

## STATUS AND CONSERVATION OF SOUTH PACIFIC CORAL REEFS

### ETAT ET CONSERVATION DES RECIFS OCEANIENS

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#### ABSTRACT

A review of available information on the status of coral reefs in the South Pacific suggests two significant trends of concern.

1. Increasing fishing pressure has led to widespread overfishing of the more valuable reef resources.

2. The impacts of development on adjacent land areas and of damaging activities on the reefs themselves are probably producing a steady increase in the proportion of damaged and degraded reefs.

The information available at present is insufficient to quantify these trends which threaten the productivity of one of the most important resources in the region. Further monitoring at a national level is obviously needed.

While some countries have taken steps to conserve coral reef areas, the results are far short of the needs for the proper management of reef resources, and enforcement of such areas as have been protected is often difficult.

#### RESUME

Un examen des données disponibles sur l'état des récifs coralliens en Océanie indique deux tendances préoccupantes.

1. L'augmentation de la pêche a conduit à une surexploitation générale des ressources les plus intéressantes.

2. L'impact du développement des zones côtières et des agressions directes des récifs ont augmenté dans des proportions croissantes la dégradation des récifs.

Les renseignements disponibles aujourd'hui sont insuffisants pour quantifier ces tendances qui menacent la productivité d'une des ressources majeures de la région. Le besoin d'un suivi au niveau national est évident.

Certains pays ont pris des mesures pour conserver des zones récifales, mais les résultats sont loin des besoins pour la bonne gestion des ressources, et l'application des zones protégées est souvent difficile.

Coral reefs are one of the most significant productive resources in the tropical Pacific, yet the evidence suggests that they are fragile and easily disturbed. The increasing human impact throughout the region is having an effect on the reefs. The 1982 report on the state of the environment in the South Pacific (Dahl and Baumgart, 1982), based on official reports from almost all the countries and territories of the region, listed the extent of the major kinds of damaging activities. Three quarters of the countries reported problems of reef pollution, nearly half noted damage from illegal fishing with explosives or poisons, and one third referred to siltation and smothering of corals by land erosion or dredging. However, man is not the only cause of reef damage. The crown-of-thorns starfish, *Acanthaster planci*, has gone through population explosions on many Pacific Islands over the last 25 or 30 years, with a significant effect on living coral cover. Other natural phenomena such as cyclones also damage reefs (Edean, 1976). Even if the destruction is natural, the other stresses on reef ecosystems may well retard or inhibit the natural recovery of damaged reefs.

While there is thus some general information on the causes of reef degradation in the different countries of the region, there is almost no quantitative information on the present status of coral reefs. As a first step towards a more complete survey of the status of reef resources, this paper brings together those observations and impressions that can give at least a general idea of the status of coral reefs in central Polynesia and western Melanesia.

#### COUNTRY STATUS

The **Solomon Islands** includes some atolls and raised coral islands, as well as many high islands with complexes of fringing and barrier reefs in some places. While there is considerable subsistence fishing activity, there is little evidence of major effects on reef resources, although larger animals such as turtles and dugongs are under pressure. There has been some fishing with explosives left from World War II, but no estimate of the resulting damage. Bomb craters are still very evident in some coastal shallows, providing environments that did not exist previously. There are coastal pollution problems on the Honiara side of Guadalcanal due to urban runoff, pesticide runoff from rice growing areas, and the effluent of an oil palm processing plant, but there are no major reefs in the area concerned. The extensive logging operations on certain islands have probably increased siltation on adjacent reefs, but no observations are available from these areas. It can probably be assumed that Solomon Islands reefs are still close to their natural state except perhaps in localized areas.

The complex of barrier reefs around **New Caledonia** is one of the largest in the world, while the islands have one of the lowest population densities of any country in the region. Half the population lives in the Noumea urban area, and most of the impact is thus concentrated on reefs accessible from Noumea. While there is commercial fishing for the local market, the most significant effects come from the heavy sport fishing and recreational use of

reefs near Noumea.

Several marine reserves have been created to protect the reefs near Noumea from overuse. The Ile Amédée and Ilot Maitre reserves protect islands with heavy tourist use. A rotating reserve covers the three sections of the barrier reef that are most often visited; each sector is protected in turn for a 3-year period. The Yves Merlet Marine Reserve protects a 16,000 ha section of the barrier reef south-east of the main island. Unfortunately there are no quantitative studies either of the state of the reefs or of the effectiveness of these conservation measures.

Some of the lagoon reefs near Noumea have been affected by *Acanthaster* aggregations over the last three years, but the result has not been disastrous.

There is some subsistence and small-scale commercial use of reef resources in the interior, including commercial harvesting of trochus and beche-de-mer. An experimental project to export corals for the curio trade is being closely followed scientifically to determine its effects and to define management guidelines. There is no evidence at present that these activities present a significant threat to reef resources.

The extensive surface mining on the island has led to erosion and heavy siltation in nearshore areas, with a serious effect on fringing reefs and lagoon bottom corals in those areas, but the major coral reefs have not been affected.

In spite of heavy human use near centers of population, and some inshore pollution, the great majority of New Caledonian reefs would still seem to be in good condition.

The people of **Vanuatu** have never made heavy use of marine resources, and while there is little documentation on the state of the coral reefs, there has probably been little human impact. There are some pollution problems in the Vila town area, but only small areas of reef are affected. There has been some land clearing, principally for pasture, which may have increased the sedimentation rate in a few areas. The most significant reported reef disturbance of recent decades was the earthquake of 1965 which elevated reefs on the north-west coast of Malekula and Santo by up to 6 meters.

**Fiji** is a populous country with extensive reefs of many types. The pressure of the population on reef resources has led to overfishing in some areas. There have also been local impacts on reefs from extensive tourism development and from construction and pollution in urban areas. While specific data on the state of the reefs is not available, it would be reasonable to suppose a gradual decline in the quality of reef resources.

Nine atolls make up the country of **Tuvalu**, with a population still living largely at a subsistence level. Reef fisheries supply an important part of the diet. There are some suggestions of overfishing in Funafuti lagoon, but otherwise there seems to be a reasonable balance between the resource and its utilization. The south-east reef of Funafuti Atoll was devastated by a cyclone in 1972, leaving a rampart of broken coral along the seaward side of the island (Baines et al., 1974).

The **Kingdom of Tonga** consists of both reef and volcanic islands with variable amounts of reef development. There is heavy fishing for reef resources except in the most remote areas. One species of giant clam, Hippopus hippopus, has been all but exterminated in Tongan waters; only the shells can be found today (McKoy, 1980). The practice of smashing corals to catch fish has led to considerable destruction of shallow reef areas (R. Cheshire, personal communication). Pollution and overfishing have affected catches in the lagoon of Tongatapu. The evidence suggests that the reef structure and productivity is being degraded relatively rapidly in Tonga.

Five Reef Reserves were created in 1979 in the waters off Tongatapu: Monuafu Island (33 ha), Malinoa Island (73 ha), Ha'atafu Beach (8 ha), Pangaimotu Reef (49 ha), and Hakaumama'o Reef (126 ha) (Dahl, 1980b), but enforcement of these areas is difficult.

The three atolls of **Tokelau** support small populations largely at a subsistence level. Traditional fisheries management methods are breaking down, but there is no sign as yet of an impact on reef resources other than a decline in giant clams (Hooper, mss.). A significant area of lagoon reef was damaged by a pesticide spill in the early 1970's.

In **Western Samoa** the islands are encircled by a large fringing reef which extends far enough offshore in some places to create a shallow lagoon. The concentration of population in the coastal areas and the accessibility of the reefs mean that fishing pressure is heavy and overfishing is widespread. The catch of the palolo reef worm, Eunice viridis, a local delicacy, has been declining steadily. Dynamiting for fish has also been a problem. Some Western Samoan reefs were heavily affected by Acanthaster around 1980, with considerable destruction of living coral cover. There is probably a slow but steady decline in Western Samoan reefs.

One marine reserve has been created at Palolo Deep near Apia, primarily to protect a reef area important for tourism.

The coral reefs of **American Samoa** are by far the best documented in the region. A very complete coral reef inventory and atlas was prepared in 1979 (Aquatic Farms, Inc./Aecos, Inc., 1980). In addition, the reefs of Tutuila have been the subject of quantitative studies for over 65 years, so there is some information on the changing state of the reefs. A comparison of these studies shows a considerable decline in reef quality (Mayor, 1924; Dahl and Lamberts, 1977; Dahl, 1981b and unpublished). The reefs have been most seriously degraded in the Pago Pago Harbor area. Ten years of surveys around other parts of Tutuila between 1970 and 1980 showed some improvement in living coral cover followed by a serious decline in many areas (Dahl, 1981b). The decline may be due in part to heavy infestations of Acanthaster in the late 1970's. The coral reef inventory shows relatively few areas with more than 50% living coral cover remaining by 1979.

Fishing pressure on reef resources is heavy, and the more accessible reefs are subject to heavy gleaning (Hill, 1978). Pago Pago Harbor has suffered from serious pollution by cannery wastes and urban runoff. Road and airport construction

have also caused reef damage. The majority of American Samoan reefs are clearly degraded today.

Rose Atoll near American Samoa has been made a National Wildlife Refuge and unauthorized entry is prohibited, preserving its coral reefs in their natural state.

To the extent that the well-documented situation in American Samoa can be extrapolated to other areas in the South Pacific, it would seem that reef degradation is caused in part by heavy subsistence use and in part by occasional severe disturbance (erosion, poisoning, Acanthaster, cyclone, etc.) often followed by partial recovery. The intermittent nature of these latter factors makes it difficult to judge the state of a reef from a single survey or point in time.

**Niue** has a narrow fringing reef that is accessible from only a few points along the shore. There is some fishing from small boats, but with a declining population, the impact is not very great. A cyclone in late 1979 severely battered the island and reef.

The **Cook Islands** has a diversity of both island types and reef situations. The fringing reef of variable width around Rarotonga is seriously degraded, with little remaining living coral in many areas. This has apparently resulted from erosion and siltation from land clearing over the past 80 years, from overfishing, from incidents where pesticides and dynamite were used for fishing, and from Acanthaster infestations in 1976 and 1980.

The reefs of the almost-atoll of Aitutaki were still in good condition when last surveyed (Dahl, 1980a), although considerable dead coral was observed on lagoon patch reefs. Fishing activity seemed to be in balance with the resource. The lagoon of Rakahanga is reported to have "died" some 20 years ago, apparently as coral growth in the channels cut off water circulation into the lagoon.

The uninhabited atoll of Suvarrow has been declared a marine park by the Cook Islands government.

## REGIONAL OVERVIEW

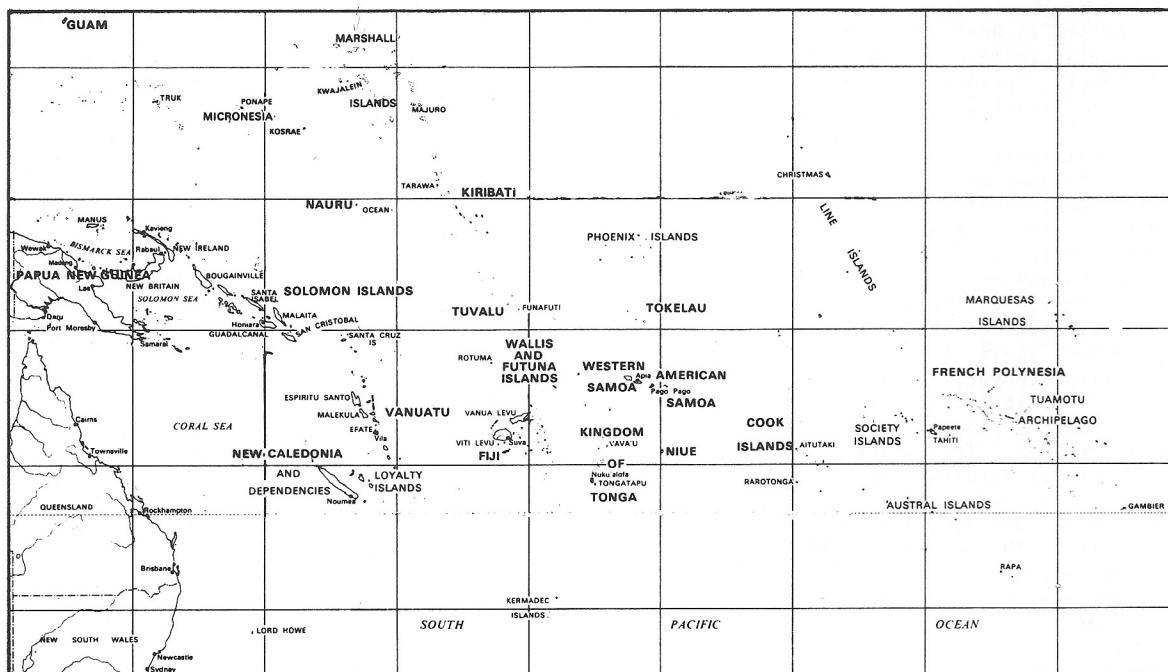
There are still some remote areas in the South-West Pacific where the coral reefs are largely untouched by man. However most of the more accessible reefs in Polynesia are in various stages of decline. The situation in most parts of Melanesia is less serious, as the reef areas are larger and the populations less dense and less oriented towards the sea.

Those reefs that are a significant fisheries resource for local people show declining productivity in most areas where the population is increasing or where traditional fishing techniques and management methods are being replaced or abandoned. The giant clams, Tridacna and Hippopus seem particularly vulnerable to overfishing and are fast disappearing from the region. The snappers, groupers, emperors and other large predators are also easily overfished in shallow water. Mullet have declined or disappeared where their breeding areas or migration routes have been affected. The management of these reef fisheries for sustained yield is a serious problem that is far from being solved.

SUMMARY TABLE  
REEF STATUS IN THE SOUTH-WEST PACIFIC

Country	Reef Status	Principal Causes of Damage	Marine Reserves	Availability of Data
Solomon Islands	Good	Pollution, siltation		Poor
New Caledonia	Good	Over-fishing, siltation from mining, pollution, cyclones, <u>Acanthaster</u> 1982-84	4	Fair
Vanuatu	Good	Siltation, pollution, earthquake uplift, cyclones	1	Poor
Fiji	Declining	Over-fishing, siltation, pollution, construction, cyclones		Poor
Tuvalu	Good	Over-fishing, cyclone		Poor
Tonga	Rapidly declining	Over-fishing, destructive fishing, pollution, cyclones	5	Fair
Tokelau	Good	Pesticide spill		Poor
Western Samoa	Declining	Over-fishing, dynamite, <u>Acanthaster</u> 1980	1	Poor
American Samoa	Poor	Over-fishing, pollution, construction, <u>Acanthaster</u> late 1970's	1	Good
Niue	Good	Cyclone		Poor
Cook Islands	Poor to good	Over-fishing, dynamite, poisons, siltation, <u>Acanthaster</u> 1976, 1980	1	Fair

MAP OF SOUTH-WEST PACIFIC  
showing areas referred to in this review



An even greater problem is the accumulation of damage to coral reefs from short-term incidents or activities. The amount of damage increases with proximity to centers of population or development, and in such areas it has exceeded the regenerative capacity of the reef ecosystem, leading to lower productivity and the replacement of calcifying organisms (corals, coralline algae) by those producing little or no cemented carbonate (algal turfs, soft corals, etc.). The reefs in such areas can be assumed to have stopped growing.

Much of this damage results from human activities such as construction or land clearing leading to soil erosion and siltation; water pollution; and destructive fishing techniques like dynamiting, poisoning or smashing corals. The causes vary from place to place, but the result is the same. The governments have not found an effective way to slow or stop this damage.

Natural catastrophes also probably contribute to reef decline, since it is often the recovery process that is most sensitive to human interference.

There is nothing to suggest that these trends will not continue. A few countries have established coral reef reserves as listed above, but enforcement of the reserve status has proven very difficult. There are no studies to show whether these conservation measures have had any effect. Fisheries management measures such as size limits or closed seasons for individual species have worked somewhat better, but these do not protect the coral reef ecosystem itself.

It is clear that far too little is known about the status of South Pacific reefs. Only in American Samoa is there both an inventory of coral reefs and some data permitting an evaluation of changes over time, and even that information is only for shallow water reefs. For most other parts of the region, there are only personal observations in limited areas, and inferences from known damaging activities. Much obviously still waits to be discovered.

Various reports of unexplained changes in coral cover and other reef parameters suggest that much more needs to be learned about natural variability on coral reefs before we can interpret reef inventory and survey data satisfactorily. More coral reef surveys and monitoring are obviously needed, but logistically they would be prohibitive in a region like the South Pacific unless they are undertaken by local users of the reef using simple methods (Dahl, 1981a). Remote sensing techniques represent another approach worth exploring.

The problems of coral reefs in the South Pacific are similar to those of most other renewable resources in a world with a growing population and increasing demands on the resource base. Degradation is advancing and productivity is declining. There is no miracle solution, but greater efforts by governments, more research into effective management methods, and above all better education of reef users may eventually succeed in slowing or reversing the trend of reef destruction.

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