Proceedings of the International Desalination Association Congress on Desalination and Water Reuse, Dubai, UAE, November 7-12, 15 p.

Mahmoodur Rahman, M., Dalvi, A.G., Rabbani, A., Al-Sulami, S., Mandilli, F., Al-Khaledi, H. and Al-Jowdi, B. 2012. Application of fuel additives to reduce corrosion and stack emissions in Saline Water Conversion Corporation's boilers. *Power Plant Chemistry* 14(1): 20-32.

Malik, A.U. and Mayan-Kutty, P.C. 1992. Corrosion and material selection in desalination plants. Proceedings of the Seminar on Operation and Maintenance of Desalination Plants, SWCC, April 27-29, pp. 274-307.

Mandeville, J.P. 1990. Flora of eastern Saudi Arabia. London, Kegan Paul International Ltd. and Riyadh, NCWCD, 482 p.

Mangi, S.C., Davis, C.E., Payne, L.A., Austen, M.C., Simmonds, D., Beaumont, N.J. and Smyth, T. 2011. Valuing the regulatory services provided by marine ecosystems. *Envirometrics* 22: 686-698.

Mann, J. and Smuts, B.B. 1998. Natal attraction: Allomaternal care and mother-infant separations in wild bottlenose dolphins. *Animal Behaviour* 55: 1097-1113.

Mann, J., Connor, R.C., Barre, L.M. and Heithaus, M.R. 2000. Female reproductive success in wild bottlenose dolphins (Turiops sp.): Life history, habitat, provisioning, and group size effects. *Behavioral Ecology* 11: 210-219.

Mannino, M.A. and Thomas, K.D. 2002. Depletion of a resource? The impact of prehistoric human foraging on intertidal mollusc communities and its significance for human settlement, mobility and dispersal. *World Archaeology* 33(3): 452-474.

Maragos, J.E. 1979. Environmental surveys five years after offshore marine sand mining operations at Keauhou Bay, Hawaii. International Report of US Army Engineer Division, Pacific Ocean, Fort Shafter, Hawaii.

Marbà, N. and Duarte, C.M. 1998. Rhizome elongation and seagrass clonal growth. *Marine Ecology Progress Series* 174: 269-280.

Marcus. J. and Thorhaug, A. 1981. Pacific vs. Atlantic responses of the subtropical hermatypic coral Porites spp. to temperature and salinity effects. *Proceedings of the 4th International Coral Reef Symposium* 2: 15-20.

Mare, M.F. 1942. A study of a marine benthic community with special reference to the micro organisms. *Journal of the Marine Biological Association of the United Kingdom* 25: 517-554.

Margalef, R. 1978. Life forms of phytoplankton as survival alternatives in an unstable environment. *Oceanologica acta* 1(4): 493-509.

Marine Emergency Mutual Aid Center. 2008. Pearl Jubilee, 1978-2008.

Márquez, M.R. 1990. Sea turtles of the world. An annotated and illustrated catalogue of sea turtle species known to date FAO species catalogue. *FAO Fisheries Synopsis* 125(11): 81.

Márquez, M.R., Villanueva, A. and Peñaflores, C. 1976. Sinopsis de datos biologicos sobre La tortuga golfina, turtle Lepdochelys olivacea (Eschscholtz, 1829) en Mexico. Ciencia Pesquera Instituto Nacional de la Pesca. INP S/2, pp. 1-61.

Marsh, H. 1980. Age determination of the Dugong (Dugong dugon (Muller)) in northern Australia and its biological implication. *Report of the International Whaling Commission Special Issue* 3: 181-201.

Marsh, H. 1995. The life history, pattern of breeding and population dynamics of the Dugong, pp. 75-83, in O'Shea, T.J., Ackermann, B.B. and Percival, H.F. (eds.). Population biology of the Florida manatee. U.S. Department of the Interior, National Biological Service, Information and Technology Report.

Marsh, H., Corkerton, P., Lawler, I.R., Preen, A. and Lanyon, J. 1996. The status of the dugong in the Southern Great Barrier Reef Marine Park.

Marsh, H. 1999. Reproduction in sirenians, pp. 243-256, in Reynolds III, J.E. and Twiss, J. (eds.). Reproduction in marine mammals. Washington, D.C., Smithsonian Institute Press, pp. 243-256.

Marsh, H. 2008. Dugong dugon. The IUCN Red List of Threatened Species 2008: e.T6909A12812709. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS. T6909A12812709.en. Downloaded on April 11, 2015.

Marsh, H., Chanells, P.W., Heinsohn, G.E. and Morrissey, J. 1982. Analysis of stomach contents of dugongs from Queensland. *Aust. Wildl. Res* 9: 55-67.

Marsh, H., Heinsohn, G.E. and Marsh, L.M. 1984. Breeding cycle, life history and population dynamics of the Dugong, (Dugong dugon) (Sirenia: Dugongidae). *Australian Journal of Zoology* 32: 767-788.

Marsh, H., Penrose, H., Eros, C. and Hugues, J. 2002. Dugong status report and actions plans for countries and territories. UNEP Early Warning and Assessment Report Series, Kenya.

Martens, H. 1996. A preliminary survey of the terrestrial reptiles and sea snakes in the Jubail marine wildlife sanctuary, pp. 360-373, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf South environmental research and conservation following the 1991 Gulf war oil spill. (NCWCD, Riyadh and Senckenberg Research Institute), Frankfurt, Germany.

Mártiz, P. and Artal, V. 2013. Impact of the discharge of brine on benthic communities: A case study in Chile. Proceedings of the International Desalination Association World Congress on Desalination and Water Reuse 2013/Tianjin, China, 13 p.

Masini, R.J., Anderson, P.K. and McComb, A.J. 2001. A Halodule dominated community in a subtropical embayment: Physical environment, productivity, biomass, and impact of dugong grazing. *Aquatic Botany* 71: 179-197.

Masry, A.H. 1997. Prehistory in Northeastern Arabia. The problem of interregional interaction. Kegan Paul, London.

Massoud, M., Al-Abdali, F. and Al-Ghadban, A. 1998. The status of oil pollution in the Arabian Gulf by the end of 1993. *Environment International* 24: 11-22.

Massoud, M.S., Al-Abdali, F., Al-Ghadban, A.N. and Al-Sarawi, M. 1996. Bottom sediments of the Arabian Gulf-II. TPH and TOC contents as indicators of oil pollution and implications for the effect and fate of the Kuwait oil slick. *Environmental Pollution* 93(3): 271-284.

Matsuike, K., Morinaga, T. and Hiraoka, T. 1986. Turbidity distribution in Tokyo bay and movement of the turbid water. *Journ. Tokyo Univ. Fish.* 73(2): 97-114.

Matsuyama, M., Kitade, Y., Senjyu, T., Koike, Y. and Ishimaru, T. 1998. Vertical structure of current and density front in the Strait of Hormuz, pp. 23-34, in Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. (eds.). Offshore environment of the ROPME Sea Area after the war-related oil spill. Terra Scientific Publishing Co. TERRAPUB, Tokyo, Japan.

Mauchline, J. 1980. The biology of Mysids and Euphauaiids, pp. 373-595, in Blaxter, J.H.S., Russell, F.S. and Yonge, M. (eds.). Advances in marine biology, Vol. 18. Academic Press, London.

Mayer, A.G. 1914. The effects of temperature upon tropical marine animals. Carnegie Institution of Washington.

Maynard, J.A., Anthony, K.R.N., Marshall, P.A. and Masiri, I. 2008. Major bleaching events can lead to increased thermal tolerance in corals. *Marine Biology* 155(2): 173-182.

McCain, J.C. 1984a. Marine ecology of Saudi Arabia. The intertidal infauna of the sand beaches in the northern area, Arabian Gulf, Saudi Arabia, pp. 53-78, in Buttiker, A. and Krupp, F. (eds.). Fauna of Saudi Arabia. Pro Entomologia, Natural History Museum, Base (Switzerland). Vol. 6.

McCain, J.C. 1984b. Marine ecology of Saudi Arabia. The intertidal infauna of the sand beaches in the northern area, Arabian Gulf, Saudi Arabia. *Fauna Saudi Arabia* 6: 53-78.

McCain, J.C. 1993. Illustrated keys to the flora and fauna of the Arabian Gulf, pp. 1-526, prepared for Arabian American Oil Company, Dhahran, Saudi Arabia.

McCain, J.C. 1984. Marine ecology of Saudi Arabia, in Buttiker, A., Krupp, F. (eds.). The near shore soft-bottom benthic communities of the Northern Area, Arabian Gulf, Saudi Arabia. Fauna of Saudi Arabia. *Pro Entomologia* 6: 79-101. Natural History Museum, Basle, Switzerland.

McCain, J.C., Tarr, A.B., Carpenter, K.E. and Coles, S.L. 1984. Marine ecology of Saudi Arabia: A survey of coral reefs and reef fishes in the northern area, Arabian Gulf, Saudi Arabia. *Fauna of Saudi Arabia* 6: 102-126.

McCauley, J.E., Parr, R.A. and Hancock, D.R. 1977. Benthic infauna and maintenance dredging. A case study. *Water Res.* 11: 233-242.

McClanahan, T.R. and Kurtis, J.D. 1991. Population regulation of the rock-boring sea urchin Echinometra mathaei (de Blainville). *Journal of Experimental Marine Biology and Ecology* 147: 121-146.

McClanahan, T.R. and Muthiga, N.A. 2001. The ecology of echinometra, pp. 225-243, in Lawrence, J.M. (ed.). Developments in aquaculture and fisheries science. Elsevier.

McClanahan, T.R., Kamukuru, A.T., Muthiga, N.A., Yebio, M.G. and Obura, D. 1996. Effect of sea urchin reductions on algae, coral, and fish populations. *Conserv. Biol.* 10: 136-154.

McClanahan, T.R., Nugues, M. and Mwachireya, S. 1994. Fish and sea urchin herbivory and competition in Kenyan coral reef lagoons: The role of reef management. *Journal of Experimental Marine Biology and Ecology* 184: 237-254.

McClanahan, T.R., Sala, E. and Mumby, P. 2004. Phosphorus and nitrogen enrichment do not enhance brown frondose "macroalgae." *Marine Pollution Bulletin* 48: 196-199.

McClenachan, L., Jackson, J.B.C. and Newman, M.J.H. 2006. Conservation implications of historic sea turtle nesting beach loss. *Frontiers in Ecology and the Environment* 4(6): 290-296.

McClure, H.A. and Al Shaikh, N. 1993. Palaeogeography of an 'Ubaid archaeological site, Saudi Arabia. Arab. *Archaeol. Epigr.* 4: 107-125.

McClure, H.A. and Vita-Finzi, C. 1982. Holocene shorelines and tectonic movements in eastern Saudi Arabia. *Tectonophysics* 85: T37-T43.

McCook, L.J., Jompa, J. and Diaz-Pulido, G. 2001. Competition between corals and algae on coral reefs: A review of evidence and mechanisms. *Coral Reefs* 19(4): 400-417.

McCosker, J.E. 1975. Feeding behavior of Indo-Australian Hydrophiidae, pp. 217-232, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore, MD, USA.

McGlade, J.M. and Price, A.R.G. 1993. Multidisciplinary modeling: An overview and practical implications for the governance of the Gulf region. *Marine Pollution Bulletin* 27: 361-375.

McIntyre, A.D. 1969. Ecology of marine meiobenthos. *Biological Review* 44: 245-290.

McIvor, A.L., Möller, I., Spencer, T. and Spalding, M. 2012. Reduction of wind and swell waves by mangroves. Natural coastal protection series: Report 1. Cambridge Coastal Research Unit Working Paper 40. The Nature Conservancy and Wetlands International, Cambridge, 27 p.

McIvor, A.L., Spencer, T., Möller, I. and Spalding, M. 2013. The response of mangrove soil surface elevation to sea level rise. Natural coastal protection series: Report 3. Cambridge Coastal Research Unit Working Paper 42. Published by The Nature Conservancy and Wetlands International, 59 p.

McIvor, C.C. and Odum, W.E. 1988. Food, predation risk, and microhabitat selection in a marsh fish assemblage. *Ecology* 69(5): 1341-1351.

McKenzie, J.A., Hsü, K.J. and Schneider, J.F. 1980. Movement of subsurface waters under the sabkha, Abu Dhabi, UAE, and its relation to evaporative dolomite genesis. SEPM Special Publication 28, pp. 11-30.

McManus, J.W. and Wenno, J.J. 1981. Coral communities of outer Ambon Bay: A general assessment survey. *Bulletin of Marine Science* 31(3): 574-580.

McMullon, C. 2008. The importance of salt marshes for biodiversity, pp. 19-22, in Inder, A. and Ansell, K. (eds.). What future for the solent's salt marshes? Solent Protection Society, Beaulieu.

McNeill, S.E. 1994. The selection and design of marine protected areas: Australia as a case study. *Biodiversity & Conservation*, 3(7): 586.

Meakins, R.H. and Al-Mohanna, S.Y. 2000. Sea turtles in Kuwait after the Gulf War. *Marine Turtle Newsletter* 88: 7-8.

Meakins, R.H. and Al-Mohanna, S.Y. 2003. Some problems and the importance of reptile biodiversity in Kuwait. *Journal of Arid Environments* 54(1): 209-217.

Medio, D. 2006. Umm el Quwain (UAE), Preliminary environmental report on Khor Beidah. Report to Anonymous Client, Halcrow Group, 65 p.

Menden-Deuer, S. and Lessard, E.J. 2000. Carbon to volume relationships for dinoflagellates, diatoms, and other protist plankton. *Limnology and Oceanography* 45(3): 569-579.

MEPA (Meteorology and Environmental Protection Administration). 1991. Coastal surveys summary report. Unpublished report.

Méry, S., Charpentier, V. and Beech, M. 2008. First evidence of shell fish-hook technology in the Gulf. *Arab. Archaeol. Epigr.* 19: 15-21.

Meshal, A.H. 1987. Hydrography of a hypersaline coastal lagoon in the Red Sea. *Estuarine Coastal Shelf Sci.* 24: 167-175.

MESL. 2004. Impacts of overboard screening and associated benthic biological community structure in relation to marine aggregate extraction. Prepared by the Marine Ecological Surveys Limited (MESL) for the Office of Deputy Prime Minister and Minerals Industry Research Organization, U.K.

Meteorology and Environmental Protection Administration (Saudi Arabia). 2012. National Ambient Water Quality Standards of 2012.

Metoffice. 2013. Saudi Arabia. (metoffice.gov.uk/media/pdf/j/m/Saudi_Arabia.pdf). Accessed: October 2013.

Meylan, A. 1985. The role of sponge collagens in the diet of the hawksbill turtle Eretmochelys imbricate, pp. 191-196, in Barrati, A. and Garrone, R. (eds.). Biology of invertebrate and lower vertebrate collagens. Plenum Publishing Corporation.

Meylan, A. 1988. Spongivory in hawksbill turtles: A diet of glass. *Science* 239: 393-396.

Meylan, A.B., Bowen, B.W. and Avise, J.A. 1990. A genetic test of natal homing verses social facilitation models for green turtle migrations. *Science* 248: 724-727.

Michel, H.B., Behbehani, M. and Herring, D. 1986a. Zooplankton diversity, distribution and abundance in Kuwait waters. *Kuwait Bulletin of Marine Science* 8: 37-105.

Michel, H.B., Behbehani, M. and Herring, D. 1986b. Zooplankton of the Western Arabian Gulf south of Kuwait Waters. *Bull. Mar. Sci.* 8: 1-36.

Michel, H.B., Behbehani, M., Herring, D., Arar, M., Shoushani, M. and Brakoniecki, T. 1981. Diversity, distribution and biomass of zooplankton in Kuwaiti waters. Report to Division of Food Resources, Mariculture and Fisheries Department. Kuwait Institute for Scientific Research.

Michel, J. and Rutherford, N. 2014. Impacts, recovery rates, and treatment options for spilled oil in marshes. *Mar. Poll. Bull.* 82(1-2): 19-25.

Michel, J., Hayes, M.O., Keenan, R.S., Sauer, T.C., Jensen, J.R. and Narumalani, S. 1993. Contamination of nearshore subtidal sediments of Saudi Arabia from the Gulf war oil spill. *Marine Pollution Bulletin* 27: 109-116.

Michel, J., Hayes, M.O., Montello, T.M. and Sauer, T.C. 1994. ROPME sea oil spill nearshore geochemical processes study: Distribution and weathering of oil in intertidal sediments for year 2 (1993). Prepared by Research Planning Inc. Marine Spill Response Corporation, Washington, D.C. MSRC Technical Report Series 94-009, 140 p.

Micheli, F. 1999. Eutrophication, fisheries, and consumer-resource dynamics in marine pelagic ecosystems. *Science* 285(5432): 1396-1398.

Michels, T. 1992. Recent achievements of low temperature multiple effect desalination in the western areas of Abu Dhabi, UAE. Proceedings of the Desal 92 Arabian Gulf Regional Water Desalination Symposium, Al-Ain, UAE.

Middle East Desalination Research Center (MEDRC), Sultanate of Oman. 2010. Environmental planning, prediction and management of brine discharge from desalination plants. MEDRC Series of R&D Reports, Project: 07-AS-003.

Millennium Ecosystem Assessment 2005. Ecosystems and human well-being: Wetlands and water synthesis. World Resources Institute, Washington, D.C.

Miller, J.D. 1989. Marine turtles. Vol. I: An assessment of the conservation status of marine turtles in the Kingdom of Saudi Arabia. M.E.P.A. Coastal and Marine Management Series, Technical Report #9, 209 p.

Miller, J.D. 1989b. Biology, distribution, and impacts on marine turtles in Saudi Arabia, in Proceedings of workshop I: On the ecological imperatives for sustainable development in the Kingdom of Saudi Arabia, National Commission for Wildlife Conservation and Development, Ministry of Agriculture and Water and Meteorological and Environmental Protection Agency, Riyadh, Saudi Arabia.

Miller, J.D. 1995. Nesting biology of sea turtles, pp. 573-575, in Bjorndal, K.A. (ed.). Biology and conservation of sea turtles [revised edition.] Smithsonian Institution Press, Washington, D.C.

Miller, J.D. 1997. Reproduction in sea turtles, pp. 51-81, in Lutz, P. and Musick, J. (eds.). The biology of sea turtles. CRC Press, New York, USA.

Miller, J.D. 2011a. Marine and coastal reptiles, pp. 264-295, in Loughland, R.A. and Al-Abdulkader, K. (eds.). Marine atlas Western Arabian Gulf. Saudi Aramco Environmental Protection Pubs. Dhahran, Saudi Arabia.

Miller, J.D. 2011b. The coastal and offshore island ecosystems, pp. 158-185, in Loughland, R.A. and Al-Abdulkader, K. (eds.). Marine Atlas Western Arabian Gulf. Saudi Aramco Environmental Protection Pubs. Dhahran, Saudi Arabia.

Miller, J.D. and Abdulqader, E.A.A. 2009. Marine turtles and sea snakes of Bahrain, pp. 263-287, in Loughland, R.A. and Zainal, A.J.M. (eds.). Marine Atlas of Bahrain. (GEOMATEC), Bahrain Center for Studies and Research, Kingdom of Bahrain.

Miller, J.D., Preen, A., Loughland, R.A., Youssif, A. and Darwish, A. 2004. Marine turtles and sea snakes in Abu Dhabi Emirate, pp. 184-201, in Loughland, R.A., Al Muhairi, F., Fadel, S., Almehdi, A. and Hellyer, P. (eds.). Marine atlas of Abu Dhabi. (Emirates Heritage Club, Abu Dhabi, UAE.

Mills, S.C., Peyrot-Clausade, M. and Fontaine, M.F. 2000. Ingestion and transformation of algal turf by Echinometra mathaei on Tiahura fringing reef (French Polynesia). *J. Exp. Mar. Biol. Ecol.* 254: 71-84.

Minello, T.J., Able, K.W., Weinstein, M.P. and Hays, C.G. 2003. Salt marshes as nurseries for nekton: Testing hypotheses on density, growth and survival through meta-analysis. *Marine Ecology Progress Series* 246: 39-59.

Misra, B.M., Paradip, K. and Bhattacharjee, B. 1999. Futuristic trends in hybrid system for desalination. Proceedings of the IDA World Congress on Desalination and Water Reuse, San Diego, CA, USA, pp. 311-320.

Mobaraki, A. 2004a. Nesting of the hawksbill turtle in Shidvar Island, Hormozgan Province, Iran. *Marine Turtle Newsletter* 103: 13.

Mobaraki, A. 2004b. Marine turtles in Iran: Results from 2002. *Marine Turtle Newsletter* 104: 13-14.

Mobaraki, A. 2011. Sea turtle situation, studies and conservation in the Islamic Republic of Iran, IOSEA Marine Turtle MoU http://www.ioseaturtles.org.

Moberg, F. and Ronnback, P. 2003. Ecosystem services of the tropical seascape: Interactions, substitutions and restoration. *Ocean and Coastal Management* 46: 27-46.

Moberg, F. and Folke, C. 1999. Ecological goods and services of coral reef ecosystems. *Ecological Economics* 29: 215-233.

Mohammad, M.M. 1972. Polychaetous annelids collected by "Umitaka-Maru" from the Arabian Gulf. *Hydrobiologia* 40(4): 553-560.

Mohammed, H.M.A., Bishop, J.M. and Xu, X. 1996. Population characteristics of green tiger prawns, Penaeus semisulcatus, in Kuwait waters prior to the Gulf war. *Hydrobiologia* 337: 37-47.

Mohammed, M. 2009. Turkey lets more water out of dams to Iraq: MP. Reuters, May 23, 2009.

Moller, I. and Spencer, T. 2002. Wave dissipation over macro-tidal salt marshes: Effects of marsh edge typology and vegetation change. *Journal of Coastal Research I* 36: 506-521.

Molvaer, J., Knutzen, J., Magnusson, J., Rygg, B., Skei, J. and Sørensen, J. 1997. Classification of environmental quality in fjords and coastal waters: A guide. Norwegian State Pollution Control Authority (SFT) publication 97: 03, Oslo, Norway, 36 p. in Norwegian.

Monniot, C. and Monniot, F. 1985. Ascidies littorales de Guadeloupe. IX: Caractéristiques des populations, écologie, rapports avec la faune mondiale. *Tethys* 11: 203-213.

Monniot, C. and Monniot, F. 1987. Les ascidies de Polynésie française. Mémoires du *Museum National d'Histoire Naturelle de Paris (A)* 136: 1-155.

Monniot, C. and Monniot, F. 1997. Records of ascidians from Bahrain, Arabian Gulf with three new species. *Journal of Natural History* 31(11): 1623-1643.

Monniot, F. and Monniot, C. 2001. Ascidians from the tropical western Pacific. *Zoosystema* 23: 201-383.

Monniot, F. and Monniot, C. 2003. Ascidians from the outer slope and bathyal western Pacific. *Zoosystema* 25: 681-749.

Montague, C.L. 1980. A natural history of temperate western Atlantic fiddler crabs (Genus Uca) with reference to their impact on the salt marsh. *Contr. Mar. Sci.* 23: 25-55.

Moore, A.B.M. 2012. Elasmobranchs of the Persian (Arabian) Gulf: Ecology, human aspects and research priorities for their improved management. *Reviews in Fish Biology and Fisheries* 22: 35-61.

Moore, A.B.M., Ward, R.D. and Peirce, R. 2012. Sharks of the Persian (Arabian) Gulf: A first annotated checklist (Chondrichthyes: Elasmobranchii). *Zootaxa* 3167: 1-16.

Moreira, F. 1995. Diet of black-headed gull Larus ridibunduss on emerged intertidal areas in the Tagus estuary (Portugal): Predation or grazing? *Journal of Avian Biology* 26: 277-282.

Morgan, G. 2006. Country review: Saudi Arabia, in De Yoyng, C. (ed.). Review of the state of world marine capture fisheries management: Indian Ocean. FAO, Rome, Fisheries Technical Paper 488.

Mortimer, J.A. 1995. Factors influencing beach selection by nesting sea turtles, pp. 45-51, in Bjorndal, K.A. (ed.). Biology and conservation of sea turtles. Revised Edition. Smithsonian Institution Press, Washington, D.C.

Mortimer, J.A. 1981. The feeding ecology of the West Caribbean green turtle (Chelonia mydas) in Nicaragua. *Biotropica* 13: 49-58.

Morton, B. 1996. The subsidiary impacts of dredging 9 and trawling on a subtidal benthic molluscan community in the southern waters of Hong Kong. *Mar Poll Bull.* 32(10): 701-710.

Moss, S. 1977. Feeding mechanisms in sharks. *American Zoologist* 17: 355-364.

Mrosovsky, N. and Provancha, J. 1989. Sex ratio of loggerhead sea turtles hatching on a Florida beach. *Can. J. Zool.* 67: 2533-2539.

Mumby, P.J., Edwards, A.J., Arias-Gonzalez, J.E., Lindeman, K.C., Blackwell, P.G., Gall, A., Gorczynska, M.I., Harborne, A.R., Pescod, C.L., Renken, H., Wabnitz, C.C.C. and Llewellyn, G. 2004. Mangroves enhance the biomass of coral reef fish communities in the Caribbean. *Nature* 427: 533-536.

Munawar, M., Price, A.R.G., Munawar, I.F., Carou, S., Niblock, H. and Lorimer, J. 2002. Aquatic ecosystem health of the Arabian Gulf: Status and research needs, pp. 303-326, in Khan, N.Y., Munawar, M. and Price, A.R.G. (eds.). The Gulf ecosystem, health and sustainability. Backhuys Pub., Leiden, the Netherlands.

Munday, P.L., Crawley, N.E. and Nilsson, G.E. 2009. Interacting effects of elevated temperature and ocean acidification on the aerobic performance of coral reef fishes. *Mar Ecol Progr Ser* 388: 235-242.

Murano, M.M. 1998. Mysidae (Crustacea: Mysidacea) collected from the western Arabian Gulf. *Plankton Biology and Ecology* 45: 45-54.

Murty, T.S. and El-Sabh, M.I. 1983. Storm tracks, storm surges and sea state in the Arabian Gulf, Strait of Hormuz and the Gulf of Oman, pp. 12-24, in El-Sabh, M.I. (ed.). Oceanographic modelling of the Kuwait action plan region. UNESCO Reports in Marine Sciences.

Musick, J.A. and Limpus, C.J. 1997. Habitat utilization and migration in juvenile sea turtles, pp. 137-163, in Lutz, P. and Musick, J. (eds.). The biology of sea turtles. CRC Press, New York, USA.

Muthu, M.S. 1978. Larval development: Specific identity of penaeid postlarvae found in brackishwater areas, in Kartha, K.N.K. (ed.). Coastal aquaculture: Marine prawn culture. Part 1: Larval development of Indian penaeid prawns. *CMFRI Bulletin* 28: 86-90.

Myers, R.A. and Worm, B. 2005. Extinction, survival or recovery of large predatory fishes. *Philosophical Transactions of the Royal Society B* 360: 13-20.

Nada, N. 2010. Difference in salinity and thermal discharges between SWRO and thermal plants. International Desalination Association (IDA): Desalination and the Gulf "The relationship between the environment and meeting the region's needs," December 6-7, 2010, Manama, Bahrain.

Nagelkerken, I., Roberts, C.M., van der Velde, G., Dorenbosch, M., van Riel, M.C., Cocheret de la Morinière, E. and Nienhuis, P.H. 2002. How important are mangroves and seagrass beds for coral reef fish? The nursery hypothesis tested on an island scale. *Marine Ecology Progress Series* 244: 299-305.

Naji, A.J. 1993. Trade relations between Bahrain and Iraq in the Middle Ages: A commercial and political outline, pp. 423-443, in Al Khalifa, A.K. and Rice, M. (eds.). Bahrain through the ages, the history. Kegan Paul, London.

Naser, H. 2014. Marine ecosystem diversity in the Arabian Gulf: Threats and conservation, pp. 297-328, in Grillo, Oscar (ed.). Biodiversity — The dynamic balance of the planet. InTech Publishing.

Naser, H.A. 2013. Assessment and management of heavy metal pollution in the marine environment of the Arabian Gulf: A review. *Marine Pollution Bulletin* 72: 6-13.

National Oceanic and Atmospheric Administration Marine Debris Program. 2014. Report on the Entanglement of Marine Species in Marine Debris with an Emphasis on Species in the United States. Silver Spring, MD, USA, 28 p.

NCWCD. 1990. A system plan for protected areas for wildlife conservation and sustainable rural development in Saudi Arabia. NCWCD/IUCN, Riyadh, Saudi Arabia.

NCWCD. 2005. National Strategy for conservation of Biodiversity in the Kingdom of Saudi Arabia. National commission for Wildlife conservation and Development

Neelamani, S., Al-Salem, K. and Rakha, K. 2007. Extreme waves for Kuwaiti territorial waters. *Ocean Engineering* 34: 1496-1504.

Neelamani, S., Al-Salem, K. and Rakha, K. 2009. Extreme gravity waves in the Arabian Gulf. *The J. Eng. Res.* 6: 21-36.

Neff, J.M. 1990. Composition and fate of petroleum hydrocarbons and spill treating agents in the marine environment, pp: 1-32, in Geraci, J.R. and St. Aubin, D.J. (eds.). Sea mammals and oil: Confronting the risks. Academic Press.

Negoro, M., Shioji, N., Miyamoto, K. and Miura, Y. 1991. Growth of microalgae in high CO_2 gas and effects of Sox and Nox. *Appl. Biochem. Biotechnol.* 28-9: 877-886.

Nellen, W. 1973. Fischlarven des Indischen Ozean. Ergebnisse der Fischbrutuntersuchungen waehrend der ersten Expedition des Forschungsschiffs "Meteor" in den Indischen Ozean und den Persischen Golf, Oktober 1964 bis April 1965. Meteor Forschungsergebnisse, R. *D Biol.* 1-66.

Nellen, W. 1973. Kinds and abundance of fish larvae in the Arabian Sea and the Persian Gulf, pp. 415-430, in Zeirtzschel, B. (ed.). Ecological studies, analysis and synthesis. Vol. 3: Biology of the Indian Ocean. Springer Verlag, Berlin.

Nelson Smith, A. 1972. Oil pollution and marine ecology. Elek Scientific Books, London.

Nelson, J.S. 2006. Fishes of the world. 4th edition. Hoboken (New Jersey, USA): John Wiley & Sons, 601 p.

Newell, R.C. and Seiderer, L.J. 1997. Benthic ecology of lowestoft: Dredging application area 454. Report prepared for Oakwood Environmental by Marine Ecological Surveys. Ref SCS/454/l.

Newell, R.C., Seiderer, L.J. and Hitchcock, D.R. 1998. The impact of dredging works in coastal waters: A review of the sensitivity to disturbance and subsequent recovery of biological resources on the seabed. *Oceanography and Marine Biology: An Annual Review* 36: 127-178.

Newson, S.E., Mendes, S., Crick, H.Q.P., Dulvy, N.K., Houghton, J.D.R., Hays, G.C., Hutson, A.M., MacLeod, CD, Pierce, G.J. and Robinson, R.A. 2008. Indicators of the impact of climate change on migratory species. *Endangered Species Research* 7(2): 10-13.

Newton, I. 2008. The migration ecology of birds. Academic Press, Elsevier Ltd.

Newton, L. 1955a. The marine algae of Kuwait, pp. 100-102, in Dickson, V. (ed.). The wild flowers Kuwait and Bahrain. Allen and Unwin, London.

Newton, L. 1955b. The marine algae of Bahrain, in the wild flowers Kuwait and Bahrain. Dickson, London, Allen and Unwin, V. (ed.): 141-144.

Newton, S.F. and Symens, P. 1994. Kingdom of Saudi Arabia, in Evans, M.I. (compiler). Important bird areas of the Middle East. BirdLife Conservation Series No. 2, BirdLife International, Cambridge, U.K.

Newton, I. 2011. BOU Proceedings — The ecology & conservation of migratory birds. http://www.bou.org.uk/bouproc-net/migratory-birds/newton.pdf.

Nielsen, V. 1958. Famed for its many pearls. *KUML* 1958: 157-163.

Niera, F.J. 2005. Summer and winter plankton fish assemblages around offshore oil and gas platforms in southeastern Australia. *Estuar. Coast. Shelf Sci.* 63: 589-604.

Nishiwaki, M. and Marsh, H. 1985. Dugong. Dugong dugon (Muller, 1776), pp. l-31, in Ridgway, S.H. and Harrison, R.J. (eds.). Handbook of Marine Mammals. Academic Press, London.

Nishiwaki, M., Kasuya, T., Miyazaki, N., Tobayama, T. and Kataoka, T. 1979. Present distribution of the dugong in the world. *Scientific Reports of the Whales Research Institute* 31: 133-141.

Nithyanandan, M. 2012. New and rare nudibranch records from Kuwait, Arabian Gulf (Mollusca: Opisthobranchia). *Marine Biodiversity Records* 5: e115. DOI: 10.1017/S1755267212000954.

Njinkoué, J.M., Barnathan, G., Kornprobst, J.M., Al-Easa, H.S.S., Al-Muftah, A. and Vacelet, J. 2006. Phospholipid fatty acids compositions of sponges from Qatar. I — Haplosclerida. *Qatar University Science Journal* 26: 31-38.

NOAA. 2014. Entanglement of marine species in marine debris with an emphasis on species in the United States. National Oceanic and Atmospheric Administration Marine Debris Program. Silver Spring, MD, USA, 28 p.

Nogales, M., Martın, A., Tershy B.R., Donlan, C.J., Veitch, D., Puerta, N., Wood, B. and Alonso, J. 2004. A review of feral cat eradication on islands. *Conservation Biology*, 18, 310-319.

Norse, E.A. 1994. Capsizing the cradle of life. *Glob. Biodivers* 4: 4-7.

Nour El-Din, N.M. and Ghobashy, A.F.A. 1999. Distribution and numerical abundance of copepods community along the coastal waters of Qatar, RSA. *Bull. Inst. Oceanogr. and Fisher. A.R.E.* 25: 203-221.

Noy, M.I. 1975. Stability of grazing systems — An application of predator-prey graphs. *Journal of Ecology* 63(2): 459-481.

NRC (National Research Council). 1990. The decline of the sea turtles. National Academy of Science Press, Washington, D.C., 259 p.

NRC (National Research Council). 2010. Assessment of sea turtle status and trends. National Academy of Science Press, Washington, D.C., 162 p.

Oates, J., Davidson, T.E., Kamilli, D. and McKerrel, H. 1977. Seafaring merchants of Ur? *Antiquity* 51: 221-223.

Ober, H.K. 2010. Effects of oil spills on marine and coastal wildlife. Department of Wildlife Ecology and Conservation. University of Florida. www.wec.ufl.edu/Effects%20of%20oil%20spills%20on%20 wildlife.pdf.

Odum, E.P. 1971. Fundamentals of ecology. W.B. Saunders, Philadelphia.

Oldfield, J.W. 2003. Survey of material usage in MSF plants over the past 25 years. Proceedings of the International Desalination Association Conference, Bahamas.

Olsen, J.L., Rouzé, P., Verhelst, B., Lin, Y-C., Bayer, T., Collen, J., Dattolo, E., De Paoli, E., Dittami, S., Maumus, F., Michel, G., Kersting, A., Lauritano, C., Lohaus, R., Töpel, M., Tonon, T., Vanneste, K., Amirebrahimi, M., Brakel, J., Boström, C., Chovatia, M., Grimwood, J., Jenkins, J.W., Jüterbock, A., Mraz, A., Stam, W.T., Tice, H., Bornberg-Bauer, E., Green, P.J., Pearson, G.A., Procaccini, G., Duarte, C.M., Schmutz, J., Reusch, T.B.H. and Van de Peer, Y. 2015. The genome of the seagrass Zostera marina reveals angiosperm adaptation to the sea. *Nature* 530, 331-335.

Olsgard, F., Brattegard, T. and Holthe, T. 2003. Polychaetes as surrogates for marine biodiversity: Lower taxonomic resolution and indicator groups. *Biodiversity and Conservation* 12: 1033-1049.

Omar, S.A.S., Misak, R.F. and Shahid, S.A. 2002. Sabkhat and halophytes in Kuwait, pp. 71-81, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Ormond, R., Bradbury, R., Bainbridge, S., Fabricius, K., Keesing, J., De Vantier, L., Medley, P. and Steven, A. 1990. Test of a model of regulation of crown-of-thorns starfish by fish predators. *Lecture Notes in Biomathematics* 88: 189-207.

Ormond, R.F.G., Price, A.R.G. and Dawson-Shepherd, A.R. 1988. The distribution and character of mangroves in the Red Sea, Arabian Gulf and Southern Arabia. Proceedings of the UNDP/UNESCO Regional Mangrove Project, Colombo, November 11-14, 1986, pp. 125-130.

Orth, R.J., Carruthers, T.J., Dennison, W.C., Duarte, C.M., Fourqurean, J.W., Heck, K.L., Hughes, A.R., Kendrick, G.A., Kenworthy, W.J., Olyarnik, S. and Short, F.T., 2006. A global crisis for seagrass ecosystems. *BioScience* 56: 987-996.

Orth, R.J. 1992. A perspective on plant-animal interactions in seagrasses: Physical and biological determinants influencing plant and animal abundance, pp. 147-164, in John, D.M, Hawkins, S.J. and Price, J.H. (eds.). Plant-animal interactions in the marine benthos. *The Systematics Association Special*, Vol. 46.

Orth, R.J. and Moore, K.A. 1986. Seasonal and year-to-year variations in the growth of Zostera marina L. (eelgrass) in the lower Chesapeake Bay. *Aquat. Bot.* 24: 335-341.

Osborne, P.E., Norton, J.A. and Aspinall, S.J. 1996. Desert birds of Abu Dhabi, pp. 98-123, in Osborne, P.E. (ed.). Desert ecology of Abu Dhabi. Pisces Publications, Newbury.

Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. 1998. Offshore environment of the ROPME Sea Area after the war-related oil spill, pp. 1-22, in Otsuki, A., Abdulraheem, M.Y. and Reynolds, R.M. (eds.). Terra Scientific Publishing Co. TERRAPUB, Tokyo, Japan.

Paerl, H.W. 1997. Coastal eutrophication and harmful algal blooms: Importance of atmospheric deposition and groundwater as "new" Nitrogen and other nutrient sources. *Limnol. Oceanogr.* 42: 1154-1165.

Pagliai, A.M.B., Varriale, A.M.C., Creama, R., Galletti, M.C. and Zunarelli, R.V. 1985. Environmental impact of extensive dredging in a coastal marine area. *Mar Poll Bull.* 16(12): 483-488.

Palgrave, W.G. 1866. Narrative of a year's journey through Central and Eastern Arabia (1862-1863). Macmillan, London.

Papageorgiou, N., Arvanitidis, C. and Eleftheriou, A. 2006. Multicausal environmental severity: A flexible framework for microtidal sandy beaches and the role of polychaetes as an indicator taxon. *Estuarine Coastal and Shelf Science* 70: 643-653.

Papathanasopoulou, N. 2009. Endangered sea turtles nesting on Kuwait Islands. *Biodiversity East*. www.bio-e.org/lib/endangered-seaturtles-nesting-kuwait-islands.

Parente, V., Ferreira, D., Moutinho dos Santos, E. and Luczynski, E. 2006. Offshore decommissioning issues: Deductibility and transferability. *Energy Policy* 34: 1992-2001.

Park, J.K. and Jong, M.H. 2003. Application of hybrid technology to the largest desalination plant, Fujairah, UAE. Proceedings of the IDA World Congress on Desalination, Bahamas.

Parra, G.J., Corkeron, P.J. and Marsh, H. 2006a. Population sizes, site fidelity and residence patterns of Australian snubfin and Indo-Pacific humpback dolphins: Implications for conservation. *Biological Conservation* 129(2): 167-180.

Parra, G.J., Corkeron, P.J. and Marsh, H. 2004. The Indo-Pacific humpback dolphin, Sousa Chinensis (Osbeck, 1765), in Australian waters: A summary of current knowledge. *Aquatic Mammals* 30(1): 197-206.

Parra, G.J., Schick, R. and Corkeron, P.J. 2006b. Spatial distribution and environmental correlates of Australian snubfin and Indo-Pacific humpback dolphins. *Ecography* 29(3): 396-406.

Parry, J. 2013. The pearl emporium of Al Zubarah. *Saudi Aramco World* 64(6): 33-39.

Parry, M.L., Rosenzweig, C., Iglesias, A., Livermore, M. and Fischer, G. 2004. Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Global Environmental Change* 14: 53-67.

Pastorok, R.A. and Bilyard, G.R. 1985. Effects of sewage pollution on coral reef communities. *Marine Ecology Progress Series* 21: 175-189.

Patterson, R.J. and Kinsman, D.J.J. 1977. Marine and continental groundwater sources in a Persian Gulf coastal sabkha. *Studies in Geology* 4: 381-397.

Patterson, R.J. and Kinsman, D.J.J. 1981. Hydrologic framework of a sabkha along Arabian Gulf. *AAPG Bulletin* 65: 1457-1475.

Pauly, D., Christensen, V., Guénette, S., Pitcher, T.J., Sumaila, U.R., Walters, C.J. and Zeller, D. 2002. Toward sustainability in world fisheries. *Nature* 418(6898): 689.

Pauly, D. 1979. Theory and management of tropical multi-species stocks: A review, with emphasis on the Southeast Asian demersal fisheries. ICLARM. *Studies and Reviews* 1: 35 p.

Pauly, D., Trites, A.W., Capuli, E. and Christensen, V. 1998. Diet composition and trophic levels of marine mammals. *ICES Journal of Marine Science* 55: 467–481.

Pawson, D.L. 2007. Phylum Echinodermata. *Zootaxa* 1668: 749–764.

Pearce-Higgins, J.W. and Green, R.E. 2014. Birds and climate change: Impacts and conservation responses. Cambridge University Press, New York, 477 p.

Pearson, T. and Rosenberg, R. 1978. Macrobenthic succession in relation to organic enrichment and pollution of the marine environment. *Oceanography and Marine Biology: An Annual Review* 16: 229–311.

Perez-Hurtado, A., Goss-Custard, J. and Garcia, F. 1997. The diet of wintering waders in Cadiza Bay, Southwest Spain. *Bird Study* 44: 45–52.

Perillo, G.M.E. 2009. Tidal courses: Classification, origin, and functionality, pp. 165–210, in Perillo, G.M.E., Wolanski, E., Cahoon, D.R. and Brinson, M.M. (eds.). Coastal wetlands: An integrated ecosystem approach. Elsevier B.V., 939 p.

Pernetta, J.C. 1993. Mangrove forests, climate change and sea level rise: Hydrological influences on community structure and survival, with examples from the Indo-west Pacific. A Marine Conservation and Development Report. IUCN, Gland, Switzerland, 44 p.

Perrone, T.J. 1981. Winter Shamal in the Persian Gulf. Naval Environmental Prediction Research Facility. Technical Report, Monterey, CA, pp. 79–86.

Perry A.L., Low, P.J., Ellis, J.R. and Reynolds, J.D. 2005. Climate change and distribution shifts in marine fisheries. *Science* 308: 1912–5.

Pesta, O. 1911. Acartia pietschmanni, nov. species aus dem Golf von Persien. *Verhandlungen der Zoologischbotanischen Gesellschaft in Wien*. 61: 112. [In German].

Pesta, O. 1912. Wissenschaftliche Ergebnisse der Expedition nach Mesopotamien. Crustaceen. I. Teil: Copepoden aus dem Golf von Persien. *Annalen des Naturhistorisches Museum Wien*. 26: 39–62. [In German].

Peterson, C.G.J. 1913. Valuation of the sea. II. The animal communities of the sea bottom and their importance for marine zoogeography. *Report of the Danish Biological Station* 21: 1–44.

Peterson, C.H. 2001. The Exxon Valdez oil spill in Alaska: Acute, indirect and chronic effects on the ecosystem. *Advances in Marine Biology* 39: 1–103.

Pethick, J.S. 1992. Salt marsh geomorphology, pp. 41–62, in Allen, J.L.R. and Pye, K. (eds.). Salt marshes morphodynamics, conservation and engineering significance. Cambridge University Press, Cambridge.

Peyrot-Clausade, M., Chabanet, P., Conand, C., Fontaine, M.F., Letourneur, Y. and Harmelin-Vivien, M. 2000. Sea urchin and fish bioerosion on La Reunion and Moorea reefs. *Bull. Mar. Sci*. 66: 477–485.

Pezzey, J.C.V., Roberts, C.M. and Urdal, B. 2000. A simple bioeconomic model of a marine reserve. *Ecological Economics* 33(1): 77–91.

Pfitzenmeyer, H.T. 1970. Gross physical and biological effects of overboard spoil disposal in Upper Chesapeake Bay. N.R.I. Special Report No. 3: 26–35. Chesapeake Biological Laboratory, Solomons, Maryland, USA. Control No. 397.

Phillips, D.C. 1988. Wildflowers of Bahrain. A field guide to herbs, shrubs, and trees, 1st edition.

Phillips, R., Loughland, R.A. and Youssef, A. 2004. Seagrasses of Abu Dhabi Emirate, UAE (Arabian Gulf), pp. 124–139, in Loughland, R.A., Al Muhairi, F.S., Fadel, S.S., Al Mehdi, A.M. and Hellyer, P. (eds.). Marine atlas of Abu Dhabi. Emirates Heritage Club, Abu Dhabi, UAE.

Phillips, R.C. 2002. A short review on seagrasses of the Arabian Peninsula region with particular reference to mineralization in sabkhat, pp. 299–302, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Phillips, R.C. 2003. The seagrasses of the Arabian Gulf and Arabian region. Chapter 6, pp. 74–81, in Green, E.P. and Short, F.T. (eds.). World Atlas of Seagrasses. Prepared by UNEP-WCMC. University of California Press, Berkeley, CA, USA.

Phillips, R.C., Loughland, R.A. and Youssef, A.M. 2002. Seagrasses of Abu Dhabi, United Arab Emirates, Arabian Gulf: A review. *Tribulus* 15, 21–24.

Phillips, R.C., McMillan, C. and Bridges, K.W. 1983. Phenology of eelgrass, Zostera marina L., along latitudinal gradients in North America. *Aquat. Bot*. 15: 145–156.

Phleger, F.B. 1969. A modern evaporite deposit in Mexico [with discussion]. *AAPG Bull*. 53: 824–829.

PIANC. 2010. Dredging and port construction around coral reefs. The World Association for Waterborne Transport Infrastructure (PIANC), Report No. 108. Brussels.

Piatt, J.F., Sydeman, W.J. and Wiese, F. 2007. Introduction: A modern role for seabirds as indicators. *Ma.(?) Ecol. Prog. Ser.* 352: 199–204.

Pichon, M., Benzoni, F., Chaîneau, C.H. and Dutrieux, E. 2010. Field guide to the hard corals of the southern coast of Yemen. BIOTOPE Parthenope, Paris, 256 p.

Pickett, S.T.A. and Cadenasso, M.L. 2002. The Ecosystem as an multidimensional concept: Meaning, model, and metaphor. *Ecosystems* 5: 1–10.

Piesinger, C. 1983. Legacy of Dilmun: The roots of ancient maritime trade in Eastern Castal Arabia in the fourth/third millennium B.C. (Ph.D. Thesis). University of Wisconsin, Madison, USA.

Pilcher, N.J. 2000. The Green turtle Chelonia mydas in the Arabian Gulf. *Chelonian Cons. Biol*. 3(4): 730–735.

Pilcher, C.W.T. and Sexton, D.B. 1993. Effects of the Gulf War oil spills and wellhead fires on the avifauna and environment of Kuwait. *Sandgrouse* 15: 6–17.

Pilcher, N.J. 1999. The hawksbill turtle Eretmochelys imbricata in the Arabian Gulf. *Chelonian Cons. Biol*. 32: 312–317.

Pilcher, N.J. 2003. Marine turtles and dugongs in the Arabian Sea grass pastures, pp. 74–81, in Green, F.P. and Short, F.T. (eds.). World Atlas of Seagrasses. UNEP, WCMC. University of California Press, Berkeley, USA.

Pilcher, N.J., Al-Maslamani, I., Williams, J., Gasang, R. and Chikhi, A. 2015. Population structure of marine turtles in coastal waters of Qatar. *Endangered Species Research* 28(2): 163–174.

Pilcher, N.J., Antonopoulou, M., Perry, L., Abdel-Moati, M.A., Al Abdessalaam, T.Z., Albeldawi, M., Al Ansi, M., Al-Mohannadi, S.F., Al Zahlawi, N., Baldwin, R., Chikhi, A., Das, H.S., Hamza, S., Kerr, O.J., Al Kiyumi, A., Mobaraki, A., Al Suwaidi, H.S., Al Suwaidi, A.S., Sawaf, S., Tourenq, C., Williams, J. and Willson, A. 2014. Identification of important sea turtle areas (ITAs) for hawksbill turtles in the Arabian region. *Jour. of Exper. Marine Bio. and Ecol.* 460: 89–99.

Pilkey, O.H. and Noble, D. 1966. Carbonate and clay mineralogy of the Persian Gulf. *Deep Sea Research* 13: 1–16.

Pitcher, T.J., 2001. Fisheries managed to rebuild ecosystems? Reconstructing the past to salvage the future. *Ecological Applications* 11(2): 601–617. Published by: Wiley on behalf of the Ecological Society of America

Pizzolon, M., Cenci, E. and Mazzoldi, C. 2008. The onset of fish colonization in a coastal defense structure (Chioggia, Northern Adriatic Sea). *Estuarine Coastal and Shelf Science* 78: 166e178.

Plotkin, P. 2003. Adult migrations and habitat use, pp. 225–241, in Lutz, P., Musick, J. and Wyneken, J. (eds.). The biology of sea turtles, Vol. II. CRC Press, New York.

PME (Presidency of Meteorology and Environment). 2007. Environmental protection standards.

Pocklington, P. and Wells, P.G. 1992. Polychaetes: Key taxa for marine environmental quality monitoring. *Marine Pollution Bulletin* 24: 593–598.

Pohle, W.G. and Thomas, L.H.M. 2001. Monitoring protocol for marine benthos: Intertidal and subtidal macrofauna. A report by the Marine

Biodiversity Monitoring Committee (Atlantic Maritime Ecological Science Cooperative, Huntsman Marine Science Centre) to the Ecological Monitoring and Assessment Network of Environment Canada.

Poiner, I.R. and Kennedy, R. 1984. Complex patterns of change in the macrobenthos of a large sandbank following dredging. *Marine Biology* 78: 335–352.

Poloczanska, E.S., Limpus, C.J. and Hayes, G.C. 2009. Vulnerability of marine turtles to climate change. Chapter 2. *Advances in Marine Biology* 56: 151–211.

Poonian, C. 2003. The effects of the 1991 Gulf War on the marine and coastal environment of the Arabian Gulf: Impact, recovery and future prospects. *Management* 44.

Pope, M. 2013. Observation Records: Tarut Bay terrestrial survey (including Rahima, and Saihat) conducted on January 15, 2013; Abu Ali Island Terrestrial Survey conducted on January 16, 2013. Unpublished data.

Porter, J.W., Lewis, S.K. and Porter, K.G. 1999. The effect of multiple stressors on the Florida Keys coral reef ecosystem: A landscape hypothesis and a physiological test. *Limnol. Oceanogr.* 44(3 part 2): 941–949.

Porter, R. and Aspinal, S. 2010. Birds of the Middle East. C. Helm Publisher, London.

Pörtner, H.O. 2010. Oxygen and capacity limitation of thermal tolerance: A matrix for integrating climate-related stressor effects in marine ecosystems. *The Journal of Experimental Biology* 213: 881–893.

Pörtner, H.O. and Knust, R. 2007. Climate change affects marine fishes through the oxygen limitation of thermal tolerance. *Science* 315(5808): 95–97.

Post, J.C. and Lundin, C.G. 1996. Guidelines for Integrated Coastal Zone Management. Environmentally Sustainable Development Studies and Monographs Series No. 9, The World Bank, Washington, D.C., 16 p.

Potts, D.T. 1983. Thaj in the light of recent research. *Atlal* 7: 86–101.

Potts, D.T. 1984. Thaj and the location of Gerrha, pp. 87–91, in Proceedings of the Seminar for Arabian Studies. Presented at the Seminar for Arabian Studies, Archaeopress, London.

Potts, D.T. 1989. Miscellania Hasaitica. Museum Tusculanum Press, Copenhagen.

Potts, D.T. 1990. The Arabian Gulf in antiquity. Vol. I: From prehistory to the fall of the Achaemenid Empire. Clarendon Press, Oxford.

Potts, D.T. 1993. The late prehistoric, protohistoric and early historic periods in Eastern Arabia (ca. 5000-1200 B.C.). *J. World Prehistory* 7: 163–212.

Potts, D.T. 2001. Before the Emirates: An archaeological and historical account of developments in the region c. 5000 BC to 676 AD, pp. 28–69, in United Arab Emirates: A new perspective. Trident Press, London.

Potts, D.T. 2008. An Umm-an-Nar-type compartmented soft-stone vessel from Gonur Depe, Turkmenistan. Arab. *Archaeol. Epigr.* 18: 167–180.

Potts, D.T. 2009. The archaeology and early history of the Persian Gulf, in Potter, L. (ed.). The Persian Gulf in history. Palgrave Macmillan, New York.

Pous, S., Carton X. and Lazure, P. 2013. A process study of the wind-induced circulation in the Arabian Gulf. *Open Journal of Marine Science* 3: 1–11.

Powers, R.W., Ramirez, L.F., Redmond, C.D. and Elberg Jr., E.L. 1966. Geology of the Arabian Peninsula, sedimentary geology of Saudi Arabia. U.S. Geological Survey Professional Paper 560-D, 147 p.

Preen, A. 1995. Impacts of dugong foraging on seagrass habitats: Observational and experimental evidence for cultivation grazing. *Marine Ecology Progress Series* 124: 201–213.

Preen, A. 1989. Technical Report, Dugongs, Vol. 1: The status and conservation of dugongs in the Arabian Region. MEPA coastal and marine management series, Saudi Arabia.

Preen, A. 1998. Marine protected areas and Dugong conservation along Australia's Indian Ocean Coast. *Environmental Management* 22: 173–181.

Preen, A.R., Marsh, H.D. and Heinsohn, G.E. 1989. Recommendations for the conservation and management of dugong in the Arabian region. M.E.P.A. Coastal & Marine Management Series (Meteorological & Environmental Protection Administration, Saudi Arabia), Report No. 10.

Preen, A. 2004. Distribution, abundance and conservation status of dugongs and dolphins in the southern and western Arabian Gulf. *Biological Conservation* 118: 205–218.

Preen, A. and Marsh, H. 1995. Response of dugongs to large-scale loss of seagrass from Hervey Bay, Queensland, Australia. *Wildlife Research* 22: 507–519.

Preen, A., Das, H., Al-Rumaidh, M. and Hodgson, A. 2012. Dugongs in Arabia, in Himes, E., Reynolds III, J., Aragones, L., Mignucci-Giannoni, A. and Marmontel, M. (eds.). Sirenian conservation: Issues and strategies in developing countries. University Press of Florida, Gainesville, USA.

Prena, J. 1996. The status of the intertidal soft-bottom macrofauna six months after the Gulf War oil spill, pp. 128-137, in Krupp, F., Abuzinada, A. and Nader, I. (eds.). A marine wildlife sanctuary for the Arabian Gulf: Environmental research and conservation following the 1991 Gulf War oil spill. National Commission for Wildlife Conservation and Development, Riyadh, Saudi Arabia.

Price, A.R., Chiffings, T.W., Atkinson, M.A. and Wrathall, T.J. 1987. Appraisal of resources in the Saudi Arabian Gulf, pp. 1031-1045, in Coastal Zone.

Price, A.R.G. 1979. Temporal variations in abundance of Penaeid shrimp larvae and oceanographic conditions off Ras Tanura, Western Arabian Gulf. *Estuarine and Coastal Marine Science,* 4: 451–465.

Price, A.R.G. 1981. Studies on the echinoderm fauna of the western Arabian Gulf. *Journal of Natural History* 15(1): 1–15.

Price, A.R.G. 1982. Conservation and sustainable use of natural resources. II. Marine. IUCN/MEPA document prepared for the Expert Meeting on the Gulf Coordinating Council to review environmental issues, 24 p.

Price, A.R.G. 1982a. Echinoderms of Saudi Arabia: Comparison between echinoderm faunas of Arabian Gulf, SE Arabia, Red Sea and Gulfs of Aqaba and Suez. *Fauna Saudi Arabia* 4: 3–21.

Price, A.R.G. 1982b. Western Arabian Gulf Echinoderms in high salinity waters and the occurrence of dwarfism. *Journal of Natural History* 16(4): 519–527.

Price, A.R.G. 1993. The Gulf: Human impacts and management initiatives. *Marine Pollution Bulletin* 27: 17–27.

Price, A.R.G. 1998. Impact of the 1991 Gulf War on the coastal environment and ecosystems: Current status and future prospects. *Environment International* 24: 91–96.

Price, A.R.G. and Robinson, J.H. (eds.). 1993. The 1991 Gulf War: Coastal and marine environmental consequences. *Marine Pollution Bulletin* 27: 1-380.

Price, A.R.G. 1990. Rapid assessment of coastal zone management requirements: A case study from the Arabian Gulf. *J. Ocean. Shoreline Management* 13: 1–19.

Price, A.R.G. and Coles, S.L. 1992. Aspects of seagrass ecology along the western Arabian Gulf coast. *Hydrobiologia* 234: 129–141.

Price, A.R.G. and Jones, D.A. 1975. Commercial and biological aspects of the Saudi Arabian Gulf shrimp fishery. *Bulletin of Marine Research Center of Saudi Arabia* 6: 1–24.

Price, A.R.G., Downing, N., Flower, S.W., Hardy, J.T., Le Tissier, M., Mathews, C.P., McGlade, J.M., Medley, P.A.H., Oregioni, B., Readman, J.W., Roberts, C.M. and Wrathall, T.J. 1994. The I991 Gulf war environmental assessment of IUCN and collaborators, 48 p. IUCN, Gland, Switzerland in collaboration with WWF, IAEA and IOC.

Price, A.R.G., Mathews, C.P., Ingle, R.W. and Al-Rasheed, K. 1993. Abundance of zooplankton and penaeid shrimp larvae in the Western Gulf: Analysis of pre-war (1991) and post-war data. *Mar. Pollut. Bull.* 27: 273-278.

Price, A.R.G., Medley, P.A.H., McDowall, R.J., Dawson-Shepherd, A.R., Hogarth, P.J. and Ormond, R.F.G. 1987. Aspects of mangal ecology along the Red Sea coast of Saudi Arabia. *J. Nat. Hist.* 21: 449-464.

Price, A.R.G., Sheppard, C.R.C. and Roberts, C.M. 1993. The Gulf — Its biological setting. *Marine Pollution Bulletin* 27: 9-15.

Price, A.R.G., Vousden D.H.P. and Ormond, R.F.G. 1983. Ecological study of sites on the coast of Bahrain, with special reference to the shrimp fishery and possible impact from the Saudi-Bahrain Causeway under construction. IUCN report to the UNEP regional seas program, Geneva.

Price, A.R.G., Vousden, D.H.P. and Ormond, R.F.G. 1984. An ecological study of sites on the coast of Bahrain, with special reference to the shrimp fishery and possible impact from the Saudi-Bahrain Causeway under construction. Report of IUCN to UNEP Regional Seas Program, Geneva.

Price, R. and Haberbeck, A. 1986. The Maritime Laws of the Arabian Gulf Cooperations Council States. London: Graham & Trotman.

Prieto, C.G. and Harrison, E. 2012. Report on the 2011 green turtle program at Tortuguero, Costa Rica. Submitted to Sea Turtle Conservancy (Formerly Caribbean Conservation Corporation) and the Ministry of Environment, Energy and Telecommunications of Costa Rica, April 19, 2012.

Primo, C. and Vazquez, E. 2004. Zoogeography of the southern African ascidian fauna. *Journal of Biogeography* 31: 1987-2009.

Pritchard, P.C.H. 1971. The leatherback or leathery turtle, *Dermochelys coriacea*. IUCN Monograph 1, 42 p.

Pritchard, P.C.H. and Mortimer, J. 1999. Taxonomy, external morphology, and species identification, pp. 21-38, in Eckert, K., Bjorndal, K., Abreu-Grobois, F. and Donnelly, M. (eds.). Research and management techniques for the conservation of sea turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Privett, D.W. 1959. Monthly charts of evaporation from North Indian Ocean, including the Red Sea and the Persian Gulf. *Quart. Journ. Royal Meteorol. Soc. London* 85: 424-428.

Punay, E.Y. 1975. Commercial sea snake fisheries in the Philippines. Chapter 21, pp. 489-502, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore, MD, USA.

Purkis, S.J., Renegar, D.A. and Riegl, B.M. 2011. The most temperature-adapted corals have an Achilles' Heel. *Marine Pollution Bulletin* 62: 246-250.

Purser, B.H. and Siebold, A. 1973. The principal environmental factors influencing Holocene sedimentation and diagenesis in the Persian Gulf, pp. 1-9, in Purser, B.H. (ed.). The Persian Gulf. Springer-Verlag, New York.

Qurban, M.A., Krishnakumar, P.K., Joydas, T.V., Mohamed Ashraf, T.T., Manikandan, K.P., Abdulkader, K.A. and Loughland, R.A. 2011. Over review of Saudi Arabia's Gulf marine habitats, pp. 17-32, in Abdulkader, K.A. and Loughland, R.A. (eds.). Marine Atlas of the Saudi Arabian Waters of the Arabian Gulf. Published by Saudi Aramco, Dhahran, Saudi Arabia.

Rabaoui, L., Yu-Jia Lin, Qurban, M.A., Maneja, R.H., Franco, J., Joydas, T.V., Panickan, P., Al-Abdulkader, K. and Roa-Ureta, R.H. 2015. Patchwork of oil and gas facilities in Saudi waters of the Arabian Gulf has the potential to enhance local fisheries production. *ICES Journal of Marine Science* 72(8): 2398-2408.

Rabaoui, L., Lin, Y.J., Maneja, R.H., Qurban, M.A., Abdurahiman, P., Premlal, P., Al-Abdulkader, K. and Roa-Ureta, R.H. 2017. Nursery habitats and life history traits of the green tiger shrimp Penaeus semisulcatus (De Haan, 1844) in the Saudi waters of the Arabian Gulf. Fisheries Research 195: 1-11.

Raffaelli, D.G., Emmerson, M.C, Solan, M., Biles, C.L. and Paterson, D.M. 2003. Biodiversity and ecosystem processes in shallow coastal waters: An experimental approach. *Journal of Sea Research* 49: 133-141.

Ragab, R. and Prudhomme, C. 2002. Climate change and water resources management in arid and semi-arid regions: Prospective and challenges for the 21st century. *Biosystems Engineering* 81(1): 3-34, DOI: 10.1006/bioe.2001.0013, available online at http://www.idealibrary.com on.

RAMSAR. Online database, www.ramsar.org, accessed May 15, 2014.

Randall, J.E. 1986. Sharks of Arabia. Immel Publishing, London, 148 p.

Randall, J.E. 1995. Coastal fishes of Oman. Crawford House, Bathurst, 439 p.

Randall, J.E. 1992. Review of the biology of the tiger shark (Galeocerdo cuvier). *Marine and Freshwater Research* 43: 21-31.

Rao, G.P., Hatwar, H.R., Al-Sulaiti, M.H. and Al-Mulla, A.H. 2003. Summer Shamals over the Arabian Gulf. *Weather* 58: 471-478.

Rasmussen, A.R. 1989. An analysis of hydrophis ornatus Gray, H. lamberti Smith and H. inornatus Gray Hydrophiidae, Serpentes based on samples from various localities, with remarks on feeding and breeding biology of H. ornatus. *Amphibia-Reptilia* 10: 397-417.

Raven, P.H. and Johnson, G.B. 2002. Biology (6th edition). McGraw-Hill Higher Education. Online textbook. http://highered.mcgraw-hill.com/sites/0073031208/.

Rayner, N.A., Parker, D.E., Horton, E.B., Folland, C.K., Alexander, L.V., Rowell, D.P., Kent, E.C. and Kaplan, A. 2003. Global analyses of sea surface temperature, sea ice, and night marine air temperature since the late 19th century. *J Geophys Res* 108: 4407.

Razzaq, S.A.A. 1991. The Ostracoda community in hypersaline channels in Al-Khiran, Arabian Gulf. *Journal of Micropaleontology* 10: 17-21.

Read, A., Drinker, P. and Northridge, S. 2006. Bycatch of Marine Mammals in U.S. and Global Fisheries. *Conservation Biology* 20(1): 163-169.

Readman, J.W., Bartocci, J., Tolosa, I., Fowler, S.W., Oregioni, B. and Abdulraheem, M.Y. 1996. Recovery of the coastal marine environment in the Gulf following the 1991 war-related oil spills. *Marine Pollution Bulletin* 32: 493-498.

Readman, J.W., Fowler, S.W., Valonouvr, J.P., Cattini, C., Oregioni, B. and Mee, L.D. 1992. Oil and combustion product contamination of Gulf marine environment following the war. *Nature* 358: 662-665.

Redfield, A.C. 1972. Ontogeny of a salt marsh estuary. *Science* 147(3653): 50-55.

Redfield, J.A., Holmes, J.C. and Holmes, R.D. 1978. Sea snakes of the eastern Gulf of Carpentaria. *Aust. J Mar. Freshwat. Res.* 29: 325-334.

Reed, D.C., Schroeter, S.C., Huang, D., Anderson, T.W. and Ambrose, R.F. 2006. Quantitative assessment of difference artificial reef designs in mitigating losses to kelp forest fishes. *Bulletin of Marine Science* 78: 133e150.

Reeler, C. and Al Shaikh, N.Y. 2010. The tomb of Thaj, pp. 392-397, in Roads of Arabia: Archaeology and history of the Kingdom of Saudi Arabia. Musée du Louvre, Paris.

Reeler, C.N. and Al Shaikh, N.Y. 2011. Human use of the coastal and marine resources, pp: 42-77, in Loughland, R.A. and Al-Abdulkader, K. (eds.). Marine Atlas of the Western Arabian Gulf. Saudi Aramco Environmental Protection Pubs. Dhahran, Saudi Arabia.

Rees, A.F. and Baker, S.L. 2006. Hawksbill and Olive Ridley nesting on Masirah Island, Sultanate of Oman: An Update. *Marine Turtle Newsletter* 113: 2-5.

Rehman, S. 2010. Temperature and rainfall variation over Dhahran, Saudi Arabia (1970-2006). *Int. J. Climatol.* 30: 445-449.

Reid, H.A. 1975. Epidemiology and clinical aspects of sea snake bites. Chapter 19, pp. 417-462, in Dunson, W.A. (ed.). The biology of sea snakes. University Park Press, Baltimore, MD, USA.

Research Planning Inc. (RPI). 2003. Oiled shoreline survey in support of the marine and coastal damage assessment. Columbia, South Carolina, Research Planning, Inc. Publication, RPI 055/2003/008, 387 p.

Reynolds, R.M. 1993. Physical oceanography of the Gulf, Strait of

Hormuz, and the Gulf of Oman — Results from the *Mt. Mitchell* expedition. *Mar. Pollution Bull.* 27: 35-59.

Reynolds, R.M. 2002a. Meteorology and climate, section 1: The Gulf ecosystem: Biogeophysical setting, pp. 41-52, in Khan, N.Y., Munawar, M. and Price, A.R.G. (eds.). The Gulf ecosystem health and sustainability. Backhhuys Publishers, the Netherlands, 510 p.

Reynolds, R.M. 2002b. Oceanography, pp. 53-64, in Khan, N.Y., Munawar, M. and Price, A.R.G. (eds.). The Gulf ecosystem: Health and sustainability. Backhuys, Leiden, the Netherlands.

Rezaie-Atagholipour, M. and Barmoodeh, M. 2012. Recent records of the leatherback turtle, Dermochelys coriacea, from the Iranian coastline of the Gulf of Oman. *Marine Turtle Newsletter* 132: 5-6.

Rezaie-Atagholipour, M., Riyahi-Bakhtiari, A. and Sajjadi, M. 2012. Feeding habits of the annulated sea snake, hydrophis cyanocinctus, in the Persian Gulf. *Journal of Herpetology* 472: 328-330.

Richer, R. 2008. Conservation in Qatar: Impacts of increasing industrialization. Center for International and Regional Studies, Georgetown University School of Foreign Service in Qatar, Doha, Qatar, 33 p.

Richmond, M.D. 1994. Ecological status of the marine subtidal habitats and the effects of the 1991 oil spill, with special reference to soft substrata communities. *Courier Forschungsinstitut Senckenberg* 166: 55-60.

Richmond, M.D. 2001. The marine biodiversity of the western Indian Ocean and its biogeography: How much do we know? pp. 241-261, in Richmond, M.D. and Francis, J. (eds.). Marine science development in Tanzania and eastern Africa. Proceedings of the 20th Anniversary Conference on Advances in Marine Science in Tanzania (IMS/WIOMSA).

Richter, C. and Abdu-Hilal, A. 2005. Seas of the Arabian region (29,S), pp. 1373-1412, in Robinson, A.R. and Brink, K.H. (eds.). The Seas, Vol. 14. The president and fellow of the Harward College.

Ricketts, E.F., Calvin, J., Hedgpeth, J.W. and Phillips, D.W. 1985. Between Pacific tides, 5th edition. Stanford, California: Stanford University Press, 652 p.

Ridley, A.P. and Seeley, M.W. 1979. Evidence for recent coastal uplift near Jubail, Saudi Arabia. *Tectonophysics* 52: 319-327.

Riegl, B. 2002. Effects of the 1996 and 1998 positive sea surface temperature anomalies on corals, coral diseases and fish in the Arabian Gulf, Dubai, UAE. *Marine Biology* 140: 29-40.

Riegl, B. 2003. Climate change and coral reefs: Different effects in two high-latitude areas, Arabian Gulf, South Africa. *Coral Reefs* 22(4): 433-446.

Riegl, B.M. and Purkis, S.J. 2012. Coral reefs of the Gulf — Adaptation to climatic extremes. Springer, New York, pp. 1-379.

Rignot, E. and Kanagaratnam, P. 2006. Changes in the velocity structure of the Greenland Ice Sheet. *Science* 311: 986-990.

Roa-Ureta, R.H. 2015. Stock assessment of the Spanish mackerel (Scomberomorus commerson) in Saudi waters of the Arabian Gulf with generalized depletion models under data-limited conditions. *Fisheries Research* 171: 68-77.

Roberts, D., Johnston, E. and Knott, N. 2010. Impacts of desalination plant discharges on the marine environment: A critical review of published studies. *Water Research* 44: 5117-5128.

Roberts, H.H. 1985. Carbonate platforms forming in a strong tidal current setting: Southern Gulf of Suez. Proceedings of the 5th International Coral Reef Congress 6: 335-341.

Roberts, C.M. and Hawkins, J.P. 1997. How small can a marine reserve be and still be effective? *Coral Reefs* 16: 150.

Roberts, C.M. 1998a. Permanent no-take zones: A minimum standard for effective marine protected areas, pp. 96-100, in Hatziolos, M.E., Hooten, A.J. and Fodor, M. (eds.). Coral reefs. challenges and opportunities for sustainable development. The World Bank, Washington, D.C.

Roberts, C.M. 1998b. Sources, sinks and the design of marine reserve networks. *Fisheries* 23: 16-19.

Robineau, D. 1998. The cetaceans of the Arabo-Persian Gulf: A review. Paper SC/50/SM1 presented to the IWC Scientific Committee, April 1998 (unpublished), 15 p.

Robineau, D. and Fiquet, P. 1996. The Cetacea of the Jubail Marine Wildlife Sanctuary, Saudi Arabia, in Krupp, F., Abuzinada, H. and Nader, I.A. (eds.). Environmental research and conservation following the 1991 Gulf War oil spill. A Marine Wildlife Sanctuary for the Arabian Gulf. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt, Germany.

Robinson, D.P., Jaidah, M.Y., Jabado, R.W., Lee-Brooks, K., El-Din, N.M.N., Al Malki, A.A., Elmeer, K., McCormick, P.A., Henderson, A.C., Pierce, S.J. and Ormond, R.F.H. 2013. Whale sharks, Rhincodon typus, aggregate around offshore platforms in Qatari waters of the Arabian Gulf to feed on fish spawn. *Plos One8*, e58255.

Roesler, C.S., Perry, M.J. and Carder, K.L. 1989. Modeling in situ phytoplankton absorption from total absorption spectra in productive inland marine waters. *Limnol. Oceanogr.* 34: 1510-1523.

Rogers, C.S. 1990. Responses of coral reefs and reef organisms to sedimentation. *Mar. Ecol. Prog. Ser.* 62: 185-202.

Rogers, R.W. 1989. The influence of sea turtles on the terrestrial vegetation of Heron Island, Great Barrier Reef. *Proceedings of the Royal Society of Queensland* 100: 67-70.

Rönnbäck, P. 1999. The ecological basis for economic value of seafood production supported by mangrove ecosystems. *Ecological Economics* 29: 235-252.

Roper, C.F.E., Sweeney, M.J. and Nauen, C.E. 1984. FAO 1984 Species Catalogue, Vol. 3. Cephalopods of the world. An annotated and illustrated catalogue of species of interest to fisheries. *FAO Fish Synop.* 3(125): 277 p.

ROPME. 2004. State of the marine environment report 2003. Regional Organization for the Protection of the Marine Environment.

ROPME. 2012. ROPME Oceanographic Cruise-Winter 2006. Technical Report No. 4, Spatial distribution of chlorophyll-a in the ROPME Sea Area. Report to ROPME, Safat, Kuwait, 59 p.

Rosen, B.R. 1971. The distribution of reef coral in the Indian Ocean. *Symp. Zool. Soc. London* 28: 263-299.

Ross, G.J.B. 2002. Humpback dolphins Sousa chinensis, S. plumbea and S. teuszi, pp. 122-128, in Perrin, W.F., Wursig, B. and Thewissen, J.G.M. (eds.). Encyclopedia of marine mammals. San Diego, California, Academic Press.

Ross, J.P. 1979. Sea turtles in the Sultanate of Oman. World Wildlife Fund Project 1320.

Ross, J.P. and Banwari, M.A. 1982. Review of sea turtles in the Arabian area, pp. 373-383, in Bjorndal, K.A. (ed.). Biology and conservation of sea turtles. Smithsonian Institute Press, Washington, D.C.

Round, F.E. 2002. Diatoms of the sabkha, pp. 247-253, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystems. Kluwer Academic Publishers.

Rouse, G.W. and Pleijel, F. 2001. Polychaetes. Oxford University Press, London.

Rouse, G.W. and Pleijel, F. 2006. Annelida. *Zootaxa* 1668: 245-264.

Rouse, G.W. and Pleijel, F. 2007. Annelid phylogeny and systematics, pp. 3-21, in Rouse, G.W. and Pleijel, F. (eds.). Reproductive biology and phylogeny of Annelida. Science Publishers Inc., Enfield, New Hampshire.

RPI (Research Planning Inc.). 2003. Oiled shoreline survey in support of the marine and coastal damage assessment. Columbia, South Carolina, Research Planning Inc. Publication, RPI 055/2003/008: 387 p.

Rubinoff, I. and Kropach, C. 1970. Differential reactions of Atlantic and Pacific predators to sea snakes. *Nature* 228: 1288-1290.

Ruddiman, W.F. 2001. Earth's climate: Past and future. WH Freeman, New York.

Ruppert, E.E., Fox, R.S. and Barnes, R.D. 2004. Invertebrate zoology (7th edition). Brooks/Cole, pp. 367–403.

Saad, M.A.H. 1978. Seasonal variations of some physico-chemical conditions of Shatt Al-Arab estuary, Iraq. *Estuarine Coastal Mar. Sci.* 6: 503–513.

Saba, V.S., Stock, C.A., Spotila, J.R., Paladino, F.V. and Tomillo, P.S. 2012. Projected response of an endangered marine turtle population to climate change. *Nature Climate Change* 2(11): 814–820.

Sabtan, A.A. and Shehata, W.M. 2002. Problematic sabkha is a potential source of freshwater. *Bulletin of Engineering Geology and the Environment* 61: 153–159.

Sabtan, A.A. and Shehata, W.M. 2003. Hydrogeology of Al-Lith Sabkha, Saudi Arabia. *Journal of Asian Earth Sciences* 21: 423-429.

Sabtan, A.A., Shehata, W.M. and El-Mahdy, O.R. 1997. Assessment of economic potentialities of sabkhah brines, Western Region, Saudi Arabia. Technical Report submitted to King Abdulaziz University, Project Number 415/138, 221 p.

Sadiq, M. and McCain, J.C. 1993. The Gulf War aftermath: An environmental tragedy. Kluwer Academic Publishers, Boston, Massachusetts, USA.

Sadiq, M. and Zaidi, T.H. 1985. Metals concentrations in the sediments from the Arabian Gulf coast of Saudi Arabia. *Bulletin of Environmental Contamination and Toxicology* 34: 565–571.

Sadiq, M. and Zaidi, T.H. 1994. Sediment composition and metal concentrations in mangrove leaves from the Saudi coast of the Arabian Gulf. *Science of the Total Environment* 155: 1–8.

Sadiq, M., Zaidi, T.H. and Mian, A.A. 1982. Heavy metal concentrations in shrimp, crab, and sediment obtained from Ad-Dammam sewage outfall area. *Bulletin of Environmental Contamination and Toxicology* 29(3): 313–319.

Saeed, M.O., Al-Khamis, S.I. and Ozair, G. 2007. Association of source water quality and high silt density index in pretreated feed water for a seawater reverse osmosis plant. Proceedings of the International Desalination Association Congress on Desalination and Water Reuse — Maspalamas, Gran Canaria, Spain, October 21–26, 16 p.

Saeed, M.O., Al-Otaibi, G.F., Ozair, G. and Jamaluddin, A.T.M. 2005. Beachwells prove best intake for Red Sea plant. *International Desalination and Water Reuse Quarterly* 15(1): 34–37.

Saeed, M.O. and Al-Nomazi, M.A. 2013. Toxic effects of brine discharge from the SWCC's Jubail desalination and power plants on selected marine organisms. Proceedings of the International Desalination Association World Congress on Desalination and Water Reuse, Tianjin, China, 12 p.

Saeed, M.O., Jamaluddin, A.T., Tisan, I.A., Lawrence, D.A., Al-Amri, M.M. and Chida, K. 2000. Biofouling in a seawater reverse osmosis plant on the Red Sea coast of Saudi Arabia. *Desalination* 128: 177–190.

Saeed, M.O., Teng, W.L., Al-Tisan, I.A. and Nomazi, M.A. 2013. Characterization of biofilm bacteria isolated from two distinct seawater reverse osmosis systems in Saudi Arabia. *Desalination and Water Reuse* 51: 1855–1860.

Saenger, P. 1993. Management of mangroves in the Kingdom of Saudi Arabia. Report prepared for the Saline Water Conversion Corporation & Ministry for Agriculture and Water, Riyadh, Saudi Arabia.

Saenger, P. 2002. Mangrove ecology, silviculture and conservation. Kluwer Academic, Dordrecht.

Saenger, P. 2011. Mangroves, p. 455, in Loughland, R.A. and Al-Abdulkader, K. (eds.). Marine Atlas of the Western Arabian Gulf. Saudi Aramco, Dhahran, Saudi Arabia.

Saenger, P. 2011. Mangroves and salt marshes, pp. 80–111, in Loughland, R.A. and Abdulkader, K.A. (eds.). Marine atlas of the Saudi Arabian waters of the Arabian Gulf. Saudi Aramco, Dhahran, Saudi Arabia.

Saenger, P. and Snedaker, S.C. 1993. Pantropical trends in mangrove aboveground biomass and annual litter fall. *Oecologia* 96: 293–299.

Saenger, P., Blasco, F., Youssef, A. and Loughland, R.A. 2004. Mangroves of the United Arab Emirates with particular emphasis on those of Abu Dhabi Emirate, pp. 58–69, in Loughland, R.A., Al Muhairi, F.S., Fadel, S.S., Al Mehdi, A.M. and Hellyer, P. (eds.). Marine Atlas of Abu Dhabi. Emirates Heritage Club, Abu Dhabi.

Saifullah, S.M., Khafaji, A.K. and Mandura, A.S. 1989. Litter production in a mangrove stand of the Saudi Arabian Red Sea coast. *Aquatic Botany* 36: 79–86.

Sakurai, T. 1998. Fisheries of Saudi Arabia. Report of Japan International Co-operation Agency (JICA) and Ministry of Agriculture and Water, Department of Marine Fisheries, 48 p.

Sale, P.F., Feary, D.A., Burt, J.A., Bauman, A.G., Cavalcante, G.H., Drouillard, K.G., Kjerfve, B., Marquis, E., Trick, C.G., Usseglio, P. and Van Lavieren, H. 2010. The growing need for sustainable ecological management of marine communities of the Persian Gulf. *Ambio* 40: 4–17.

Saline Water Conversion Corporation (SWCC), Saudi Arabia. 2015. Design capacity of SWCC plants, in SWCC Annual Report/2015.

Salm, R.V. and Clark, J.R. 1989. Marine and coastal protected areas: A guide for planners and managers. IUCN, Gland, Switzerland.

Samiullah, Y. 1985. Biological effects of marine oil pollution. *Oil and Petrochemical Pollution* 2(4): 235–264.

Sanchirico, J.N. and Emerson, P.M. 2002. Marine protected areas: Economic and social implications. Resources for the Future, Washington, D.C.

Sanders, H.L. 1958. Benthic studies in Buzzards Bay. I. Animal sediment relationships. *Limnology and Oceanography* 3: 245–258.

Sanford, W.E. and Wood, W.W. 2001. Hydrology of the coastal sabkhas of Abu Dhabi, United Arab Emirates, *Hydrogeology Journal* 9(9): 358–366.

Santos, A.J.B., Freire, E.M.X., Bellini, C. and Corso, G. 2010. Body mass and the energy budget of gravid hawksbill turtles (Eretmochelys imbricata) during the nesting season. *Journal of Herpetology* 44(3): 352–359.

SATTL. 1982. Northern area marine environmental baseline and impact assessment. Vol. I–III. Prepared by Saudi Arabian Tetra Techn. Ltd. for the Arabian American Oil Company, Dhahran, Saudi Arabia.

SATTL. 1982. A survey of infaunal communities of the western Arabian Gulf. Report prepared for Aramco, Dhahran, Saudi Arabia by Saudi Arabian Tetra Techn. pp. 57–128.

SATTL. 1984. Final draft environmental report. Environmental analysis Qatif home ownership project. Prepared for Consulting and Design Engineering by Saudi Arabian Tetra Techn Inc.

Saudi Electric Company. 2003. *The Plant Bulletin, In-House News Letter* Issue No. 20: June 2003.

Saudi Ports Authority. 2013. Introduction top authority. Retrieved October 15, 2013, from Saudi Ports Authority: http://www.ports.gov.sa/English/Aboutus/Pages/ Introduction.aspx.

Sauer, T.C., Brown, J.S., Boehm, P.D., Aurand, D.V., Michel, J. and Hayes, M.O. 1993. Hydrocarbon source identification and weathering characterization of intertidal and subtidal sediments along the Saudi Arabian coast after the Gulf War oil spill. *Mar. Poll. Bull.* 27: 117–134.

Saul, M. 2004. Money in colonial transition: Cowries and francs in West Africa. *American Anthropologist* 106(1): 71–84.

Saunders, J.E., Al-Zahed, K.M. and Paterson, D.M. 2007. The impact of organic pollution on the macrobenthic fauna of Dubai Creek, UAE. *Marine Pollution Bulletin* 54: 1715–1723.

Saunders, M.I., Leon, J.X., Callaghan, D.P., Roelfsema, C.M., Hamylton, S., Brown, C.J., Baldock, T., Golshani, A. and Phinn, S.R. 2014. Interdependency of tropical marine ecosystems response to climate change. *Nature Climate Change* 4(8): 724–729.

Scanlan, C., Foden, J., Wells, E. and Best, M. 2007. The monitoring of opportunistic macroalgal blooms for the water framework directive. *Marine Pollution Bulletin* 55(1): 162–171.

Scarcella, G., Grati, F. and Fabi, G. 2011. Temporal and spatial variation of the fish assemblage around a gas platform in the Northern Adriatic Sea, Italy. *Turkish J. Fish. Aquat. Sci.* 11: 433–444.

Schiedek, D., Sundelin, B., Readman, J.W.R. and MacDonald, R.W. 2007. Interactions between climate change and contaminants. *Marine Pollution Bulletin* 54: 1845-1856.

Schile, L.M., Kauffman, J.B., Crooks, S., Fourqurean, J.W., Glavan, J. and Megonigal, J.P. 2016. Limits on carbon sequestration in arid blue carbon ecosystems. *Ecological Applications* 27: 859-874. DOI: 10.1002/eap.1489.

Schluessel, V., Bennett, M.B. and Collin, S.P. 2010. Diet and reproduction in the white-spotted eagle ray Aetobatus narinari from Queensland, Australia and the Penghu Islands, Taiwan. *Marine and Freshwater Research* 61: 1278-1289.

Schott, G. 1918. Ozeanographie und klimatologie des Persischen Golfes und des Golfes von Oman. *Annalen der Hydrographie und Maritimen Meteorologie* 46: 1-46.

Schreiber, E.A. and Burger, J. (eds.). 2001. Biology of marine birds. CRC Marine Biology Series.

Schumann, N., Arnould, J.P.Y., Gales, N. and Harcourt, R. 2012. Marine mammals, in Poloczans, E.S., Hobday, A.J. and Richardson, A.J. (eds.) Marine climate change impacts and adaptation report card for Australia 2012. <http://www.oceanclimatechange.org.au>. ISBN: 978-0-643-10928-5.

Scoffin, T.P. 1979. The trapping and binding of subtidal carbonate sediments by marine vegetation in Bimini Lagoon, Bahamas. *Journ. Sedimentary Petrology* 40: 249-273.

Secor, D.H. 2004. Fish migration and the unit stock: Three formative debates, pp. 17-44, in Cardin, S.X., Friedland, K.D. and Waldman, J.R. (eds.). Stock identification methods. Elsevier Inc., Burlington.

Sell, D., Conway, L., Clark, T., Picken, G.B., Baker, J.M., Dunnet, G.M., McIntyre, A.D. and Clark, R.B. 1995. Scientific criteria to optimize oil spill clean-up, pp. 595-611, in Proceedings of the 1995 Oil Spill Conference. American Petroleum Institute, Washington, D.C.

Serventy, D.L. 1956. Additional observations on the biology on the northern bluefin tuna, Kishinoella tonggol (Bleeker) in Australia. *Aust. J. Mar. Freshw. Res.* 7: 44-63.

Setchell, W.A. 1929. Morphological and phenological notes on Zostera marina L. *Univ. Calif. Publ. Bot.* 14: 389-452.

Sharaf, G.M. and Al-Ghais, S.M. 1997. Distribution of zooplankton in offshore waters of the West Coast of the United Arab Emirates. *Kuwait Journal of Science and Engineering* 24(1): 131-144.

Shearman, D.J. 1970. Recent halite rock, Baja California, Mexico. *Trans. Inst. Min. Metall. B.* 75: 208-215.

Sheehy III, C.M., Pfaller, J.B., Lillywhite, H.B. and Heatwole, H.F. 2011. Pelamis platura yellow-bellied seasnake predation. *Herpetological Review* 42: 443.

Shenkar, N. and Swalla, B.J. 2011. Global diversity of Ascidacea. *PLOS one* 6(6): e20657.

Shepherd, S.A., McComb, A.J., Bulthuis, D.A., Neverauskas, V., Steffensen, D.A. and West, R. 1989. Decline of seagrasses, pp. 346-387, in Larkum, A.W.D., McComb, A.J. and Shepherd, S.A. (eds.). Seagrasses: A treatise on the biology of seagrasses with special reference to the Australian region. Elsevier, North Holland.

Sheppard, C. 2000. Commentary. Coral reefs: Beyond mortality? *The Scientific World* 1: 7-9.

Sheppard, C. 2003. Predicted recurrences of mass coral mortality in the Indian Ocean. *Nature* 425: 294-297.

Sheppard, C. and Borowitzka, M.A. 2012. Chapter 5: Subtidal habitat, pp. 119-135, in Loughland, R.A. and Abdulkader, K.A. (eds.). Marine atlas of western Arabian Gulf. A Saudi Aramco Environmental Protection Publication, Saudi Arabia.

Sheppard, C. and Loughland, R.A. 2002. Coral mortality and recovery in response to increasing temperature in the southern Arabian Gulf. *Aquatic Ecosystem Health & Management* 5(4): 1-8.

Sheppard, C., Al-Hussani, M., Al-Jamali, F., Al-Yamani, F., Baldwin, R., Bishop, J., Benzoni, F., Dutrieux, E., Dulvy, N., Durvasula, S., Jones, D., Loughland, R.A., Medio, D., Nithyanandan, M., Pilling, G., Polikarpov, I., Price, A., Purkis, S., Riegl, B., Saburova, M., Namin, K., Taylor, O., Wilson, S. and Zainal, K. 2010. The Gulf: A young sea in decline. *Marine Pollution Bulletin* 60: 13-38.

Sheppard, C. and Price, A. 1991. Will marine life survive in the Gulf. *New Scientist* 1759: 36-40.

Sheppard, C. and Rioja-Nieto, R. 2005. Sea surface temperature 1871-2099 in 38 cells in the Caribbean region. *Marine Environmental Research* 60: 389-396.

Sheppard, C. and Borowitzka, M. 2011. Subtidal habitats, pp. 117-135, in Loughland, R.A. and Abdulkader, K.A. (eds.). Marine Atlas of the Saudi Arabian Waters of the Arabian Gulf. Saudi Aramco, Dhahran, Saudi Arabia.

Sheppard, C., Price, A.R.G. and Roberts, C. 1992. Marine ecology of the Arabian region: Patterns and processes in extreme tropical environments. Academic Press, London.

Sheppard, C.R.C. 1988. Similar trends, different causes: Responses of corals to stressed environments in Arabian seas. Proceedings of the 6th International Coral Reef Symposium 3: 297-302.

Sheppard, C.R.C. 1993. Physical environment of the gulf relevant of marine pollution: An over view. *Mar. Pollut. Bull.* 27: 3-8.

Sheppard, C.R.C. and Wells, S.M. 1988. Coral reefs of the world, Vol. 2, Indian Ocean, Red Sea and Arabian Gulf. IUCN/UNEP, Copenhagen, 389 p.

Sheppard, C.R.C. and Sheppard, A.L.S. 1991. Coral and coral communities of Arabia. *Fauna of Saudi Arabia* 12: 3-10.

Sheppard, C.R.C. and Rayner, N.A. 2002. Utility of the Hadley Centre sea ice and sea surface temperature data set (HadISST1) in two widely contrasting coral reef areas. *Mar Pollut Bull* 44: 303-308.

Sheppard, C.R.C., Price, A.R.G. and Roberts, C.M. 1992. Marine Ecology of the Arabian Region. Patterns and processes in an extreme tropical environment. Academic Press, London, 359 p.

Shigenaka, G. (ed.). 2003. Oil and sea turtles: Biology, planning, and response. Office of Response and Restoration, NOAA Ocean Service, Seattle, WA, 111 p.

Shinn, E.A. 1966. Coral growth rate, an environmental indicator. *Journal of Paleontol.* 40(2): 233-241.

Shinn, E.A. 1973. Sedimentary accretion along the Leeward, SE coast of Qatar peninsula, Persian Gulf, pp. 199-210, in Purser, B.H. (ed.). The Persian Gulf. Springer-Verlag, New York.

Shinn, E.A. 1976. Coral reef recovery in Florida and the Persian Gulf. *Env. Geol.* 1: 241-254.

Shobrak, M. 2011. Bird flyways and stopover conservation sites in the Arabian Peninsula. *Zoology in the Middle East, Supplementum* 3: 27-30.

Short, F.T. and Neckles, H.A. 1998. The effects of global climate change on seagrasses. *Aquatic Botany* 63: 169-196.

Short, F.T. and Wyllie-Echeverria, S. 1996. Natural and human-induced disturbance of seagrasses. *Environmental Conservation* 23: 17-27.

Short, F.T., Polidoro, B., Livingstone, S.R., Carpenter, K.E., Bandeira, S., Bujang, J.S., Calumpong, H.P., Carruthers, T.J.B., Coles, R.G., Dennison, W.C., Erftemeijer, P.L.A., Fortes, M.D., Freeman, A.S., Jagtap, T.G., Kamal, A.M., Kendrick, G.A., Kenworthy, W.J., La Nafie, Y.A., Nasution, I.M., Orth, R.J., Prathep, A., Sanciangco, J.C., van Tussenbroek, B., Vergara, S.G., Waycott, M. and Zieman, J.C. 2011. Extinction risk assessment of the world's seagrass species. *Biological Conservation* 144: 1961-1971.

Short, M. 2011. Pacific adventurer oil spill: big birds, sea snakes and a couple of turtles. International Oil Spill Conference Proceedings: March 2011, (1): abs207.

Shriadah, M.M.A. 1999. Heavy metals in mangrove sediments of the United Arab Emirates shoreline, Arabian Gulf. *Water, Air and Soil Pollution* 116: 523-534.

Shuntov, V.P. 1971. Sea snakes of the North Australian shelf. *Ekologiya* 2: 65-72. [In Russian. Translation into English by Consultants' Bureau, 1972.]

Siddeek, M.S.M. 1995. Review of fisheries biology of Scomberomorus and Acanthocybium species in the Western Indian Ocean, FAO Area 51. Working Paper No. 95/2 to the Working Group on Pelagics. Gulfs Committee for Fisheries Management and Development.

Siddeek, M.S.M., Fouda, M.M. and Hermousa, G.V. 1999. Demersal fisheries of the Arabian Sea, the Gulf of Oman and the Arabian Gulf. *Estuarine and Coastal Shelf Science* 49(Sup A): 87–97.

Silva, P.C., Basson, P.W. and Moe, R.L. 1996. Catalogue of the benthic marine algae of the Indian Ocean 79. Univ. of California Press.

Simmonds, M.P. and Isaac, S.J. 2007. The impacts of climate change on marine mammals: Early signs of significant problems. *Oryx* 41(1): 19–26.

Simpson, A.W. and Watling, L. 2006. An investigation of the cumulative impact of shrimp trawling on mud-bottom fishing grounds in the Gulf of Maine: Effects on habitat and macrofaunal community structure. *ICES Journal of Marine Sciences* 63: 1616–1630.

Sivasubramaniam, K. and Ibrahim, M.A. 1982. Common fishes of Qatar. University of Qatar, Doha.

Smallwood, B.J., Wolff, G.A., Bett, B.J., Smith, C.R., Hoover, D., Gage, J.D. and Patience, A. 1999. Megafauna can control the quality of organic matter in marine sediments. *Naturwissenschaften* 86(7): 320–324.

Smith, G.B. and Saleh, M.A. 1987. Abundance and bathymetric distribution of Bahrain (Persian Gulf) reef ichthyofaunas. *Estuarine, Coastal and Shelf Science* 24: 425–431.

Smith, R., Purnama, A. and Al-Barwani, H. 2007. Sensitivity of hypersaline Arabian Gulf to seawater desalination plants. *Applied Mathematical Modelling* 31: 2347–2354.

Smith, S.V. and Jokiel, P.L. 1978. Water composition and biogeochemical gradients in the Canton Atoll lagoon. *Atoll Res. Bulletin* 221: 15–54.

Smith, S.V. and Buddemeier, R.W. 1992. Global change and coral reef ecosystems. *Annual Review of Ecology and Systematics* 23: 89–118.

Smythe, K.R. 1972. Marine mollusca from Bahrain island, Persian Gulf. *Journal of Conchology* 27: 491–496.

Snelgrove, P., Blackburn, T.H., Hutchings, P.A., Alongi, D.M., Grassle, J.F., Hummel, H., King, G., Koike, I., Lambshead, P.J.D., Ramsing, N.B. and Solis-Weiss, V. 1997. The importance of marine sediment biodiversity in ecosystem processes. *Ambio* 26: 578–583.

Snelgrove, P.V.R. 1998. The biodiversity of macrofaunal organisms in marine sediments. *Biodiversity and Conservation* 7: 1123–1132.

Solan, M., Batty, P., Bulling, M.T. and Godbold, J.A. 2008. How biodiversity affects ecosystem processes: Implications for ecological revolutions and benthic ecosystem function. *Aquatic Biology* 2: 289–301.

Somero, G.N. 2002. Thermal physiology and vertical zonation of intertidal animals: Optima, limits, and cost of living. *Integrative and Comparative Biology* 42: 780–789.

Sommariva, C. 2001. Matching power and desalination by combining thermal and membrane processes: The alternative to improve flexibility and performance. Proceedings of the IDA World Congress on Desalination and Water Reuse. Manama, Bahrain.

Sommariva, C. and Syambabu, V.S.N. 2001. Increase in water production in UAE. *Desalination* 138: 173–179.

Sommariva, C., Hogg, H. and Callister, K. 2001. Forty-year design life: The next target material selection — Conditions in thermal desalination plants. *Desalination* 136: 169–176.

Spalding, M., Kainuma, M. and Collins, L. 2010. World atlas of mangroves. Earthscan, London.

Springer, V.G. and Gold, J.P. 1989. Sharks in question. The Smithsonian answer book. Smithsonian Institution Press, Washington, D.C., 71 p.

Squire, J.L. 1987. Striped Marlin, Tefrapfurus audax, migration patterns and rates in the Northeast Pacific Ocean as determined by a cooperative tagging program: Its relation to resource management. *Mar. Fish. Rev.* 49: 26–43.

Stanley, D.R. and Wilson, C.A. 1997. Seasonal and spatial variation in the abundance and size distribution of fishes associated with a petroleum platform in the northern Gulf of Mexico. *Can. J. Fish. Aquat. Sci.* 54: 1166–1176.

Stegeman, J.J. 1977. Fate and effects of oil in marine animals. *Oceanus* 20: 59–66.

Stern, E.M. and Stickle, W.B. 1978. Effects of turbidity and suspended material in aquatic environments: Literature review. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, Tech Report D-78-21.

Stevens, J.D., Bonfil, R., Dulvy, K. and Walker, P.A. 2000. The effects of fishing on sharks, rays, and chimaeras (chondrichthyans), and the implications for marine ecosystems. *ICES Journal of Marine Science* 57: 476–494.

Strong, W.R., Snelson, F.F. and Gruber, S.H. 1990. Hammerhead shark predation on stingrays: An observation of prey handling by Sphyrna mokarran. *Copeia* 1990: 836–840.

Subba Rao, D.V. and Al-Yamani, F. 1998. Phytoplankton ecology in the waters between Shatt Al-Arab and Straits of Hormuz, Arabian Gulf: A review. *Plankton Biology and Ecology* 45(2): 106–116.

Sugden, W. 1963. The hydrography of the Persian Gulf and its significance in respect to evaporative deposition. *American Journal of Science* 261: 741–755.

Sukhdev, P. 2008. The economics of ecosystems and biodiversity. *European Communities* 3. Brussels.

Sumner, J., Webb, J.K., Shine, R. and Keogh, J.S. 2010. Molecular and morphological assessment of Australia's most endangered snake, Hoplocephalus bungaroides, reveals two evolutionarily significant units for conservation. *Conservation Genetics* 11: 747–758.

SUSRIS (Saudi-US Relations Information Service). 2008. Saudi Arabia — Country analysis brief. http://www.Saudi-US-Relations.org.

Suter, G.W., Efroympson, R.A., Sample, B.E. and Jones, D.S. 2000. Ecological risk assessment for contaminated sites. Lewis Publishers, Boca Raton, FL, USA.

Swift, S.A. and Bower, A.S. 2003. Formation and circulation of dense water in the Persian/Arabian Gulf. *J. Geophys. Res.* 108 (C1), 3004, DOI: 10.1029/2002JC001360.

Symens, P. and Alsuhaibany, A.H. 1996. Status of the breeding populations of terns (Sternidae) along the eastern coast of Saudi Arabia following the 1991 Gulf War, pp. 404–420, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Symens, P. and Alsuhaibany, A.H. 1996a. The ornithological importance of the Jubail marine wildlife sanctuary, pp. 374–389, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Symens, P. and Al-Suhaibany, A.H. 1996b. Status of the breeding populations of terns (Sternidae) along the eastern coast of Saudi Arabia following the 1991 Gulf War, pp. 404–420, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Symens, P. and Werner, M. 1996. Status the Socotra cormorant in the Arabian Gulf after the 1991 Gulf War oil spill, with and outline of a standardized census technique, pp. 390–403, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Symens, P. and Al Salamah, M.I. 1993. The impact of the Gulf War oil spills on wetlands and waterfowl in the Arabian Gulf. *IWEB special publication* 25: 24–28.

Tabugo, S.R.M., Pattuinan, J.O., Sespene, N.J.J. and Jamasali, A.J. 2013. Some economically important bivalves and gastropods found in the

Island of Hadji Panglima Tahil, in the province of Sulu, Philippines. *International Research Journal of Biological Sciences* 2(7): 30–36.

Talbot, F. and Wilkinson, C., 2001. Coral reefs, mangroves and seagrasses: A sourcebook for managers, pp. 85–91. Science Communication, Australian Institute of Marine Science.

Tarawneh, Q. 2013. Quantification of drought in the Kingdom of Saudi Arabia. *International Journal of Water Resources and Arid Environments* 2(3): 125–133.

Tawfiq, N. and Olsen, D.A. 1993. Saudi Arabia's response to the 1991 Gulf oil spill. *Marine Pollution Bulletin* 27: 333–345.

Tayab, M.R. and Quiton, P. 2003. Marine turtle conservation initiatives at Ras Laffan Industrial City, Qatar Arabian Gulf. *Marine Turtle Newsletter* 99: 14–15.

Taylor, P.M. and Saloman, C.H. 1968. Some effects of dredging and coastal development in Boca Ciega Bay, Florida, United States, Fish and Wildlife Service. *Fishery Bulletin* 67(2): 213–241.

Te, F.T. 1991. Effects of two petroleum products on Pocillopora damicornis planulae. *Pacific Science* 45(3): 290–298.

Tehranifard, A. and Dastan, K. 2011. General morphological characteristics of the Sepia pharaonis (Cephalopoda) from Persian Gulf, Bushehr region. *International Conference on Biomedical Engineering and Technology* 11: 120–126.

Teller, J.T., Glennie, K.W., Lancaster, N. and Singhvi, K. 2000. Calcareous dunes of the United Arab Emirates and Noah's flood: The post glacial reflooding of the Persian (Arabian Gulf). *Quat. Int.* 68–71: 297–308.

Terrados, J., Duarte, C.M., Kamp-Nielsen, L., Agawin, N.S.R., Gacia, E., Lacap, D., Fortes, M.D., Borum, J., Lubanski, M. and Greve, T. 1999. Are seagrass growth and survival affected by reducing conditions in the sediment? *Aquatic Botany* 65: 175–197.

Tharwat, A.A. 2005. Stock assessment of orange-spotted grouper Epinephelus coioides inhabiting the Arabian Gulf at Saudi Arabia. *Saudi J. Biol. Sci.* 12: 81–89.

Tharwat, A.A. and Al-Gaber, A.L. 2006. Fishery traps (Gargours) in Saudi territorial waters of the Arabian Gulf. *JKAU: Marine Sci.* 17: 13–31.

Thayer, G.W., Bjorndal, K.A., Ogden, J.C., Williams, S.L. and Zieman, J.C. 1984. Role of larger herbivores in seagrass communities. *Estuaries* 74: 351–376.

Thayer, G.W., Engel, D.W. and Bjorndal, K.A. 1982. Evidence for short-circuiting of the detritus cycle of seagrass beds by the green turtle, Chelonia mydas L. *J. Exp. Mar. Biol. Ecol.* 62: 173–183.

Thom, R.M. 1990. Spatial and temporal patterns in plant standing stock and primary production in a temperate seagrass system. *Bot. Mar.* 33: 497–510.

Thompson, P. and Ollason, J. 2001. Lagged effects of ocean climate change on fulmar population dynamics. *Nature* 413: 417–420.

Thoppil, P.G. and Hogan, P.J. 2010. Persian Gulf response to a wintertime shamal wind event. *Deep Sea Research I* 57: 946–995.

Thoppil, P.G. and Hogan, P.J. 2010. A modeling study of circulation and Eddies in the Persian Gulf. *Journal of Physical Oceanography* 40: 2122–2134.

Thorne, L.T. and Nickless, G. 1981. The relation between heavy metals and particles size fraction within the severn Estuary (U.K.) inter-tidial sediments. *Science of the Total Environment* 19: 207–213.

Thrush, S.F. and Dayton, P.K. 2002. Disturbance to marine benthic habitats by trawling and dredging: Implications for marine biodiversity. *Annu. Rev. Ecol. Syst.* 33: 449–473.

TMRU. 1982. Management requirements for natural habitats and biological resources on the Arabian Gulf coast of Saudi Arabia. IUCN Report to MEPA prepared by Coral Reef and Tropical Marine Research Unit. University of York.

Tomasko, D.A., Corbett, C.A., Greening, H.S. and Raulerson, G.E. 2005. Spatial and temporal variation in seagrass coverage in southwest Florida: Assessing the relative effects of anthropogenic nutrient load reductions and rainfall in four contiguous estuaries. *Marine Pollution Bulletin* 50: 797–805.

Townsend, D.W. and Cammen, L.M. 1988. Potential importance of the timing of spring phytoplankton blooms to benthic pelagic coupling and recruitment of demersal fishes. *Biological Oceanography* 5: 215–229.

Trites, A.W. 2001. Marine mammal trophic levels and interactions, pp. 1628-1633, in Steele, J., Thorpe, S. and Turekian, K. (eds.). Encyclopedia of ocean sciences. Academic Press, London.

Tutin, T.G. 1942. Zostera. *Journal of Ecology* 30: 217–266.

Twilley, R., Kemp, W., Staver, K., Stevenson, J.C. and Boynton, W. 1985. Nutrient enrichment of estuarine submersed vascular plant communities. 1. Algal growth and effects on production of plants and associated communities. Marine ecology progress series. *Oldendorf* 23(2): 179–191.

U.S. Hydrographic Office. 1978. Co-tidal chart of the Arabian Gulf. HO 5091. U.S. Hydrographic Office, Washington, D.C.

Uddin, S. 2014. Environmental impacts of desalination activities in the Arabian Gulf. *International Journal of Environmental Science and Development* 5: 114.

UNCTAD. 2012. Review of maritime transport. United Nations Conference on Trade and Development, New York and Geneva.

UNEP. 1994. Assessment and monitoring of climatic change impacts on mangrove ecosystems. UNEP Regional Seas Reports and Studies No. 154, pp. 1–62.

UNEP. 2002. Global Environment Outlook 3. United Nations. United Nations Conference on Trade and Development UNCTAD. (2012). Review of maritime transport. New York and Geneva: UNCTAD secretariat.

UNEP. 2002. Dugong: Status report and action plans for countries and territories. UNEP/DEWA/RS.02-1, ISBN 92-807-2130-5.

UNEP/CMS. 2007. Memorandum of Understanding on the conservation and management of Dugongs (Dugong dugong) and their habitats throughout their range. Report of the Technical Workshop and Meeting to sign the Dugong MoU. Abu Dhabi, UAE.

UNESCO. 1968. Zooplankton sampling. Monograph on oceanographic methodology, No. 2, UNESCO, Paris.

Ungar, I.A. 1991. Ecophysiology of vascular halophytes. CRC Press, Boca Raton, FL, USA.

Unsworth, R.K., Cullen, L.C., Pretty, J.N., Smith, D.J. and Bell, J.J. 2010. Economic and subsistence values of the standing stocks of seagrass fisheries: Potential benefits of no fishing marine protected area management. *Ocean & Coastal Management* 53: 218–224.

Unsworth, R.K.F. and Cullen, L.C. 2010. Recognizing the necessity for Indo-Pacific seagrass conservation. *Conservation Letters* 3: 63–73.

Unsworth, R.K.F., Collier, C.J., Henderson, G.M. and McKenzie, L.J. 2012. Tropical seagrass meadows modify seawater carbon chemistry: Implications for coral reefs impacted by ocean acidification. *Environmental Research Letters* 7(2): 024–026.

Urban, E.K., Fry, C.H. and Keith, S. 1986. The birds of Africa, Vol. II. Academic Press, London.

Uthicke, S., Schaffelke, B. and Byrne, M. 2009. A boom-bust phylum? Ecological and evolutionary consequences of density variations in echinoderms. *Ecol. Monogr.* 79: 3–24.

Valentine, J.F., Kenneth, L., Heck, K.L. and Cinkovish, A.M. 2002. Impacts of seagrass food webs on marine ecosystems: A need for a broader perspective. *Bulletin of Marine Science* 7: 1361–1368.

van Buskirk, J. and Crowder, L.B. 1994. Life-history variation in marine turtles. *Copeia* 1994(1): 66–81.

van Dam, R.L., Eustice, B.P., Hyndman, D.W., Wood, W.W. and Simmons, C.T. 2014. Electrical imaging and fluid modeling of convective fingering in a shallow water-table aquifer. *Water Resour. Res.* 50: 954–968. DOI: 10.1002/2013WR013673.

van Gils, A.G. 2010. Classes of chemicals used in desalination (short vs. long-life), usage levels and relative priority and impact. IDA Environmental Symposium, "Desalination and the Gulf: The relationship between the environment and meeting the region's water needs." December 6-7, 2010, Manama, Bahrain.

van Lavieren, H., Burt, J., Feary, D.A., Cavalcante, G., Marquis, E., Benedetti, L., Trick, C., Kjerfve, B. and Sale, P.F. 2011. Managing the growing impacts of development on fragile coastal and marine ecosystems: Lessons from the Gulf. A policy report. UNU-INWEH, Hamilton, ON, Canada.

van Moorsel, G.W.N.M. 1994. The Klaver Bank (North Sea), geomorphology, macrobenthic ecology and the effect of gravel extraction. Rapport Bureau Waardenburg and North Sea Directorate (DNS). Ministry of Transport, Public Works and Water Management, the Netherlands.

van Name, W.G. 1945. The North and South American ascidians. *Bulletin of the American Museum of Natural History* 84: 1-476.

van Oostrum, R.W. and Vroege, P. 1994. Turbidity and contaminant release during dredging of contaminated sediments. Proc. of the Second International Conference on Dredging and Dredge Material Placement, Dredging '94.

Vandermeulen, J.H. and Singh, J.G. 1994. Arrow oil spill, 1970-90: Persistence of 20 year weathered bunker C fuel oil. *Can. J. Fish. Aquat. Sci.* 51: 845-855.

Vasquez, M.A., Allen, K.W. and Kattan, Y.M. 2000. Long-term effects of the 1991 Gulf War on the hydrocarbon levels in clams at selected areas of the Saudi Arabian Gulf coastline. *Mar. Poll. Bull.* 40: 440-448.

Vaudo, J.J. and Heithaus, M.R. 2009. Spatiotemporal variability in a sand flat elasmobranch fauna in Shark Bay, Australia. *Marine Biology* 156: 2579-2590.

Veit, R.R., McGowan, J.A., Ainley, D.G., Wahls, T.R. and Pyle, P. 1997. Apex marine predator declines ninety percent in association with changing climate. *Global Change Biol* 3: 23-28.

Venkat, K., Anil, A.C. and Wagh, A.B. 1997. Macrofouling community development at tropical coastal environment (New Mangalore Port, West Coast of India). Proceedings of the U.S. Pacific Rim Workshop on Emerging Nonmetallic Materials for the Marine Environment, Honolulu, Hawaii, March 1997, pp. 40-52.

Verdonschot, P.F.M. 2006. Beyond masses and blooms: The indicative value of oligochaetes. *Hydrobiologia* 564: 127-142.

Vermaat, J.E., Hootsmans, M.J.M. and Nienhuis, P.H. 1987. Seasonal dynamics and leaf growth of Zostera noltii Hornem, a perennial intertidal seagrass. *Aquat. Bot.* 28: 287-299.

Vermey, J.W. and Berand, D. 2001. Breakthrough of MED technology in very large-scale applications, Al-Taweelah case. Proceedings of the IDA Conference. Manama, Bahrain.

Veron, J.E.N. 2000. Corals of the world, 3 vols. Australian Institute of Marine Science, Townsville, Australia, pp. 463, 429, 490.

Vincent, C., Heinrich, H., Edwards, A., Nygaard, K. and Haythornthwaite, J. 2002. Guidance on typology, classification and reference conditions for transitional and coastal waters. Commission Européenne. CIS WG 2.4 (COAST), 119 p.

Viskovich, P.G., Gordon, H.F. and Walker, S.J. 2013. Light at the end of the tunnel: A benthic community perspective. Proceedings of the International Desalination Association World Congress on Desalination and Water Reuse 2013/Tianjin, China, 17 p.

Vita-Finzi, C. 1982. Recent coastal deformation near the Straits of Hormuz. *Proc. Roy. Soc. London*, A382: 441-457.

Vogt, H. 1996. Investigations on coral reefs in the Jubail marine wildlife sanctuary using under water video recordings and digital image analysis, pp. 302-326, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Arabian Gulf: Environmental research and conservation following the 1991 Gulf War oil spill. European Commission, National Commission for Wildlife Conservation and Development, and Forschungsinstitut Senckenberg.

Vogt, P. 1995. Coral reefs in Saudi Arabia: 3.5 years after the Gulf War oil spill. *Coral Reefs* 14: 271-273.

Volsoe, H. 1939. The Sea snakes of the Iranian Gulf and the Gulf of Oman with a summary of the biology of Sea snakes, pp. 9-45, in Jessen, J. and Sparck, R. (eds.). Danish scientific investigations in Iran. Einar Munksgaard, Copenhagen.

Von Trepke, L. 1968. Investigations of the tides in the Persian Gulf by means of a hydrodynamic-numerical model, Proc. of the Symp. on Mathematical-Hydrodynamical Investigations of Physical Processes in the Sea, No. l0, Inst. fur Meers. Univ. Hamburg, pp. 59-63.

Voris, H.K. 1966. Fish eggs as the apparent sole food item for a genus of sea snake, Emydocedphalus Krefft. *Ecology* 47: 152-154.

Voris, H.K. and Jayne, B.C. 1979. Growth, reproduction and population structure of a marine snake, Enhydrina schistosa Hydrophiidae. *Copeia* 1979: 307-318.

Voris, H.K. and Voris, H.H. 1983. Feeding strategies in marine snakes: An analysis of evolutionary, morphological and ecological relationships. *American Zoologist* 23: 411-425.

Voris, H.K., Voris, H.H. and Liat, L.B. 1978. The food and feeding behavior of a marine snake, Enhydrina schistosa Hydrophiidae. *Copeia* 1978: 134-146.

Vousden, D.H. 1988. The Bahrain marine habitat survey: A study of the marine environment of Bahrain using remote sensing as a rapid assessment methodology. Proc. ROPME Workshop on Coastal Area Development, UNEP Reg. Seas Report Study, Vol. 90: 1-33.

Wade, N.M. and Fletcher, R.S. 1995. Energy allocation and other factors influencing water costs in desalination and dual purpose Power/Water plants. Proceedings of the IDA Congress on Desalination and Water Reuse, 1995/Abu Dhabi, UAE, November 18-24.

WCC'93, 1994. Preparing to meet the coastal challenges of the 21st century. Report of the World Coast Conference, Noordwijk, the Netherlands, November 1-5, 1993. Ministry of Transport, Public Works and Water Management, The Hague, the Netherlands, 49 p. plus apps.

Wagner, C.W. and van der Togt, C. 1973. Holocene sediment types and their distribution on the southern Persian Gulf, pp. 123-156, in Purser, B.H. (ed.). The Persian Gulf. New York: Springer-Verlag.

Walker, D.G. and Pittaway, A.R. 1987. Insects of Eastern Arabia. Macmillan, London.

Walker, D.I., Kendrick, G.A. and McComb, A.J. 2006. Decline and recovery of seagrass ecosystems the dynamics of change, in Larkum, A.W.D., Orth, R.J. and Duarte, C.M. (eds.). Seagrasses: Biology, ecology and conservation. Springer, Dordrecht, the Netherlands.

Walker, N.D., Roberts, H.H., Rouse, L.R. and Huh, O.K. 1982. Thermal history of reef associated environments during a record cold air outbreak event. *Coral Reefs* 1: 83-87.

Walker, P. and Wood, E. 2005. Life in the Sea: The open ocean. Infobase Publishing.

Wallace, C.C. 1999. Staghorn corals of the world. A revision of the genus Acropora. CSIRO Publications, Collingwood, 421 p.

Walther, G-R., Post, E., Convey, P., Menzel, A., Parmesank, C., Beebee, T.J.C., Fromentin, J-M., Hoegh-Guldberg, O. and Bairlein, F. 2002. Ecological responses to recent climate change. *Nature* 416: 389-395.

Wang, Y.C. 1980. Early Chinese coinage. Sanford J. Durst Numismatic Publications, New York.

Ward, T.M. 1996a. Sea snake by-catch of fish trawlers on the Northern Australian Continental Shelf. *Marine and Freshwater Research* 47: 625-630.

Ward, T.M. 1996b. Sea snake bycatch of prawn trawlers on the Northern Australian Continental Shelf. *Marine and Freshwater Research* 47: 631-635.

Ward, T.M. 2000. Factors affecting the catch rates and relative abundance of sea snakes in the by-catch of trawlers targeting tiger and endeavour prawns on the northern Australian continental shelf. *Marine and Freshwater Research* 51: 155-164.

Wardrop, J.A., Butler, A.J. and Johnson, J.E. 1987. A field study of the toxicity of two oils and a dispersant to the mangrove Avicennia marina. *Marine Biology* 96: 151-156.

Warnken, J. 1996. Salt marshes and intertidal habitats of the Jubail marine wildlife sanctuary: Extent of oil impacted areas and estimated losses of aboveground plant biomass following the 1991 Gulf War oil spill, pp. 177-185, in Krupp, F., Abuzinada, A.H. and Nader, I.A. (eds.). A marine wildlife sanctuary for the Gulf. Environmental research and conservation following the 1991 Gulf War oil spill. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt aM, Germany.

Warren, J.K. 2006. Evaporites: Sediments, resources and hydrocarbons. Springer, 1036 p.

Warshay, B., Pan, J. and Sgouridis, S. 2011. Aviation industry's quest for a sustainable fuel: Considerations of scale and modal opportunity carbon benefit. *Biofuels* 2: 33-58.

Wassenberg, T.J., Salini, J.P., Heatwole, H. and Kerr, J.D. 1994. Incidental capture of sea snakes (Hydrophiidae) by prawn trawlers in the Gulf of Carpentaria, Australia. *Australian Journal of Marine and Freshwater Research* 45: 429-43.

Water Technology and Customer Insight. 2015. Ras Al-Khair desalination plant, Saudi Arabia. http://www.water-technology.net/-ras-al-khair-desalination-plant/.

Water Technology Net. 2009. Shoaiba Desalination Plant, Saudi Arabia. http://www.water-technology.net/projects/shuaiba/.

Waterman, T.H. and Chace, F.A. 1960. General crustacean biology, pp. 1-33, in Waterman, T.H. (ed.). The physiology of Crustacea: Metabolism and growth. Academic Press, New York.

Watling, L. and Norse, E.A. 1998. Disturbance of the seabed by mobile fishing gear: A comparison to forest clearcutting. *Conservation Biology* 12: 1180-1197.

Watt, I., Woodhouse, T. and Jones, D.A. 1993. Intertidal clean-up activities and natural regeneration on the Gulf coast of Saudi Arabia from 1991 to 1992 after the 1991 Gulf oil spill. *Marine Pollution Bulletin* 27: 325-331.

Waycott, M., Duarte, C.M., Carruthers, T.J.B., Orth, R.J., Dennison, W.C., Olyarnik, S., Calladine, A., Fourqurean, J.W., Heck Jr., K.L., Hughes, A.R., et al. 2009. Accelerating loss of seagrasses across the globe threatens coastal ecosystems. Proceedings of the National Academy of Sciences of the USA 106: 12377-12381.

Wehe, T. and Fiege, D. 2002. Annotated checklist of the polychaete species of the seas surrounding the Arabian Peninsula: Red Sea, Gulf of Aden, Arabian Sea, Gulf of Oman, Arabian Gulf. *Fauna of Arabia* 19: 7-238.

Weigmann, R. 1970. Zur Okologie und Ernahrungsbiologie der Euphausiaceen (Crustacea) in Arabischen Meer. "METEOR" Forschungscrgebnisse. *Reihe* D.5: 11-52.

Weimerskirch, H., Chastel, O., Barbraud, C. and Tostain, O. 2003. Frigatebirds ride high on thermals. *Nature* 421: 333-334.

Weisburg, S.B. and Lotrich, V.A. 1982. The importance of an infrequently flooded intertidal marsh surface as an energy source for the mummichog Fundulus heteroclitus: An experimental approach. *Marine Biology* 66: 307-310.

Weishampel, J.F., Bagley, D.A., Ehrhart, L.M. and Weishampel, A.C. 2010. Nesting phenologies of two sympatric sea turtle species related to sea surface temperatures. *Endangered Species Research* 12: 41-47.

Weldon, P.J. 1988. Feeding responses of Pacific snappers genus Lutjanus to the yellow-bellied sea snake Pelamis platurus. *Zoological Science* 5: 443-448.

Wells, R.S. and Scott, M.D. 2002. Bottlenose dolphins Tursiops truncatus and T. aduncus, pp. 122-128, in Perrin, W.F., Wursig, B. and Thewissen, J.G.M. (eds.). Encyclopedia of Marine Mammals. San Diego, California, Academic Press.

Wells, R.S., Scott, M.D. and Irvine, A.B. 1987. The social structure of free-ranging bottlenose dolphins, pp. 247-305, in Genoways, H. (ed.). Current mammology, Vol 1. Plenum Press, New York.

Western, A.R. 1989. The flora of the United Arab Emirates. An introduction. Al Ain, United Arab Emirates University.

Whanpetch, N., Nakaoka, M., Mukai, H., Suzuki, T., Nojima, S., Kawai, T. and Aryuthaka, C. 2010. Temporal changes in benthic communities of seagrass beds impacted by a tsunami in the Andaman Sea, Thailand. *Estuarine, Coastal and Shelf Science* 87: 246-252.

Whilekamp, R.H., Romand, R. and Scheel, J.J. 1986. Cyprinodontidae, in Daget, J., Gosse, J-P. and Thys van den Audenaerde, D.F.E. (eds.). Checklist of the freshwater fishes of Africa (CLOFFA), Vol. 2. ISNB, Brussels, MRAC; Tervuren; and ORSTOM, Paris, pp. 165-276.

White, A.T. 1990. Coral reefs: Valuable resources of Southeast Asia. ICLARM Education Ser. 1. International Center for Living Aquatic Resources Management, Manila, the Philippines, 35 p.

White, H.K., Hsing, P.Y., Cho, W., Shank, T.M., Cordes, E.E., Quattrini, A.M., Nelson, R.K., Camilli, R., Demopoulos, A.W.J., German, C.R., Brooks, J.M., Roberts, H.H., Shedd, W., Reddy, C.M. and Fisher, C.R. 2012. Impact of the deepwater horizon oil spill on a deepwater coral community in the Gulf of Mexico. PNAS 109: 20303-20308.

White, W.T. and Potter, I.C. 2004. Habitat partitioning among four elasmobranch species in nearshore, shallow waters of a subtropical embayment in Western Australia. *Marine Biology* 145: 1023-1032.

Whitehead, P.J.P. 1985. FAO species catalogue, Vol. 7. Clupeoid fishes of the world. An annotated and illustrated catalogue of herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. Part I — Chirocentridae, Clupeidae and Pristigasteridae. FAO Fish. *Synop.* 7(125) Pt. I, Rome.

Wibbels, T. 2003. Critical approaches to sex determination in sea turtles, pp. 103-134, in Lutz, P., Musick, J. and Wyneken, J. (eds.). The biology of sea turtles. Vol. II CRC Press, New York.

Widdows, J. and Brinsley, M. 2002. Impact of biotic and abiotic processes on sediment dynamics and the consequences to the structure and functioning of the intertidal zone. *Journal of Sea Research* 48: 143-156.

Wijsman, J.W.M. and Riegl, B. 2001. Fact finding mission and ecological survey. Al Taweelah Report National Coral Reef Institute. Nova Southeastern University, Florida, USA, pp. 1-21.

Wilen, J.E., Cancino, J. and Uchida, H. 2012. The economics of territorial use rights fisheries, or TURFs. *Review of Environmental Economics and Policy* 6: 237-257.

Wiley, T.R. and Simpfendorfer, C.A. 2007. The ecology of elasmobranchs occurring in the Everglades National Park, Florida: Implications for conservation and management. *Bulletin of Marine Science* 80: 171-189.

Williams, E.H. and Bunkley-Williams, L. 1990. Coral reef bleaching alert. *Nature* 346: 225.

Williams, J.B., Shobrak, M., Wilms, T.M., Arif, I. and Khan, H.A. 2012. Climate change and animals in Saudi Arabia. *Saudi Journal of Biological Sciences* 19: 121-130.

Williams, M.J. (ed.). 1998. A Roadmap for the future for fisheries and conservation: Proceedings of the fisheries session, IUCN marine and coastal workshop October 17-18, 1996, Montreal, Canada. ICLARM Conf. Proc. 56. ICLARM, Manila, the Philippines, 58 p.

Williams, R.O. 1979. Meteorologic and oceanographic data book for the Eastern province region of Saudi Arabia. Arabian American Oil Company, Dhahran, Saudi Arabia.

Wilson, E., Miller, K., Allison, D. and Magliocca, M. 2010. Why healthy oceans need sea turtles: The importance of sea turtles to marine ecosystems. Oceana. (Oceana.org/sea turtles, accessed 2014).

Wilson, S., Fatemi, S.M.R., Shokri, M.R. and Claereboudt, M. 2002. Status of coral reefs of the Persian/Arabian Gulf and Arabian Sea region, pp: 53-62, in Wilkinson, C. (ed.). Status of coral reefs of the world. Aust. Instit. of Marine Science, Townsville, Australia.

Wilson, S.C. 2000. The Arabian Sea and Gulf of Oman, pp. 17-33, in Sheppard, C.R.C. (ed.). Seas at the Millenium. Pergamon Press, Amsterdam, the Netherlands.

Wiltshire, E.P. 1990. An illustrated, annotated catalogue of the Macro-Heterocera of Saudi Arabia. *Fauna Saudi Arabia* 11: 91-250.

Witzell, W.N. 1983. Synopsis of biological data on the hawksbill turtle, Eretmochelys imbricata Linnaeus, 1766, *FOA Fisheries Synopsis* 137: 78.

Wolanski, E., Fabricius, K., Spagnol, S. and Brinkman, R. 2005. Fine sediment budget on an inner-shelf coral-fringed island, Great Barrier Reef of Australia. *Estuarine, Coastal and Shelf Science* 65: 153-158.

Wolfson, A., VanBlaricom, G.R., Davis, N. and Lewbel, G.S. 1979. The marine life of an offshore oil platform. *Marine Ecology Progress Series* 1: 81-89.

Womersley, H.B.S. 1987. The marine benthic flora southem Australia. Part JI. Adelaide. South Australian Government Printing Division, 484 p.

Wood, E.J.F. and Johannes, R.E. (eds.). 1975. Tropical marine pollution. Elsevier Oceanography Series, Elsevier Scientific Publishing Company, Amsterdam-Oxford-New York, Vol. 12.

Wood, W.W. and Sanford, W.E. 2002. Hydrogeology and solute chemistry of the coastal sabkha aquifer in the Emirate of Abu Dhabi, p. 354, in Barth, H-J. and Boer, B. (eds.). Sabkha ecosystem, Vol. 1 — The Sabkhas of the Arabian Peninsula and adjacent countries. Kluwer Academic Publishers, Dordrecht.

Wood, W.W., Sanford, W.E. and Al Habschi, A.R. 2002. The source of solutes in the coastal sabkha of Abu Dhabi. *Bulletin of the Geological Society of America* 114(3): 259-268.

Wood, W.W., Sanford, W.E. and Frape, S. 2005. Chemical openness and potential for misinterpretation of the solute environment of coastal sabkhat. *Chemical Geology* 215(1-4): 361-372.

Wooster, W.S., Schaffer, M.B. and Robinson, M.K. 1967. Atlas of the Arabian Sea for fishery oceanography. Institute of Marine resources, University of California.

World Health Organization. 1991. Hydrazine health and safety guide. International program on chemical safety, health and safety guide No. 56.

Wright, D.G. (Coordinator). 1977. Artificial islands in the Beaufort Sea. A review of potential impacts. Department of Fishery and Environment. Winnipeg, Manitoba. September 1977.

Wright, J.L. 1974. A hydrographic and acoustic survey of the Persian Gulf, Part I.M.S. Thesis, Naval Postgraduate School, 87 p.

Wright, T.D. 1978. Aquatic dredged material disposal impacts. United States Army Engineers Waterways Experiment Station, Vicksburg, MS, USA, Tech. Report DS-78-1, 57 p.

Wyneken, J., Musick, J.A. and Lohmann, K.J. 2013. The biology of sea turtles, Vol. III.

Yamazi, I. 1974. Analysis of the data on temperature, salinity and chemical properties of the surface water, and zooplankton communities in the RSA in December 1968. *Transactions of the Tokyo University of Fisheries* 1: 26-51.

Yasseen, B.T. and Abu-Al-Basal, M.A. 2008. Ecophysiology of Limonium axillare and Avicennia marina from the coastline of Arabian Gulf-Qatar. *J. Coastal Conservation* 12: 35-42.

Yechieli, Y. and Wood, W.W. 2002. Hydrogeologic processes in saline systems: Playas, sabkhas, and saline lakes. *Earth Science Reviews* 58: 343-365.

Youssef, A.M. and Al-Fredan, M.A. 2008. Community composition of major vegetations in the coastal area of Al-Uqair, Saudi Arabia in response to ecological variations. *J. Biol. Sci.* 8: 713-721.

Youssef, T. and Ghanem, A. 2002. Salt secretion and stomatal behavior in Avicennia marina seedlings fumigated with the volatile fraction of Arabian Light crude oil. *Environmental Pollution* 116: 215-223.

Zacttruba, J. 2009. W ater Desalination using multistage flash distillation (MSF). https://www.brighthubengineering.com/power-plants/29623-how-desalination-by-multi-stage-flash-distillation-works.

Zahran, M. 1977. Africa A: Wet formations of the African Red Sea coast, pp. 215-231, in Chapman, V.J. (ed.). Ecosystems of the world I: Wet coastal ecosystems. Elsevier, Amsterdam, Oxford, New York.

Zainal, K. 2009. The cumulative impacts of reclamation and dredging activities. Report for ROPME, Kuwait.

Zainal, K., Al-Madany, I., Al-Sayed, H., Khamis, A., Al Shuhaby, S., Al Hisaby, A., Elhoussiny, W. and Khalaf, E. 2012. The cumulative impacts of reclamation and dredging on the marine ecology and land-use in the Kingdom of Bahrain. *Marine Pollution Bulletin* 64: 1452-1458.

Zajonz, U., Beech, M. and Gill, A.C. 2002. Fishes of sabkha-related habitats. Sabkha ecosystems, Vol. I: *The Arabian Peninsula and Adjacent Countries* 36: 283-298.

Zarba, M.A., Mohammed, O.S., Anderlini, V.C., Literathy, P. and Shunbo, F. 1985. Petroleum residues in surface sediments of Kuwait. *Marine Pollution Bulletin* 16(5): 209-211.

Zarins, J.A., Al-Mughanam, A.S. and Kamal, M. 1984. Excavations at Dhahran South — The Tumuli field (208-91). 1403 A.H. 1983. A preliminary report. *Atlal* 8: 25-54.

Zayani, A.K. and Loughland, R.A. 2009. Intertidal habitats, pp. 85-113, in Loughland, R.A. and Zainal, A.J. (eds.). Marine Atlas of Bahrain. GEOMATEC, Kingdom of Bahrain.

Zhang, Z.Q. 2011. Animal biodiversity: An introduction to higher level classification and taxonomic richness. *Zootaxa* 3148: 7-12.

Zieman, J-C. and Wood, E.J.F. 1975. Effect of thermal pollution on the tropical-type estuaries, with emphasis on Biscayne Bay, Florida, in pp. 75-98, Wood, E.l.F. and Johannes, R.E. (eds.). Tropical marine pollution, Elsevier.

Zimmerman, K.D. and Heatwole, H. 1992. Ventilation rates in three prey fish species treated with venom of the olive sea snake, Aipysurus laevis. *Comparative Biochemistry and Physiology* 102C: 421-425.

Zimmerman, K.D., Gates, G.R. and Heatwole, H. 1990. Effects of venom of the olive sea snake, Aipysurus laevis, on the behaviour and ventilation of three species of fish. *Toxicon* 28: 1468-1478.

Zimmerman, S.E. and Heatwole, H. 1987. Olive sea snake venom, pp. 204-213, in Covacevich, J., Davie, P. and Pearn, J. (eds.). Toxic plants and animals, a guide for Australia. Queensland Museum, Brisbane.

Zimmerman, S.E., Heatwole, H., Andreopoulos, P.C. and Yong, L.C. 1992. Proliferative glomerulonephritis in mice induced by sea snake Aipysurus laevis venom. *Experimental and Toxicologic Pathology* 44: 294-300.

Zuykov, M., Pelletier, E. and Harper, D.A.T. 2013. Bivalve mollusks in metal pollution studies: From bioaccumulation to biomonitoring. *Chemosphere* 93(2): 201-208.

Zwarts, L., Felemban, H.M. and Price, A.R.G. 1991. Wader counts along the Saudi Arabian Gulf coast suggest that the Gulf harbors millions of waders. *Wader Study Group Bull.* 63: 25-32.

APPENDIX I

Environmental Studies

of the Sustaining Research Project Conducted by Research Institute of King Fahd University of Petroleum and Minerals (KFUPM/RI) and Funded by Saudi Arabian Oil Company (Saudi Aramco).

Project	Project Title	Project Start	Project End
GST E-4009	Meteorological and Oceanographic Data Report	01-Sep-77	01-Mar-79
CEW0000	Preliminary Benthic Biology Survey	01-Jan-80	01-Jan-12
24004	Simulation of an Oil Spill in the Arabian Gulf	01-Jul-80	31-Dec-80
TC-4030	Pollutant Pathways Characterization in Shallow Bay Systems	01-Jul-81	01-Jul-83
24010	Ambient Air Suspended Particulate Sampling and Characterization	01-Oct-81	30-Nov-82
TSI 57-111	An Analysis of the Impact of the Ghazlan Generating Station on Benthic Marine Communities	01-Dec-81	01-Jan-82
RP878-1	Methodology for Evaluation of Multiple Cooling System Effects	01-Jan-82	01-Jan-83
24011	Trace Metals in Marine Sediments and Water Columns	20-Feb-82	30-Nov-82
AER-5229	A Survey of Infaunal Communities of the Western Arabian Gulf	01-Jun-82	01-Jun-83
TC-3598	Marjan Offshore Gas/Oil/Pipeline Current Data Analysis and Numerical Simulation	01-Oct-82	01-Oct-83
24028	Estimating Oil Spill Size by Visual Observation	13-Nov-82	15-May-83
24038	Ballast Discharge Evaluation at Yanbu' Natural Gas Liquids Facility	01-Nov-83	13-Jul-85
24058	Mixing Heights for Three Cities in the Eastern Province	01-Jan-84	30-Jun-85
24059	Marine Environmental Investigation in the Arabian Gulf with Emphasis on the Northern Area of Saudi Arabia	01-Feb-84	30-Sep-86
24065	Solid Waste Planning Guide	01-Mar-84	31-Dec-84
24079	Saudi Aramco Sustaining Research Project Marine Environmental Studies I	01-Oct-84	30-Oct-90
GST E-4032	Sampling and Monitoring Report	10-Nov-84	11-Nov-84
24108	Marine Environmental Effect of the Abu Ali-Berri Causeway Extension	01-Aug-87	28-Feb-88
24114	Groundwater Resources Evaluation in the Eastern Province of Saudi Arabia	31-Dec-87	31-Mar-88
24120	Wave Climate Study in the Arabian Gulf	15-Aug-89	15-Aug-91
24129	Marine Environmental Study at the Safaniyah GOSP-4 Offshore Facility	11-Dec-89	30-Sep-90

Project	Project Title	Project Start	Project End
24131	Sustaining Research Project Marine Environmental Studies	18-Aug-90	30-Sep-94
24137	Gulf Atmospheric Pollution 1991	01-Feb-91	30-Sep-92
24138	Arabian Gulf Oil Spill Research Program 1991 (also called Gulf Atmospheric Pollution 1991)	01-Feb-91	30-Sep-92
24142	Ras Tanura Refinery/Terminal Upgrade: Environmental Impact Assessment	15-Aug-92	15-Apr-93
21132	Solubility of Calcium Carbonate in Synthetic and Natural Oil Field Brines	01-Apr-94	31-Mar-96
24150	Contaminant Transport Model for the Ras Tanura Groundwater Investigation	22-Aug-94	15-Dec-95
24154	Sustaining Research Project Marine Environmental Studies Phase III	01-Jul-95	31-Mar-01
24162	Investigation of Ambient Concentrations of Automotive Emissions in Three Major Cities	01-May-97	30-Apr-98
24164	Development of Red Sea Biotope Maps Using Remote Sensing Imagery	01-Jul-97	30-Jun-99
CEW2217	Marine Biological and Oceanographic Database Development	15-Nov-00	15-Nov-02
CEW2236	Environmental Impact Assessment for Abu Safah Offshore AM Producing Facilities	01-Jun-01	31-Jul-01
CEW2233	Saudi Aramco/KFUPM-RI Sustaining Research Project Marine Environmental Studies Phase IV	01-Oct-01	30-Sep-06
CEW2242	Conceptual Estimate of Environmental Impacts of Existing and New Arabia-Bahrain Pipeline Routings	28-Oct-01	24-Apr-02
CEW2259	Duba Marine Terminal Permanent Berth (BI-8232) Environmental Impact Assessment for the Construction and Removal of Temporary Roads	15-Jan-03	31-Oct-06
CEW2269	Offshore MP Facilities Berri-119 Pipeline (BI-8294) Environmental Impact Assessment Study	01-Apr-03	31-Oct-03
CEW2278	Offshore MP Facilities 15 kV Cable (BI-8294) Environmental Impact Assessment	15-Sep-03	31-Dec-03
CEW2285	Environmental Impact Assessment North Safaniyah Artificial Lift (BI-10-0047)	12-Jul-04	09-Feb-05
CEW2287	Offshore MP Facilities Qatif QV Cable (BI-8294) Environmental Impact Assessment	26-Jul-04	29-Sep-04
CEW2310	Environmental Impact Assessment of the New Khursaniyah 30” Dia. Pipeline (BI-10-08022)	04-Jun-05	30-Nov-05
CEW2311	Environmental Impact Assessment Upgrade Northern Area Oil Operations Offshore Platforms Wastewater (BI-01-00197).	13-Jun-05	31-Oct-05
CEW2303	Environmental Impact Assessment for the Berri Causeway and Associated Drill Site Landfilling	24-Dec-05	12-Apr-06
CEW2325	Operational Marine Modeling System (OMMS)	01-Jan-06	31-Dec-08
CEW2328	Environmental Impact Assessment for Manifa Field Development (NAFD/L-001-06): Causeway Construction	11-Mar-06	30-Sep-06
CEW2329	Environmental Impact Assessment for Abu Ali Flanks Scraped Water Handling (BI-10-00220)	01-Apr-06	31-Jul-06
CEW2338	Environmental Impact Assessment for Manifa Field Development Program: Platforms, Pipelines and Submarine Cables (BI-01-00452 and BI-01-00453)	11-Nov-06	30-Jun-07
CEW2336	Marine Environmental Monitoring of the New Khursaniyah 30” Dia. Pipeline (BI-10-08022) Project	01-Jan-07	31-Dec-09
CEW2345	Environmental Impact Assessment for the King Abdullah University of Science & Technology Development Project	02-Jun-07	30-Jul-08
CEW2342	Marine Environmental Monitoring of the Manifa Causeway	12-Jun-07	30-Jun-10
CEW2343	Assessment of Ras Tanura Marine Environment and Bioaccumulation Monitoring along the Saudi Coastal Waters of the Arabian Gulf	21-Jul-07	30-Dec-10
CEW2350	Environmental Impact Assessment for Tanajib Channel and Basin Dredging	31-Jul-07	31-Oct-07

Project	Project Title	Project Start	Project End
CEW2344	Saudi Aramco/KFUPM-RI Sustaining Research Project, Marine Environmental Studies Phase V	15-Aug-07	16-Aug-12
CEW2353	Biodiversity of the Offshore Saudi Islands of the Arabian Gulf	21-Oct-07	31-Jul-11
CEW2354	The Western Arabian Gulf Ecosystem: A Reference for Researchers, Planners and Environmental Managers	21-Oct-07	31-Jul-11
CEW2355	Marine Atlas of the Western Arabian Gulf Phase I: Coastal and Marine Surveys and Photo Documentation	21-Oct-07	31-Jul-11
CEW2352	Environmental Impact Assessment for a Seawater Reverse Osmosis Water Treatment Plant at King Abdullah University of Science and Technology	03-Nov-07	31-Mar-08
CEW2343-01	Assessment of Ras Tanura Marine Environment and Bioaccumulation Monitoring along the Saudi Coastal Waters of the Arabian Gulf Additional Scope	01-Jan-08	30-Nov-08
CEW2357	Environmental Impact Assessment for Karan Platforms, Power (BI-10-00579) and Pipelines (BI-10-00580) Construction	01-Jan-08	31-Aug-08
CEW2359	Environmental Impact Assessment for Drill Cutting Disposal at Manifa	01-Jun-08	31-Dec-08
CEW2360	Environmental Impact Study for Channel Dredging at Safaniyah	07-Jun-08	31-Dec-08
CEW2370	Environmental Impact Assessment for Land Filling and Reclamation at Ras Tanura Refinery	15-Nov-08	31-Dec-09
CEW2373	Environmental Impact Assessment for the Upgrade of Crude Gathering and Power Supply Facilities Phase I: Safaniyah Field	27-Jun-09	31-Mar-10
CEW2380	Conduct LC-50 Drilling Fluid Sampling and Toxicity Testing	11-Nov-09	31-Dec-11
CEW2379	Environmental Impact Assessment for Installing Instrument Scraping Facilities at Zuluf and Marjan Oil Fields (BI-10-00187)	20-Feb-10	20-Apr-10
CEW2381	Environmental Impact Assessment for Upgrade of the Fire Protection System, Ju'aymah Offshore Platform (BI-10-00185)	24-Apr-10	31-Aug-10
CEW2382	Environmental Impact Assessment for Arabiyah-Hasbah Platforms, Power (BI-10-00916) and Subsea Pipelines (BI010-00917)	19-Jun-10	19-Dec-10
CEW2374	Fisheries Program: Population Dynamics and Stock Assessment of the Major Fisheries Resources in Saudi Arabian Waters	01-Jan-11	30-Nov-13
CEW2375	Fisheries Program Assessment and Management of Essential Fish Habitats in Saudi Arabian Waters	01-Jan-11	30-Nov-13
CEW2376	Fisheries Program Environmental Impacts of Fishing Methods in Saudi Arabia: Toward Mitigation and Management	01-Jan-11	30-Nov-13
CEW2377	Fisheries Program Development of a Strategic Framework for Fisheries Management in Saudi Arabia	01-Jan-11	30-Nov-13
CEW2385	GMARS Development of GIS Compatible Marine Database and Analysis System (GMARS)	01-Feb-11	31-Jul-12
CEW2389	Red Sea Environmental Impact Assessment for Drilling Exploration in the Shallow Waters of the Northern Red Sea	11-Jun-11	03-Jun-12
CEW2390	Tarut Bay Environmental Assessment Report for Tarut Bay Pipelines & Structural Support System	02-Jul-11	31-Dec-11
CEW2392	Safaniyah Pier Environmental Assessment for the Safaniyah Pier Trestle Replacement	23-Jul-11	31-Mar-12
CEW2399	Environmental Impact Assessment for Dredging (Category III) for Upgrade of Electrical Power Supply to Abu Ali Plants	15-Feb-12	15-Aug-12

APPENDIX II

Checklist of marine invertebrates

*Checklist of marine invertebrates occurring in the area of the Arabian Gulf. Bold Arabic numbers (**1** to **34**) indicate the references of record of the species. Note that the list represented in this appendix has been modified from those published in the references used. Some non-identified species or only identified to the order/family level were excluded from the present list. Taxa identified to only genus level (noted as Genus sp.) were kept but they may refer to one or many species (belonging to the same genus) recorded in one or various references; more details about this can be obtained from the original references of record. The species belonging to each class are listed in alphabetic order.* **1** Price (1991), **2** KFUPM/RI (1987), **3** Al-Yamani et al. (2012), **4** Hasam (1994), **5** Al-Naser et al. (2010), **6** Nithianandan (2012), **7** Smythe (1972), **8** Al-Khayat and Al-Ansi (2008), **9** Tehranifard and Dastan (2011), **10** Al-Khayat (2008), **11** Roper et al. (1984), **12** Sheppard and Borowitzka (2012), **13** Al-Yamani et al. (2011), **14** Carpenter et al. (1997), **15** KFUPM/RI (2003), **16** Apel and Türkay (1999), **17** Hogart and Tigar (2002), **18** Al-Sayed and Zainal (2005), **19** Al-Khayat and Al-Maslamani (2001), **20** KFUPM/RI (1990), **21** Grabe et al. (2004), **22** Murano (1998), **23** Razzaq (1991), **24** Abdulqader (1999), **25** Price and Jones (1975), **26** Enomoto (1971), **27** Hosny (2007), **28** Badawi (1975), **29** Chen et al. (2013), **30** Monniot and Monniot (1997), **31** KFUPM/RI (2006a), **32** KFUPM/RI (2013), **33** KFUPM/RI (2006b), **34** Njinkoué et al. (2006).

PHYLUM PORIFERA

Class Demospongiae

Adocia sp. **2**
Aplysina sp. **2**
Axinella sp. **2**
Biemna sp. **2**
Cacospongia sp. **2**
Gelliodes cf. *incrustans* **34**
Callyspongia cf. *siphonella* **34**
Callyspongia sp. **2, 34**
Choristida sp. **2**
Cinachyra sp. **2**
Ciocalypta sp. **2**
Cliona schmidti **2**
Cliona sp. **2**
Cliona vastifica **2**
Coelosphaera sp. **2**
Dysidea sp. **2**
Europon sp. **2**
Fasciospongia sp. **2**
Gelliodes cf. *incrustans* **34**
Gelliodes sp. **2**
Halichondria sp. **2**
Haliclona sp. **2**
Haliclona sp. **2**
Mycale sp. **2**
Niphates sp. **34**
Spongia sp. **2**
Tedania sp. **2**
Tethya aurantium **2**
Tethya sp. **2**
Tetilla sp. **2**

PHYLUM CNIDARIA

Class Anthozoa

Acanthastrea echinata **12**
Acropora clathrata **12**
Acropora downing **12**
Acropora horrida **12**
Acropora pharaonis **12**
Acropora valenciennesi **12**
Actiniaria sp. **2**
Anemonactis sp. **2**
Anomastrea irregularis **12**
Blastomussa merleti **12**
Coscinaraea monile **12**
Culicia rubeola **12**
Cyphastrea micropthalma **12**
Cyphastrea serialia **12**
Echinophyllia aspera **12**
Favia favus **12**
Favia pallida **12**
Favia speciosa **12**
Favites chinensis **12**
Favites pentagona **12**
Heterocyathus aequicostatus **12**
Hydnophora exesa **12**
Leptostrea inaequalis **12**
Leptostrea purpurea **12**
Leptostrea transversa **12**
Madracis kirbyi **12**
Montipora circumvallata **12**
Montipora spumosa **12**
Paracyathus sp.12
Pavona cactus **12**
Pavona diffluens **12**
Pavona explanulata **12**
Pavona varians **12**
Platygyra daedalea **12**
Platygyra sinensis **12**
Plesiastrea versipora **12**
Pocillopora damicornis **12**
Porites compressa **12**
Porites harrisoni **12**
Porites lutea **12**
Porites murrayensis **12**
Porites nodifera **12**
Psammocora contigua **12**
Psammocora haimeana **12**
Psammoseris sp. **12**
Pseudosiderastrea tayamai **12**
Siderastrea savignyana **12**
Stylophora pistillata **12**
Tubastraea aurea **12**
Turbinaria mesenterina **12**
Turbinaria peltata **12**

Class Hydrozoa

Aequorea pensilis **13**
Aglaura hemistoma **13**
Amphinema rugosum **13**
Campanularia crenata **2**
Clytia cf. *gravieri* **2**
Clytia discoida **13**
Clytia gravieri **2**
Clytia latitheca **2**
Corynactis sp. **2**
Cunina octonaria **13**
Cytaeis nassa **2**
Diphyes chamissonis **13**
Dynamena cornicina **2**
Dynamena crisioides **2**
Dynamena quadridentata **2**
Eirene viridula **13**
Eudendrium capillare **2**
Eudendrium sp. **2**
Eutima gegenbauri **13**
Gonionemus murbachi **2**
Halocordyle disticha **2**
Hydractinia cf. *diogenes* **2**
Liriope tetraphyla **13**
Obelia bispinosa **2**
Obelia cf. *dichotoma* **2**
Obelia sp. **13**
Octophialucium funerarium **13**
Plumularia cf. *setacea* **2**
Plumularia sp. **2**
Podocoryne sp. **13**
Rhizorhagium robustum **2**
Sanderia malayensis **13**
Sertularia distans **2**
Sertularia longa **2**
Solmundella bitentaculata **13**
Staurocladia vallentini **2**
Thyroscyphus fruticosus **2**

PHYLUM ANNELIDA

Class Polychaeta

Aglaophamus sp. **2**
Amaeana sp. **2**
Ampharete acutifrons **31**
Ampharete sp. **15**
Amphicteis gunneri **15**
Amphicteis sp. **2**
Amphiglena mediterranea **15**
Amphiglina sp. **2**
Amphinome sp. **15**
Amphisamytha sp. **2**
Amphitrite pauciseta **31**
Amphitrite sp. **15**
Anaitides sp. **2**
Ancistargis sp. **2**
Ancistrosyllis constricta **15**
Ancistrosyllis parva **15**
Ancistrosyllis sp. **15**
Aonides oxycephala **15**
Aonides sp. **2**
Aphrodita sp. **2**
Arabella iricolor iricolor **15**
Arabella sp. **2**
Aricidea curviseta **31**
Aricidea fauveli **15**
Aricidea jeffreysi **31**
Aricidea longobranchiata **15**
Aricidea sp. **15**
Aricidea suecica simplex **31**
Armandia intermedia **15**
Armandia sp. **2**
Asclerocheilus capensis **31**
Asclerocheilus sp. **2**
Autolytus prolifer **2**
Autolytus sp. **15**
Axiothella sp. **2**
Bhawania goodie **31**
Brada sp. **2**
Brada villosea capensis **32**
Branchiomma sp. **2**
Brania sp. **2**
Cabira sp. **2**
Capitella sp. **2**
Capitomastus sp. **2**
Caulleriella sp. **2**
Ceratocephale sp. **2**
Ceratonereis erythraeensis **2**
Ceratonereis mirabilis **2**
Ceratonereis sp. **2**
Chaetoparia sp. **2**
Chaetopterus sp. **15**
Chaetopterus variepedatus **31**
Chaetozone sp. **2**
Chane sp. **2**

Chloeia sp. 15
Chone collaris 31
Chone filicaudata 31
Chone sp. 2
Chrysopetalum sp. 2
Cirratulus chrysoderma 15
Cirratulus cirratus 15
Cirratulus filiformis 15
Cirratulus sp. 15
Cirriformia filigera 31
Cirriformia sp. 2
Cirrophorus branchiatus 31
Cirrophorus sp. 2
Clymenella sp. 2
Cossura coasta 15
Dasybranchus caducus 15
Dasybranchus sp. 2
Decamastus sp. 2
Diopatra sp. 2
Dioplosyllis sp. 2
Dispio sp. 31
Dorvillea angolana 15
Dorvillea rubrovittata 31
Dorvillea rudolphi 15
Drilonereis monroi 31
Drilonereis sp. 2
Drilonerels filum 2
Ehlersia cornuta 2
Ehlersia sp. 2
Epidiopatra sp. 31
Eteone foliosa 31
Eteone sp. 2
Euchone rosea 15
Euchone sp. 2
Euclymene lombricoides 31
Euclymene luderitziana 15
Euclymene oerstedi 31
Euclymene sp. 2
Eulalia sp. 2
Euleanira sp. 15
Eumida sp. 2
Eunice antennata 15
Eunice australis 15
Eunice indica 2
Eunice sp. 15
Eunice vittatta 31
Eunoe sp. 2
Euphrosine capensis 15
Euphrosine foliosa 15
Euphrosine myrtosa 15
Eurythoe parvencarunculata 15
Eurythoe sp. 15
Exogone clavator 15
Exogone cornuta 2
Exogone gemmifera 15
Exogone normalis 15
Exogone sp. 15
Exogone verugera 2
Filograna implexa 31
Flabelligera affinis 31
Genetyllis sp. 2
Glycera longipinnis 31
Glycera rouxi 2
Glycera sp. 2
Glycera spongicola 32
Glycera tesselata 31
Glycinde sp. 2
Glyphanostomum abyssale 31
Goniada congoensis 32
Goniada emerita 31
Goniada maculata 15
Goniada sp. 2
Goniadella gracilis 31
Grubeulepis sp. 2
Gyptis capensis 15
Haplosyllis spongicola 2
Harmothoe sp. 2
Hesionides sp. 2
Heteroclymene cf. Quadrilobata 2
Heteromastus filiformis 15
Heteromastus sp. 2
Hipponoa gaudichaudi agulhana 31
Hipponoa sp. 31
Horstileanira sp. 2
Hyalinocecia tubicola 31
Hyboscolex longiseta 15
Hydroides heteroceros 31
Hydroides homaceros 2
Hydroides monoceros 15
Hydroides norvegica 2
Hydroides sp. 2
Hydroides uncinata 2
Hypsicomus phaetonia 15
Isolda pulchella 31
Isolda sp. 2
Jasmineira elegans 31
Jasminiera sp. 2
Laeonereis ankyloseta 31
Lanice conchilega 15
Laonice cirrata 31
Laonome sp. 2
Leiochrus sp. 2
Leocrates claparedeii 15
Leodora sp. 2
Leonnates jonaseaumei 2
Leonnates persica 2
Lepidonotus sp. 2
Linopherus sp. 15
Loimia medusa 2
Lumbrineriopsis sp. 2, 15
Lumbrineris aberrans 15
Lumbrineris albidentata 15
Lumbrineris brevicirra 31
Lumbrineris heteropoda 2
Lumbrineris inflata 15
Lumbrineris latrielli 15
Lumbrineris megalhaensis 15
Lumbrineris meteorana 31
Lumbrineris simplex 15
Lygdamis murata gilchrisi 15
Lygdamis sp. 15
Lysidice collaris 15
Lysidice longiceps 15
Lysidice sp. 2
Lysilla sp. 2
Magelona cincta 15
Magelona papillicornis 31
Malacoceros indicus 15
Manayunkia sp. 2
Marphysa bifurcata 15
Marphysa sp. 2
Marphysia mossambica 31
Mastobranchus sp. 2
Mediomastus capensis 31
Mediomastus sp. 2
Megalomma quadriculatum 15
Megalomma sp. 2
Melinna cristata 32
Melinna monoceroides 15
Melinna sp. 2
Melinopsides capensis 31
Mesochaetopterus minutus 15
Mesochaetopterus sp. 15
Mesospio sp. 2
Micromaldane sp. 2
Micronephtys spaerocirrata 2
Mysta sp. 2
Mystides angolensis 31
Myxicola sp. 2
Nainereis laevigata 2
Neanthes sp. 2
Neanthes unifasciata 2
Nematonereis unicornis 15
Nephtyis lyrochaeta 15
Nephtyis sphaerocirrata 15
Nephtys dibranchis 15
Nephtys hombergi 15
Nephtys polybranchia 15
Nephtys tulearensis 2
Nereimyra sp. 2
Nereis coutierei 2
Nereis persica 2
Nereis sp. 15
Nereis trifasciata 2
Nicolea macrobranchia 15
Ninoe sp. 2
Nothria sp. 2
Notomastus aberrans 31
Notomastus fauveli 31
Notomastus latericeus 31
Notomastus sp. 2
Odontosyllis polycera 2
Onuphis eremita 15
Onuphis geophiliformis 15
Onuphis holobranchiata 15
Onuphis sp. 15
Ophelia sp. 2
Ophelina acuminata 15
Ophelina sp. 2
Ophiodromus angustifrons 15
Ophiodromus berristordei 15
Ophiodromus sp. 15
Orbinia angrapequensis 31
Orbinia sp. 2
Oriopsis bansei 31
Oriopsis neglecta 31
Oriopsis sp. 15
Owenia fusiformis 31
Owenia sp. 2
Paleanatus chrysolepis 31
Paleanatus debilis 31
Panthalis sp. 2
Paraamphinome indica 15
Paralacydonia paradoxa 15
Paralepidonotus ampulliferus 2
Paranaites sp. 2
Paraonides lyra lyra 31
Paraonides sp. 15
Paraonis gracilis graicilis 15
Paraonis gracilis oculata 15
Paraschlerocheilus capensis 15
Pectinaria antipoda 2
Pectinaria capensis 31
Pectinaria crassa 15
Pectinaria koneri koneri 31
Pectinaria neopolitana 31
Pectinaria papillosa 15
Pectinaria sp. 15
Perenereis cultrifera 15
Peresiella acuminatobranchiata 2
Peresiella sp. 2
Petaloproctus terricola 2
Pherusa monroi 15
Pherusa sp. 15
Pholoe sp. 2
Phyllochaetopterus elioti 31
Phyllocomus hiltoni 31
Phyllodoce capensis 15
Phyllodoce castanea 31
Phyllodoce longipes 31
Phyllodoce malmgreni 15
Phyllodoce sp. 15
Phyllodoce tubicola 31
Phylo capensis 15
Phylo sp. 15
Pilargis sp. 2
Pionosyllis sp. 2
Piromis arenosus 15
Piromis sp. 2
Pista brevibranchia 15
Pista cristata 31
Pista dibranchis 15
Pista macrolobata 15
Pista medusaera 2
Pista sp. 15
Pista typha 2
Platynereis dumerilii 2
Platynereis isolita 33
Platynereis pulchella 2
Platynereis sp. 15
Podarke sp. 2
Podarkeopsis sp. 2
Poecilochaetus serpens 15
Poecilochaetus sp. 2
Polycirrus aurantiacus 31
Polycirrus cf. haematodes 15
Polycirrus plumosus 31
Polycirrus sp. 2
Polydora capensis 15
Polydora ciliata 15
Polydora kempi 31
Polydora sp. 2
Polyodontes sp. 2
Polyophthaimus sp. 2
Polyphysia crassa 15
Pomatoleios kraussii 15
Potamila linguicollaris 31
Potamila reniformis 31
Potamilla sp. 15
Potamilla tanelli 15
Praxillella sp. 2
Prionospio bocki 15
Prionospio cirrifera 31
Prionospio cirrobranchiata 15
Prionospio ehlersi 15
Prionospio pinnata 15
Prionospio sexoculata 15
Prionospio sp. 2
Procerastea perrieri 31
Protodorvillea biarticulata 15
Protodorvillea egena 2
Pseudoclymene sp. 2
Pseudomalacoceros sp. 2
Pseudonereis anomala 2
Pseudopolydora antennata 2
Pseudopolydora sp. 2
Pulliella armata 15
Pycnoderma congoense 31
Pygospio elegans 15
Rhamphobrachium capense 31
Rhamphobrachium sp. 15
Rhodine sp. 2
Rynchospio glutaea 15
Sabella sp. 15
Sabellaria intoshi 31
Sabellaria sp. 31
Sabellaria spinulosa alcocki 15
Sabellides capensis 31
Sabellides luderitzi 31
Sabellides octocirrata 31
Sabellides sp. 15
Schistomeringos neglecta 2
Schistomeringos rudolphi 2
Scolelepis lefebvrei 15
Scolelepis sp. 15
Scoloplos armiger 15
Scoloplos johnstonei 15
Scoloplos johnstonei 31
Scoloplos sp. 15
Scyphoproctus djiboutiensis 31
Serpula vermicularis vermicularis 15
Sigambra sp. 2
Sphaerodoridium benguellarum 15
Sphaerodoropsis sp. 2
Sphaerosyllis brenicirrus 2
Sphaerosyllis capensis 2
Sphaerosyllis semiverucossa 15
Sphaerosyllis sp. 2
Sphaerosyllis sublaevis 15
Spherodoridium capens 31
Spio filicornis 15
Spio sp. 15
Spiochaetopterus sp. 2
Spiophanes bombyx 15
Spiophanes soderstromei 31
Spirobranchus tetraceros 15
Spirorbis sp. 15
Sternaspis scutata 15
Sthenelais sp. 2
Streblosoma hesslei 15
Streblosoma persica 31
Streblosoma sp. 2
Syllides fulva 2
Syllides sp. 2
Syllidia armata 15
Syllidia sp. 15
Syllis exilis 15
Syllis longissima 15
Syllis sp. 15
Syllis spongicola 31
Tauberia sp. 2
Terebella pterochaeta 15
Terebella sp. 2
Terebellides sp. 2
Terebellides stroemi 2
Thalenessa sp. 2
Tharyx filibranchia 15
Tharyx marioni 31
Tharyx sp. 2 15
Thelepus plagiostoma 15
Thelepus sp. 15
Timarete sp. 2
Trichobranchus sp. 2
Trypanosyllis zebra 2
Typosillis prolifera 2
Typosyllia sp. 2
Typosyllis armillaris 2
Typosyllis hyaline 2
Vermiliopsis glandigerus 2
Vermiliopsis pygidialis 15
Vermiliopsis sp. 15
Zeppelina sp. 2

Class Oligochaeta

Bathydrilus adriaticus 2
Bathydrilus sp. 2
Duridrilus tectus 2

Heterodrilus maccaini **2**
Heterodrilus sp. **2**
Inanidrilus sp. **2**
Limnodriloides appendiculatus **2**
Limnodriloides bipapillatus **2**
Limnodriloides tenuiductus **2**
Limnodriloides sp. **2**
Olavius manifae **2**
Olavius verga **2**
Paranais litoralis **2**
Phallodrilus sp. **2**
Tectidrilus arabicus **2**
Tubificoides sp. **2**
Class Sipunculidea
Apionsoma trichocephalus **2**
Aspidosiphon sp. **2**
Phascolapsis sp. **2**
Phascolion convestitum **2**
Phascolion valdiviae var. sumatrense **2**
Phascolion sp. **2**
Phascolosoma sp. **2**
Siphonosoma sp. **2**
Class Echiura
Anelassorhynchus branchiorhynchus **3**
Listriolobus brevirostris **3**
Ikeda pirotansis **3**

PHYLUM ARTHROPODA
Class Crustacea
Acanthephyra sp. **13**
Acetes Japonicus **13**
Aeginella sp. **15**
Aeginellopsis arabica **15**
Aglaiocypris sp. **2**
Alocopocythere reticulate **2**
Alpheus sp. **13**
Ampelisca brevicornis **2, 15**
Ampelisca hemigera **15**
Ampelisca insignis **2, 15**
Ampelisca scabripes **2, 15**
Ampelisca sp. **2, 3**
Ampelisca tulearensis **2, 15**
Amphiascopsis subdebilis **20**
Amphiascus minutus **20**
Amphiascus sp. **2**
Amphilochus neapolitanus **2**
Amphilochus sp. **2**
Ampilochus hemigera **15**
Ampilochus neopolitanus **15**
Ampithoe falsa **2, 15**
Ampithoe ramondi **2, 15**
Ampithoe sp. **2, 3, 15**
Apanthura africana **2**
Apanthura sandalensis **3**
Apseudopsis sp. **2, 3**
Arabanthura enigmatica **2**
Arcturinoides sp. **2**
Astacilla mediterranea **2, 20**
Asteropterrgion sp. **2**
Atergatis integerrimus **3**
Azotostoma sp. **15**
Balanus amphitrite **3, 13, 19, 20**
Balanus sp. **3**
Balanus venustus **2, 20**
Biancolina sp. **15**
Bodotria parva **15**
Bodotria siamensis **15**
Bodotria similis **2, 15, 20**
Bodotria sp. **3**
Bodotria sublevis **15**
Branchinella spinosa **17**
Branchipus schaefferi **18**
Brianola sp. **2**
Bulbamphiascus inermis **2, 20**
Byblis sp. **3, 15**
Calanopia parathompsoni **20**
Calanopia sp. **2**
Callianassa sp. **13**
Callistocythere cf. *flavidofusca intricatoides* **2, 23**
Callistocythere cf. *intricatoi* **2**
Campylaspis glabra **15**
Campylaspis sp. **2, 3, 15**
Canuella furcigera **2, 20**
Canuella sp. **2**
Caprella danilevskii **2, 15**
Caprella sp. **15**
Carinocythereis batei **23**
Carinocythereis hamata **2**
Ceradocus rubromaculatus **2, 15**
Ceradocus serratus **2, 15**
Ceradocus sp. **2, 3**
Cerapus sp. **2**
Cerapus tubularis **2**
Cheiriphtis sp. **3**
Cheirocratus intermis **2**
Cheirocratus unidentatus **2**
Cheirophotis megacheles **2, 15**
Chiromantes boulengeri **16**
Cirolana parva **2**
Cirolana sp. **2**
Cirolana sulcata **2**
Cleistostoma sp. **3**
Cletodes cf. *dissimilis* **2**
Colomastix pusselia **2**
Corophinum sp. **3**
Cumella forficula **2, 15, 20**
Cumella nispida **15, 20**
Cumella sp. **2, 3, 15**
Cumopsis sp. **3**
Cyclaspis cingulate **20**
Cyclaspis hornelli **2, 15, 20**
Cyclaspis picta **2, 15, 20**
Cyclaspis sp. **3, 15**
Cyclopoid sp. **2**
Cyelaspis cingulate **2**
Cylindroleberis sp. **2**
Cymadusa filosa **2, 15**
Cymadusa sp. **3**
Cymodoce sp. **2**
Cypridina sp. **2**
Cypridinodes minuta **2**
Cyproidea sp. **3**
Cyproidea tecticauda **2, 15**
Cytherella sp. **2, 15**
Cytherelloidea sp. **2**
Dactylopodia sp. **2**
Darcythompsonia sp. **2**
Dardanus sp. **13**
Diogenes sp. **13**
Diosaccid sp. **2**
Dotilla blanfordi **16**
Dotilla sulcata **16**
Dulichiella appendiculata **2**
Ebalia sp. **13**
Ectinosoma sp. **2**
Elasmopus pectinicrus **15**
Elasmopus rapax **15**
Eocuma affine **2, 3, 15, 20**
Eocuma rosae **3**
Eocuma sarsi **2, 3, 20**
Eocuma sp. **3, 15**
Eocuma taprobanicum **2, 15**
Epixanthus frontalis **3**
Erichthonius sp. **3**
Erichthonius brasiliensis **2**
Erythrops minuta **21**
Eudactylopus andrewi **2, 20**
Euphilomedes sp. **2**
Euraphia withersi **3**
Euroides caesaris **2, 15**
Eurycarcinus orientalis **3**
Euryte pseudorobusta **20**
Euterpina acutifrons **20**
Eviopisa sp. **3**
Exanthura filiformis **20**
Eyakia sp. **2 15**
Galathea sp. **13**
Gammaropsis atlantica **2, 15**
Gammaropsis sp. **2, 15**
Gastrosaccus kempi **15, 22**
Gibboborchella alata **23**
Gibboborchella venosa **23**
Gigacuma sp. **2**
Gitanopsis gouriae **15**
Gitanopsis sp. **15**
Gnathia africana **2**
Gnathia sp. **2 3**
Gonodactylus demanii **2, 29**
Grandidierella bonnieroides **2, 15**
Grandidierella exilis **2, 15**
Guernea rhomba **2**
Gumella hispida **2**
Gynodiastylis sp. **2, 15**
Halectinosoma sp. **2**
Haliophasma sp. **2**
Haplostylus bengalensis **21**
Haplostylus parerythraeus **22**
Harpacticoid copepodites **20**
Harpacticus nicaeensis **20**
Heppomedon longimanus **2**
Heppomedon normalis **2**
Hersiliodes latericia **20**
Heterocuma andamani **15, 20**
Heterocuma sp. **15**
Heteromysis proxima **22**
Hippolyte sp. **2**
Hornella incerta **2, 15**
Hyale grandicornis **2**
Hyale sp. **2**
Hyograpsus paludicols **16**
Idunella lindae **2**
Idunella similis **2**
Idunella sp. **2, 15**
Ilyoplax frater **13, 16**
Ilyoplax sp. **3**
Ilyoplax sulcata **16**
Indischnopus herdmani **15**
Indomysis annandalei **21, 22**
Iphimedia sp. **2**
Iphinoe crassipes **15**
Iphinoe ischnura **20**
Iphinoe maeotica **3**
Iphinoe sp. **3, 15**
Jainella karwarensis **2**
Kainomatomysis foxi **21**
Kalliapseudopsis mauritanicus **2**
Keijella darwini **2**
Lankacxthere coralloides **2**
Lanocira gardineri **2**
Lanocira glabra **2**
Laomedia sp. **13**
Laophonte cornuta **20**
Laophonte inornata **20**
Laophonte sp. **2**
Laophontopsis lamellifera **20**
Latreutes pygmaeus **2, 15**
Latreutes sp. **13**
Lemboides ofer **2**
Lembos sp. **2**
Lembos teleforus **2**
Leptochela aculeocaudata **2**
Leptochela sydniensis **2, 15**
Leptochelia lifuensis **2**
Leptochelia minuta **2**
Leptochelia savignli **2**
Leptochelia sp. **2**
Leptochryseus kuwaitense **16**
Leucosia sp. **13**
Leucothoe lesson **2**
Leucothoe sp. **2, 15**
Leucothoe spinicarpa **2**
Leucothoella bannwarthi **2, 15**
Leucothoella sp. **15**
Leucothoides sp. **15**
Leucothrals sp. **2**
Liljeborgia sp. **2**
Limbos leptocheirus **2**
Longipedia sp. **2**
Lourinia armata **2**
Loxoconcha amygdalanux **2**
Loxoconcha gurneyi **2**
Loxoconcha indica **23**
Loxoconcha multiornata **23**
Loxoconcha ornatovalvae **2**
Lucifer hanseni **13**
Lucifer typus **13**
Lycomysis platycauda **21**
Lysianassa cinghalensis **2, 15**
Lysianassa coelochir **2**
Lysmata sp. **13**
Lyssianassa sp. **2**
Macrophthalmus (Macrophthalmus) laevis **16**
Macrophthalmus (Macrophthalmus) sulcatus **16**
Macrophthalmus (Mareotis) depressus **16**
Macrophthalmus (Venitus) dentipes **3, 16**
Maera hemigera **15**
Maera pacifica **2, 15**
Maera quadrimana **2, 15**
Maera sp. **2, 15**
Maera tenella **2, 15**
Malacanthura africana **20**
Malacanthura mombasa **2, 20**
Manningia sp. **2**
Manningis arabicum **16**
Maua sp. **2**
Medaeops granulosus **3**
Megabalanus sp. **3**
Megabalanus tintinnbulum **3**
Melita sp. **2, 3**
Metamphiascopsis hirsutus **20**
Metapenaeopsis mogiensis **24**
Metapenaeopsis stridulans **24, 25, 26**
Metapenaeus affinis **25, 27**
Metapenaeus stebbingi **24, 25, 27, 28**
Metaplax indicus **16**
Metaprotella sandalensis **2, 15**
Metopograpsus messor **3, 16**
Metopograpsus thukuhar **16**
Microasteropteron bacescui **2**
Microlysias denoceras **2**
Microlysias sp. **2**
Microphotis blachei **3**
Microsetella norvegiga **20**
Mycrolysias xenoceras **2**
Mysidopsis kempi **21**
Nannastacus gibbosus **15**
Nannastacus gurneyi **15, 20**
Nannastacus inflatus **2, 15, 20**
Nannastacus lepturus **2, 15, 20**
Nannastacus lepturus **20**
Nannastacus sp. **2, 15**
Nannastacus stebbingi **2, 15, 20**
Nannastacus zimmeri **15**
Nannastacuss gurneyi **2**
Nanosesarma minatum **3**
Nasima ditilliformis **16**
Natarajphotis manieni **15**
Natatolana neglecta **2, 20**
Nebalia marerubri **2**
Nebalia sp. **2**
Neomonoceratina sp. **23**
Neonesidea schulzi **2**
Nitocrella sp. **2**
Nitrocra sp. **2**
Ocyode rotundata **16**
Oediceroides cinderella **2**
Orchomene sp. **3**
Pachcheles sp. **13**
Paguristes sp. **13**
Pagurus sp. **13**
Palaemon sp. **13**
Panulirus versicolor **14**
Paracytheridea sp. **2**
Paradexamine sp. **2**
Paradiastylis brachyura **2, 15, 20**
Paradiastylis culicoides **2**
Paradiastylis sp. **2, 15**
Paralaophonte congenera **20**
Paralaophonte mediterranea **20**
Paralaophonte sp. **2**
Paranamixis sp. **2**
Parapenaeopsis stylifera **13, 26**
Parasesama plicatum **16**
Parathalestris sp. **2**
Paratymolus sp. **2**
Parhyale sp. **15**
Paromoera capensis **15**
Parthenope sp. **13**
Penaeus japonicus **26, 27**
Penaeus latisulcatus **24, 25, 27**
Penaeus semisulcatus **25, 26, 28**
Periclimenes sp. **13**
Perioculodes aequimanus **3**
Perioculodes longimanus **2**
Perioculodes pallidus **2**
Perioculodes sp. **3**
Philyra platychira **2**
Philyra sp. **3**
Photis digitata **15**
Photis dolicammota **2**
Photis longimanus **2, 15**
Photis sp. **2**
Pilumnopeus sp. **2**
Pilumnus vespertilis **3**
Pinnixa sp. **2**
Platyisohnopus herdmani **3**
Podocerus brasiliensis **2**
Poecilostomatoida sp. **2**

Portunus segnis (previously named P. pelagicus) **3**
Praniza (Gnathia) sp. **2**
Processa aequimana **2, 15**
Processa australiensis **2**
Processa japonica **2**
Psammameira reducta **20**
Pseudobradya sp. **2**
Pseudocaprellina pambanensis **15**
Pseudocyclops xiphophorus **20**
Pseudodiaptomus salinus **20**
Pseudodiaptomus sp. **2**
Pseudosympodomma indicum **2, 15, 20**
Reterocuma sndamani **2**
Rhepoxynius sp. **15**
Rhopalophthalmus sp. **21**
Robertgurneya ilievecensis **20**
Robertgurneya rostrata **20**
Rocinela orientalis **2**
Rutiderma sp. **2**
Sarsiella sp. **2**
Schizotrema bifrons **15, 20**
Schizotrema depressum **15**
Schizotrema sordidum **2, 15**
Schizotrema sp. **2, 15**
Scopimera crabricauda **16**
Scottolana longipes **2, 20**
Serenlla leachii **16**
Sergestes sp. **13**
Sinoediceros homopalmatus **3**
Siphonoecetes arabicus **2**
Siphonoecetes sp. **3**
Siriella affinis **21**
Siriella brevicaudata **15, 21, 22**
Siriella hanseni **15, 22**
Siriella sp. **21**
Solenocera crassicornis **27**
Solenocera hextii **13**
Stenhelia sp. **2**
Stenothoe adhaercus **2**
Stenothoe galensis **2**
Sunaristes sp. **2**
Synchelidium haplocheles **2**
Syncheliolium sp. **3**
Synelmis sp. **2**
Synssterope sp. **2**
Tanella cf. gracilis **23**
Tetraleberis sp. **2**
Thalamita poissoni **2**
Thalassocaris obscura **13**
Thenus orietalis **3, 13, 14**
Thompsonula sp. **2**
Tozeuma sp. **13**
Trachypenaeus curvirostris **13, 24, 25**
Trachypenaeus granulosus **25, 28**
Triliropus minutus **2, 15**
Tylodiplax indica **16**
Tylodiplax sp. **2**
Typhlamphiascus sp. **2**
Typhlocarcinus villosus **2**
Uca annulipes albimana **16**
Uca annulipes iranica **16**
Uca hesperiae **16**
Uca inversa **16**
Uca sindensis **16**
Uca tetragonon **16**
Upogebia sp. **13**
Urothoe grimaldi **2**
Urothoe sp. **2, 3, 15**
Urothoe spinidigitus **2, 15**
Urothoe tumorsa **2**
Vaunthompsonia arabica **2, 15, 20**
Vijaiella mandriensis **2**
Xantho (Leptodius) exaratus **3**
Xestoleberis rhomboidea **2**
Xestoleberis rotunda **2, 23**

Class Pycnogonida

Ammothella indica **2**
Anoplodactylus glandulifera **2**
Anoplodactylus sp. **2**
Ascorhynchus sp. **2**
Callipallene pectinata **2**

PHYLUM MOLLUSCA

Class Polyplacophora

Ischnochiton yerburyi **3**

Class Gastropoda

Acteon sp. **3**
Alaba virgata **7**
Amaea acuminata **4**
Ancilla castenea **4**
Ancilla castanea **3 8**
Ancilla cinnamomea **7**
Ancilla fasciata **7**
Ancilla sp. **8**
Architectonica perspectiva **4**
Architectonica sp. **3**
Atys cylindrica **4, 7**
Atys pellyi **3**
Atys sp. **3**
Babylonia spirata **4**
Bittium sp. **3**
Bulla ampulla **3, 4, 7**
Bullia mauritiana **4**
Bullaria ampulla **8**
Calyptraea pellucida **3, 4**
Calyptraea sp. **3**
Caecum sp. **3**
Casmaria ponderosa **3**
Cantharus wagneri **3**
Cellana rota **3**
Cerithidea cingulata **3 4**
Cerithidea sp. **8**
Cerithium caeruleum **3**
Cerithium morus **7**
Cerithium petrosum **7**
Cerithium rugosum **7**
Cerithium ruppelli **7**
Cerithium scabridum **3, 4, 7, 8**
Cerithidium cerithinum **3**
Cerithideopsis cingulatus **7**
Chicoreus (Hexaplex) kusterianus **7**
Cerithiopsis (Seila) hinduorum **7**
Cerithiopsis sp. **3**
Chromodoris annulata **6, 8**
Chromodoris obsoleta **6**
Chrysallida sp. **3**
Clanculus pharaonis **3**
Clypeomorus bifasciatus **3**
Clypeomorus bifasciatus bifasciatus **3**
Clypeomorus clypeomorus **5**
Conus sp. **3, 9**
Conus milesi **8**
Costellaria sp. **3**
Crepidula walshii **3, 4**
Cronia konkanensis **3, 8**
Cuthona albocrusta **3**
Cylichna collyra **3**
Cylichna cylindracea **3**
Cylichna sp. **3**
Cymatium sp. **3**
Cypraea arabica **4**
Cypraea chinensis **4**
Cypraea gracilis **7**
Cypraea grayana **3, 4**
Cypraea lamarckii **3**
Cypraea lentiginosa **3**
Cypraea pulchra **3**
Cypraea tardus winkworthi **4**
Cypraea turdus **3, 7**
Dendrodoris fumata **6**
Dendrodoris cf. nigra **6**
Diala sulcifera **7**
Diala semistriata **7**
Diodora funiculata **3, 4, 7, 8**
Diodora funiculata subsp. **7**
Diodora quadriradiata **7**
Diodora rueppellii **3, 7, 8**
Doriopsilla cf. miniata **6**
Doto kya **3**
Drupa tuberculata **7**
Duplicaria duplicata **4**
Ellobium sp. **3**
Eurobranchus misakiensis **3**
Euchelus asper **3, 5, 7**
Echinolittorina arabica **3**
Epitonium sp. **3**
Ethminolia degregorii **3**
Flabellina amabilis **3**
Flabellina bicolor **6**
Fusinus arabicus **3, 4, 7**
Gibberula mazagonica **3**
Glossaulax didyma **3**
Glossodoris cf. pallida **6**
Granulina oodes **3**
Haminoea vitrea **3**
Hastula sp. **8**
Heliacus sp. **3**
Hexaplex kusterianus **3, 4, 5, 8**
Hypermastus epiphanes **3**
Hypermastus sp. **8**
Hypselodoris dollfusi **6**
Hypselodoris maculosa **6**
Leucotina gratiosa **3**
Lunella coronata **3**
Marginella (Persicula) mazagonica **7**
Melanella cumingi **3**
Melanella sp. **3**
Minolia holdsworthiana **7**
Mitrella blanda **3, 4, 7, 8**
Monilea chiliarches **3, 4**
Monilea gradata **4**
Monilea obscura **7**
Monodonta nebulosa **3**
Murex malabricus **4**
Murex scolopax **3, 4, 7**
Murex tribulus **5**
Nassarius albescens **3**
Nassarius albescens gemmuliferus **4, 8**
Nassarius arcularis plicatus **4, 8**
Nassarius arcularius **5**
Nassarius coronatus **4**
Nassarius concinnus **3**
Nassarius emilyae **3**
Nassarius frederici **3**
Nassarius marmoreus **3**
Nassarius persicus **3**
Nassarius pullus **7**
Nassarius sp. **3, 8**
Natica pulicaris **4**
Natica vitellus **4, 8**
Natica sp. **8**
Nerita albicilla **4**
Nerita sp. **3**
Neverita didyma **4**
Niso venosa **4**
Nodilittorina subnodosa **7**
Odostomia eutropia **3**
Odostomia sp. **3**
Oliva bulbosa **4**
Omalogyra sp. **3**
Perinella caillaudi **7**
Perinella conica **7**
Peristerina nassatula forskalii **4**
Peronia peronii **3**
Phasianella jaspidea **7**
Phasianella solida **8**
Phyllidia (Fryeria) rueppelii **6**
Phyllidia sp. **8**
Pirenella conica **4**
Pisania sp. **8**
Placida daguilarensis **3**
Planaxis sulcatus **3, 4, 7**
Plocamopherus ocellatus **6**
Polynices tumidus **4**
Potamides conicus **3, 8**
Priotrochus obscurus **3**
Pseudodaphnella daedala **3**
Pseudonoba alphesiboei **3**
Pseudonoba columen **3**
Pupa affinis **3**
Pyramidella sp. **3**
Ranularia boschi **4**
Rapana bulbosa **4**
Rapana rapiformis **3**
Rapana venoza **3**
Retusa sp. **3**
Rhinoclavus fasciatum **7**
Rhinoclavus fasciata **8**
Rhinoclavis kochi **3**
Ringicula propinquans **3**
Rissoina sp. **3**
Rissoina distans **7**
Salinator fragilis **4**
Scabricola desetangsii **3**
Sebadoris fragilis **6**
Semicassis faurotis **4**
Serpulorbis variabilis **3**
Siphonaria belcheri **3**
Siphonaria laciniosa **4**
Siphonaria rosea **7**
Siphonaria savignui **3**
Siphonaria tenuicostulata **4**
Splendrillia sp. **3**
Stomatella auricula **3**
Strombus decorus **3**
Strombus decorus percicus **4 7**
Strombus fasciatus **4**
Strombus gibberulus **4**
Strombus persicus **3, 8**
Strombus plicatus sibbaldi **4**
Strombus sp. **8**
Syrnola aclys **3**
Syrnola brunnea **3**
Syrnola sp. **3**
Terebralia palustris **4**
Terebellum terebellum **3**
Terebellum sp. **8**
Terebra sp. **3, 8**
Thais carinifera **7**
Thais margariticola **7**
Thais mutabilis **4**
Thais pseudohippocastanum **7**
Thais savigny **3, 4, 8**
Thais sp. **5, 8**
Thais tissoti **4, 7, 8**
Thaisella lacera **3**
Thaisella tissoti **3**
Tibia fusus **4**
Tibia insulaechorab curta **4**
Tibia insulaechorab **3**
Tonna dolium **4**
Tornatina inconspicua **3**
Tornatina persiana **3**
Tornatina sp. **3**
Tricolia fordiana **7**
Tricolia sp. **3**
Trochus sp. **8**
Trochus fultoni **3**
Trochus erythraeus **3, 4, 7, 8**
Turbo coronatus **7**
Turbo radiatus **4**
Turbonilla icela **2 7**
Turbonilla linjaica **3**
Turbo radiatus **3**
Turitella cochlea **4, 8**
Turitella fultoni **8**
Turitella turulosa **4**
Turitella sp. **8**
Umbonium vestiarum **3, 4, 7**
Vanicoro sp. **3**
Vermetus sulcatus **4, 7, 8**
Vexillum acuminatum **4**
Vexillum asiridis **3**
Vexillum diaconalis **3**
Volema pyrum **4**
Zafra selasphora **3**
Ziba sp. **8**
Ziba pretiosa **8**

Class Bivalvia

Acar abdita **3**
Acar plicata **3, 4**
Acrosterigma sp. **8**
Amiantis umbonella **3, 4**
Amphilepida faba **3**
Amphilepida peilei **3**
Amphilepida sp. **3**
Anadra ehrenbergi **8**
Anadra birleyana **8**
Anadara ehrenbergi **3, 4**
Anadara erythraeonensis **3**
Anadara uropigimelana **4**
Anadara sp. **3**
Anodontia edentula **3, 7**
Anomia laqueata **4**
Anomia sp. **8**
Apolymetis dubia **4**
Arca lacerata **7**
Arca plicata **7, 8**
Arca uropigmelana **7**
Arca sp. **3, 8**
Asaphis deflorata **4**
Asaphis violascens **3**
Barbatia fusca **2**
Barbatia decussata **3, 8**
Barbatia foliata **3**
Barbatia fusca **3**
Barbatia helblingi **4, 7**
Barbatia obliquata **4**
Barbatia parva **8**

Barbatia plicata **8**
Barbatia setigera **3, 8**
Barbatia sp. **3, 8**
Bassina callophyla **3, 4, 8**
Bassina foliacea **8**
Brachiodontes variabilis **3, 4, 7**
Brachiodontes sp. **8**
Brachidontes variabilis **8**
Brachidontes sp. **8**
Callista erycina **4**
Callista florida **3, 8**
Callista multiradiata **4**
Cardita bicolor **4**
Cardita gubernaculum **4**
Carditella sp. **3**
Cardites bicolor **3**
Cardites sp. **3**
Cardium sp. **8**
Chama asperella **8**
Chama brassica **3**
Chama pacifica **4**
Chama reflexa **3, 8**
Chama sp. **3, 8**
Chlamys livida **3, 8**
Chlamys ruschenbergii **4, 7, 8**
Chlamys senatorius **4, 7, 8**
Chlamys sp. **8**
Circe corrugata **4, 8**
Circe intermedia **3, 8**
Circe scripta **7, 8**
Circentia callipyga **4**
Circenita callipyga **8**
Codakia tigerina **4**
Corbula sulculosa **3, 4**
Corbula taitensis **3, 8**
Cuna sp. **7**
Curvimysella sp. **3**
Decatopecten plica **4**
Didimacar tenebrica **3**
Diplodonta ravayensis **4**
Diplodonta sp. **3**
Divaricella cumingiana **4**
Donax cuneatus **4**
Donax scalpellum **4**
Donax sp. **3**
Dosinia alta **3, 4**
Dosinia erythraea **3**
Dosinia tumida **4**
Dosinia sp. **3, 8**
Ervilia sp. **3**
Fulvia fragile **3**
Fulvia australe **8**
Gafrarium arabicum **7**
Gafrarium callipygeum **7**
Gafrarium divaricatum **7**
Gafrarium pectinatum **4**
Gafrarium sp. **8**
Gari maculosa **3, 8**
Gari sp. **3**
Gari (Psammobia) occidens **7**
Glycemeris lividus **4**
Glycemeris livida **3**
Glycemeris pectunculus maskatensis **4, 8**
Glycemeris pectunculus **3**
Gregariella simplicifilis **3**
Hiatula ruppelliana **3**
Hyotissa hyotis **8**
Irus irus **4**
Isognomen legumen **7**
Isognomon sp. **8**
Kellia sp. **3**
Laevicardium papyraceaum **4, 7**
Lima sowerbyi **4**
Lioconcha ornata **3, 8**
Lithophaga cumingiana **4**
Lithophaga robusta **3**
Loripes sp. **3**
Loripes fisheriana **7**
Loxoglypta rhomboides **3**
Lucina dentifera **8**
Lutraria philippinarum **4**
Mactra glabrata glabrata **4**
Mactra lilacea **3**
Mactra olorina **7**
Mactrinula sp. **3**
Malleus malleus **8**
Malleus regula **4, 7**
Malleus sp. **8**
Malvifundus normalis **3**
Malvufundus normalis **8**
Malvufundus regula **8**
Marcia ceylonensis **4**
Marcia hiantina **4**
Marcia marmorata **3**
Marcia opima **3**
Marikellia sp. **3**
Meretrix metretrix **7**
Modiolus ligneus **8**
Musculista senhousia **3**
Musculus sp. **8**
Mytilicardita (Beguina) gubernaculum **7**
Nemocardium sp. **8**
Nemocardium aurantiacum **8**
Nucula inconspicua **3**
Nucula sp. **3**
Nuculoma layardii **3**
Ostrea cristagalli **4**
Ostrea cucullata **4**
Ostrea sp. **3**
Paphia gallus **4**
Paphia sulcaris **4**
Paphia textile **3, 4**
Paphia sp. **3**
Parviperna dentifera **7**
Pecten erythraeensis **4**
Periglypta reticulata **4**
Periploma indicum **3**
Phaxas cultellus **4**
Pinctada margarinifera **3**
Pinctada margaritifera **4**
Pinctada radiata **3, 4, 7, 8**
Pinctada sp. **8**
Pinna atropurpurea **7**
Pinna bicolor **3, 8**
Pinna muricata **4**
Pinna sp. **8**
Plicatula imbricata **4**
Plicatula plicata **7**
Protapes cor **3**
Protapes sinuosa **3**
Pteria marmorata **4**
Saccostrea cucullata **3**
Sanguinolaria cumingiana **4**
Scintilla sp. **3**
Semele scabra **4**
Semele sinensis **4**
Solen brevis **4**
Solen dactylus **3**
Soletellina rosea **3**
Spondylus aculeatus **7**
Spondylus exilis **4, 8**
Spondylus gloriandus **7**
Spondylus marisrubri **3**
Spondylus townsendi **7**
Spondylus variegatus **3**
Streptopinna saccata **4**
Sunetta effosa **4, 7, 8**
Syndesmya sp. **3**
Tapes texturata **4**
Tapes bruguierei **3**
Tapes sulcarius **3, 8**
Tellina arsinoensis **3**
Tellina donacina **3**
Tellina foliacea **4**
Tellina inflata **4**
Tellina methoria **3**
Tellina valtonis **3**
Tellina vernalis **3**
Tellina sp. **3, 8**
Theora cadabra **3**
Timoclea sp. **3, 7**
Tivela adamoides **4**
Trachycardium assimile **3**
Trachycardium lacunosum **3, 4, 7, 8**
Trachycardium maculosum **7**
Trachycardium rubicundum **3, 4**
Trapezium sublaevigatum **3, 7**
Tridacna maxima **4**
Turtonia minuta **3**
Turtonia sp. **3**
Venerupis deshaysei **7**
Venerupis rugosa **3**
Yoldia tropica **3**

Class Cephalopoda

Loligo duvauceli **11**
Octopus cyaneus **10, 11**
Sepia pharaonis **9, 10, 11**
Sepia arabica **11**
Sepia latimanus **11**
Sepia murrayi **11**
Sepia prashadi **11**
Sepia savignyi **11**
Sepiella inermis **11**
Sepioteuthis lessoniana **11**

Class Scaphopoda

Cadulus euloides **3**
Dentalium octangulatum **3, 8**
Laevidentalium longitrorsum **8**
Tesseracme quadrapicalis **3**

Class Amphineura

Chiton sp. **8**

PHYLUM ECHINODERMATA

Class Crinoidea

Amphilycus scripta **1**
*Amphiodia (Amphiodia) **obtecta*** **1**
Amphioplus (Amphioplus) seminudus **1**
Amphioplus (Lymanella) hastatus **1**
Amphipholis squamata **1**
Amphiura (Amphiura) crispa **1**
Amphiura (Amphiura) fasciata **1**
Amphiura (Amphiura) sp **1**
Amphiura (Amphiura) sp. *nov.* **1**
Asterina burtoni **1**
Asteropsis carinifera **1**
Astropecten indicus **1**
Astropecten monacanthus **1**
Astropecten polyacanthus phragmorus **1**
Astropecten polyacanthus polyacanthus **1**
Astropecten pugnax **1**
Decametra mollis **1**
Euretaster cribrosus **1**
Leiaster leachi **1**
Linckia multifora **1**
Luidia hardwicki **1**
Luidia maculata **1**
Macrophiothrix elongata **1**
Macrophiothrix sp. aff. Hirsuta cheneyi **1**
Macrophiotrix sp. **1**
Ophiactis savignyi **1**
Ophionereis dubia **1**
Ophiothela danae **1**
Ophiothela venusta **1**
Ophiothrix savignyi **1**
Ophiura kinbergi **1**
Paracrocnida persica **1**
Pentaceraster mammillatus **1**

Class Echinoidea

Brissopsis persica **1**
Clypeaster humilis **1, 2**
Clypeaster reticulatus **1, 2**
Clypeaster savignyi **2**
Clypeaster sp. **2**
Diadema setosum **1, 2**
Dougaloplus echinatus **2**
Dougaloplus personatus **2**
Echinodiscus auritus **1**
Echinodiscus auritus **2**
Echinoidea sp. **2**
Echinoidea unid. **2**
Echinometra mathei **1**
Lovenia elongata **1, 2**
Metalia sternalis **1, 2**
Metalia townsendi **1**
Prionocidaris baculosa **1**
Temnopleurus toreumaticus **1, 2**
Temnotrema siamense **1**
Temnotrema sp. **2**

Class Holothurioidea

Holothuria (Cystipus) rigida **1**
Holothuria (Halodeima) atra **1**
Holothuria (Halodeima) edulis **1**
Holothuria (Mertensiothuria) leucospilota **1**
Holothuria (Thymiosycia) arenicola **1, 2**
Holothuria (Thymiosycia) hilla **1**
Holothuria (Thymiosycia) impatiens **1, 2**
Holothuria sp. **2**
Labidodemas semperianum **1**
Leptosynapta chela **1, 2**
Ohshimella ehrenbergi **1**
Protankyra pseudodigitata **1, 2**
Stichopus variegatus **1**
Thone sp. **1**
Thyone dura **2**

Class Asteroidea

Asterina burtoni **2**
Astropecten hemprichi **2**
Astropecten monacanthus **2**
Astropecten polyacanthus **2**
Astropecten pugnax **2**
Astropecten sp **2**

Class Ophiuridea

Amphiodia microplax **2**
Amphiodia obtecta **2**
Amphiodia sp. **2**
Amphioplus hastatus **2**
Amphioplus personatus **2**
Amphioplus seminudus **2**
Amphipholis squamata **2**
Amphiura crispa **2**
Amphiura fasciata **2**
Amphiura sp. **2**
Amphiura tennis **2**
Ophiactis savignyi **2**
Ophiocentrus asper **2**
Ophiomyxa sp. **2**
Ophioneries dubia **2**
Ophiothrix savignyi **2**
Ophiura kinbergi **2**
Paracrocnida persica **2**

PHYLUM BRYOZOA

Class Gymnolaemata

Aeverrillia setigera **2**
Antropora minor (Antropora marginella) **2**
Crisia elongata **2**
Hippodiplosia otto-mulleriana **2**
Jellyella (Membranipora) tuberculata **2**
Microporella orientalis **2**
Nellia quadrilatera **2**
Parasmittina cf *tropica* **2**
Parasmittina dentigera **2**
Parasmittina egyptica **2**
Parasmittina gnata **2**
Parasmittina parsevali **2**
Parasmittina raigii **2**
Parasmittina signata **2**
Parasmittina unispinosa **2**
Patinella (Lichenopora) radiata **2**
Rhynchozoon larreyi **2**
Schizoporella unicornis **2**
Thalamoporella gothica **2**
Thalamoporella indica **2**
Watersipora subtorquata **2**

Class Stenolaemata

Celleporaria (Holoporella) labelligera **2**
Celleporaria labelligera **2**

PHYLUM CHORDATA

Subphylum Cephalochordata
Branchiostoma lanceolatum **2**
Subphylum Tunicata (Class Ascidiacea)
Aplidium rubripunctum **30**
Botryllus gregalis **30**
Botryllus niger **30**
Didemnum obscurum **30**
Didemnum yolky **30**
Diplosoma listerianum **30**
Ecteinascidia thurstoni **30**
Eusynstyela hartmeyeri **30**
Herdmania momus **30**
Lissoclinum fragile **30**
Phallusia nigra **30**
Polyclinum constellatum **30**
Styela canopus **30**
Symplegma bahraini **30**
Symplegma brakenhielmi **30**

Editors Affiliation

Dr. Khaled A. Al-Abdulkader is a senior marine environmental consultant working for the *Environmental Protection Department of Saudi Aramco. He has a Ph.D. in biological oceanography from Texas A&M University in the United States. Before joining Saudi Aramco, he worked as a marine scientific consultant for the Research Institute of King Fahd University of Petroleum & Minerals in Dhahran, Saudi Arabia*.

Dr. Ronald A. Loughland is a marine scientist working for the Environmental Protection Department of Saudi Aramco. He has a Ph.D. in marine and coastal management of the Arabian Gulf obtained from Southern Cross University in Australia. Before joining Saudi Aramco, Ronald was the Director of the Centre of Environmental Research, for the Emirates Heritage Club in Abu Dhabi, UAE.

Dr. Mohammed A. Qurban *is Director of the Center for Environment & Water in Research Institute of King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia. He has a Ph.D. in oceanography from University of Southampton, U.K. He is also a faculty member at Geosciences Department, College of Petroleum Engineering & Geosciences at the same university.*

Finito di stampare nel mese di Giugno 2019
Papergraf.it – Via della Resistenza, 18
35016 Piazzola sul Brenta (Padova) Italia