

# Marine Environments

The marine environment has always been a vital component of our way of life. It provided, and still provides, a major source of our protein. In the past, travelling by sea within Samoa was common. In 1722, Roggewein, the first European to sight Samoa, gave it the name, “the Isles of the Navigators” when he noticed how much the Samoans used canoes then. It has been estimated that approximately 70 percent of Samoa’s population is situated in low-lying areas along the coast.

## Why are marine habitats and ecosystems important?

Samoa’s marine environment has a diverse range of valuable marine ecosystems and habitats that house a spectacular array of marine organisms and species. Included in the list of special ecosystems and habitats are coral reefs, mangrove areas, seagrass beds, sea water surface and beaches. Each habitat has its unique qualities that it provides the different marine species that utilise them as homes and feeding grounds. They also play a vital role by providing us with needs such as food and the protection of our coastlines. Conservation of these habitats is important for the long term sustainability of the resources which they support and provide.

## Corals and Coral Reefs

The coral reef system is known to be the “rainforests of the sea”. They are the most complex, diverse, species-rich as well as highly productive biological systems in the world. The reefs provide habitats to one-third of all marine fish species and tens of thousands of other species.

The coral reefs of Samoa’s Archipelago contain approximately 50 species of hard coral and support over 900 fish species and numerous other reef-dependent organisms. Samoa has a low number of coral species compared to other islands such as Fiji with a count of 163 species of hard coral. Nevertheless, our coral reef systems provide us with resources that are vital to our needs. Like all other Pacific islands, we depend on the marine environment for food which provides us with the bulk of our protein intake. The coral reefs also play an important role by providing critical protection to coastlines from storm damage, erosion and flooding by reducing wave action. They also provide a source of income for local people through tourism, fisheries, building materials and pharmaceutical compounds.



A sand bank off Laullii which was formed after Cyclone Val in 1991. This resulted from corals crushed and washed up by strong cyclone wave action and current. [Source: Bell, 2002]

Despite their importance, coral reefs world wide have experienced widespread declines due to anthropogenic and natural activities. Human impacts includes coastal developments that may lead to land reclamation and beach erosion due to poor infrastructures. The use of destructive fishing methods such as dynamites and poisons kills both marine species and the coral reef. The over-exploiting/over-fishing of marine resources such as the collection of the triton and the removal of corals for aquarium trade have impacts on the reef. Marine pollution such as oil spills, littering, chemical and human wastes dumped into the ocean, and the increased deforestation leading to siltation runoffs threatens coral reefs throughout the world.

These impacts are being exacerbated with natural impacts such as the outbreak of the crown of thorns, global climate changes and associated impacts such as coral bleaching. Other natural

threats includes cyclones and tropical storms, elevated sea water levels and increased carbon dioxide concentrations due to greenhouse gas emissions.

We depend on biological diversity for the very sustenance of life therefore the need to protect and conserve our marine environment. Threats to our marine environment can be minimized by stopping the use of destructive fishing methods, such as dynamiting and ava niukini, reducing pollution flowing into the ocean, placing regulations on the harvesting of certain marine resources, and by educating the local people on the value and importance of coral reefs.

In Samoa, Marine Protected Areas [MPAs] have been established in efforts to protect our marine environment and resources. These MPAs include the Palolo Deep Marine Reserve, 56 village-based Fish Reserves established under the Fisheries Division community project, and district-based MPAs at Aleipata and Safata.

### Mangroves

Mangroves are unique ecosystems and amazing trees that live halfway between the land and the sea. Plants identified as mangroves represent over 80 species of which three are found in Samoa. The two common mangrove species found in Samoa are *Rhizophora mangle (samoensis)* [Red mangrove], *Bruguiera gymnorrhiza* (Oriental mangrove) and the rarest of the three, is *Xylocarpus moluccensis*. Mangroves of Samoa are not very common and confined to the two large islands of Upolu and Savaii, covering about 10km<sup>2</sup>. Despite the small area covered by mangroves, the Vaiusu Mangal near Apia is considered to be the largest mangrove area in Eastern Polynesia. The Vaiusu Bay and Saanapu-Sataoa mangrove stands are the two main mangrove stands in Samoa, with a number of other stands scattered throughout the two main Islands.



Mangrove species (Red mangrove & Oriental mangrove) at Sataoa Saanapu Mangrove Reserve. Photo: lakopo,2003

Mangroves form a very productive ecosystem and is a source of renewable resources in terms of the vital roles they play on a continuous basis. They are of high scientific and environmental values, and play an important ecological role as nursery grounds and as a physical habitat for a wide variety of vertebrates and invertebrates. In addition to this, they also recycle nutrients, and maintain the nutrient mass balance of estuarine ecosystems. Mangrove leaves, wood, roots, and detritus material provide essential food chain resources and habitat to a wide variety of wildlife. They also serve as storm buffers, and their roots stabilize shorelines and filter sediments from rivers, enhancing water clarity.

Significantly, mangrove areas provide shelter for many marine species. This is seen by the diversity of fish species, crabs, shellfish, seabirds and many others found living in mangrove areas. Mangroves provide safe sheltered nursery grounds for important fish species such as eels, mullets and trevallies. These species breed and spend most of their juvenile life stages in the safety of the mangrove root systems. Here they are provided with food and protected from the big predators, moving back into the seas only when they mature. Other animals include shrimps, prawns, mangrove crabs and certain bivalve species which live in the muddy areas, while oysters grow up the mangrove roots. Several bird species known to utilise mangrove habitats include the Pacific Reef Heron, and Golden Plover.

Commonly found on sheltered coastlines where sediments deposit, such as river estuaries; mangrove areas are recognised as biodiverse wetlands in the country, yet these unique coastal

tropical environments are among the most disregarded and fast depleting habitats. Pressures from growing populations and urbanisation, have led to changes in land use and over utilisation of this resource, contributing to its rapid loss around the Apia area and around the country.

Mangrove conservation is of great importance for the protection of these valuable habitats from further degradation. This can be carried out by establishing mangrove protected reserves such as the Saanapu-Sataoa Reserve; avoiding developments on mangrove areas such as roads and reclamation; encouraging ecotourism; and lastly, improving public awareness and education.

### Seagrass beds

Sea-grasses are found in shallow soft muddy sand areas and are similar to flowering plants on land. They provide shelter and food for many marine animals and stabilize foreshores. Typically, seagrasses are found in water depths of 2-12 metres where light can penetrate and allow them to photosynthesise. They are an important food source for many herbivorous fish species, marine turtles and invertebrates. Seagrass leaves provide shelter to many small animals, sheltering them from predators, the weather



Rubbish dumped in the mangrove area at Vaitoloa.  
[Source: Bell, 2002]

and strong water currents. Other than providing shelter for marine animals, they also play an important role by acting as sediment traps and nurseries for many species. They are special habitat areas because they are important to the livelihood of many marine organisms such as fish, crabs, prawns, octopus and turtles. Big sea animals like turtles forage on these seagrass beds while small animals live amongst them. Seagrasses are not directly used by humans, and because of this their importance is often overlooked.

Seagrass bed distribution in Samoa is limited with the best patches found around Manono Island and the Northern coasts of Upolu. Only two species of seagrasses have been reported to occur in Samoa, *Halophila ovalis* and *Syringodium isoetifolium*. Some researchers are of the opinion that *H. ovalis* reported in Samoa is probably endemic or belongs to another species, *H. minor*. *Halophila* specimen collected from the Palolo Deep Marine Reserve recently showed it to resemble *H. minor* morphologically.

Factors that affect seagrasses include dredging. Lagoon sand dredging are sometimes conducted in areas where sea-grasses are located. Thus either the sea-grasses are extracted together with the sand or the high siltation resulting from the dredging activities smothers seagrass beds. In addition, siltation and fresh-water influx from land due to poor planning of activities on land, such as land clearing near river banks for agriculture, result in soil erosion which can smother seagrasses during heavy periods of rain. When reefs are damaged by destructive fishing methods or natural causes, waves and strong sea currents are not “slowed” down. Unhindered waves and currents bring in sand faster which can build up on sea-grass beds, killing them.

### Beaches

Most of the beaches in Samoa are formed by coral particles broken up by storms or passed through the guts of coral-eating fish, such as parrotfish, and washed ashore by waves and currents. However, some beaches are also formed by particles carried from inland by rivers. Beaches prevent waves eroding and washing away the shore. Beaches are a major attraction for tourists. In addition, beaches are homes for some eatable bivalve species as well as other species the shells of which are used to make traditional necklaces and other handicrafts.

Destruction of reefs by means such as destructive fishing methods will also expose the shores with no structure to break huge waves and slow down strong currents during rough weather or a cyclone, resulting in shore erosion and more severe damages to habitation near the shore. Unsustainable and excessive beach sand mining renders the beach itself to be eroded easily and faster.

### Sea surface ecosystem

The sea surface is one of the marine ecosystems that has been neglected and its importance underestimated. It is becoming more apparent that the sea surface ecosystem, also referred to as the “skin” of the sea, plays vital roles in the whole marine environment. It has been indicated that “pollution of the sea surface layer may be the most critical problem for ocean ecosystems”.

The sea surface ecosystem covers the top few centimetres of the sea but covers about 70 % of the earth’s surface. Studies have shown that this layer has unique physical and chemical characteristics that have contributed to the evolution of a highly diverse and abundant assemblages of species, including many that are of commercial and ecological importance. Some marine organisms live their whole lives in this sea surface layer. These organism are known as neuston which includes bacterioneuston, phytoneuston, zooneuston and ichthyneuston [microscopic plants and animals].

It is known that many marine animals spend the most sensitive stages of their lives [embryonic and larval stages] at the surface of the sea. Eggs of many species of fish and invertebrates are shed into the sea and float to the surface where they develop into tiny swimming larvae and move deeper into the water. Thus the sea surface is a critical habitat for most of the world's major fish species as well as the invertebrates like lobsters, shrimp, oysters, clams and mussels.

Unfortunately, the sea surface, due to its very nature, is the most easily affected marine ecosystem by pollution. It is the first layer of the marine environment to receive pollutants from the atmosphere. Since the marine organism life phases spent in the sea surface layer are the most fragile and sensitive stages to environmental poisons and extremes, the sea surface becomes a vital habitat for the survival of the marine organisms. A study discovered that fish eggs that develop where the sea surface is polluted either die, develop slowly or become malformed.

Studies have shown that the sea surface layer is polluted by toxic metals, organic pollutants, bacteria, pesticide residues, and by-products of combustion-derived hydrocarbons from cars, trucks, aeroplanes, refuse incinerators, and power plants. Coastal sewage waste-water discharges, runoff from municipal and agricultural drainage systems and direct industrial discharges into rivers contribute to the contamination.

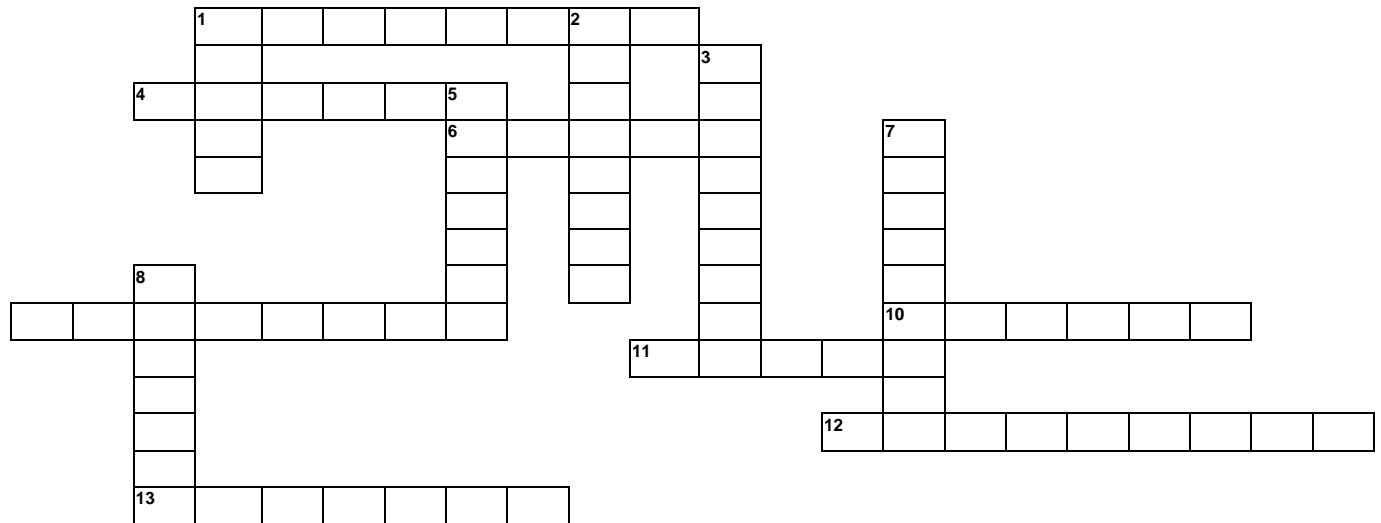
If the toxins are killing marine organisms when they are eggs or when they are very young, even a small fishing pressure could result in rapid failure of fisheries. A polluted sea surface has the potential to poison much of the complex marine food web, including fish, crustaceans, whales, and seabirds.

# Childrens Corner



1. Samoa has how many species of hard corals?  
[a] 163  
[b] 50  
[c] none
2. One of the human impacts on coral reefs are?  
[a] destructive fishing methods  
[b] outbreak of crown of thorns  
[c] cyclones and storms
3. We can minimize threats to our marine environment by?  
[a] using dynamites to catch fish  
[b] removing corals from the reefs  
[c] reducing pollution flowing into the ocean
4. Coral reefs play an important role by?  
[a] building homes for people  
[b] providing shelter for land animals  
[c] protecting our coastlines from wave action
5. Which statement is FALSE?  
[a] mangroves filter sediments from rivers  
[b] mangroves are important nursery grounds for most fish species  
[c] mangroves grow on coral reefs
6. The Vaiusu mangal area near Apia is considered to be the largest mangrove area in  
[a] the world  
[b] eastern Australia  
[c] eastern Polynesia
7. Which Reserve is directed to conserving mangroves?  
[a] Palolo Deep Reserve  
[b] Saanapu-Sataoa Reserve  
[c] O Le Pupu Pu'e National Park
8. The best seagrass beds found in Samoa are around  
[a] Apolima Island and Southern Upolu  
[b] Manono Island and Northern Upolu  
[c] Namu'a Island and Eastern Upolu
9. The two species of seagrasses reported in Samoan waters are  
[a] *Rhizophora mangle* and *Bruguiera gymnorrhiza*  
[b] *Halophila ovalis* and *Syringodium isoetifolium*  
[c] *Samoana stevensonia* and *Eua expansa*
10. One of the coral-eating fish whose feeding activities contribute to beach formation is  
[a] octopus  
[b] emperor fish  
[c] parrotfish
11. Apart from being a major attraction for tourists, beaches are also homes for  
[a] the Samoan flying fox, *Pteropus samoensis*  
[b] spiny lobsters and the reef crab  
[c] some edible bivalves
12. The sea surface covers about  
[a] 5 % of the of the earth's surface  
[b] 70 % of the of the earth's surface  
[c] 100 % of the of the earth's surface
13. Marine organisms that live permanently in the sea surface layer are called  
[a] neuron  
[b] neutron  
[c] neuston
14. Many marine animals spend the most sensitive stages [embryonic and larval development] of their lives  
[a] on the beach  
[b] in the deep ocean  
[c] at the surface layer of the sea
15. Fish eggs that develop where the sea surface is polluted  
[a] develop fast and become normal  
[b] develop to become fish that will live longer  
[c] either die, develop slowly or become malformed

# CROSSWORD PUZZLE



## **CLUES:**

### **Across**

- 1) A small marine animal with a head that looks like a horse.
- 4) Samoa's seafood delicacy (marine worms).
- 6) Hard as stone and home to lots of sea animals
- 9) They look like flowers but is a soft animal that catches prey with its many tentacles.
- 10) An animal that carries its shell on its back.
- 11) A sea animal that looks like a fish but is really a mammal that breathes air.
- 12) Trees that grow in muddy grounds between the land and the sea.
- 13) A small playful mammal starred as Flipper.

### **Down:**

- 1) A large ocean fish with sharp teeth and tough skin.
- 2) This animal has 5 arms and a body the shape of a star.
- 3) This animal has a soft rounded body that looks like and feels like jelly.
- 5) A sea animal that has a soft body with 8 parts that look like arms.
- 7) Unpleasant fish poisoning you get from eating fish.
- 8) A make believe sea creature with the upper body of a woman and a fish tail.