

16 Red Sea

Overview

The Red Sea is a semi-enclosed tropical body of water located between the Mediterranean Sea and the Indian Ocean, and is bordered by Egypt, Sudan, Eritrea and Djibouti on the west, and Yemen and Saudi Arabia on the east. Although the Red Sea is known for its natural beauty, with extensive coral reefs, it is also an important shipping route for the oil tankers and other ships traveling through the Suez Canal.

Location

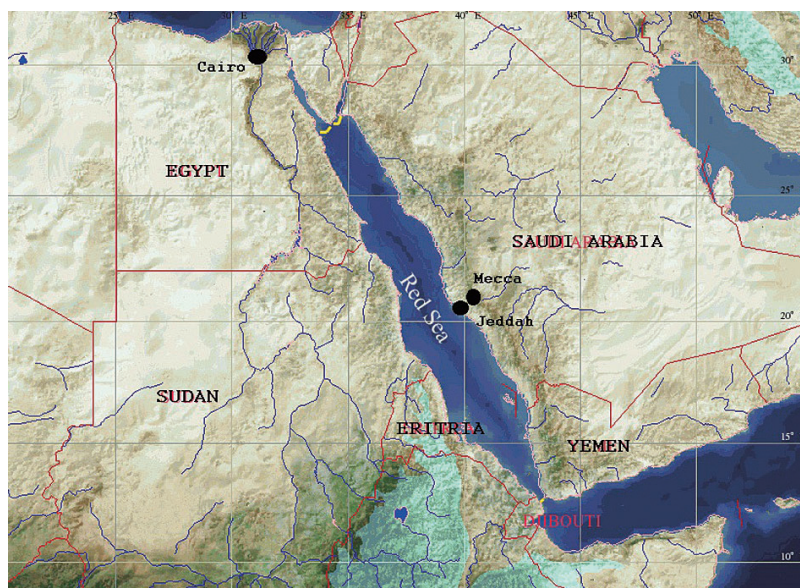
Basic information¹³

Surface area : 438,000 km²

Volume : 215,058 km³

Average depth : 491 m

Maximum depth : 3,040 m



Nature

< Background >

The Red Sea is an elongated and narrow-shaped sea, which extends from north to south over a distance of approximately 2,000 km. The average width is about 280 km, with a maximum breadth of 306 km in the south. The width of the strait of Bal-el-Mandeb is about 26 km and separates the Red Sea from the outer ocean via the Gulf of Aden. The northern tip of the Red Sea separates into two gulfs, the Gulf of Suez, which is connected to the Suez Canal and the Gulf of Aqaba. The adjacent land area of the Red Sea is mostly arid, having desert or semi-desert regions with no major river inflow. Further inland, the desert regions are bordered by extensive mountain ranges.^{1,2,3}

Climate

The Red Sea is located in an arid region with extremely hot weather in the summer. The southern region is considered to be among the hottest regions in the world. The air temperature in the northern region is slightly lower than the southern region. For example, the air temperature at the Suez Canal ranges from 6~39 °C, compared to 13~42 °C along the Jeddah coast.¹

Rainfall in the Red Sea region is extremely sparse and is usually localized in the form of short showers. The annual rainfall is around 110 mm.¹

Topography

Sandwiched between the narrow continental shelves runs a deep trench that stretches from north to south for almost the entire sea area. The deepest region lies between 14°N and 28°N, with a maximum depth of 3,040 m. These deep areas are still geologically active and have numerous volcanic vents, emitting hot, salty and metal-rich sea water.¹

The two gulfs in the northern region are similar in shape but their topography is quite distinct. The Gulf of Suez is shallow and has a relatively flat bottom, with a depth ranging from 55-73 m. On the other hand, the Gulf of Aqaba is comprised of a deep basin and a narrow shelf. The basin is separated into two by a submarine sill, with both basins having a depth of over 1,000 m.¹

Hydrology

Surface water temperature in the Red Sea varies seasonally between about 22 and 32 °C. The surface temperature generally declines towards the Bab-al-Mandeb, due to the influx of cool water from the Gulf of Aden, and also gradually decreases towards the northern region. The deeper waters are stable throughout the region, and below 300 m the water temperature is constantly between 21 and 22 °C.¹

Salinity in the Red Sea is generally high (36-39 ppt) due to high evaporation, low precipitation and the lack of a major river inflow. Salinity is usually lower in the southern region due to the inflowing waters from the Gulf of Aden.

Water renewal in the Red Sea is slow, and exchange with the ocean takes approximately 6 years for the 200 m above the thermocline and 200 years for the entire sea.⁴

< Surrounding environment >

The Red Sea is blessed with natural beauty and astounding biological diversity. Coral reefs, mangrove forests, seagrass

beds, salt marshes and salt-pans are distributed throughout the region. These unique habitats support a diverse range of marine life, including sea turtles, dugongs, dolphins, and many endemic fish species.²

Habitats

Coral reefs are mainly distributed along the northern and central coasts and decrease in abundance towards the southern region as the water becomes more turbid. In the central region, corals are mainly found about 3–10 km offshore along a narrow bank, forming a large barrier reef structure that runs parallel to the coastline. The most extensive areas of coral reefs are found along the Saudi coast, with over 190 recorded coral species.⁴

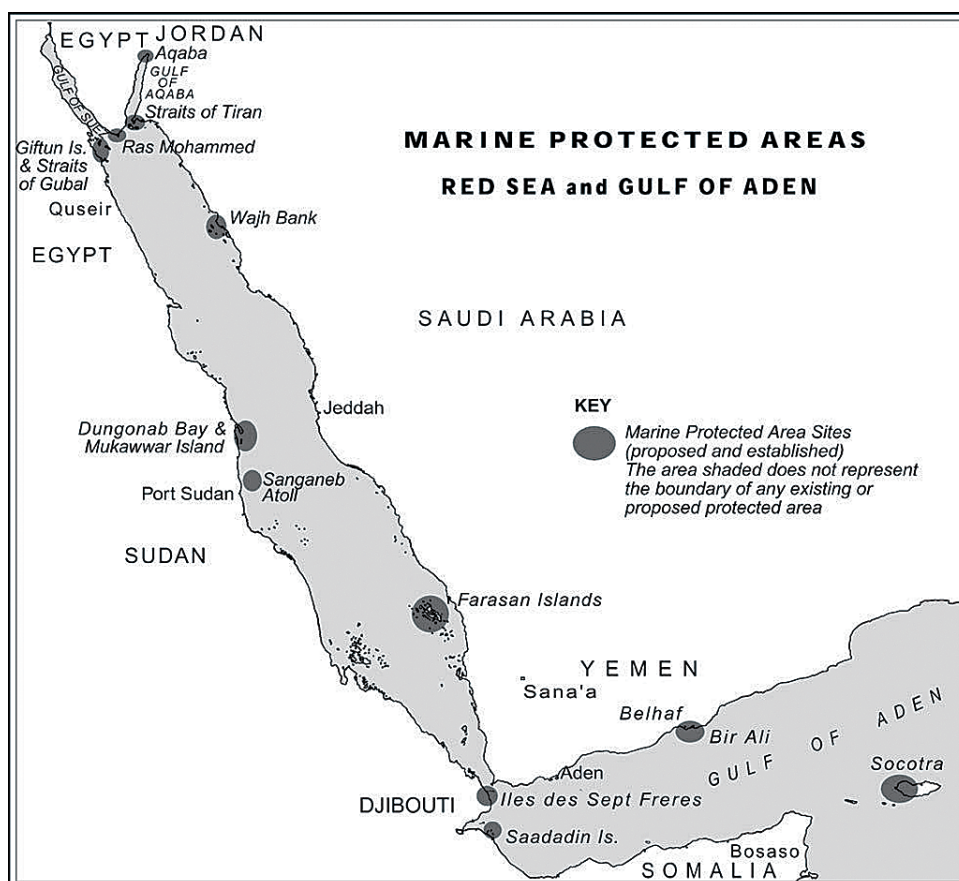
While mangrove forests are scattered along much of the Red Sea coast, the main concentration is in the southern region, due to the soft bottomed substrate. Ten species of seagrass are widespread in the Red Sea, but are most common in the lagoons and embayments of the southern region.⁴



Red Sea Coral Reef⁷

Protected Areas

The Red Sea has 12 marine protected areas, the most well-known being the Ras Mohammed National Park at the southern tip of Egypt's Sinai Peninsula, Hurghada and the adjacent islands in the Egyptian Red Sea coast, Sanganeb atoll in Sudan and the Farasan Islands in Saudi Arabia.^{5,6}



Marine Protected Areas in the Red Sea and Gulf of Aden⁷

History and Culture

< History >

The Red Sea was formed about 25 million years ago when the African and Asian continental plates started to move apart. It continues to widen at a rate of about 1–2 cm per year.⁸

The Red Sea was an important trade route in antiquity. Its importance declined with the discovery of an all-water route around Africa in 1498. The opening of the Suez Canal in 1869 made the Red Sea one of the chief shipping routes connecting Europe with East Asia. The closing of the canal after the 1967 Arab-Israeli War, the building of pipelines to the Mediterranean Sea, and the construction of supertankers too large for the canal diminished the sea's importance as a commercial artery, especially for petroleum. In 1975, however, the canal was reopened and enlarged, and traffic through the sea increased again.⁹

Social Environment

< Population >

The Red Sea region is sparsely populated, and not more than 5 million people are estimated to live along the coast. Jeddah, in Saudi Arabia, supports the largest population with 3.4 million people.^{1,3,10}

< Industry >

The major industries in the Red Sea region include oil exploration, oil production, oil processing, manufacturing industries (fertilizers, chemicals, cement), tourism, fisheries and oil related maritime transport.

Oil Industry

Oil production and transportation play an important role in the Red Sea economy with over 100 million tons of oil transported through the Red Sea annually. Between 20,000 and 35,000 tankers enter the Red Sea annually and proceed northward to the Mediterranean Sea via the Suez Canal. Oil production is mainly concentrated in the Gulf of Suez but is rapidly expanding and moving further into the Red Sea.¹¹

Tourism

Attracted by the rich marine life and favorable climate, tourism has become important for many Red Sea countries, with over 1 million tourists per year expected in the future. Extensive areas of the coastline have been developed to accommodate the increasing flux of tourists, especially in Aqaba, Jordan, the Jeddah coastline of Saudi Arabia and various areas along the Egyptian coastline.⁴

Fisheries

Fisheries in the Red Sea are of considerable socio-economic importance to the Red Sea countries in terms of national food security and income generation for rural communities. Fishing is mainly conducted by artisanal subsistence fishermen, local commercial fisheries and foreign industrial fisheries.

Fishery production has steadily increased in the Red Sea region with over 17,000 tons of invertebrate species and 190,000 tons of finfish produced in 1998, compared to around 7,900 tons and 136,000 tons respectively, in 1988. Over 74% of the annual landing is recorded in the southern region between Al Lith of Saudi Arabia and the Yemen border.^{1,2}

Fish collecting for the aquarium trade is significant in Saudi Arabia and Yemen, with Saudi Arabia having at least seven aquarium fish exporters in operation. Shrimp farming operates in Egypt and Saudi Arabia and pearl-oyster farming occurs in Sudan.²

Environmental Problems

< Water quality >

Although the Red Sea region has remained relatively free of pollution, the environment is currently under increasing threat from a wide range of human activities. Also, in contrast to other regional seas around the world where most pollution comes from land-based activities, marine-based activities such as shipping and oil exploitation are becoming a significant source of marine pollution in the Red Sea.¹³

Land based pollution

Industrial effluents, in the form of thermal pollution from power and desalination plants, hypersaline brine water from desalination plants, particulate matter and mineral dust from fertilizer and cement factories, and chemicals and organic wastes from food processing factories have contributed to the degradation of water quality in the Red Sea.¹³ Major areas of concern are in the coastal industrial areas of the Gulf of Aqaba in Jordan, tourism areas on the Egyptian coast, industrial areas in the Gulf of Suez and in the industrial areas of Yanbu and Jeddah in Saudi Arabia.¹³ Poorly treated or untreated sewage effluents from treatment plants, cargo vessels, tour boats and ferries have damaged marine life in certain areas inside the Gulf of Aqaba and the Egyptian Red Sea coasts. Solid wastes such as plastics and other refuse materials are also commonly found in the beaches, reefs and seagrass areas of the Gulf of Aqaba.⁴

Oil pollution

Although no major oil spills have been recorded in the Red Sea, minor oil leaks from oil tankers are frequent. The risk of an oil spill is high since an estimated 100 million tons of oil and oil products are transported annually through the region. Furthermore, the risk of vessel collision is enhanced by insufficient navigational aid and unregulated maritime traffic.¹³

< Other Environmental Problems >

Destruction of habitat

Natural habitats, such as coral reefs, mangroves and seagrass beds, have been physically altered and destroyed through

dredging and landfilling operations associated with urban expansion, industrial development and tourism, especially in Jordan, Saudi Arabia, Egypt, Sudan and Yemen. Sediments produced from these development activities have spread down to other regions and have affected distant natural habitats. Dredge and fill activities around Aqaba have altered coastline morphology and created a plethora of erosion and sedimentation problems in the entire area.^{7,13}

On a minor scale, uncontrolled tourist activities have inflicted damage on coral reefs through boat anchors and insensitive divers.

Over exploitation of marine resources

Some living marine resources in the Red Sea are being over-exploited. For example, the catch of lobsters and strombids are rapidly declining and cuttlefish stocks in major fishing grounds have completely collapsed. Sharks are illegally exploited for the East Asian shark-fin market, especially in Sudan, Djibouti and Yemen. Internationally endangered sea turtles are caught for their meat, oil and shells, and their eggs are taken from their nesting sites, leading to a decline in their nesting populations.²

< Environmental Protection Measures >

Jeddah Convention

In the 1970s, the Arab League Educational, Cultural and Scientific Organization (ALECSO) brought together the countries bordering the Red Sea and Gulf of Aden to discuss shared marine environmental issues. The outcome of these meetings culminated in the signing of an international agreement in 1982, the Jeddah Convention, and formally entitled the "Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment". This agreement focuses on the prevention, reduction and fight against pollution, and is significant because it provides the first regional legal framework for cooperation in marine issues between the member countries. Subsequently, an official intergovernmental organization known as the "Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA)" was established in 1995 as an implementation body of the Jeddah Convention and is dedicated to the conservation of the coastal and marine environment. Since then PERSGA has prepared a Strategic Action Plan (SAP) for the Red Sea and Gulf of Aden, which was implemented as a major new environmental initiative in 1998 through cooperation from the Global Environment Facility and other international organizations.⁸

The SAP mainly focuses on the following key issues, and progress will be constantly evaluated and monitored.¹³

- Reduction of navigation risks and maritime pollution
- Sustainable management of living marine resources
- Conservation of habitats and biodiversity
- Establishment of a regional network of marine protected areas
- Support for integrated coastal zone management
- Enhancing public awareness and participation

Two additional protocols were adopted in 2005 concerning protection from land-based activities and conservation of marine biodiversity- establishment of a regional network of protected areas. More recently another protocol concerning facilitation of movement of personnel and equipment during emergency was adopted in 2009.⁴

Operational Framework of Action for 2006- 2010

This framework is the follow-up phase for the SAP. The priority of it is establishment of a sound foundation of structure and systems; to developing regional capacity building; to promoting national and local on-the-ground initiative and; and to transferring lessons learned across the Region. The framework includes partnership activities with donors and international organizations.¹²

Monitoring program

PERSGA - the international organization established for environmental protection of the Red Sea and Aden Sea - has been continuing efforts to enable the comparison of monitoring results across the border (from 1998 to 2005).² Also, as part of the SAP, biological parameters have been monitored since 1998.

Related organizations and NGOs

- Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) - <http://www.persga.org/>
- Friends of the Earth Middle East (FoEME) <http://www.foeme.org/www/?module=home>

References

1. UNEP. Assessment of Land-based Sources and Activities Affecting the Marine Environment in the Red Sea and Gulf of Aden. UNEP Regional Seas Reports and Studies No.166.1997.
<http://www.oceandocs.org/bitstream/handle/1834/285/166-eng.pdf?sequence=1&isAllowed=y>, (accessed March 31, 2015)
2. PERSGA. Status of the Living Marine Resources in the Red Sea and Gulf of Aden Region and their Management. 2000.
<http://www.persga.org/Documents/Vol3bStatusofLMRinRSGA.pdf>, (accessed March 31, 2015)
3. Heileman, S., and Mistafa, N. III-6 Red Sea: LME #33,
http://lme.edc.uri.edu/index.php?option=com_content&view=article&id=79:lme33&catid=41:briefs&Itemid=72, (accessed March 31, 2015)
4. Barale, V., 2007. Marine and Coastal Features of the Red Sea.
http://publications.jrc.ec.europa.eu/repository/bitstream/JRC41911/reqno_jrc41911_cdocuments%20and%20settingsbaralvimy%20documents1%5B1%5D%5B1%5D.activitiesp.red.seaur_23091_en_2007.pdf.pdf, (accessed March 31, 2015)
5. PERSGA. Marine Environmental Protection in the Red Sea and Gulf of Aden - a New Initiative (brochure). 2001.
6. PERSGA. The Regional Organization for the Conservation of the Environment in the Red Sea and Gulf of Aden.
<http://www.persga.org/>, (accessed March 31, 2015)
7. Gladstone, W., Krupp, F., and Younis, M., 2003. Development and management of a network of marine protected areas in the Red Sea and Gulf of Aden region. *Ocean & Coastal Management*, 46 (2003): pp. 741-761.
8. Go to Egypt <http://goto-egypt.com/egypt/red-sea/?cat=25>, (accessed March 31, 2015)
9. Infoplease. <http://www.infoplease.com/encyclopedia/world/red-sea.html>, (accessed March 31, 2015)
10. Jeddah Municipality, 2015. About Jeddah city.
<https://www.jeddah.gov.sa/English/JeddahCity/About.php>, (accessed March 31, 2015)
11. UNEP, 1998. Red Sea and Gulf of Aden, Strategic Action Programme.
<http://www.unep.ch/regionalseas/main/persga/redsap.html>, (accessed March 31, 2015)
12. Al-Agwan, Z., 2009. PERSGA AND MAIN ACHIEVEMENTS SINCE 2005. Summary Voluntary Report.
<https://www.cbd.int/marine/voluntary-reports/vr-mc-persga-en.pdf>, (accessed March 31, 2015)
13. Hutchinson, S.; Hawkins, L.E., 2007. *Oceans: A Visual Guide*. Shinjusha Co., Ltd.: China, 2007. Japanese translation