

# 14 Gulf of California

## Overview

Located between the lower California Peninsula (Baja California) and the state of Sonora on the mainland of Mexico, the Gulf of California is also known as the Sea of Cortes and the Vermilion Sea.

Sheltered by the long, narrow Baja peninsula and nourished by great masses of plankton, the Gulf of California is one of the most productive and diverse marine nurseries on Earth.<sup>1</sup>

## Location

### Basic information<sup>7</sup>

Surface area : 153,000 km<sup>2</sup>

Volume : 183,600 km<sup>3</sup>

Average Depth : 1,200 m

Maximum Depth : 3,050 m

## Nature

### < Background >

The Gulf of California is narrow, marginal sea with deep, cold waters that provide abundant nutrients transported towards the surface by upwelling. Because the peninsula is formed by an almost uninterrupted chain of mountains, the climate of the gulf is more continental than oceanic. The gulf coastline is irregular and forms numerous small bays. The head of the gulf is dominated by the Colorado River delta, which extends offshore for as much as 32 km with depths as shallow as 18 m.<sup>1</sup>



### Climate

The gulf region's climate is more continental due to the chain of high mountains along the Baja California peninsula. Temperatures contain a wide range annually and diurnally, with desert-like conditions (annual rainfall less than 100 mm) at the northern part of the gulf and most of the peninsula. Summer brings monsoon rainfall patterns for almost the entire region (annual rainfall 1,000 mm in the southeast), and hurricanes affect the lower Gulf.<sup>2</sup> Temperatures are 13-21 °C in the winter, and 28-31 °C in the summer, with the surface water average 30 °C in summer and 16 °C in winter.<sup>1</sup> Generally, the region is a tropical/subtropical climate in the summer, and exhibits temperate characteristics during winter especially in the northern portion.

### Topography

The Gulf contains deep basins (greater than 3,000 m) at the entrance, steep slopes, a very wide continental shelf in the northern portion, medium width shelf with abundant coastal lagoons in the eastern section, and an island studded narrow shelf in the western Gulf. There is tectonic activity and hydrothermal vents in the Guaymas Basin.<sup>2</sup>

### Hydrology

Input of freshwater and saltwater into the Gulf of California is relatively little, since most river water is being diverted for human use and the Gulf as an evaporative basin exchanges little water with the Pacific Ocean. Three mechanisms control the movement of water in the Gulf: wind-induced upwelling, tidal mixing, and thermohaline circulation. Upwelling generally occurs off the eastern coast with northwesterly winds and off the Baja California coast with southeasterly winds. Tidal mixing occurs the most in the upper Gulf and around the Midriff Islands, and has the function of carrying colder and nutrient-rich water to the surface. Due to the thermohaline balances, inflowing deep water from the Pacific has a higher inorganic nutrient concentration than outflowing surface water, and generally heat and salt outflow from the Gulf into the open ocean.<sup>2</sup>

### < Surrounding environment >

#### Habitat

Many coastal wetland systems function as "ecological oases" with high productivity contrasted to the surrounding desert ecosystems. The Colorado River delta is historically the most important in the area.<sup>1</sup>

### Biota

The Gulf of California is often referred to as "the world's largest fish trap". Its fertile waters are home of over 800 species of fish and 2,000 species of invertebrates. The area has been influenced by culture and commerce for over four centuries. The islands and waters of the gulf are a heaven to many species of plants and animals found nowhere else on Earth.

## History and Culture

---

### < History >

The gulf and its islands are a result of the crustal movement which began to detach the peninsula from the continent 1.7 to 2.5 billion years ago. As a sea it is only about 450 million years old.<sup>3</sup>

The Gulf of California is very young from the viewpoint of Geological age, and it was formed by separation by the tectonic movements of North America and the Pacific Ocean plate.

### <Culture>

The Baja California peninsula is important culturally and historically. Many archaeological remains have been found, such as mural style cave paintings in the central part of the peninsula and remains of ancient hunter-gatherer communities. A fusion of the cultures of the Jesuits and their missions with the natives is characteristic of this region, and can still be found in local communities. Indigenous groups that inhabit the mainland side of the gulf include the Seri, Yaqui and Cucapa, who have lifestyles closely linked to the marine and terrestrial resources.<sup>4</sup>

## Social Environment

---

### <Population>

About 8.6 million people inhabit the region surrounding the Gulf of California, with the population expected to grow rapidly, especially in the coastal municipalities. If the Colorado River Basin is included, the total population is about 62.8 million, with over two-thirds inhabiting urban areas for both Mexico and the US.<sup>4,5</sup>

### <Landuse>

Development of land for industry and tourist facilities has led to the destruction and loss of habitat in the marine ecosystem of the gulf. Examples of areas affected by tourism development is Quintana Roo, Mazatlan, and Cabo San Lucas. Conversion of land in the Colorado River basin such as the disappearance of wetland vegetation has also led to decrease in freshwater flow and habitat destruction for species. Mangrove forests are also decreasing, being cleared for shrimp farms or tourism construction.<sup>4</sup>

### < Industry >

#### Fisheries

The main economic activity in the Gulf of California is fishing, both commercial and traditional, that takes place in coastal areas, as well as in the deepest parts of the Gulf. This activity is of importance of both the national economy, as well as for local people. Around 70 commercial species are exploited, mainly shrimp, gulf grouper, anchovies, sardines, dorado, squid and different species of marlin.<sup>2</sup>

#### Tourism

Tourism is an important sector for the region's economy, with many attractive natural landscapes such as the Sea of Cortez. It is estimated that 4.8 million tourists visit the area every year.<sup>4</sup>

## Environmental Problems

---

### < Current status >

Human activities are altering the Gulf's ecosystems. The decrease of Colorado River freshwater input has drastically changed the ecological conditions of what used to be an estuarine system, important for fish reproduction. It is now an area of high salinity.

Pollution problems are mostly concentrated in the mid to upper Gulf, with significant pesticide inputs from the agricultural areas in the state of Sonora. However, the main issue affecting ecosystem health has been the increase in fishing vessels and the improvement in fishing equipment, from small pangas, handlines and spearguns to more efficient gill nets, trawls and longlines. Species in danger of economic extinction in the Gulf include the cabrilla, black and white seabass, Gulf grouper, yellowtail, dog snapper and sierra. Sea turtles, hammerhead sharks and giant manta rays are virtually gone.<sup>6</sup>

### < Environmental Protection Measures >

Frustrated by decades of overfishing and mismanagement, Mexican people are making a stand for greater local control over the Gulf's marine resources, and more law enforcement and integrity in the government. In 1998, Mexican President Ernesto

Zedillo asked the governors of the four states bordering the Gulf to prepare a plan for the regional, long-term use of its resources. The move indicated a shift from economic exploitation to environmental protection and a loosening of the federal government's historic control over the region. Initiatives by local residents aim to safeguard the coast from poaching, promote marine conservation and work for local control over fish and shellfish. Currently, there are 2 marine parks - the Cabo Pulmo National Marine Park and the Loreto National Marine Park.

The United States is providing financial assistance for the environmental protection of the Gulf. Mexican NGOs, such as The Sea of Cortez International Preservation Foundation, seek to motivate change in policies for the purpose of preserving the biodiversity and ecological balance of the Gulf. Effective management needs good data, and current information on catch and effort by area and gear type is very limited. A program for collecting and analyzing such data from both the recreational and commercial sectors is required.

Furthermore, to sustain the health of the ecosystem, there is a need to develop public educational materials, an ecotourism-based economy, to seek stronger legislation and regulations prohibiting the use of certain types of fishing equipment and to form policy and management strategies for utilizing the Gulf.<sup>3</sup>

## References

---

1. The University of Texas at Dallas. "The Gulf of California". [http://www.utdallas.edu/~rnix/MAT-SE\\_Units/gulf\\_cal.pdf](http://www.utdallas.edu/~rnix/MAT-SE_Units/gulf_cal.pdf), (accessed March 31st 2015)
2. Commission for Environmental Cooperation, 2011. 18: Gulf of California. North American Marine Protected Areas Network. <http://www2.cec.org/nampan/ecoregion/gulf-california> (accessed March 31st, 2015)
3. UNESCO. "Latin America/Caribbean Island & Protected Areas of The Gulf of California Mexico." [http://whc.unesco.org/archive/advisory\\_body\\_evaluation/1182ter.pdf](http://whc.unesco.org/archive/advisory_body_evaluation/1182ter.pdf), (accessed March 31st, 2015)
4. Oropeza, O-A., and C. Lopez-Sagastegui, 2006. A Marine Reserve Network for the Gulf of California: the next step in conserving 'the world's aquarium'. Greenpeace Mexico. <http://www.greenpeace.org/usa/Global/usa/report/2007/7/a-marine-reserve-network-for-t.pdf> (accessed March 31st, 2015)
5. UNEP, 2004. Arias, E., Albar, M., Becerra, M., Boone, A., Chia, D., Gao, J., Muñoz, C., Parra, I., Reza, M., Sainz, J. and A. Vargas. Gulf of California/Colorado River Basin, GIWA Regional assessment 27. University of Kalmar, Kalmar, Sweden. [http://www.unep.org/dewa/giwa/areas/reports/r27/giwa\\_regional\\_assessment\\_27.pdf](http://www.unep.org/dewa/giwa/areas/reports/r27/giwa_regional_assessment_27.pdf) (accessed March 31st, 2015)
6. The Encyclopedia of Earth. "Gulf of California Large Marine Ecosystem". <http://www.eoearth.org/view/article/153191/>, (accessed March 31st, 2015)
7. Hutchinson, S.; Hawkins, L.E., 2007. Oceans: A Visual Guide. Shinjusha Co., Ltd.: China, 2007. Japanese translation