

# GULF OF MANNAR



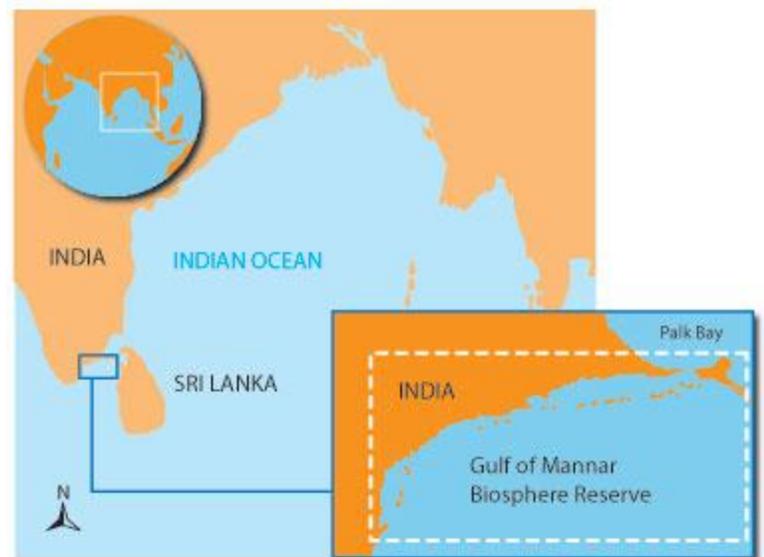
MORGAN MILLER

ALEXANDRA SCOTT

BIOSPHERE RESERVE PROJECT

A biosphere reserve is an area that is intended to secure fundamental diversity of life in a region while continuing to advocate economic growth. According to the *Natural Resources Defense Council*, regions that are nominated to become biosphere reserves must consist of three main sections. The first are called core areas, which are geared toward keeping the ecosystem as pure and untouched as possible. Buffer zones usually surround the core areas and are places devoted to research, education, tourism, and often recreation. The final section is centered more upon the economic growth of the reserve as a result of the human activities. Cooperative zones include farms and towns to promote the assets and economy of the region.

The Gulf of Mannar can be found in the Indo-Pacific Region. The Gulf of Mannar Biosphere Reserve is located on the southeastern tip of India and is near Sri Lanka.



Marine Conservation Society. Gulf of Mannar Biosphere Reserve.

According to the Marine Conservation Society it is made up of about 21 islets lying off the coast of Tamil Nadu. It has an area of 10,500sq km and is mostly marine life.

The Gulf of Mannar was established as a biosphere reserve in 1989 by the Indian Government and the State of Tamil Nadu. The Tamil Nadu forest department conducts the reserve, and in addition, a Trust has been established that requires aid for the reserve from surrounding communities (*Marine Conservation Society, 2009*). This region is also home to the

Ram Sethu, or Adam's Bridge. This bridge is a series of islands and reefs that separates the Gulf of Mannar from the Palk Strait. Historically, the bridge was said to be built by Lord Rama and is considered sacred to Hindus around the world and is visited by thousands each year. The history of the area contains much about Lord Rama and other figures of importance to Hindus. Many of the towns were said to be visited by Lord Rama or the god Devi, and today many temples are dedicated to these religious icons, as reported by *WebIndia123.com*.

Recently, the Indian government has begun plans to build a shipping canal that will be called the Sethu-samudram Ship Channel through the Gulf of Mannar. There has been vigorous opposition to this idea from scientists and religious leaders alike. Not only would the canal destroy the sacred Adam's Bridge, but it would more importantly disrupt the pure and amazingly preserved ecosystem of the Gulf. Thousands of people all over the world were pushing for the reserve to be accepted as a World Heritage site, which it recently has been, in hopes that this would persuade India leaders to abandon the idea of a shipping canal (*Eastern Eye, 2008*).

The Gulf of Mannar is has a hugely marine ecosystem, which includes coral reefs, salt marshes, algae communities, mangroves, and sea grasses, among many others. The reserve



Mangroves (<http://en.wikipedia.org/wiki/File:Mangroves.jpg> National Oceanic and Atmospheric Administration/Wikipedia)

includes twenty-one islands where beaches and estuaries are predominant. Forests of dry broadleaves can also be found throughout the buffer zones. The climate of the region is that of a

tropical one, consisting of relatively high temperatures from January to May, and heavy rainfall due to monsoons. From October to December rainfall is usually at its maximum due to the Northeast monsoon. The Southwest monsoon contributes, but plays a much smaller role in overall rainfall. The tides of the region are also considered to be rapid. The oceans have periods of calm in the fall but are often choppy in late spring and through summer due to storms. Inland on the coastal plains, the wind velocity is usually high, which causes the tides to occasionally be irregular (*Ecologically Important Areas on the Tamil Nadu Coast*).

The Gulf of Mannar Biosphere Reserve is known for its vast coral reefs, mangroves, and lagoons. The majority of the ecosystem is aquatic, but there is a small portion based on land. Most of the land based ecosystem is found on the small islets littered throughout the gulf. There are many dry deciduous plants and forests found on land. The *Handbook of National Parks, Wildlife Sanctuaries, and Biosphere Reserves in India* states that there are five different types of forest in the Gulf of Mannar, dry mixed deciduous, dry tropical riverine, secondary dry deciduous, littoral, and mangrove. The mangroves consist of 17 different species. There are also several coastal lagoons making up the biosphere that serve as marine fisheries. These fisheries act as nurseries for shellfish and fish. The trees, fauna, and lagoons are spread across the islets and coastal land areas.



PonnVandu. "Premeditated Ocean Rape."

Most of the animals are aquatic or reside primarily in the water, but there are some that live on land. Some of the animals that can be found on the islands and coastal areas, found in the *Handbook of National Parks,*

*Wildlife Sanctuaries, and Biosphere Reserves in India*, are jungle cats, Indian tree shrews, spotted deer, grey heron, black ibis, spotted crane, common kingfisher, pied kingfisher, swallow, common Indian crocodile, and the common sand boa. There are many other animals in the Gulf of Mannar and they can usually be found residing in the gulf itself. Some examples of these animals would be the, smooth Indian otter, honey badger, blue whale, finner whale, sei whale, common dolphin, little Indian porpoise, sea cow, 5 different types of tortoise, salmon, and heckle. The Gulf of Mannar has a vast array of animals located in its biosphere reserve. Many of these animals not only live on land but also reside in water making for one of the most unique biosphere reserve to be studied.

Much of the time when discussing the Gulf of Mannar Biosphere reserve people will think of the aquatic aspect. This reserve is widely known for having a large coral reef that provides shelter to many plants and animals. These reefs are knows as fringing reefs. Fringing reefs grow in shallower water where they get



Living Planet Foundation. "Gulf of Mannar Photo Gallery."

lots of sunlight, and are one of the most common types of reef. They can be found directly off the shoreline and are extraordinarily diverse in color and build. These reefs are delicate and grow slowly. According to the article *Marine Ecosystems of India* fringe reefs are made up of 77.8% reef building coral called "Hermatypes". The other 22.2% of the reef is made of none reef building coral called "Ahermatypes" making for weakness in the reef.

There are over 117 species of coral found in these reefs, and they serve as home to more than 3,600 species of plants and animals. The coral provides crevices for fish, plants, and other animals to make their homes, breed, or find protection within.

Many of these coral reefs support other life like mollusks that play dead when touched, and sea anemones that come in a variety of colors and move with the currents like leaves in a gently breeze. Some unique organisms can even be found in these reefs. The organism called “balanoglossus” also known as the “living fossil”, discussed in Parvathi Menon’s article *An*

*Ecosystem in Peril*, serves as a link between invertebrates and

vertebrates live here. Living among these creatures one can also find sea grasses.



Thalassia hemprichii Photo by: J S Bujang

Living Planet Foundation. “Gulf of Mannar Photo Gallery.”

The Gulf of Mannar is home to one of the highest concentrations of sea grass species in India. These sea grass beds are some of the largest remaining in the area. They act as feeding grounds to many sea dwelling creatures like, dugongs, sea turtles, dolphins, and sharks. Although dugong sightings have gone down

over the years the other animals seem to have remained. There are 5 different species of sea turtles that make these sea grasses their homes and breeding grounds. Over ten species of whales have been sighted swimming through the area. Two different species of dolphin, spinner and bottlenose, have been known to forage through the sea grass, and have even been caught in fishing nets on various occasions.

Life in coral reefs is not all grand for its biological inhabitants. Humans have damaged much of these reefs and the marine life living on them. Indian Conch or “Chanks” are famous in the area, but due to fishing they have been severely depleted. The reefs themselves are also being destroyed. Coral mining for limestone, digging for pearls, and fish trawling causes damage to the reefs and destroy habitats for aquatic plants and animals. Even with laws prohibiting much of these damaging actions, they are still happening. Conflicting laws make it difficult to stop much of the destruction.

Not only do humans cause damage to the coral reefs, but also disease has started to increase among the reef. (J. Praveen Paul Joseph “nine Types of Diseases Found in the Gulf of Mannar.”) Coral diseases caused by bacteria, viruses, protozoa, and fungi are cause lesions and tissue loss in the coral. Stress on the environment is the main reason for these disease causing bacteria. Water quality is a major factor in either furthering or preventing the diseases. If people can keep the water in these biospheres clean then we will have a long time to study all the beautiful creatures within.



The Hindu. “Nine Types of Diseases Found in the Gulf of Mannar.”

The Gulf of Mannar contains 47 villages along its coast and supports more than 100,000 inhabitants, who are mainly fishermen. Human impacts on the reserve have had both negative and positive effects. A current worry is the deterioration of many coral reefs which may be caused by both humans and other natural factors, states *Sethu Samudram*. Coral mining for lime, fishing, pollution, and shell collecting for commercial sale are all ways that humans have impacted the reefs and aided in their continuing deterioration.

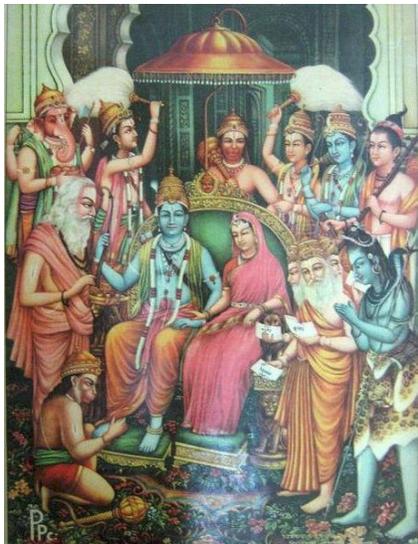
Another issue that has arisen in this region is the decreasing amount of fish being harvested. Since the inhabitants of these villages are mainly fishermen, they depend completely on the abundance of fish to not only feed their families, but also to maintain their livelihood. Unfortunately, the decreasing bounty of fish is due to the fishermen themselves. With so many relying on these fish to make a living, they have been far over harvested, and the waterways have had no time to replenish themselves. This biosphere reserve is also a popular region for pearl fisheries, having ten along its banks. As a direct result of the great demand for pearls, the abundance of pearl oysters has declined as well.

Problems dealing with pollution have also arisen in the reserve. *Environmental Geology* published an article in 2004 outlining what trace elements have been found in sediments in the Gulf. Elements such as Aluminum, Magnesium, Iron, lead, and Zinc have been found, among many others, in sediment samples from the region. This metal contamination is thought to be due to riverine sources and industries that are close by. It was concluded that human activity in the region over the past decades has in fact been corrupt and may in the long run have undesirable consequences. As of now, however, the metal levels in the sediments are below toxic value and with the proper actions by area industries, could be greatly reduced over future decades.

Research throughout this reserve is constant due to its outstanding biodiversity. Currently, the Intergovernmental Oceanographic Commission is in talks about laying permanent transects to track slight to major changes in the coral reefs, according to Reefindia.org. Marine sponges from the Gulf of Mannar area are also being studied to ascertain how they have been affected by antifouling paints that contain Tributyltin (TBT) and copper compounds. According

to the *International Biodeterioration and Biodegradation* journal, *Haliclona exigua* (a species of sponge) were gathered in March of 2005 for testing. After a freshwater bath, the sponges were soaked in acetone. Results from the extract were then tested and conclusions were drawn as to the toxic and adverse effects of TBT on the marine life that was not the initial target of antifouling.

Many make the trip to the Gulf of Mannar every year to view their 117 species of wondrous coral reefs, as well the 5 species of sea turtles, migratory birds, sharks, and the dolphins and whales that are now endangered by pollution. The marine life of this biosphere reserve is one of the most diverse and intriguing the world has to offer. Eco-tourism is currently on the rise and the Tamil Nadu forest department intends on trying to open up new locations along the coast so that tourists may see the coral reefs. However, tourism cannot be opened widely throughout the reserve due to the damage it could impose on the fragile ecosystem. As summarized by *The Hindu*, all regions opened will be those that pose the least threat to overall well-being of the reserve's ecology.



Lord Rama (center on throne)  
([http://en.wikipedia.org/wiki/File:Rama-Sita\\_coronation.jpg](http://en.wikipedia.org/wiki/File:Rama-Sita_coronation.jpg) No copyright/Wikipedia)

Many also make the trip for religious reasons according to *WebIndia123.com*. Hindus hold the Ram Sethu as a sacred place and there are also many temples along the islands. Sethukkaria is a popular pilgrimage location, as it is said to be where Lord Rama built the Ram Sethu to reach Sri Lanka. It is also believed by Hindus that Lord Rama stopped by the town of Devipatnam, which houses a temple where

Hindus often perform religious rites for their dead. [Webindia123.com](http://Webindia123.com) says that the best time to visit the Gulf of Mannar is from October through March, most likely in order to avoid the unbearably hot summers that occur throughout India.

## **Bibliography**

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This article discusses the marine ecosystems of India. It goes into detail about coral reefs, mangroves, lagoons, plants, and animals of these ecosystems. It also discusses why these ecosystems are necessary, and the impact that has been had on them from the world. I have used the details they provide about the Gulf of Mannar ecosystem for my research.

Menon, Parvathi. "An Ecosystem in Peril." India's National Magazine March 15-28, 2003 Vol. 20 Issue 06, November 3, 2009 <<http://www.dgukervis.nic.in/news03-6.htm>>

This article discusses the different types of marine life in the Gulf of Mannar and the Palk Bay. It also points out the danger that these forms of life are in due to overfishing and general abuse. Coral reefs are the featured marine life, but the article also discusses the many other diverse animals and plants that are part of this ecosystem due to its coral reefs.

J. Praveen Paul Joseph. "Nine Types of Diseases Found in the Gulf of Mannar." The Hindu April 2009, November 3, 2009  
<<http://www.hinduonnet.com/thehindu/thscrip/print.pl?file=2009050450410200.htm&date=2009/05/04/&prd=th&>>

This article discusses the different types of diseases that are affecting coral reefs in the Gulf of Mannar. Also discussed are the frequency and cause of these diseases. The coral disease is caused by bacteria, viruses, protozoa, and fungi. These cause lesions and tissue loss. Stress on the environment is also a factor. Water quality is one of the keys in maintaining health.

S.S. Negi. *Handbook of National Parks, Wildlife Sanctuaries, and Biosphere Reserves in India*. New Delhi: Indus Publishing Company, 2002. Print.

This book describes the Forests, Flora, and Fauna of a biosphere reserve. It also goes into detail about the location of the biosphere reserve. There are lists of what animals and plants are found on that particular biosphere reserve. I used this book to find out exactly what plants and animals were found on the Gulf of Mannar Biosphere Reserve.

Turtle Track Sri Lanka. "Gulf of Mannar Biosphere Reserve." Marine Conservation Society 2009, November 3, 2009

<[http://www.google.com/imgres?imgurl=http://www.mcsuk.org/images/trackturtle/northern\\_india\\_n\\_ocean.jpg&imgrefurl=http://www.mcsuk.org/marineworld/trackturtle/gulf%2Bof%2Bmannar%2Bbiosphere%2Breserve&h=294&w=400&sz=23&tbnid=--QiQuID8Tpym0M:&tbnh=91&tbnw=124&prev=/images%3Fq%3Dgulf%2Bof%2Bmannar&hl=en&usg=\\_\\_l8QqjVIYv1A-7cbE6awADUPmHOY=&ei=HpLxSteUFJSk8Qbu0On8CA&sa=X&oi=image\\_result&resnum=4&ct=image&ved=0CBIQ9QEwAw](http://www.google.com/imgres?imgurl=http://www.mcsuk.org/images/trackturtle/northern_india_n_ocean.jpg&imgrefurl=http://www.mcsuk.org/marineworld/trackturtle/gulf%2Bof%2Bmannar%2Bbiosphere%2Breserve&h=294&w=400&sz=23&tbnid=--QiQuID8Tpym0M:&tbnh=91&tbnw=124&prev=/images%3Fq%3Dgulf%2Bof%2Bmannar&hl=en&usg=__l8QqjVIYv1A-7cbE6awADUPmHOY=&ei=HpLxSteUFJSk8Qbu0On8CA&sa=X&oi=image_result&resnum=4&ct=image&ved=0CBIQ9QEwAw)>

A.N.I. "World Campaign to save Gulf of Mannar gains momentum." *Thaindian News*. 21 Nov. 2008. Web. <[http://www.thaindian.com/newsportal/india-news/world-campaign-to-save-gulf-of-mannar-gathers-momentum\\_100121999.html](http://www.thaindian.com/newsportal/india-news/world-campaign-to-save-gulf-of-mannar-gathers-momentum_100121999.html)>.

This site will be used to identify the Ram Sethu and explain the opposition to the shipping canal.

"Biosphere Reserve Information: India: Gulf of Mannar." *The MAB Programme*. United Nations Educational, scientific, and Cultural Organization, 27 Sept. 2001. Web. 25 Oct. 2009. <<http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=all&code=IND+02>>.

This site was used for geography of the region.

"Gulf of Mannar Biosphere Reserve." *Sethu Samudram No ram - No Ram Sethu - Let's Save our Environment*. Sethu Samudram- Nothing Religious About It, 2009. Web. 27 Oct. 2009. <<http://sethusamudram.info/content/view/37/27/>>.

This was used not only for geography, but also for how humans impact the reserve. Also, it was used to help explain the Ram Sethu and highlight shipping canal plans and problems.

"Gulf of Mannar." *Ecologically Important Areas on the Tamil Nadu Coast*. Anna University. Web. 27 Oct. 2009. <<http://www.iomenviis.nic.in/gulf%20of%20mannar.htm>>.

Climate and geography of the Gulf of Mannar were described in this article. I found it very helpful when talking about the rainfall and ocean tides.

"Gulf of Mannar, Marine National Park." *WebIndia123.com*. Suni Systems Ltd. Web. 28 Oct. 2009. <<http://tourism.webindia123.com/tourism/wildlife/nationalpark/marinenationalpark/touristinformation.htm?place=Gulf+of+Mannar%2C+Marine+National+Park>>.

This site gave me much of my information on tourist attraction and also helped with the significance of many temples and the Ram Sethu.

"India Reef Region: Gulf of Mannar." *Reefindia.org*. National Institute of Oceanography, India. Web. 27 Oct. 2009. <<http://www.reefindia.org>>.

I obtained information about ongoing research for coral reefs from this site. It also had interesting facts about coral reefs.

Jaishankar, C. "Front Page: Plan to promote eco-tourism along coast." *The Hindu*. The Hindu, 29 Aug. 2009. Web. 28 Oct. 2009. <<http://www.thehindu.com/2009/08/29/stories/2009082961160100.htm>>.

This site gave me insight into future plans to expand Eco-tourism in the reserve.

Jonathan, M. P., V. Ram-Mohan, and S. Srinivasalu. "Geochemical variations of major and trace elements in recent sediments, off the Gulf of Mannar, the southeast coast of India." *Environmental Geology* 45.4 (2004): 466-80. Print. <<http://www.springerlink.com/content/2146lndtf5ka73mh/fulltext.pdf>>.

This article explains in great detail the geology of the Gulf of Mannar region. It discusses soil and sand as well as trace metals and elements found in the sediments of the region. Many forms of carbonates and silicates were found and the varying values of these substances can tell a lot about how soils as well as reefs were formed.

Mol, Limna, T. V. Raveendran, and P. S. Parameswaran. "Antifouling activity exhibited by secondary metabolites of the marine sponge, *Haliclona exigua*." *International Biodeterioration and Biodegradation* 63.1 (2009): 67-72. Print.

This article contains scientific descriptions of research being done at and about the Gulf of Mannar. Scientists have been studying the marine sponges located in this area and have found seven strains of fouling bacteria at a depth of 1 meter or more. This article will be helpful when discussing ongoing research and will be greatly summarized, as the information contained in it would be extremely dry to the normal reader.

"Turtle Track Sri Lanka: Gulf of Mannar Biosphere Reserve." *Marine Conservation Society*. Marine Conservation Society, 2009. Web. 27 Oct. 2009.

<<http://www.mcsuk.org/marineworld/trackturtle/gulf-of-mannar-biosphere-reserve>>.

I learned a lot about the history and upkeep of the reserve from this site, as well as some about its ecology.

"What is a Biosphere Reserve?" *Natural Resources Defense Council*. 3 May 2000. Web. 25 Oct. 2009.

<<http://www.mcsuk.org/marineworld/trackturtle/gulf-of-mannar-biosphere-reserve>>.

From here I defined what a biosphere reserve is, and the criteria needed to be considered one.

"Unholy Row over Bridge." *Eastern Eye* [London] 28 Nov. 2008, 972nd ed.: 2-2. Print.

Many scientists and religious leaders gathered in London to protest the Indian government tearing down the Ram Sethu (Adam's Bridge) and replacing it with a shipping canal. The bridge is sacred to many Hindus around the world and scientists also believe that the destruction of this bridge and building of a canal will threaten the lives of many endangered plants and animals that live in the Gulf of Mannar.

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