

## World Heritage Sites

Protected  
Areas and  
World  
Heritage



## ISLANDS & PROTECTED AREAS OF THE GULF OF CALIFORNIA MEXICO

*A dramatically beautiful area of 244 desert islands, coasts and fertile seas known as the Sea of Cortés described by Cousteau as ‘the world’s aquarium’. One of the most ecologically intact ecosystems in the world with an unrivalled variety of marine and coastal processes which are extremely valuable to science, and rich fisheries. It harbours 34% of the world’s marine mammals and a third of all cetaceans, 891 species of fish, a great diversity of macro-invertebrates, endemic reptiles, cacti and Sonoran desert landscapes.*

### COUNTRY

Mexico

### NAME

Islands and Protected Areas of the Gulf of California

### NATURAL WORLD HERITAGE SERIAL SITE

2005: Inscribed on the World Heritage list under Natural Criteria vii, ix and x;

2007: Extended to include Islas Marias National Park and the Archipelago de San Lorenzo National Park under Natural Criteria vii, ix and x.

### STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The UNESCO World Heritage Committee issued the following Statement of Outstanding Universal Value at the time of inscription:

#### Brief Synthesis

The site comprises 244 islands, islets and coastal areas that are located in the Gulf of California in north-eastern Mexico. The Sea of Cortez and its islands have been called a natural laboratory for the investigation of speciation. Moreover, almost all major oceanographic processes occurring in the planet’s oceans are present in the property, giving it extraordinary importance for study. The site is one of striking natural beauty in a dramatic setting formed by rugged islands with high cliffs and sandy beaches, which contrast with the brilliant reflection from the desert and the surrounding turquoise waters. It is home to 695 vascular plant species, more than in any marine and insular property on the World Heritage List. Equally exceptional is the number of fish species: 891, 90 of them endemic. The site, moreover, contains 39% of the world’s total number of species of marine mammals and a third of the world’s marine cetacean species.

**Criterion (vii):** The serial property is of striking natural beauty and provides a dramatic setting due to the rugged forms of the islands, with high cliffs and sandy beaches contrasting with the brilliant reflection from the desert and the surrounding turquoise waters. The diversity of forms and colours is complemented by a wealth of birds and marine life. The diversity and abundance of marine life associated to spectacular submarine forms and high water transparency makes the property a diver’s paradise.

**Criterion (ix):** The property ranks higher than other marine and insular World Heritage properties as it represents a unique example in which, in a very short distance, there are simultaneously “bridge islands” (populated by land in ocean level decline during glaciations) and oceanic islands (populated by sea and air). Moreover, almost all major oceanographic processes occurring in the planet’s oceans are present in the property, giving it extraordinary

importance for the study of marine and coastal processes. These processes are indeed supporting the high marine productivity and biodiversity richness that characterize the Gulf of California.

**Criterion (x):** The diversity of terrestrial and marine life is extraordinary and constitutes a unique ecoregion of high priority for biodiversity conservation. The number of species of vascular plants (695) present in this serial property is higher than that reported in other marine and insular properties included in the WH List. The number of species of fish (891) is also highest when compared to a number of marine and insular properties. In addition the marine endemism is important, with 90 endemic fishes. The serial property contains 39% of the world's total number of marine mammal's species and a third of the world's total number of marine cetacean's species. In addition the serial property includes a good sample of the Sonora desert ecosystems, considered one of the richest deserts in the world from the desert biodiversity point of view.

## INTERNATIONAL DESIGNATIONS

1993: *Alto Golfo de California y Delta del Río Colorado* designated a UNESCO MAB Biosphere Reserve; extended 1995 (960,000 ha);

1995: *Las Islas del Golfo de California* designated a UNESCO MAB Biosphere Reserve (360,000 ha);

1993: *El Vizcaíno* designated a UNESCO MAB Biosphere Reserve (2,546,790 ha);

1996-2008: 21 sites have been designated Ramsar Wetlands of International Importance in or adjoining the World Heritage sites or the Gulf. Their total area is 1,558.580 ha:

1996: *Humedales del Delta del Río Colorado* (250,000 ha)

2003: *Parque Nacional Isla Isabel* (94 ha);

2004: *Isla San Pedro Mártir* (30,165 ha);

2004: *Parque Nacional Bahía de Loreto* (206,581 ha);

2004: *Playa Tortuguera El Verde Camacho* (6,454 ha);

2005: *Corredor Costero La Asamblea - San Francisquito* (44,304 ha);

2006: *Estero de Punta Banda* (2,393 ha);

2007: *Isla Rasa* (66 ha);

2008: *Laguna Huizache-Caimanero* (48,283 ha);

2008: *Balandra* (449 ha);

2008: *Complejo Lagunar Bahía Guásimas - Estero Lobos* (135,198 ha);

2008: *Ensenada de Pabellones* (40,639 ha);

2008: *Humedal La Sierra de Guadalupe* (348,087 ha)

2008: *Humedales El Mogote - Ensenada de La Paz* (9,184 ha);

2008: *Oasis Sierra de La Giganta* (41,181 ha);

2008: *Parque Nacional Cabo Pulmo* (7,100 ha);

2008: *Sistema de Humedales Remanentes del Delta del Río Colorado* (127,614 ha);

2008: *Sistema Lagunar Agiabampo - Bacrehuis - Río Fuerte Antiguo* (90,804 ha);

2008: *Sistema Lagunar Ceuta* (1,497 ha);

2008: *Sistema Lagunar San Ignacio-Navachiste-Macapule* (79,873 ha);

2008: *Sistema Ripario de la Cuenca y Estero de San José del Cabo* (124,219 ha).

## IUCN MANAGEMENT CATEGORIES

Islands of the Gulf of California

Flora & Fauna Protected Area:

Upper Gulf of California and Río Colorado

VI Managed Resource Protected Area

Delta Biosphere Reserve:	VI Managed Resource Protected Area
Archipelago de San Lorenzo National Park:	II National Park
San Pedro Mártir I. National Biosphere Reserve:	VI Managed Resource Protected Area
El Vizcaíno Biosphere Reserve:	VI Managed Resource Protected Area
Bahía de Loreto National Park:	II National Park
Cabo Pulmo National Park:	II National Park
Cabo San Lucas Flora & Fauna Protected Area:	VI Managed Resource Protected Area
Islas Marías National Biosphere Reserve:	VI Managed Resource Protected Area
Islas Marías National Park:	II National Park
Isla Isabel National Park:	II National Park

## BIOGEOGRAPHICAL PROVINCE

Sonoran (1.8.7) / Sinaloa (8.13.4)

## GEOGRAPHICAL LOCATION

The nominated islands and protected areas are located in the Gulf of California in northwestern Mexico over an area extending from the Colorado River delta in the north to the Islas Marías 1,400 km to the south. It comprises 244 scattered islands in eight groups. These are from north to south: the delta, the Colorado River delta, the Great Islands, the Archipelago de San Lorenzo and San Pedro Mártir I. a third of the way down the Gulf, the Vizcaíno coast in Baja half way down, Bahía de Loreto two-thirds of the way down and Cabo Pulmo and Cabo San Lucas near and at the end of the peninsula. The Islas Marías and Isla Isabel lie 360 and 420 km respectively southeast of Cabo San Lucas. The extreme coordinates of the area are 31° 53' 06" to 20° 58' 01" N by 105° 52' 44" to 114° 57' 11" W.

Protected Area	Location	Extreme Coordinates
Upper Gulf of California & Colorado River Delta <i>Biosphere Reserve (marine)</i>	Baja California / Mexicali / Sonora / Puerto Penasco / San Luis Rio Colorado	31°53'06" - 31°02'40" N 114°52'37" - 106°02'30" W
Islands in the Gulf of California <i>Flora &amp; Fauna Protected Area</i>	Baja Calif./ Baja Calif.Sur / Sonora / Sinaloa	31°45'00" - 22°50'00" N 114°52'37" - 106°02'30" W
Archipelago de San Lorenzo <i>National Park</i>	Baja California	± 28°32' - ± 28°56' N ±112°38' - ±113°04' W
Isla San Pedro Mártir * <i>National Biosphere Reserve</i>	Sonora	28°28'00" - 28°18'00" N 112°13'30" - 112°23'01" W
El Vizcaíno <i>Biosphere Reserve (coast+sea)</i>	Baja California Sur	28°00'02" - 27°22'44" N 112°46'18" - 112°15'00" W
Bahía de Loreto * <i>National Park</i>	Baja Calif.Sur / Los Cabos	26°08'00" - 25°35'18" N 111°21'07" - 110°45'00" W
Cabo Pulmo <i>National Marine Park</i>	Baja Calif.Sur / Los Cabos	23°30'00" - 23°22'30" N 109°22'59" - 109°27'58" W
Cabo San Lucas* <i>Flora &amp; Fauna Protected Area</i>	Baja Calif.Sur / Los Cabos	22°54'00" - 22°50'49" N 109°49'59" - 109°54'00" W
Islas Marías * <i>National Park and Biosphere Reserve</i>	Nayarit	22°04'01" - 20°58'01" N 105°54'00" - 107°03'00" W
Isla Isabel *	Nayarit	21°52'01" - 21°50'35" N

Note: States: Baja Calif. - Baja California, Baja Calif.Sur - Baja California South, Nayarit, Sinaloa, Sonora  
Municipalities: Los Cabos, Mexicali, Puerto Peñasco, San Luis Río Colorado.

### DATES AND HISTORY OF ESTABLISHMENT

- 1950s: The delta was gazetted as a Refuge zone; 1974: declared a Reserve to protect the fisheries;
- 1963: Tiburon I. gazetted a National Natural Reserve Zone and Wildlife Refuge;
- 1964: Rasa I. (in the Great Islands) gazetted a Natural Reserve Zone & Bird Refuge;
- 1973: Cabo San Lucas marine zone declared a Submarine Flora and Fauna Refuge;
- 1978: The Gulf islands decreed the Islands of the Gulf of California Reserve Zone, Migratory Bird and Wildlife Refuge; included all the islands plus I. San Pedro Mártir with its marine area;
- 1980: Isla Isabel decreed a National Park for its bird life and scenery;
- 1988: El Vizcaíno declared a National Biosphere Reserve; 1993: designated a MAB Biosphere Reserve;
- 1993: The Upper Gulf of California & Colorado River Delta designated a MAB Biosphere Reserve;
- 1995: Cabo Pulmo declared a National Marine Park; 2000: decreed a National Park; the Gulf islands designated a UNESCO Man and Biosphere Reserve;
- 1996: Bahía de Loreto with five islands declared a National Marine Park; 2000: decreed a National Park; Colorado Delta River Marshes designated a Wetland of International Importance (Ramsar Site);
- 2000: The Gulf islands reclassified as the Gulf of California Flora and Fauna Protected Area; Cabo San Luis reclassified a Flora and Fauna Protected Area; the islands of the Bahía de San Lorenzo Archipelago designated a National Biosphere Reserve;
- 2003: Isla San Pedro Mártir and Islas Marías declared National Biosphere Reserves;
- 2003/4: Isla Isabel, Bahía de Loreto and I. San Pedro Mártir designated Wetlands of International Importance (Ramsar Sites);
- 2005: San Lorenzo Archipelago declared a National Park;
- 2007: World Heritage site extended by Islas Marias and San Lorenzo Archipelago National Parks.

### LAND TENURE

Federal government, including the seas, It is administered by the *Comisión Nacional de Áreas Naturales Protegidas* (CONANP) of the Ministry of the Environment & Natural Resources. Isla Isabel is administered by the Ministry of the Interior. The islands of Carmen, Cerralvo, San José and six smaller islands are privately owned, Tiburón is communally owned.

### AREAS

Protected Area	Land Area (ha)	Marine Area (ha)	Core Area (ha)	Buffer Area (ha)	Total Area (ha)
Upper Gulf of California & Colorado River Delta <i>Biosphere Reserve (marine)</i>	86,638	454,591	86,638	454,591	541,229
Islands in the Gulf of California <i>Flora &amp; Fauna Protected Area</i>	358,000		358,000		358,000
Archipelago de San Lorenzo <i>National Park</i>	8,806*	49,637*	8,806*	49,637*	58,443*

Isla San Pedro Mártir <i>Biosphere Reserve</i>	1,111	29,054	1,111	29,054	30,165
El Vizcaíno <i>Biosphere Reserve (marine &amp; coast in Gulf of California)</i>		49,451	49,451		49,451
Bahía de Loreto <i>National Park</i>	22,690	183,891	206,581		206,581
Cabo Pulmo <i>National Marine Park</i>		7,111	7,111		7,111
Cabo San Lucas <i>Flora &amp; Fauna Protected Area</i>	211	3,785	3,996		3,996
Islas Mariás <i>Biosphere Reserve + buffer</i>	14,845	626,440	641,285		641,285
Isla Isabel <i>National Park</i>	79*	1,304*	79*	1,304*	1,383*
Totals	492,382	1,405,264	1,363,058	534,588	<b>1,897,646*</b>

\* figures added from UNESCO 2007

The above is from the summary table in the Nomination document completed from figures for the areas of islands given in the text. The terrestrial area of the nominated sites is 26% of the total area and the marine area is 74%. The core area is 28.2% and the buffer zones 71.8% of the total. Areas given in the World Database of Protected Areas differ in some cases, including the sum total.

## ALTITUDE

Below sea level to 990m (Isla Ángel de la Guarda).

## PHYSICAL FEATURES

The Gulf of California is more than 1,050 kilometers from the mouth of the river Colorado to a line between Cabo San Lucas and Eldorado on the coast of Sinaloa. It averages about 175 km wide, widening towards the south. The Gulf contains some 900 desert islands, 244 of which are within the nominated area. It can be divided into five oceanographic zones: The Upper Gulf, the Great Islands with the San Lorenzo Archipelago and Isla San Pedro Mártir, the Central Gulf with el Vizcaíno and Bahía de Loreto, and the South, which includes Capes Pulmo and San Lucas. The wide mouth is open to the ocean and the Islas Mariás and Isla Isabel lie 300 km to the south of Cabo San Lucas, off the mainland. The approximate area of land is 24% and of sea 76% of the total nominated area.

As a sea the Gulf is only about 4.5 million years old. It results from a crustal movement which began to detach the peninsula from the continent between 17 to 25 million years ago. The separation is continuing, and faulting in the northernmost part of the Gulf related to tectonic movements has thrown up many plant, coral and animal fossils dating from a warmer past. It is notable for containing both bridge islands populated across past land bridges, and oceanic islands populated by sea and air. During its formation, temperate eastern Pacific waters were trapped in the upper Gulf while the lower Gulf remained tropical. This has created a unique marine ecosystem, the Sea of Cortés ecosystem which contains a variety of pelagic (deep) and benthic (shallow) environments and extends from wetlands to coral reefs. Within the Gulf many oceanographic processes occur: different systems of upwelling currents, wind-driven currents, high tidal mixing and hydrothermic vents. These contribute to the Gulf's immense marine productivity.

There are also four main terrestrial sub-zones within the nominated area: the Colorado Desert with the very recent alluvium of the delta and the Laguna Salado; Sonoran Desert, one of the biologically richest deserts of the world, with alluvial deposits of many types of rock; the Pacific Coastal Plain of Sinaloa with alluvial deposits and Mesozoic crystalline rocks; and the Baja California peninsula, also desert, largely formed of granites, Tertiary volcanic and sedimentary rocks. The serial nomination includes

sites representative of all these zones. Most of the islands are barren, volcanic and mountainous with mainly rocky shores, and, except for a few mined for guano, undisturbed. Many have yet to be accurately described since their isolation, lack of water and desert conditions make research difficult. Both the islands and the land on either side are predominantly Sonoran desert, of which Tiburón Island, the largest in the Gulf, is a well conserved example. Despite the desert climate, under the clear light the arid mountainous coasts and surrounding seas are scenically very dramatic and beautiful.

The **Upper Gulf of California & Rio Colorado River Delta** Reserve is one third terrestrial and two thirds marine. The waters of the upper Gulf are shallow (50-200m) and are becoming more saline (to 35.5 ppm) as a result of the upstream diversions from the Colorado River which started in 1909. But they have a variety of intertidal wetlands and sandy and rocky coasts of coquina (cemented molluscs). Its conditions are rather extreme: a wide tidal range (two high and two low tides every 24 hours), relatively shallow depth, fine sediments with high turbidity, and large variations in seasonal temperatures and salinity. Its currents alternate between clockwise in winter to counter-clockwise in summer. There is also mixing by tidal and winter convection currents when cold saline surface water sinks, setting up a thermohaline circulation which promotes natural fertilisation. The sea floor is mud and silts near the delta, sandy and rocky further south.

The **Great Islands** region of the Gulf Islands Reserve extends from I. Ángel de la Guarda to I. San Pedro Mártir and includes Tiburón, the largest island in the Gulf, also the **San Lorenzo Archipelago** (comprising I. San Lorenzo, I. Rasa and I. Partida) which is largely a marine reserve. The sea floor of the region is composed of five basins which limit circulation to the north and generate surges, strong tidal currents and upwelling currents which make its waters very fertile and productive. **Isla San Pedro Mártir** in the north-central Gulf, is a small isolated island of 1,110 ha, 40 km south of the Great Islands. This is one of the best preserved islands in the Gulf. Its steep cliffs, white with guano, rise 100m; its top is a plateau reaching 305m. To its west and southwest are deep sea bed basins which restrict the flow of water to the north but accelerate currents: these mix water masses, producing upwelling currents and tidal surges. Temperate currents from the east coast in winter and spring and tropical currents from the west coast in summer and autumn are biologically rich.

In the Central Gulf, the nominated area of **El Vizcaíno** is the eastern marine buffer zone of the largest reserve in Mexico which straddles a huge area of the Baja Peninsula. The coastal strip within the nominated area is 5 km wide by about 90 km long. The coast is arid but offshore currents and surges entrain high waves and nutrient enriched waters. The Central Gulf, as far as the bays of La Paz and Topolobampo on the mainland to its northeast, has deep marine depressions, one of 220 km long and 2,000m deep, strong seasonal surges and variations in surface temperatures. These can vary 15°C in temperature between February and August and between the surface and 150m deep in summer. **Bahía de Loreto**, two-thirds of the way down the peninsula, contains twelve barren offshore islands of volcanic origin covering 22,692 ha. Of these, Carmen (15,110 ha), Santa Catalina (4,300 ha), Montserrat 1,940 ha), Coronado (850 ha) and Danzante (490 ha) are the largest. They are set in fertile warm shallow seas. Its three main types of sea floor are rocky reef, mixed rocks and sand, and sand.

**Cabo Pulmo** National Marine Park has the only coral reef in the Gulf; it is about 20,000 years old and is one of the oldest and most important in the eastern Pacific. On shore, 5m sand dunes and alluvial sands and gravels overlie relatively recent sedimentary, Tertiary clastic and PreCambrian crystalline rocks. Marine terraces and offshore basalt bars at depths between 2 and 20m form the substrate for coral communities. The water is clear, with a normal salinity of 34-35 ppt. **Cabo San Lucas** nearby is protected for its scenery and as a laboratory for the study of a deep submarine canyon with spectacular sand cascades which plunges from 15 to 2,000m below sea level just off-shore. Here the ocean environment is still very intact. The subtropical west-flowing North Equatorial current passes through the area, under the tropically warm surface and above cold north Pacific currents at depth. The Southern Gulf is over 2,000m deep in the centre and is open for 200 km to strong tidal currents and summer storms from the Pacific which bring high waves. These currents run from north to south in winter and spring and from south to north in summer and autumn.

The **Islas Marías** lie 220-270 km southeast of the peninsula, parallel to the mainland between 90-120 km from it. There are four islands covering an area of 27,429 ha: I. Marfa Magdalena (8,677 ha), I. María Cleophas (2,730 ha) and I. San Juanito (1,235 ha) which form the core protected area, and I. María Madre (14,787 ha) which, with the marine envelope comprises the buffer zone. The islands are of volcanic origin associated with crustal rifting with basic intrusive and acid extrusive igneous rock overlying Cretaceous sandstones and surrounded by limestones and alluvial plains. I. Marfa Magdalena is 6 km across rising to 350m. I. San Juanito is 5 km by 3 km. Shorelines are formed of cliffs, sands and rocks. Marine environments include igneous rock coral reefs, conglomerate rock coral reefs, littoral rock coral reefs, sandy bottoms with rocky patches, sandy bottoms with pebbles and plant cover and pebbly bottoms. The channels between the islands are not deep and they sit on a relatively shallow continental shelf which drops off suddenly to the west some 1000m. At the mouth of the Gulf, ocean currents from the sub-arctic at depth and from the tropics on the surface, from the Gulf itself and the sub-tropical north-flowing Costa Rica current under the surface, mix at the beginning of the North Equatorial current.

**Isla Isabel** lies between the Islas Marías and the mainland, 30 km from the latter. The island is 82 hectares in size, with an adjacent coral reef, and rises to 85 m. It is of explosive volcanic origin of which one cone remains containing a small lake of hypersaline water, Lago Cráter. The interstratified basalt lava, scoria and pyroclastic rocks yield sand, clayey soils in depressions, on plains and on outward draining slopes and a sterile cemented hardpan surface where hydrated. Rains drain away underground to the crater or the sea.

## CLIMATE

The enclosed Gulf has a dry arid climate with high (10°C) diurnal and annual fluctuations, low humidity, high rates of evaporation and intense solar radiation. The northern section has a Mediterranean pattern of winter rain (50mm) and summer dryness. Temperatures there range between a mean of 11°C in January to 32°C in July and August. Halfway down the Gulf the annual rainfall at El Vizcaíno is between 50-70mm and the annual mean temperature ranges between 18° and 27°C. The area is subject to hurricanes. At Bahía de Loreto the climate is less dry with 190mm of rain, mainly falling in August and September. The mean annual temperature is 23.1°C. Tides are predominantly diurnal and less than a metre. The surface water in the shallows can range between 26° and 33°C in temperature and is very clear. In deeper areas the downward visibility can be 25m. At Cabo Pulma temperatures average 25°C in the coral reef and 24°C on land though this has reached as high as 48.5°C. The mean rainfall is between 200 and 317mm but tropical storms in late summer and autumn rainfall can bring as much as 700mm which is held on land by retention dikes. Coastal islands experience mainly land and sea breezes. Islands in the open sea experience northwest winds from November to May and southeast winds from June to October. The change causes upwellings along the east coast in spring and the west coast in summer.

The Islas Marias are exposed to the Pacific and have a warm maritime climate averaging 24.9°C, with a mean annual rainfall of 563.2mm, most falling from June to November; with 27.1mm falling between November to May. Hurricanes and tropical storms occur in September and October. Surrounding water temperatures vary between 23/24°C in winter to 28/29°C in summer. Where the Gulf is open to the ocean the annual, mostly summer, rainfall increases to over 950mm. Isla Isabel has a subhumid tropical climate with rains in summer. The mean temperature in January is 22.6°C, and in September, 30.3°C. Autumn hurricanes can be very destructive there.

## VEGETATION

The dominant flora is that of the floristically rich Sonoran desert with its many varieties of cactus and other succulents, including some of the tallest cacti in the world. 695 vascular plants have been recorded in the nominated area, 28 species or subspecies being endemic. Variations in the diversity of habitats and plants on the islands are due mainly to proximity to the coast, island size and elevation: the islands of Tiburón and Espiritu Santo have 298 and 235 species while San Pedro Mártir has only 27. The harsh conditions, the isolation and variations from north to south have resulted in speciation and endemism. These have also limited settlement by man. The lower Gulf coasts fall within the

Sinaloan biogeographic region; the Islas Marias have a relict biota of continental dry tropical habitat species. The marine environment is fragile but diverse, being between the Pacific tropical and temperate ecoregions. It harbors 626 species of macroalgae in submarine forests which protect and feed large concentrations of invertebrate life.

Characteristic Sonoran species on the islands are the palo verde *Cercidium* spp., elephant tree *Bursera microphylla*, desert ironwood *Olneya tesota*, limberbush *Jatropha* spp., ocatillo *Fouquieria diguetii*, white bursage *Ambrosia* spp. and cacti such as the columnar cardon *Pachycerus pringlei*, viejito *Mammillaria capensis*, cholla *Opuntia cholla* and prickly pears *Opuntia* spp. The drier northeastern Gulf has more small-leaved plants such as creosote bush *Larrea divaricata*. The vegetation of Isla San Pedro Mártir is Sonoran with only 27 species, dominated by an open forest of a columnar cactus, cardon *Pachycerus pringlei*, which can reach 25m high. The nutrient-rich coastal waters of both this island and El Vizcaino have dense and productive submarine vegetation. On the islands of the Bahía de Loreto National Park 262 species of vascular plants are recorded, 120 of them in the coastal zone. The Bay has 161 species of macroalgae, red (73% cover), green and brown, sheltering plentiful phytoplankton and zooplankton which provide nurseries for larval reef fish. Carmen Island has a large mangrove forest of red *Rhizophora mangle*, black *Avicennia germinans* and white *Laguncularia racemosa* mangroves and a mantle of dense macroalgal growth. Off Cabo Pulmo there are species of macroalgae of some commercial value, but unexploited.

The Islas Marias far southeast of the peninsula, have been separated from the mainland for some eight million years, and preserve a relict dry tropical forest flora and fauna. The main types of vegetation are deciduous and sub-deciduous tropical forest, subtropical matorral with low spiny forest, and mangroves of four species on María Magdalena and María Cleophas islands. There is also coastal dune, cliff and secondary vegetation. 387 vascular plant species are recorded, including 11 endemic or restricted range species. Over a fifth of the flora is of species from the Fabaceae and Euphorbiaceae. The most diverse genera are Euphorbia, Ipomoea and Solanum. 40% of the 77 plant families are monogeneric and 87% of these are monospecific. 73% of Isla Isabel is covered by three types of vegetation: tropical deciduous forest, grassland and introduced species. The forest is 60% garlic pear trees *Crataeva tapia* and 27% papelillo *Euphorbia schlechtendalli*. Their height varies between 2.5m to 5m. The grassland has three main species including flat sedge *Cyperus ligularis* and *Ipomea* spp. on disturbed ground. Introduced plants include fruit trees and purslane *Portulacca oleracea*.

## FAUNA

The Gulf's immense biodiversity productivity is due to the abundant phytoplankton and zooplankton which proliferates on the nutrients brought by upwelling oceanic currents. Its marine fauna is so rich that it was called 'the world's aquarium' by Cousteau. But having evolved in isolation, the marine wildlife is also vulnerable to introduced predators and disturbance by man, as is the sparser terrestrial fauna. There are 31 species of marine mammals (75% of Mexico's and 39% of the world's total species), 34 species of cetaceans (a third of the world's total), 891 species of fish in 441 genera including 90 endemic species and over 150 rocky and sandy coastal species; 73% of the fish are tropical. There are also 4,848 recorded macro-invertebrates.

In the **Upper Gulf** there are 18 species of marine mammal, one, the *vaquita* or Gulf porpoise *Phocoena sinus* (CR), found only in the northern Gulf, is one of the world's four rarest marine mammals. There are California sea lion, *Zalophus californianus* especially on I. San Jorge, and five species of dolphin: rough-toothed *Steno bredanensis*, Risso's *Grampus griseus*, bottlenose *Tursiops truncatus*, long-beaked common *Delphinus capensis* and Pacific *D. delphis*. Eleven species of whale visit the northern Gulf: blue *Balaenoptera musculus* (EN), fin *B. physalus* (EN), sperm *Physeter macrocephalus* (VU) and humpback *Megaptera novaeangliae*, also killer *Orcinus orca*, false killer *Pseudorca crassidens*, shortfinned pilot *Globicephala macrorhynchus*, Cuvier's beaked *Ziphius cavirostris*, pygmy sperm *Kogia breviceps*, minke *Balaenoptera acutorostrata* and grey whale *Eschrichtius robustus*. 161 species of fish, 42 of them endemic, are recorded there. This relatively low number is due to the restricting effect of winter cold and the wide tidal range. Eleven species are found only in the northern part of the Gulf though they are also found on the Pacific side of the peninsula. Two of these are the giant sea



bass *Stereolepis gigas* (CR) and the basking shark *Cetorhinus maximus* (VU). The large croaker the *Totoaba macdonaldi* (CR) used to spawn in the Colorado river delta and supported a fishery which has since been devastated by U.S. withdrawal of the river's water. The desert pupfish *Cyprinodon macularis macularis*, a Colorado River freshwater fish, is threatened for the same reason. Marine invertebrate records for include 35 abundant species of mollusc and 190 decapods.

The **Islands of the Gulf** provide nursery and breeding grounds for some 30,000 California sea lion (25% of the total Mexican population) which in the 1980s had 40 denning grounds, especially around the Great Islands on I. San Esteban and I. Ángel, and on I. San Pedro Mártir. There are many cetaceans, the Bahía de Loreto being the area richest in marine mammals. There are grazing and wintering grounds for five out of the world's eight marine turtles: leatherback *Dermochelys coriacea* (CR), hawksbill *Eretmochelys imbricata* (CR), loggerhead *Caretta caretta* (EN), black or Pacific green *Chelonia mydas agassizii* (EN) and olive ridley *Lepidochelys olivacea* (VU). The poisonous yellow-bellied sea snake *Pelamis platura* is common. The coral reef at Cabo Pulmo is the only one in the Gulf and one of the most important in the eastern Pacific. There are many endemic and as yet undescribed invertebrate species, especially in the intertidal zones.

The terrestrial fauna is not abundant except for birds and the distribution of the land animals is dependent on the availability of food and fresh water. The greatest diversity, because of their adaptability, is of the invertebrates which form a basic food resource for the larger animals. Mammals are not diverse though there are 31 species listed as nationally threatened, the commonest being rodents. They include antelope jackrabbit *Lepus alleni*, coyote *Canis latrans*, ringtailed cat *Bassariscus astutus* and mule deer *Odocoileus hemionus* on the larger islands. Bighorn sheep *Ovis canadensis* were introduced onto Tiburon in 1975. There are 115 species of reptiles, 48 (42%) being endemic and 25 being nationally endangered or in need of protection. 154 land bird species are recorded, 45 being migratory. The commonest resident land birds are the raven *Corvus corax*, mourning dove *Zenaida macroura* and cactus wren *Campylorhynchus brunneicapillus*; raptors include the red-tailed hawk *Buteo jamaicensis*, osprey, *Pandion haliaetus*, peregrine falcon *Falco peregrinus* and Harris's hawk *Parabuteo unicinctus*.

The Gulf is on the Eastern Pacific Flyway between the Americas. At least 181 species of birds are recorded, 56 being seabirds. Important breeding colonies include more than 90% of Heerman's gull *Larus heermanni*, 70% of the world population of black storm-petrel *Oceanodroma melania*, the world's fourth largest population of blue-footed booby *Sula nebouxii*, on I. San Pedro Mártir and large colonies of elegant tern *Sterna elegans* on Rasa Island. On Partida Island, there are least and black storm petrels *Halocptena microsoma* and *Oceanodroma melania* and the locally endemic yellow-footed gull *Larus livens*. Isabel Island, protected for its birds, supports 92 species. Other notable species and their roosts include brown pelican *Pelicanus occidentalis* on I. Las Animas, double-crested cormorant *Phalacrocorax auritus* on Alcatraz I., brown pelican and Brandt's cormorant *P. penicillatus* on Salsipuedes I. Widespread are great blue heron *Ardea herodias*, great egret *Casmerodias albus*, marbled godwit *Limosa fedoa*, whimbrel *Numenius phaeopus* and longbilled curlew *N. americanus*, royal terns *Sterna maxima*, and on rocky shores, black-necked grebe *Podiceps nigricollis* and belted kingfisher *Ceryle alcyon*. Storm petrels *Oceanodroma* spp. and phalaropes *Phalaropus* spp. visit from the ocean to feed. **San Lorenzo Archipelago** National Park is a marine protected area in the Great Islands which includes an 8,800 ha no-take area. It is a highly productive group that sustains important populations of marine mammals and sea birds especially Heerman's gulls and elegant terns for which Isla Rasa is the world's primary breeding area. It is also important for the sustainable use of commercial and sport fisheries and is an important generator of biological resources for fisheries, especially for the small pelagic fishery.

The small isolated **Isla San Pedro Mártir** Biosphere Reserve, is one of the best preserved islands in the Gulf. The surrounding waters, influenced by temperate currents in winter and spring and tropical currents in summer and autumn, are biologically very rich. The commonest wildlife on land are the insects. There are two endemic San Pedro Mártir lizards, the sideblotched lizard *Uta palmeri* living in densities of 2,200/hectare, and the whiptail *Aspidoscelis martyris* (VU); the only native mammal is also

a Gulf endemic, the fish-eating bat *Myotis vivesi* (VU). All five of the Gulf's turtles swim around the island: leatherback, hawksbill, loggerhead, Pacific green and olive ridley. Ten land birds and 17 seabirds are recorded. These include the world's fourth largest population of blue-footed booby *Sula nebouxii*, Mexico's largest population of brown booby *S. leucogaster* and large colonies of brown pelican and red-billed tropicbird *Phaethon aethereus*. There is a very large sea lion colony of 2,500 and aggregations of bottlenose dolphins and fin whales are seen offshore.

The nominated part of the large **El Vizcaíno** Reserve is a narrow strip parallel to the shore. The coast is arid but offshore currents and surges entrain high waves and nutrient enriched waters. The dense algae and seagrass growing on the sandy and rocky seabed nurse rich invertebrate and vertebrate marine life and a valuable fishery. In contrast to the northern Gulf over 300 species of fish are recorded, most of them common to the Central Gulf. Sea lions are abundant. Other marine mammals occurring are the elephant seal *Mirounga angustirostris*, common and longbeaked dolphins, grey, humpback and blue whales, and Baird's beaked whale *Berardius bairdii*. In the past there was commercial over-exploitation of the sea cucumbers *Isostichopus fuscus* and *Parastichopus parvimensis*, of mother-of-pearl *Pinctada mazatlanica* and winged oysters *Pteria sterna*. These species were subsequently protected and their taking forbidden, but the populations have not yet recovered.

**Bahía de Loreto** National Park comprises twelve barren islands set in very productive warm shallow seas. There are 25 species of land mammals, 13 of them bats, 12 species being protected. Of the 51 terrestrial reptile species, 33 are protected. The area's long history of use has left many relics, palaeological, archaeological and historic; also, on Carmen Island a legacy of bighorn sheep *Ovis canadensis* and domestic pests such as rats, cats, dogs, goats which have had to be controlled. The Bay's marine life is particularly rich. The three main seafloor environments are the rock reef, mixed rocks and sand, and sand. The dense macroalgae shelters phytoplankton and zooplankton which provide nursery conditions for larval reef fish. 299 species of macroinvertebrates have been recorded to date, 120 being species of the rocky reef, the most diverse environment. Six out of the seven invertebrates protected in Mexico are found in the Bay, including the giant sea cucumber, mother-of-pearl and winged oyster. Many species of mollusc are commercially fished but the black coral *Antipathes galapagensis* having been overexploited is now endangered. The giant squid spawns in the area in summer.

The Bay has the country's largest concentration of marine mammals: 30 occur, 75% of those found off Mexican coasts. The nationally protected species among them are the blue, fin, humpback, sperm, killer, gray, Cuvier's beaked and Bryde's whales *Balaenoptera edeni*. There are also the California sea lion, elephant seal, Risso's dolphin, spinner dolphin *Stenella longirostris* and striped dolphin *S. coeruleoalba*. There are 53 species of reef fish, rather fewer on the rocky-sandy reef, but over the sands there are several fish important to sportsmen: dorado *Coriphaena hippurus*, roosterfish *Nemastitius pectoralis*, blue marlin *Makaira nigricans*, striped marlin *Tetrapterus audax*, sailfish *Istiophorus platypterus*, swordfish *Xiphias gladius* and yellowtail kingfish *Seriola lalandi*. There are also large populations of sharks, among them the pelagic thresher *Alopias pelagicus* (VU), the bigeye thresher *A. superciliosus* (VU), silky shark *Carcharinus falciformis* and bull shark *C. leucas*. Attracted by the variety of habitats and food all five of the Gulf's marine turtles are found and normally migratory species are often resident. The Bay's popularity for all kinds of fishing has depleted populations, degrading the environment on both land and at sea until their protection in the 1990s.

**Cabo Pulmo** National Marine Park has the only coral reef in the Gulf. The terrestrial wildlife is typical of the Baja California desert with two species of mammal, black-tailed jackrabbit *Lepus californicus*, mule deer *Odocoileus hemionus*, four species of bird and 22 species of reptiles which are nationally rare, threatened or protected. The marine flora and fauna is little studied except for the reef. Dense macroalgae, provide a protective mantle for reef organisms. These include 226 of the Gulf's 891 species of fish, 154 species of marine invertebrates and 11 of its 14 hard or hermatypic corals. There are many endemic and as yet undescribed invertebrate species especially in the intertidal zone. Offshore there is a non-breeding colony of sea lions. All five of the Gulf's sea turtles occur, as do bottlenose, spinner and rough-toothed dolphins and, in winter, humpback, fin and Bryde's whales.

**Cabo San Lucas** reserve protects a deep submarine canyon with spectacular sand cascades just off shore where the ocean environment is still very intact. The subtropical North Equatorial current passes west through the area, under the tropically warm surface and above cold north Pacific water at depth.

The volcanic **Islas Marias** have very varied sea currents and sea-bed conditions. Having been separated from the mainland for some eight million years they preserve a relict dry tropical forest fauna. This, over the four islands includes 19 species of mammals, 24 reptiles and three amphibians. The northern raccoon *Procyon insularis* (EN) and Tres Marias cottontail rabbit *Sylvilagus graysoni* (EN) are endemic. There are also introduced species such as the whitetailed deer *Odocoileus virginianus*, black rat *Rattus rattus* and feral dogs and cats. Reptiles include American crocodile (VU), common green iguana *Iguana iguana*, *Boa constrictor* and Mexican spiny-tailed iguana *Ctenosaura pectinata*. Of 158 bird species, 23 are nationally protected and 12 are endemic. Among these are the Tres Marias yellow-headed parrot *Amazona oratrix tresmariae* (EN), yellow-naped parrot *Amazona auropalliata* and the Tres Marias tropical parula *Parula pitiayumi insularis*. The local elf owl *Micrathene whitneyi graysoni* is probably extinct. 48 species are resident, 21 resident in winter and 55 are transitory.

21 shark and 10 ray species are found around the islands, some being commercially valuable species. Among these are scalloped *Sphyrna lewini* (EN) and great hammerhead sharks *S. mokarran* (EN), white-margin fin hound-shark *Mustelus albigipinnus*, whitenose shark *Nasolamia velox*, bigeye thresher *Alopias superciliosus* (VU), Pacific sharpnose shark *Rhizoprionodon longurio*, and whale shark *Rhinocodon typus* (VU); also sharks of the genus *Carcharhinus*: bignose *Carcharhinus altimus*, Galapagos *C. galapagensis*, bull *C. leucas*, blacktip *C. limbatus*, dusky *C. obscurus* (VU), and smalltail *C. porosus*. 302 species of fish have been reported in the area around the islands, several being valuable commercial species. Four are nationally protected: blue-and-yellow chromis *Chromis limbaughi*, Pacific seahorse *Hippocampus ingens* (VU), king angelfish *Holocacanthus passer*, and Cortez angelfish *Pomacanthus zonipectus*. Sea lion are seen and it is assumed that humpback, Bryde's, grey and killer whales, also bottlenose dolphins and bridled dolphins *Stenella attenuata* are present. 13 coral species, including the endemic *Porites baueri*, 249 gastropods and 30 pelecypods are recorded. The mother-of-pearl, wide-mouthed purpura *Purpura patula pansa*, giant limpet *Patella mexicana* and spiny rock scallop *Spondylus calcifer* are nationally protected.

The small **Isla Isabel** is notable for its birds. It hosts 90% of the world's population of Heerman's gull (400 individuals). The dominant garlic pear tree is a favored roost of the magnificent frigatebird *Fregata magnificens*, the most abundant seabird on the island (11,800 birds in 2001-2002) and of brown pelicans (200) and red-footed boobies *Sula sula rubripes* (200 birds). The flat sedge of the grassland provides essential cover for nesting sooty terns *Sterna fuscata* (654 birds), a vast population of which was recently decimated by cats, which have themselves since been eradicated. Other notable species are the brown booby (16), blue-footed booby (2,000), white-tailed tropicbird *Phaethon aethereus* (100) and brown noddy *Anous stolidus* (650 - the largest colony in Mexico). There are few terrestrial animals: six reptiles, one amphibian, one bat and the black rat. The marine fauna around the islands includes at least 79 invertebrate, 79 reef fish and 22 shark and 10 ray species. The surrounding seas are visited by whale sharks, olive ridley, black and hawksbill turtles, humpback and killer whales, dolphins and California sea lions. Two ahermatypic corals are noted: *Tubastrea coccinea* and *Astrangia ecuatorialiscoccinea* and *Astrangia ecuatorialis*

## CONSERVATION VALUE

The area is one of the most ecologically intact ecosystems in the world, described by Cousteau as 'the world's aquarium', valuable both to science and for its fisheries. It has 34% of the world's marine mammals and a third of all cetaceans, also a great diversity of macro-invertebrates, fish, endemic reptiles and cacti with high endemicity among cacti, terrestrial reptiles and marine mammals. It is a dramatically beautiful desert with several Sonoran landscapes. It contains two UNESCO MAB Biosphere Reserves and 21 Ramsar Wetland sites, is one of the World Wildlife Fund's 200 globally most important ecoregions and is recognised by Mexico as a priority for conservation.

## **CULTURAL HERITAGE**

Carbon-dating has identified signs of habitation by mollusc-eating humans 40,000 years ago on Isla Espiritu Santo and I. Partida. Pictographs and petroglyphs 12,000 years old attest to a hunting culture which pictured the fauna still seen today. The coasts around the delta bear traces of past Cucupá river and Pápago Arenaro desert cultures. The Cochimi inhabited the northern two thirds of the peninsula, moving seasonally to follow resources. On the southern peninsula 40,000 Guaycura lived near Loreto in the 17<sup>th</sup> century and Pericú bands from the peninsula left island shelters and camps, middens and funeral caves on southern islands. There are archaeological remains at Cabo Pulmo. The Conchero people, throughout the area and the Canca'ac (Seri) grouping of six peoples on the east Gulf coast used the marine resources extensively. To the Spanish who first landed in 1539, the Gulf was known as the Sea of Cortés. Religious missions were established, exploratory expeditions made and after 1826 commercial exploitation began, but by the 19<sup>th</sup> century imported diseases had decimated the native cultures. The Islas Mariás were discovered in 1526/7 and became a pirate refuge until the 19<sup>th</sup> century when exploitation began: trees were felled for precious woods on I. María Madre, and salt mining started there.

## **LOCAL HUMAN POPULATION**

All the Gulf islands are uninhabited except for six where there are populations of between 35 and 60, mostly fishermen. There is temporary ritual use of Tiburón by Canca'ac Indians who were granted use of it by the government in 1978 and whose traditional culture still employs several plants for medicine, food, shelter, fuel and ritual. In the past there was some pearl and nacre fishing and several islands, like San Pedro Mártir, were stripped of guano; saltbeds were exploited on the islands of Carmen, Carrillo and San Jose and others were regularly visited for tern and pelican egg collecting and the hunting of sea lions and whales. I. San Marcos is the world's second most important source of gypsum and 129 hectares on the east Gulf coast are used for aquaculture. Isla Maria Madre has been a state penitentiary since 1905 and 1,801 prisoners are still housed in several camps, but it may close in the near future.

The local economy depends largely on artisanal fishing, some free as in the south, some in the Great Islands by cooperatives, but little is done on an industrial scale except for shrimp trawling in the north. Fishing thrives all year, the fishermen following preferred species around the sea with the seasons to selected fishing grounds. Some 70 commercial fish and 12 invertebrate species are regularly taken, mainly blue shrimp, gulf grouper, anchovy, sardines, dorado, squid and various species of marlin. In 1997 there were some 17,680 artisanal boats, 50% from Sonora and 30% from Sinaloa provinces, and the boats and equipment are continually being improved. Providing for sport fishing tourists is also a growing industry. Isla Isabel is used by 360 artisanal fishermen. Fishing must be authorised and is controlled by government and navy inspectors using high speed patrol boats.

## **VISITORS AND VISITOR FACILITIES**

Visitation is increasing especially near the city of La Paz, and the number is increasing. Sport fishing both by tourist service companies and independents is well established in the central and southern areas from La Paz and Loreto, mainly rod and hook fishing for serranidae and carangidae. In the north, fishing is promoted and camps for American retirees proliferate. Adventure and ecotourist groups come individually and in guided groups and cruises especially from the U.S.A. to watch whales and nesting birds, to skin-dive, kayak, sail, camp and trek. Guidelines for tourism and ecotourism, tourist information and permits are obtainable at the regional and local offices of CONANP. An Orientation Center is to be set up at Bahía Kino opposite Tiburón. About 1,000 visitors a year, half Mexican and half foreign, visit Isla Isabel, principally for bird-watching, also for camping, diving and sport fishing. A rustic cottage and a half built refuge are used to accommodate them. And because of its remoteness and beauty, some 3,000 visit Isla San Pedro Mártir every year.

## **SCIENTIFIC RESEARCH AND FACILITIES**

The naturalist-pirate William Dampier observed seals off the Islas Mariás in 1729. The islands' geology was first described in 1771 and in fuller detail in the 19th century. In the mid 19th century, Grayson

studied the natural history of the Islas Mariás. In the early 20th century, the Scripps Oceanographic Institute of San Diego supported several scientific expeditions. Almost all major oceanographic processes occurring in the planet's oceans are present which give it extraordinary importance for the study of marine and coastal processes. The islands are seen as natural laboratories for the examining of speciation, colonisation, interaction and adaptation among species; also for geological and evolutionary research. MacArthur and Wilson's theory of island biogeography was tested there. Between 1994-6 an archaeological project on Isla Espíritu Santo and I. Partida uncovered 127 shelters, camps, shell middens, funeral caves and cave paintings. Universities in northwest Mexico and southwest U.S.A. work from field stations at Bahía de los Angeles on the peninsula, Isla Rasa in the San Lorenzo archipelago, on Isla Isabel and at Bahía Kino and Guyamas on the mainland. The National University of Mexico has monitored seabird populations on Isla Isabel since 1981; the Universities of Nayarit and Guadalajara also use the island's excellent opportunities for research. Much remains unknown but numerous research projects are in hand. Much information is available although it is scattered. Research will also be promoted by a new South Californian Fund for Protected Natural Areas.

## **MANAGEMENT**

The nominated sites comprise 5% of the area of the Gulf of California and form the third largest World Heritage marine property. The Gulf is an area valuable to science, increasingly important for tourism and is an important economic fishery, especially for blue shrimp, corvina, northern milkfish, sierra, manta ray, guitarfish, shark, crab and clam. To control burgeoning tourism, CONANP, local governments and the Navy will enforce revised regulations. To control fisheries and the overfishing of commercial stocks fishing in marine protected areas is prohibited, and in other protected areas, permitted only by traditional hook and line. The protected areas are managed by CONANP from five regional and six local offices. Management programs were published for the Upper Gulf and Delta Reserve in 1995, An Integrated Management Plan for the whole property was approved in 2000 including the Islands of the Gulf Protected Area, El Vizcaíno Reserve, Bahía de Loreto National Park and I. Espíritu Santo. On Tiburón Island a Program for the Conservation and Management of bighorn sheep was set up to re-introduce these animals for the hunt, and since 1996 an expert-advised Conca'ac Unit for Management and Sustainable Utilisation of Wildlife has produced income for the community. Programs for Isla Isabel, and other islands were to be finished by 2005, and that for Tiburón-San Esteban soon after. The management of islands without plans is by annual operational plans guided by the Integrated Plan.

Publishing of an updated management plan involving local stakeholders is expected within a year of official designation of a site as a Protected Area. The aims are the protection of nature, genetic diversity and cultural relics by surveillance and monitoring; management with sustainable and economically beneficial use of local resources; and the collection and dissemination of biological knowledge. A program for Ecological Planning of the Sea of Cortés is to be set up in 2005-6, coordinated by the Ministry of the Environment and CONANP, the Ministry of Agriculture and Fisheries and local state governments, research centres, national and international NGOs. This is to guide conservation and revise fishery regulations. The National Ecology Institute on behalf of the government is preparing ecological ordinances to control future development. With the cooperation of eight national ministries, agencies, universities, NGOs and locals, CONANP is studying the establishment of further or enlarged protected areas and a strategy for managing the many natural and cultural resources of the Gulf, starting with an inventory of all the islands. A system for monitoring key indicators of the state of conservation has been created. These are: degree of changes to habitat, the average number of species, the area converted to sustainable use and the number of people following sustainable practices. Sources of expertise and training are being sought from six Mexican, four North American and four other international sources. A Coalition for Sustainability in the Gulf of California brings together The National Information System for Mexican Biodiversity (CONABIO) the Mexican Foundation for the Conservation of Nature, the National Institute for Ecology, the Guaymas Monterey Technical College, Conservation International, WWF and CEMEX.

## MANAGEMENT CONSTRAINTS

Isolation, desert heat and scarce water have largely preserved the Gulf islands in the past, but threats to the marine resources are increasing from both artisanal and industrial fishing. Increasing numbers of fishermen using improved equipment have established more camps on the islands. Trawling, shrimp trawling, the use of line and depth seines and harpoons, the by-catching of juvenile fish and cetaceans such as the *vaquita*, even the shooting of sea lions, and the overfishing of commercially important species such as the *totoaba*, are all contributing to the gradual degradation of this rich sea. In the north destructive industrial drag-netting for shrimps, and pollution from farm run-off, boat fuel, plastic flotsam and sewage are on the increase. Some ornamental fish collecting also occurs. There has also been an absence of government surveillance, of monitoring and closed seasons and of compliance by tourist and industrial companies. But there have been some successes. In Bahía de Loreto for instance, long popular for artisanal and sport fishing both legal and illegal, industrial shrimp-trawling is now banned.

On land, past guano collection has scalped some islands irretrievably. Alien predators are still being introduced, threatening the delicate existing balance. Endemic species with a high market value, both animal and plant, are taken, mule deer, bighorn sheep and goats are poached, Tourists and even research scientists degrade habitats, cause erosion, leave wastes and litter and disturb the breeding grounds of birds and sea lions. Looting of archaeological sites, deforestation of dunes and tree-felling have all occurred. Unaccompanied individuals are the most destructive. Research is necessary but should be controlled by permit and patrolled to avoid danger to the island's fragile environments. Far greater surveillance and regulation of boat traffic by more port captains are needed but are costly. The National Fund for the Promotion of Tourism has proposed a 'Nautical Stairway for the Sea of Cortés' to better exploit the large nearby market for aquatic tourism. Over the long term this proposes improved infrastructure and transport facilities of every kind, particularly the updating or construction of 27 marinas along the Gulf's shores which could improve employment opportunities for local people. The costs on construction and operation and the impact on the area would be very considerable. However, investment has not yet started and there is pressure to reduce the extent of its potential impacts.

## COMPARISON WITH SIMILAR SITES

The nominated area is a scattering of volcanic desert islands and coasts in an enclosed and fertile sea, described as 'the world's aquarium'. It is one of the most ecologically intact ecosystems in the world, valuable both for fisheries and to science. It has great diversity of marine mammals, birds and macro-invertebrates, endemic reptiles and cacti, in a biogeographic province not yet represented on the World Heritage list. A closely comparable World Heritage site is the Galapagos Islands. These are an isolated group of volcanic islands, partly desert and subject to the same sea currents of the convergence zone with spectacular underwater life. They have 447 species of fish and 62 species of plants, so are less rich, though in their oceanic character, reptiles and particular endemism they are not comparable.

Similar enclosed seas among non World Heritage sites are the Red Sea and the Arabian Gulf where the Hawar Islands have been nominated for World Heritage status. Both are enclosed between subtropical deserts and contain a variety of coasts and islands. The coral-based Tiran Islands of the northern Red Sea and the Dahlakh and Farasan Islands of the south are all isolated, inhabited yet undeveloped and rich in terrestrial, avian and marine life including coral reefs of very high quality. All have potential for valuable research and the need for protection from over-fishing. The Arabian Gulf is also faunistically rich, with the world's second largest dugong population in its seagrass beds. The shores are very barren but have some dense coastal mangroves. Politically however, both seas are bordered by eight or nine states which would make designation difficult. Highly productive islands and coasts on the World Heritage list with some similar characteristics are Cocos Island, the Brazilian Atlantic islands, East Rennell Island and Komodo Island; the Banc d'Arguin in Morocco, Shark Bay in west Australia, the Belize Barrier Reef System and Ujong Kulon in Java. All have some remarkable features but do not compare with the range of the Gulf's oceanographic conditions and processes nor with the richness of its wildlife.

## STAFF

CONANP has Regional Divisional Directors for Baja California, Baja California Sur, Nayarit and Sonora, where there is also a coordinating Director for the four regions in Hermosillo. There are also local Directors for the Bahía de los Angeles, the Upper Gulf and Colorado River Delta Reserve, Bahía de Loreto National Park, Cabo San Lucas & Cabo Pulmo, Isla Isabel National Park and El Vizcaíno Biosphere Reserve. Most of the 50 permanent staff are graduates and local people are also trained for specific work. All units have at least one speedboat and a routine of 2-3-week patrols.

## BUDGET

Until 2000 the Gulf Reserves were under-funded, though in the 1990s the World Bank/GEF via the Mexican Fund for Nature Conservation granted US\$16.5 million, and several national and international donors made donations. In 2000 the Federal government granted CONANP 147 million pesos (US\$15.7 million) but expenses that year totalled 226.7 million pesos, 60% going to central offices. A second GEF grant in 2002 totalled \$31.1 million. Since then, US\$13,320,000 has come from private commercial companies. In-kind contributions to management worth US\$450,000 have come from WWF, CI, TNC and PRONATURA. In 2003 the South Californian Fund for Protected Natural Areas was established to promote and coordinate giving. The budget in 2003/4 was US\$1,092,195 channelled via CONANP plus US\$710,400 from donors plus US\$412,776 from the GEF. Entrance fees are charged via tourist service companies and to individuals.

## LOCAL ADDRESSES

The Director, CONANP Regional Coordinating Office, Av. Aquiles Cerdán, No.80, Planta alta Edif.Correos, Col. Centro, Hermosillo, Sonora, CP 83000, Mexico.

The Director, CONANP Baja California Regional Division, Av. del Puerto No.375-24 Fraccionamiento, Playas de Ensenada, Ensenada, Baja California CP 22800, Mexico.

The Director, CONANP Baja California Sur Regional Division, Melchior Ocampo No.1045 piso 2 esq Lic.Verdad y Marcelo Rubio, Col.Centro, La Paz, Baja California Sur, CP 23000

The Director, CONANP Sonora Regional Division, Bahía de Bacochibampo, Sonora.

The Director, CONANP Isla Isabel Regional Division, Ofic. Regional de SEMARNAT, calle Cuauhtémoc, Ap. Postal 87, San Blas, Nayarit, CP 63740

## REFERENCES

The principal source for the above information was the original nomination for World Heritage status.

Case, T., Cody, M. & Ezcurra, E. (2002). *A New Island Biogeography of the Sea of Cortés*.

IUCN (2009). *The Red List of Threatened Species*. IUCN, Cambridge, U.K.

Lluch-Cota, S. *et al.* (2007). The Gulf of California: Review of ecosystem status and sustainability challenges. *Progress in Oceanography*. 7(1): 1-26.

National Commission of Protected Natural Areas (*Comisión Nacional de Areas Naturales Protegidas CONANP*) (2004). *Serial Nomination Format for the Islands and Protected Areas of the Gulf of California for Inscription on the World Heritage List*. Secretariat of Environment and Natural Resources. 132 pp. [Contains a bibliography of 75 references.]

Rosabel, P. (2005). *World Heritage Nomination IUCN Summary: Islands and Protected Areas of the Gulf of California (Mexico)*. IUCN, Gland, Switzerland.

Sala, E., Aburto, G. *et al.* (2002). Marine conservation at a regional scale: developing a science-based network of marine reserves in the Gulf of California. *Science* Vol. 298.

Walter, B. (1960). The distribution and affinities of the marine fish fauna of the Gulf of California, *Systematic Zoology* 9 (3).

WWF-Mexico (n.d.). *Base de datos de Biodiversidad, Procesos Ecológicos, Físicos y Socio-económicos Para la Definición de Prioridades de Conservación de Biodiversidad en el Golfo de California*.

**DATE**

September 2004. Updated 7-2005, 1-2006, 1-2009, May 2011.