



**THIRD SOUTH PACIFIC NATIONAL
PARKS & RESERVES CONFERENCE**

CONFERENCE REPORT — VOLUME 2

COLLECTED KEY ISSUE AND CASE
STUDY PAPERS

© Copyright South Pacific Commission, 1985.

All rights reserved. No part of this publication may be reproduced in any form or by any process, whether for sale, profit, material gain, or free distribution without written permission. Inquiries should be directed to the publisher.

Original text: English.

Prepared for publication at
South Pacific Commission headquarters, Noumea, New Caledonia
and printed at

Universal Print, 18-20 Lorne Street, Wellington, New Zealand.

"Reprinted July 1987"

REPORT OF THE THIRD SOUTH PACIFIC NATIONAL
PARKS AND RESERVES CONFERENCE

HELD IN
APIA, WESTERN SAMOA, 1985

VOLUME II

COLLECTED KEY ISSUE AND CASE STUDY PAPERS

FOREWORD

The Third South Pacific National Parks and Reserves Conference was held in Apia, Western Samoa, 24 June - 3 July 1985 and as its title implies it was the third in a series of regular meetings of Pacific countries on the issues of protected areas and conservation. The earlier conferences were held in New Zealand and Australia in 1975 and 1979 respectively.

The principal objective of the Conference was to promote the conservation of nature in the South Pacific Region by raising awareness of its importance and by encouraging governments to protect and manage both their terrestrial and marine ecosystems. The theme of traditional conservation knowledge and practices was central to the Conference. Other themes covered included legal, administrative and regional issues; marine and coastal issues; training and tourism and resource and park management.

The Conference was organised by the South Pacific Regional Environment Programme (SPREP) of the South Pacific Commission (SPC) in conjunction with the Government of Western Samoa, and the International Union for the Conservation of Nature and Natural Resources (IUCN).

The Conference comprised two main sessions:

- (i) A six day Technical Session at which Country Review, Key Issue and Case Study papers were presented, a draft Action Strategy for Protected Areas in the Pacific Region prepared and resolutions formulated for review and adoption by the subsequent Ministerial Session.
- (ii) A three day Ministerial Session at which resolutions and the draft Action Strategy were considered and adopted, the Convention on Nature Conservation for the South Pacific discussed and commitments by countries to protected areas and nature conservation were made.

A one week training course in protected area management followed the Conference.

This report is Volume two of the four volumes which comprise the full report of the Conference. It is a compilation in six chapters of the Key Issue and Case Study papers presented at the Conference. The six chapters generally reflect the principal Conference themes, however, some modification to theme titles and the order of paper presentation has been necessary in the interests of a balanced publication.

Papers for the Conference fell into three main categories: Key Issue papers, Case Studies and Country Reviews. Key Issue papers generally introduced a Conference theme and covered subjects of regional relevance, i.e. of relevance to all countries, while Case Studies documented a specific issue or approach to an issue under a Conference theme. Country Reviews recorded the current state of protected area management in each of the participating countries.

The range of topics covered was wide and reflected the very diverse backgrounds of the Conference participants. Although the papers highlight the many difficulties facing those responsible for protected area management and resource conservation in the region, there is also heartening evidence that despite these difficulties, significant progress is being made in these areas. There is also evidence of a growing awareness throughout the region of the need for environmental protection and conservation measures if the island countries are to achieve a sustainable standard of living. In this respect strong emphasis is placed on the important role of education and training.

This volume, and volume 3 containing the Country Reviews, represent the first comprehensive publications on protected areas and related issues in the South Pacific region. As such they are valuable source reference material and a basis on which to gauge progress in the fields of protected area management and resource conservation in the four years before the fourth Conference in 1989.

The Volumes comprising the full Conference Report are:

- Volume 1. Summary Record of Conference Proceedings
- Volume 2. Collected Reviews, Key Issues and Case Study Papers
- Volume 3. Country Reviews
- Volume 4. Report on Conference Arrangements.

Additional publications arising from the Conference are the Action Strategy for Protected Areas in the South Pacific Region and a Training Manual for Protected Area Management in the South Pacific.

All publications are available from the:

South Pacific Regional Environment Programme (SPREP)
South Pacific Commission
B.P. D5,
Noumea,
New Caledonia.

Volumes Two and Three have been edited by: Mr P.E.J. Thomas for the South Pacific Regional Environmental Programme.

Noumea
February, 1986.

CONTENTS

i.

		<u>Page</u>
CHAPTER 1:	<u>THE REGIONAL PERSPECTIVE</u>	1.
ADEQUACY OF PROTECTED AREAS IN OCEANIA	Arthur L. Dahl	2.
PARKS IN THE PACIFIC	William K. Riley	9.
UNESCO'S PROGRAMME ON WORLD HERITAGE AND BIOSPHERE RESERVES	Kuswata Kartawinata	16.
ENVIRONMENTAL MANAGEMENT THROUGH REGIONAL CO-OPERATION	Jeremy Carew-Reid & David Sheppard	28.
CHAPTER 2:	<u>MARINE AND COASTAL RESOURCE MANAGEMENT</u>	39.
COASTAL ZONE MANAGEMENT AND CONSERVATION IN THE SOUTH PACIFIC	Graham Baines	40.
COASTAL ZONE MANAGEMENT IN WESTERN SAMOA	Lui A.J. Bell	57.
MARINE RESERVES IN NEW CALEDONIA	Jean-Louis Jourde	74.
FAGATELE BAY NATIONAL MARINE SANCTUARY	William Thomas	79.
ESTABLISHMENT AND MANAGEMENT OF MARINE AND ESTUARINE PROTECTED AREAS IN AUSTRALIAN WATERS	C. Murray Macdonald	88.
THE STATUS AND CONSERVATION OF A NEWLY "DISCOVERED" LEATHERBACK TURTLE (<i>DERMOCHELYS CORIACEA LINNEGAUS, 1766</i>) CHELONERY AT MAUS BUANG, PAPIUA NEW GUINEA	Norman Quinn et.al	90.
SUSTAINABLE BLACK CORAL HARVESTING POTENTIAL IN TONGA	Ministry of Lands, Survey and Natural Resources, Tonga	100.
IMPACT AND CONTROL OF DYNAMITING IN PALAU	Division of Marine Resources, Ministry of National Resources, Palau	111.
CHAPTER 3:	<u>TRADITIONAL USE AND PROTECTED AREAS</u>	113.
TENURE AND TABOO: CUSTOMARY RIGHTS AND CONSERVATION IN THE SOUTH PACIFIC	Peter Eaton	114.
TRADITIONAL USE OF PLANTS OR ANIMALS IN PROTECTED AREAS IN NEW CALEDONIA	Jacques Kusser	135.

	<u>Page</u>
ABORIGINAL CUSTOMS AND KNOWLEDGE AND ITS RELEVANCE TO PROTECTED AREA MANAGEMENT IN NEW SOUTH WALES	138.
	New South Wales National Parks and Wildlife Service, Australia.
TRADITIONAL RIGHTS AND PROTECTED AREAS - THE NEW ZEALAND EXPERIENCE	144.
	Department of Lands and Survey, New Zealand.
RESOLVING CONFLICTS BETWEEN TRADITIONAL PRACTICES AND PARK MANAGEMENT	154.
	Iosefatu Reti
CHAPTER 4: <u>TRAINING AND EDUCATION</u>	163.
TRAINING FOR CONSERVATION AREA MANAGEMENT IN THE SOUTH PACIFIC REGION	164.
	Peter Eaton
RESOURCE MANAGEMENT AND CONSERVATION IN THE PACIFIC ISLANDS: RELATED ACTIVITIES AND CAPABILITIES OF USP AS A REGIONAL UNIVERSITY	176.
	Harley Manner
OPTIONS FOR TRAINING OF PROTECTED AREA MANAGERS IN THE PACIFIC	187.
	James Thorsell
AN APPROACH TO TRAINING: PARK MANAGERS IN THE SOUTH PACIFIC REGION	189.
	Rex Mossman
TRAINING ABORIGINAL PARK MANAGERS IN AUSTRALIA	192.
	Peter Taylor
CHAPTER 5: <u>TOURISM</u>	199.
ENVIRONMENTAL EFFECTS OF OFFSHORE TOURIST DEVELOPMENT ON THE GREAT BARRIER REEF	200.
	Graham Kelleher & Ian Dutton
CHAPTER 6: <u>PROTECTED AREA MODELS AND RESOURCE MANAGEMENT</u>	209.
TECHNICAL ASPECTS OF SUB-REGIONAL CO-OPERATION ON MANAGEMENT OF PROTECTED AREAS	210.
	Masahiro Ohta
MICROPARKS IN THE PACIFIC ISLANDS - THE RELEVANCE OF TRADITIONAL AND MODERN SMALL SCALE CONSERVATION AREAS IN THE PACIFIC ISLANDS	215.
	Randy Thaman
IRIAN JAYA, THE OTHER SIDE OF NEW GUINEA: BIOLOGICAL RESOURCES AND RATIONALE FOR A COMPREHENSIVE PROTECTED AREA DESIGN	237.
	Ronald Petocz

		111.
		<u>Page</u>
WILDLIFE MANAGEMENT AREAS IN PAPUA NEW GUINEA	Office of Environment and Conservation, Papua New Guinea	253.
NEW ZEALAND FOREST PARKS: A MULTIPLE USE MANAGEMENT MODEL FOR THE SOUTH PACIFIC	John Holloway	261.
OWNER INVOLVEMENT IN THE ESTABLISHMENT OF PARKS	Birandra Singh	269.
ENDANGERED SPECIES MANAGEMENT NEEDS IN THE COOK ISLANDS	Conservation Service, Cook Islands	271.
FERAL ANIMAL ERADICATION PROGRAMME KIRRIMATI, KIRIBATI	Wildlife Conservation Unit, Kiribati	276.
ANNEX I - BIBLIOGRAPHY		278.
ANNEX II - LIST OF CONTRIBUTORS		293.

CHAPTER 1 : THE REGIONAL PERSPECTIVE

ADEQUACY OF COVERAGE OF PROTECTED AREAS IN OCEANIA

Arthur L. Dahl

PARKS IN THE PACIFIC

William K. Riley

APPLICATION OF THE WORLD HERITAGE CONVENTION
AND BIOSPHERE RESERVES CONCEPT IN THE PACIFIC

Kuswata Kartawinata

ENVIRONMENTAL MANAGEMENT THROUGH REGIONAL CO-OPERATION:
SOUTH PACIFIC REGIONAL ENVIRONMENTAL PROGRAMME
South Pacific Regional Environment Programme

KEY ISSUE PAPER: ADEQUACY OF COVERAGE OF PROTECTED AREAS IN OCEANIA

Arthur Lyon Dahl
Gorre Rible, Plomodieru
FRANCE

INTRODUCTION

The question of how much conservation is enough is one that is almost impossible to answer. There must first be some agreement on basic principles or goals, such as the desirability of preserving the diversity of life on this planet, but even then the specific application of these principles to local situations can raise many complex issues (is feeding hungry children more important than saving an endangered land snail?). Adequacy of protected area coverage may seem very different viewed from a world scientific perspective or from that of a local decision-maker who seeks to balance many different demands. Ultimately decisions on adequacy must be made by each country, although hopefully the needs of the world community will be taken into account. This paper looks at the principles by which adequacy of protected area coverage must be judged, evaluates the present status of conservation action in Oceania, and then develops some goals for protected area development in the region.

CONSERVATION

Protected areas, like national parks and reserves, are generally established to conserve some part of the natural or cultural heritage. But what precisely does conservation mean? The World Conservation Strategy (IUCN/UNEP/WWF, 1980) lists three objectives for the conservation of nature:

1. maintenance of essential ecological processes and life-support systems;
2. preservation of genetic diversity;
3. sustainable utilization of species and ecosystems.

Each of these has its own particular importance in the Pacific Islands.

Essential ecological processes are such things as the development by natural plant communities of good island soils, the restoration of soil fertility when land is left fallow, and the purification of our wastes by environmental processes. Life support systems include the fresh-water supplies on which we depend for survival, and the air and environmental that we must keep free from poisonous or cancer-causing chemicals. Often these processes and systems are more limited on islands and can be more rapidly damaged here than in big continental areas.

The genetic diversity which underlies the great variety of kinds of plants, animals and other living things is much greater on many islands than it is elsewhere, because the isolation of islands has allowed new species to evolve to suit particular local conditions. This richness of species and varieties is a potential resource of world importance, but the responsibility for its preservation falls on a much smaller human population in the Pacific than in any continental area. For example, there are 54 endangered species of bird in Oceania, or one for every 92,000 people, where in Australia and New Zealand the ratio is 1 : 400,000, in the Caribbean 1 : 670,000 and in North America 1 : 9,000,000. Already the

region shares with other island areas some of the world's highest rates and numbers of species extinctions (Dahl, 1984).

The greatest threat to the aspirations and well-being of the peoples of Oceania is the failure to use island resources in ways that can be sustained on into the future. Island life and most island development projects depend on agriculture, fisheries and forestry, which use resources which are renewable if used wisely, but which can be destroyed if need or greed pushes people to take more than the resource can replace. The trend in most islands today is for total island productivity to decline as natural areas are developed and developed areas become degraded through over-use or misuse. Since islands are inherently limited, such trends can only lead sooner or later to the bankruptcy of island natural systems.

It is hard to argue against these conservation goals. No one wants to condemn his children or grandchildren to misery and suffering. Yet because the threats are gradual and not immediate, there is a natural tendency to concentrate on the short term and forget the eventual consequences. This cannot go on for ever, and governments must sooner or later face up to their responsibilities for conservation.

Protected areas can be important in achieving conservation, since within them ecological processes can continue without disturbance, samples of the genetic diversity of plants and animals are maintained, and species and ecosystems are protected from destruction by development or over-use. However, to achieve these goals, protected areas must be properly designed and well enforced and maintained. Areas that are protected only on paper can give a false sense of conservation accomplishment while the real damage to the country continues.

PROTECTING PACIFIC ECOSYSTEMS

Regardless of whether the primary justification is an endangered species, a natural feature, a scenic site or an essential process or resource, protected areas are usually created to protect the ecosystems of which these species or features are a part. The ecosystem includes both an environment or habitat and the different species, communities and processes that make up the whole working system. Protecting only part of an ecosystem is like protecting only the roots of a tree or the head of a chicken. The size and boundaries of a protected area should ideally conform to or exceed the minimum ecological limits of a viable sample of the ecosystem.

The Regional Ecosystems Survey of the South Pacific (Dahl, 1980), requested ten years ago by the First South Pacific Conference on National Parks and Reserves, attempted to list the kinds and numbers of ecosystems to be found in Oceania as a measure of the needs for conservation. That survey estimated that there were about 2,000 different ecosystems in the region, of which over 600 were specifically listed, ranging from unique marine lakes or loud forests to widespread atoll/beach strand forest. Many of these ecosystems are still unstudied or very poorly known, and further scientific work could well increase the number. Ideally, if the goals of conservation are to be achieved in the long term, adequate samples of all these ecosystems should be included in protected areas.

There is, however, a basic problem with the use of protected areas for nature conservation on islands. The number of species on most islands is related to the size of the island and its distance from other land areas. On smaller islands, it is harder for a newly-arrived species to get

established, and easier for it to be wiped out by a natural disaster or other cause; therefore the total number of species is less. The same principle applies to protected areas, which may become "islands" of nature in a sea of disturbed or developed areas. No protected area can assure the best chance for the long-term survival of all an island's flora and fauna unless it includes the whole island. The smaller the protected area, the fewer the number of species it can protect. Parks and reserves are thus an important but only partial solution to the problems of conservation on islands.

CONSERVATION AND MAN

If we eliminated all people, the environment would return to its natural state and there would be no need for conservation. Conservation is needed precisely because there are people, and indeed it is for people. Conservation is not against development, it is part of development, and its goal is the same as that of development: the progress and well-being of the people. Development that does not fit with the goals of conservation is not really development, but short-sighted exploitation that can only lead to the exhaustion of resources, unhappiness, frustrated desires and a declining quality of life.

Since resources are particularly limited on islands, people who live there must learn to live within those limits or face the consequences. The striking example of island environmental disaster is Easter Island, where a growing population destroyed the forest and exhausted the soil, leading to wars, disease and other factors that reduced the population to a handful. Because islands are small, maximum use must be made of all resources, and conservation principles are a guide to the greatest sustainable development. It is seldom possible to reserve a major part of an island for only a single need like preserving genetic resources. However, different essential needs can often fit together to achieve conservation of species while assuring life support systems and sustainable use. Conservation actions like creating parks and reserves can contribute to the wise use of all resources.

PROTECTED AREAS FOR CONSERVATION

A protected area is an area of land or water with defined boundaries recognised by law which is protected from all or certain classes of human activities to preserve natural or cultural features. There are many categories of protected areas which serve different needs. IUCN (1982) recognises ten categories which are summarised here to show the wide variety of uses of protected areas. A greater application of these different types in the Pacific Islands would help to solve a number of conservation and environmental problems.

1. Scientific or Strict Nature Reserves are closed to all use except scientific research to protect fragile natural areas or endangered species.
2. National Parks (or Territorial Parks) are relatively large natural areas, usually over 1,000 ha, open to visitors for education and recreation.
3. Natural Monuments or Landmarks are significant natural features of any size protected for public education and appreciation.

4. Nature Conservation Reserves, Managed Nature Reserves and Wildlife Sanctuaries are areas for the protection of particular species or habitats in which some use or management is permitted to ensure the survival or development of the species.
5. Protected Landscapes are areas either of natural beauty important for tourism or of traditional land uses and villages which are protected from incompatible developments.
6. Resource Reserves are areas temporarily protected from all but traditional subsistence uses until decisions are made as to alternate uses of the resources.
7. Anthropological Reserves are protected so that the people in them can continue their traditional life-style without outside interference.
8. Multiple Use Management Areas or Managed Resource Areas are large areas such as forests in which all resources are managed under government control on a sustained yield basis to meet the needs of the country.
9. Biosphere Reserves have both national legal protection and recognition by the UNESCO Man and the Biosphere programme with zoning to protect both natural and cultural values and human uses while permitting research on man's relation to natural systems.
10. World Heritage Sites are areas of world rather than just national interest which are nominated by countries that are party to the World Heritage Convention as areas of outstanding universal value.

There are about a hundred protected areas in Oceania, most of which are either strict nature reserves or wildlife sanctuaries. Only three countries have established national parks. Several smaller countries still have no protected areas.

Much more use could be made of protected areas in the islands, going beyond their narrow use for nature conservation to combine conservation with water supply protection, the maintenance of tourism resources, fisheries management, and wildlife resources management. These broader types of protected areas could help to make the most efficient multiple use of island resources on a sustainable basis.

However, protected areas are not the solution to all conservation problems, and other approaches are also needed to achieve essential conservation objectives consistent with maximum human benefits from the island. These approaches may include the protection of rare or endangered species wherever they occur, seasonal restrictions on the taking of certain species (often during the breeding season), licensing or other limitations on the numbers of people allowed to use a natural resource, habitat improvements to increase the area in which wild species can thrive (even in areas of human use), the control of environmentally damaging actions leading to pollution or erosion, etc.

ACHIEVING PROTECTED AREA DEVELOPMENT IN OCEANIA

It should be clear from the above that national parks and reserves cannot solve all the problems of nature conservation in the islands, and that in many cases human constraints will prevent their establishment even when they are desirable. What then are realistic goals for the coverage of protected areas in Oceania?

At present less than 20 percent of the ecosystems in the region are represented in protected areas. Thus 80 percent of the natural biotic communities and habitats presently have no assured protection. Some may not be in areas immediately threatened by development, and others may be sufficiently widespread that they are not in immediate danger of disappearance, but that still leaves a large number of unique island ecosystems and their associated species that are vulnerable to complete disappearance, often through unconscious acts in the normal course of island development. A species that is lost is gone forever, and with it an unknown potential for human use or betterment. An ecosystem cannot be reconstructed unless all its species can be reassembled, and even then there is much we do not know about the workings of such complex systems. Extinct species and lost ecosystems mean islands that are that much poorer and perhaps less able to respond to changing world needs and development possibilities. No country can afford to lose irreplaceable resources, and protecting them is therefore worth a considerable effort.

The ideal situation would be for each country to have a system of protected areas of different types which, together with other conservation measures, would assure the survival of all the ecosystems and species that make up the country's natural heritage. The same system of protected areas could safeguard island water supplies and hydro-electric potentials, prevent erosion in mountain areas, supply forest products, maintain fisheries productivity, encourage tourism, protect the cultural heritage, and help to ensure a high quality of life for island people. The designation of protected areas may be one of the most effective ways for a government to protect fragile or vulnerable island resources with minimum interference with peoples' attachment to their land.

Obviously such complete systems of parks and reserves cannot and should not be created overnight. Public support is necessary, the needs vary from country to country and island to island, and the resources available are very limited. The following are some suggested steps along the way towards adequate coverage of protected areas. The order is not necessarily important and can vary with country needs and possibilities.

1. Legislation will be needed to provide for protected area establishment. Even where national park Acts exist in the Pacific, they are often too narrow to allow the creation of a wide range of protected areas better adapted to island conditions. There should be provision for the creation of at least some types of protected areas on freehold or customarily owned land either with the consent of the owners or through easements, leasehold or other arrangements.
2. Each country should make a survey of all potential protected areas with natural or cultural interest. Such a survey can be used by planners to steer development away from sites with conservation interest even when it is not possible to provide formal protection for all the sites immediately.
3. Valuable natural areas that are in immediate danger should be identified for priority conservation action.

4. A few carefully selected parks and reserves can be established as demonstrations to show the values of such areas and to accustom the public to this approach to island development and management.

Several suggestions can help to make the development of protected areas easier. Whenever possible try to plan park and reserve development well in advance of any land or resource use conflicts; it can be almost impossible to set aside an area if someone else wants the resource for immediate development. In the same way try to discourage development in areas of conservation interest, such as by avoiding road building (which improves access), withholding development financing or not allowing the use of government bulldozers or other machinery in such areas. If there is a choice between several areas with similar natural interest, make reserves in those with the least development potential and the maximum inherent protection, such as broken terrain, steep slopes, remote reefs and inaccessible islands or valleys. Above all, make a major effort in public information and education so that the people will understand and support the parks and reserves. Without such support, enforcement will be almost impossible; with it, enforcement will hardly be necessary.

GOALS FOR ADEQUATE PROTECTED AREA COVERAGE

While it is clear that the coverage of protected areas in Oceania is far from adequate, a good start has been made. Steps such as broadening the categories of protected areas, and drawing on traditional knowledge and examples should help to make progress easier.

Perhaps this conference could consider setting goals or targets for conservation accomplishments by the time of the next South Pacific National Parks and Reserves Conference. Such goals might include:

- a. the establishment of at least one protected area in each country and territory of the region;
- b. an increase to 40 percent in the number of ecosystems receiving some kind of protection; and
- c. the establishment of 50 new protected areas in the region (on the average hardly more than two per country).

Such accomplishments are within the reach of the countries and territories of the Pacific. They will require the constant efforts of those responsible for conservation in each country, and the continuing support and encouragement of regional and international bodies such as the South Pacific Regional Environment Programme and the International Union for Conservation of Nature and Natural Resources. If they are achieved or surpassed, then good progress will have been made towards an adequate coverage of protected areas in Oceania.

SUMMARY

Protected areas contribute to the essential goals of conservation: maintenance of essential ecological processes and life-support systems, preservation of genetic diversity, and sustainable utilization of species and ecosystems. Such areas are usually created to protect ecosystems of which species and processes are parts. There are perhaps 2,000 kinds of ecosystems in Oceania, and ideally samples of all of them should be included in protected areas. Conservation is part of wise development and conservation areas can contribute to meeting essential human needs.

There are many categories of protected areas which could be useful in island environmental management, but of the approximately 100 parks and reserves in the region, most are more narrowly focused on nature conservation. Even these areas protect less than 20% of the ecosystems in Oceania, and many natural areas and species risk destruction, often as an unconscious side effect of development. A coherent system of protected areas can bring a country many benefits, but this requires adequate legislation, a survey of all potential protected areas, priority action for areas in immediate danger and demonstrations of the usefulness of protected areas to gain public support. Conflicts between conservation and development activities should be avoided whenever possible.

Potential targets for protected area accomplishments before the next conference might include the establishment of a protected area in each country, increasing the coverage of ecosystems in protected areas to 40%, and creating 50 new protected areas in the region.

KEY ISSUE PAPER: PARKS IN THE PACIFIC

William K. Riley
Conservation Foundation
Washington, D.C.
U.S.A.

More than a century ago, in 1870, a party of explorers travelled to the American West. They had been sent to determine the truth about fantastic tales of steaming rivers and bubbling pools. These explorers agreed among themselves, once they saw the wonders of Yellowstone, that "the sight ought to be as free as the air and water."

At that time, the natural wonders of Yellowstone were part of an enormous public domain. Most of this domain was being carved into parcels for development and resource exploitation by private parties. Yet in 1872, only two years after the party of explorers verified the reports of its wonders, Yellowstone was set aside as a "public park and pleasuring ground." It was the first National Park created in the United States.

To this day, many Americans still think first of Yellowstone when they hear the words "national park." Their vision is of a huge preserve, filled with natural wonders, much of it little changed since its discovery. Citizens of other countries also visit this splendid setting. For them, too, United States national parks often mean Yellowstone. This is true despite the fact that Yellowstone is but one of more than 300 units in the U.S. National Park System, a system that now includes some 80 million acres or more than 300,000 square kilometres.

This perception - that Yellowstone, our first park, is still the one people think of most readily - presents a special problem for me today. Undoubtedly, each of you already has made a mental note that there are no Yellowstones to be carved from public domain in your country. You may have concluded from this that the U.S. experience in creating national parks has little to do with creating national parks or reserves in your own countries.

As I was preparing for this trip, talking to people familiar with parks abroad, I heard again and again a scepticism that the U.S. experience had anything to offer to park planners and managers in Oceania. I disagree. True, there are risks in transferring ideas and experiences from one culture to another. Of course, different legal and social institutions, different traditions and perceptions, make it inadvisable merely to replicate one country's approaches in another. My organisation, The Conservation Foundation, in its nearly 40 years of activity, has worked in Latin America, Africa and elsewhere sufficiently to develop a healthy respect for cultural differences.

In fact, local differences must be respected even in our own country. What works in the State of California may not, across the continent, in New York. So I address the conference with these caveats in mind but also convinced that an understanding of the U.S. experience in establishing and managing national parks can inform your efforts.

The invitation to speak here comes at an opportune time. The Conservation Foundation has just completed a three-year study of the U.S. National Park system, its third study of the U.S. Parks in two decades. In a nutshell, the report reviewed and acknowledged many problems in resource management.

It articulated threats to the national parks from mining, urban development, energy development, and other activities outside their boundaries and thus beyond the jurisdiction of the park managers. We thought through an agenda for improving the management capabilities of the National Park Service. The Foundation recommended modest new expenditures to restore natural and cultural resources in parks where over-whelming numbers of visitors have degraded the very resources that bring people to the parks. It urged the creation of several new parks. These need not be parks in the traditional mode where the federal government owns all the land. Rather, they could reflect the new breed of parks evident in our country, parks intermixing public and private lands where the presence of the National Park Service will elevate awareness of the value of natural and cultural resources and improve land management. The Foundation's new report also urged that park managers look to state and local governments and private conservation groups for assistance in protecting park resources.

My hope today is to draw a few nuggets from the Foundation's research and the U.S. Parks experience that can help you in your respective countries do a more effective job protecting natural resources. From the report, I distill four fundamental messages:

- * First, special places - scenic and natural wonders, cultural and historic sites, and others - are worthy of special effort and attention. Amid efforts to address the spectrum of pressing national problems, policy-makers should not overlook the national assets that special places represent.
- * Second, creating a constituency is the key to protecting special places.
- * Third, in fixing your goals for special places, seek as much protection as you can achieve - but don't expect to get everything at once. Persistence is also critical for protection.
- * Fourth, in assessing opportunities, in developing plans, in carrying out protection efforts, keep your goals firmly in mind, but stay flexible in the means. Circumstances and opportunities change, therefore conservation efforts, to remain effective, must change as well.

SPECIAL PLACES

As I already noted, most Americans and many foreign visitors think of U.S. national parks in terms of Yellowstone or the Grand Canyon - to mention two of our "crown jewels." In fact, many national parks in the United States don't resemble Yellowstone at all. Many of the units are quite small. Many were not carved from the public domain. The majority protect not natural resources but cultural and historic sites - Independence Hall in Philadelphia, for example, as well as birthplaces of presidents, military battlefields and the like. Many park units, particularly those created during the past couple of decades, include private land and sometimes whole communities, inside park boundaries. These are more like parks in Europe than the traditional U.S. model.

Yet a fundamental message of Yellowstone remains true for all our parks and also for parks throughout the world: they are special places - places worthy of respect, worthy of a level of stewardship that cannot be, or at least will not be, provided for every part of a country. Given the tendency of government policy-makers to focus on problems, it's important to note that parks are not places of special problems - like toxic waste

dumps. Rather, they are assets. They have met the standard expressed best perhaps by Australia's Commission on the National Estate when it sought to identify "the things you save." As those explorers in Yellowstone recognised more than a century ago, national parks are places you save.

The value of saving these places will increase as population and development pressures in the next few decades begin to press on ever more remote places around the globe. Some species of flora and fauna native to the South Pacific face growing threats as their habitats are destroyed. The strong impetus for economic progress will continue, intensifying pressures on particular habitats and on particular species.

THE IMPORTANCE OF CONSTITUENCY

Identifying special places is only the first step. To protect them effectively, over time, it is vital to develop a constituency: people who care about these places and are willing to advocate and fight on their behalf. Both public and private demands for consumption or use of these resources often can be quite strong. So, too, the forces favouring protection must be strong.

Constituencies can be created in many ways. No one can prescribe a "right" way to create and maintain one. The U.S. experience, however, does provide an instructive example. Stephen Mather, the first director of the U.S. National Park Service, was a political wizard. He realised he needed a constituency to defend the parks against the interests representing development, that is, grazing, mining and dam construction. He created a constituency by encouraging people from all over the United States to visit the great wonders of the National Parks. He sought out the attention of political leaders and journalists.

Some of the methods he employed - encouraging the construction of large hotels near spectacular natural features, for example - seem unfortunate today. Many now wish that some of those hotels were elsewhere, outside the parks or at least more sensitively located. Other ideas seemed mistaken even to conservationists of Mather's own day. One of his close colleagues broke with him over park policy because Mather was encouraging visitor entertainment that the associate found "vulgar". The point to keep in mind today is that Mather recognised the need for political support to protect his parks from pressures to develop or exploit resources within. At that time, encroachment was the greater threat.

EVOLVING GOALS

Although there is singular danger in suggesting that someone else's goals should be, let me take the plunge: your goal in park protection probably should be to protect as much as you can, as effectively as you can, as soon as you can. In the short run, this means doing everything you can do with today's constituency and in today's political climate. In the longer run, it means shifting the constituency and the political climate to build consensus that will permit more effective protection.

In our recent report on U.S. Parks, we said that we "tilt toward protection." We did not disregard the other purposes of the national parks. Indeed, we stressed the importance - in the U.S. context - of providing for visitor enjoyment of the parks.

Yet we favoured protection because we saw no real danger of an excessively protectionist policy. Quite the opposite is true: growing impacts of visitors, increased development, commercialisation, incompatible and polluting activities around park boundaries - these are the problems confronting today's parks in the United States. We concluded in our report that the need for strong policies favouring protection has never been clearer.

In the United States, better park protection has not come primarily through passing a series of stronger and stronger laws in our Congress. Rather, the 1916 law creating the National Park system has established an unchanging goal, which successive generations of Americans have re-interpreted and applied. The 1916 law directs that park resources be preserved "unimpaired" but it also directs the service to foster public enjoyment. In short, it establishes an ideal of preservation and use. Better park protection has indeed come over time. But it has come as increasingly sophisticated and sensitive constituencies have sought to reconcile the perpetual tension between preservation and use embodied in the 1916 law.

During the 1960's, for example, the budding ecology movement began to develop a consensus that helped alleviate the disruption of wildlife and other park resources, which had resulted from well-intentioned but inadequately informed actions by park managers. Until then, Park Service staff had often tried to preserve "good" species of wildlife and eliminate "bad" ones. Mountain lions and wolves, for example, were eliminated whenever possible. Native forest insects were sprayed if they seemed to be damaging forests. Recent decades, by contrast, have brought a new recognition that preservation of park resources requires greater respect for natural processes. Though often controversial in application, this standard represents a fundamental step in the evolution of the park ideal.

The dilemma over preservation-versus-use remains today. Indeed, it seems more difficult and more pressing than ever before. Higher standards for protecting parklands are advanced by stronger and more diverse constituencies. At the same time, demands by would-be users have multiplied. Visitors are both more willing and better equipped to travel to remote parts of the parks. Although more sophisticated management techniques have improved the Park Service's ability to cope with growing use, inevitably we will fall short of the ideal that would leave resources wholly unimpaired. The long-standing struggle to apply the charge to preserve and enjoy continues to refine the park ideal.

The twin goals of preservation and visitor use have served the U.S. park system very well and perhaps some of you, too, may find this formulation a useful framework within which to work out competing public needs and demands.

Or perhaps not. For some of your special places, or perhaps even for all of them, you may find opportunities only to establish reserves with other goals in mind. Ample room exists under the umbrella of parks and nature reserves to meet many different needs. You may find, in particular, that management of natural areas strictly as natural areas, without any economic activity save perhaps tourism, is unachievable or inappropriate. The trick in such cases is to fashion a mandate responsive to your country's traditions and current needs that will enable you to protect as well as possible.

It is important to consider the long term in fashioning the legislative mandate. In the short run, it may indeed make sense to call units "national parks" even though they lack permanent protection. If this is the case, it is important to leave room for the achievement over time of additional protection. Someone - perhaps government, perhaps a community of concerned conservationists, perhaps other citizen groups - should be working to strengthen management so that it more closely approaches the goal of effective protection. If your legislative charter does not lock in today's compromises too explicitly, it may allow the degree of protection to evolve.

One way to establish the highest standards for national parks may be to establish other types of reserves for quite different purposes. Again to cite a U.S. example, some of our federal lands have very different management policies though no less carefully worked out.

Our national forests, for example, are managed by a different agency from the national parks and have a different history and legislative charge. For large portions of the national forests, our laws establish a goal of "multiple use" to benefit recreation, logging, wildlife, watershed management, and so on. Plans are prepared regularly that subsume all these activities. Planning starts with no bias. Specific plans in particular forests may emphasise one use over another, for they are tailored to the resources and needs of the forests and surrounding communities.

Incidentally, in contrast to the experience in our parks, legislative changes have played a major part in enhancing the protection afforded portions of our national forests. I refer specifically to wilderness legislation, which preserves substantial portions of the national forests in pristine condition. Within wilderness areas, the "multiple use" standard applicable in most of the forests does not apply.

Our wildlife refuges constitute another, distinct, federal land system in the U.S. Here the needs of wildlife are paramount. Particular species are protected. Sometimes for the express benefit of these species, nature is manipulated in ways that would be considered out of place in the national parks.

THE SEARCH FOR OPPORTUNITIES: KEEPING THE GOAL FIRMLY IN MIND WHILE STAYING FLEXIBLE IN APPROACH

The final message that I want to draw for you from the Foundation's research is to be not only persistent, but flexible. A great deal of what you really can do, in fact, comes down to recognising or searching out opportunities to provide special management for special places. The U.S. experience points to a few of the many opportunities that may arise from time to time. I'd like to tick off several of them.

- * In seeking special places to protect, pay attention to the political priorities of the day. In our own experience, there are far more places deserving protection than we can possibly include in the National Park system. The trick at any given time is to identify forces that may make protection possible.

During the great depression of the 1930's, for example, the U.S. government added almost 400,000 acres of marginal agricultural lands to the National Park system, relying on armies of unemployed young men to construct recreational camps for use by urban dwellers. Thirty years later, in the late 1960's, riots in some of our largest cities, where many poor and minorities reside, added impetus to the creation of National Parks in and near metropolitan areas.

- * Look for lands that are regarded as "worthless". Often the fact that an important area is unattractive for economic development provides an opportunity to protect it. One historian of the U.S. Parks experience has pointed strongly to evidence that some of the great parks, at the time they entered the system, were considered worthless.

A variety of factors besides their natural condition can make lands undesirable for development and thus, perhaps, open to special management to preserve their natural values. Taboos protecting particular areas, for example, might reinforce protection. So might badly confused land titles.

- * Seek out and strengthen local support. An important factor creating opportunities for special management is strong local support. To get a park established today, it is usually essential to have not just a constituency but specifically, a local constituency. Local support can derive from a variety of bases.

One corollary is the importance of heading off local opposition. When Redwood National Park north of San Francisco was expanded in 1978, to cite one particularly expensive example from the United States, unemployment compensation was provided for the loggers who would otherwise have cut down the preserved trees. At another new park, Voyageurs, the National Park Service has begun a campaign to attract more visitors. Neighbouring residents had expressed growing uneasiness over the failure of expected big-spending visitors to appear and pump up the local economy. In the Virgin Islands, the park hired local residents to work in the park, not only enriching the experience for visitors but also reducing local tensions.

- * Seek out and stimulate the forceful leadership of individuals and groups. Another factor creating opportunity has often been the force of a single personality. A surprising number of America's parks stand as testimony to the continuing efforts of individuals or conservation groups who persisted, often for decades, in seeking special protection for an area they loved. Crater Lake National Park, for example, testifies to the efforts of Oregon Judge William Gladstone Steel, who devoted his life to finding a way to preserve the lustrous lake that had mesmerised him as a boy.

By the same token, private groups can have enormous influence in creating new units and in maintaining them in the face of pressures to put them to other uses.

On the island nation of St. Lucia in the Caribbean, for example, the World Wildlife Fund-U.S. played the essential role of catalyst. At stake was the survival of the Saint Lucia parrot, one of the world's rarest birds. With this specific goal in mind, the World Wildlife Fund worked with the government and with non-governmental organisations to begin a wide-ranging conservation programme that enjoys

support from all segments of the community. A nature reserve was created. An environmental education programme was started which sought to change the attitudes of decision-makers, school children, university students, and the public about the value of protecting the island's wildlife. Beyond protecting an important natural area, the effort will also create jobs and train local people to manage nature reserves. Today, there is a strong sense among the people that the reserve is benefiting the entire island nation.

In the long run, it is most important to remain open to opportunities for innovation and not to be bound by what works elsewhere. In Oceania, it is not surprising to find a number of reserves that protect water areas. Given the extreme scarcity of land and the importance of ocean resources, this is a sensible adaptation of tradition. Only within the past decade has the United States made significant progress in establishing marine and estuarine sanctuaries to protect the spawning grounds of fish and shellfish, to preserve special underwater archaeological sites, and to meet other important objectives.

CONCLUSION

In conclusion, let me reiterate the four messages I would draw from the U.S. parks experience that are relevant to other countries:

- * Recognise and protect special places. Do so, to be effective, before population and development pressures engulf the natural resources you want to protect or the difficulties will magnify and the chance of success diminish.
- * Develop a constituency for protection, and most importantly a local constituency, for this will help assure not only political support for conservation when it is needed but a ready group of people to engage in protection efforts, including the necessary, ongoing management and monitoring of special places.
- * Seek as much protection as the current consensus will permit and simultaneously seek opportunities to move or enlarge the constituency so that more effective protection will become possible in the future.
- * And finally, recognise that while the goal of protection must be firmly rooted, as times and conditions change, so will opportunities and methods. Be prepared. Anticipate. And you will begin to see opportunities to advance conservation goals.

KEY ISSUE PAPER: UNESCO'S PROGRAMME ON WORLD HERITAGE AND BIOSPHERE RESERVES

Kusawata Kartawinata
UNESCO Regional Office for Science and Technology
for Southeast Asia (ROSTSEA),
Jakarta,
INDONESIA

INTRODUCTION

Unesco's programme for the environment and conservation is covered mainly by the Man and the Biosphere (MAB) Programme, which was officially launched at the 16th Session of the General Conference of Unesco in 1970.

The MAB Programme is an international programme of research, training and demonstration with the goal of developing a scientific basis for the rational use and conservation of the resources of the biosphere and for the improvement of the global relationships between man and the environment. It is an inter-disciplinary applied research programme involving specialists in natural and social sciences, planners and managers, and local populations.

Among the broad outlines of the Programme are the MAB Project 8: "Conservation of Natural Areas and of the Genetic Material They Contain and Biosphere Reserves"; MAB Project 1: "Ecological Effects of Increasing Human Activities on Tropical and Sub-tropical Forest Ecosystems"; MAB Project 5: "Ecological Effects of Human Activities and the Value of Resources of Lakes, Marshes, Rivers, Deltas, Estuaries and Coastal Zones"; and MAB Project 7: "Ecology and Rational Use of the Island Ecosystems". In the Medium Plan for 1984-1989 conservation and related research and training activities are contained in Programme X.5 (Management of Coastal and Lowland Regions), X.6 (Land-use Planning and Terrestrial Resources), X.8 (The Natural Heritage) and X.9 (Environment Education).

In 1971 the Convention on Wetlands of International Importance, Especially As Waterfowl Habitat was adopted by the International Conference on the Conservation of Wetlands and Waterfowl at Ramsar, Iran. UNESCO accepted the role of depository for the Convention and the International Union for the Conservation of Nature and Natural Resources (IUCN) agreed to provide the Secretariat for the management of the Convention.

In 1972, the Convention on the Protection of the World Cultural and Natural Heritage was adopted by the UNESCO General Conference at its 17th Session. UNESCO is not only the depository but also provides the Secretariat for this Convention. IUCN was one of the initiators of the Convention and assists the World Heritage Committee in an advisory capacity with the identification of natural areas which qualify for the World Heritage List. These Conventions and the Inter-Governmental MAB Programme are three major instruments by which UNESCO helps to implement the World Conservation Strategy which was launched in 1980 by the members of the Ecosystems Conservation Group (UNEP, FAO, UNESCO, IUCN) and the World Wildlife Fund.

THE RAMSAR CONVENTION

The Convention on Wetlands of International Importance, Especially as Waterfowl Habitat was adopted at Ramsar, Iran, on 2 February 1971. Today, 36 states have become Contracting Parties and more than 200 wetlands covering about six million hectares have been designated by Contracting Parties for inclusion in the List of Wetlands of International Importance, the so-called Ramsar List.

The Ramsar Convention is unique in that it is the only world-wide treaty so far established for preserving certain types of ecosystems, i.e. wetlands, together with the species, in particular migratory waterfowl species, that are ecologically dependent on these ecosystems.

The Wetlands Convention at present lacks force, requiring only that States select at least one wetland for conservation, but not providing criteria to guide selection, guidelines for management, or adequate safeguards against delisting a wetland once selected. An international conservation convention must have a secretariat and financial mechanism to be effective and these are lacking for the Wetlands Convention.

Efforts are being made to revise the Convention and make it an important force for the protection of coastal and other wetlands essential for supporting fisheries as well as waterfowl, which is its chief concern at present.

THE WORLD HERITAGE CONVENTION

The International Convention for the Protection of the World's Cultural and Natural Heritage (World Heritage Convention) was adopted by the General Conference of UNESCO in 1972. The Convention provides for the first time a permanent legal, administrative and financial framework for international co-operation.

A significant innovation in the Convention is the linking together of what were traditionally regarded as two quite different sectors: the protection of both the cultural and the natural heritage. It introduces also the specific notion of a "world heritage" which does not recognise political or geographical boundaries.

The World Heritage Convention came into force in December 1975, after twenty UNESCO Member States had adhered to it. To date, the number of States Parties has grown to 73. The process of identifying those cultural and natural sites which qualify for protection under the Convention has started, and technical assistance through the World Heritage Fund has already been provided to a number of States Parties.

At present, 136 natural and cultural properties of outstanding universal value have been designated in the World Heritage List by decisions of the World Heritage Committee. However, only 44 properties are natural, or are mixed cultural/natural properties. UNESCO hopes to make a balance between natural and cultural properties on the World Heritage List with the help of IUCN, particularly its Commission for National Parks and Protected Areas which plays an advisory role in the implementation of the Convention.

The Convention has not made a good progress in Southeast Asia and the Pacific. As of 1982 only four sites have been listed and all are in Australia, i.e. the Great Barrier Reef Marine Park, Kakadu National Park and Willanda Lakes Region (IUCN 1982). It is very evident that important

gaps exist for the region and in particular for the South Pacific, both in terms of States Parties to the Convention and of properties on the World Heritage List.

Through the Convention technical co-operation to support the efforts of States Parties to preserve their cultural and natural heritage is made possible in a number of ways (Von Droste 1982):

1. Assistance for the preparation and elaboration of nominations to the World Heritage List;
2. Assistance for preparation in drawing up large-scale requests for technical co-operation;
3. Assistance for the preparation in drawing up inventories of cultural and/or natural properties suitable for inclusion in the World Heritage List;
4. Emergency assistance for properties included in the World Heritage List or potentially suitable for inclusion therein, which are in imminent danger of important damage or destruction;
5. Conservation measures for properties included in the World Heritage List or considered suitable for inclusion;
6. Fellowships for training in conservation methods and techniques; and
7. Assistance to national or regional training centres.

Many States Parties to the Convention have gained benefits from international assistance financed through the World Heritage Fund. There is no doubt that this Convention provides a system of international co-operation that is attractive to developing countries in the South Pacific.

BIOSPHERE RESERVE NETWORK

The Natural Heritage Programme is aimed to encourage the preservation of natural sites and the maintenance of the greatest possible variety of genetic resources of animal and plants and the preservation of natural heritage in accordance with the World Heritage Convention. Through the development of biosphere reserves efforts are focussed on the protection of landscapes, unique organisms, entire ecosystems, balanced man-made landscapes and certain ecological and evolutionary processes.

The biosphere reserve concept was introduced in 1971 by the MAB Programme and is an integrated concept of conservation, combining the preservation of a variety of ecosystems and their genetic resources with research, ecological monitoring, education and training. Biosphere reserves are selected as representative examples of the world's major ecosystems.

The characteristics of biosphere reserves may be summarised as follows:

1. Biosphere reserves are protected areas and together they form a world-wide network;
2. The network includes representative examples of world major ecosystems;
3. Each biosphere reserve may include one or more of:

- i. representative examples of natural biomes;
 - ii. unique communities or areas with unusual features of exceptional interest;
 - iii. examples of traditional land-use patterns resulting in harmonious landscapes;
 - iv. examples of modified or degraded ecosystems capable of being restored to more natural conditions.
4. Each biosphere reserve should be large enough to be an effective conservation unit and to accommodate various forms of utilisation without conflicts;
 5. Biosphere reserves should be able to provide facilities for research, education and training; and possess values as standards of measurement of long-term changes;
 6. A biosphere reserve should have sufficient long-term legal protection;
 7. A biosphere reserve may coincide with another form of protected area (e.g. national park, nature reserve, sanctuary, etc).

In essence a biosphere reserve is composed of a strictly protected core area surrounded by a buffer zone in which experimental and manipulative research as well as traditional land-uses are accommodated.

Notable features that make biosphere reserves different in emphasis to other conservation approaches are:

- (a) the emphasis on conservation of ecosystem rather than individual species;
- (b) selection of representativeness instead of uniqueness;
- (c) provisions for long-term continuous research and monitoring, including research towards improvement of the scientific basis for conservation; and
- (d) provisions for international co-operation in conservation and research through the UNESCO's Intergovernmental MAB Programme.

In the biosphere reserve concept the co-operation and participation of the local population (living within or around the reserve) is especially emphasised, in order to make conservation activities socially acceptable. Research and training for instance, may not be confined to purely scientific research but may also be directed towards aspects supporting the development and welfare of local population. The application of the biosphere reserve concept has been successfully demonstrated in the Mapimí Biosphere Reserve, Mexico (Halfpeter 1981). The key to this success lies in a pragmatic approach to conservation.

Great flexibility is possible in the application of the biosphere reserve concept. Thus its emphasis can be adapted to satisfy the specific needs of different regions. In one country it may emphasise research while in others conservation or research and training are given special emphasis.

To establish an ideal biosphere reserve, a large area is required to accommodate all its characteristics. This is not always possible particularly in insular countries like those in the Pacific, and it is difficult even in a large country like the United States. As a solution to this problem the U.S. MAB Bureau came up with the "cluster concept". This was originally conceived with the linking of separately designated biosphere reserves under different administrators, but was later expanded to accommodate multiple sites covered by the same biogeographic sub-region (Gregg 1983). Thus each biosphere reserve will eventually comprise multiple sites that include a variety of representative ecosystems. The California Coast Ranges Biosphere Reserve, for instance, consists of the Redwood National Park as the northern unit, evergreen douglas fir forests as the central unit with the natural stands of redwood forest representing the southern limit. It brings together various protected areas managed by various agencies, and has facilitated ecological monitoring, experimental research, watershed rehabilitation, environmental education and student training (Gregg 1983).

To date 243 biosphere reserves in 65 countries have been designated by UNESCO, covering a total area of more than 115 million hectares. The Southeast Asia and the Pacific region registers only 18 biosphere reserves. These are in the Peoples Republic of China (3), French Polynesia (1), Indonesia (6), Japan (3), Republic of Korea (1), Philippines (1), and Thailand (3). They form an international network with an international character made possible by the exchange of information and personnel. The network is co-ordinated by the MAB Secretariat at the UNESCO Headquarters, which also provides catalytic support for various activities. Under such an arrangement it is possible to make the research, training and other relevant activities organised by MAB National Committees in 105 countries in various biogeographic zones comparable.

Biosphere reserve networks may be established on an ecological basis, such as has been the case with the following:

- (a) The Tropical Biological Reserve Network with 25 sites;
- (b) The Arid Zone Biological Reserve Network, covering sites in Asia, Africa and South America;
- (c) The Temperate Mixed Forest Biological Reserve Network which includes sites in South and North America and in Europe;
- (d) The Wetland Biological Reserve Network with sites in Africa, Europe and North America.

So far no biosphere reserve network covering islands with similar ecological systems has been established, although the potential for such a network exists, e.g. Komodo Island (Indonesia), Atoll de Taiaro (French Polynesia), Malandi-Watamu (Kenya), Macchabee/BeI Ombre (Mauritius) and Virgin Island (USA). An international Biosphere Reserve Network for Conservation and Research exists today and the status of the Network was reviewed in 1983 at the First International Biosphere Reserve Congress in Minsk, USSR.

During the Eighth Session of the International Council of the MAB Programme in Paris, in 1984, the Council paid special attention to the Five-Year (1985-1989) Action Plan for Biosphere Reserves. The Action Plan has three major thrusts: to improve and expand the worldwide network of biosphere reserves; to make the reserve more effective in carrying out conservation

and development goals; and to increase man's knowledge of natural ecosystems. Included among its provisions are:

1. improvement of the international network of global ecosystem conservation;
2. improvement and upgrading of the management of existing and new biosphere reserves to correspond with their multi-purpose objectives;
3. promotion of the conservation of key species and ecosystems in biosphere reserves;
4. promotion of co-ordinated research projects on conservation science and ecology within biosphere reserves;
5. development of monitoring activities in biosphere reserves to provide a basis for scientific research and management activities and contribute to the understanding of environmental changes;
6. enhancement of the role of biosphere reserves in planning and development;
7. promotion of local participation in the management of biosphere reserves;
8. promotion of environmental education and training related to biosphere reserves and the use of the full potential of the reserves for these purposes;
9. full utilisation of the potential of the network to generate and spread knowledge about the conservation and management of the biosphere and to promote the biosphere reserve concept through information and demonstration.

In keeping with the general nature of the MAB Programme implementation of the Plan will be carried out by individual countries throughout the world, and its success will depend largely on the support of governments. Since UNESCO's membership is made up of national governments, the Action Plan serves as an ideal medium through which to organise the Programme and to strengthen international co-operation.

RELATIONSHIPS BETWEEN BIOSPHERE RESERVES AND WORLD HERITAGE SITES

Because of their different characteristics and criteria for selection, only in very special cases will biosphere reserves qualify as World Heritage sites. It has been emphasised earlier that biosphere reserves are established to protect and preserve representative ecosystems of the world terrestrial and aquatic biomes. The World Heritage sites, on the other hand, are designed to protect exceptional cultural and natural properties of universal value. In other words, biosphere reserves must satisfy the criteria of representativeness and naturalness, and World Heritage sites the criteria on uniqueness and universal values.

Furthermore, biosphere reserves differ also from other protected areas. The latter may have specific main purposes, such as conservation, research or education and training; but in biosphere reserves these three purposes should be integrated. Being an integral part of the MAB Programme, all activities in biosphere reserves should emphasise aspects of man's relationship with the environment.

Although there are differences between World Heritage sites, other protected areas and biosphere reserves, the inclusion of part or wholly protected areas in biosphere reserves is possible provided that biosphere reserve criteria are satisfied. The opposite is also true, i.e. that biosphere reserves having unique characteristics may qualify as World Heritage sites. This is, in fact, desirable because their protection will be strengthened legally and financially by the World Heritage Convention.

APPLICATIONS IN THE PACIFIC REGION

The diverse terrestrial and marine ecosystems, varied cultural histories and traditions as well as diverse traditional land-use systems in the Pacific Islands provide good opportunities for applying the concept of multi-sites (Gregg 1983) or cluster biosphere reserves. The countries in this region have a long history and strong inter-island co-operation and good relationships with developed nations. The concept of conservation is not new to the people of the region. The people are endowed with a wealth of traditional knowledge of conservation and rational use of natural resources (Johannes 1978, 1984; Ruddle and Johannes 1984), which are ecologically sound. In fact, this knowledge has been put into practice for a very long time, long before the modern day ecologists came to think about the necessity of applying the principles of ecology and conservation in natural resource utilisation. Thus there are favourable conditions necessary for a successful establishment of biosphere reserves.

The 1982 United Nations List of National Parks and Protected Areas registered several parks and reserves in the region; i.e. two in Fiji, five in Tonga, two in Western Samoa and one in French Polynesia; the latter is the Atoll de Taiaro Biosphere Reserve. There are, therefore, already protected areas available as building blocks for further expansion into a biosphere reserve system. It may be done through the expansion of existing individual parks and reserves to meet the biosphere reserve criteria, or else by selecting new areas that fit biosphere reserve requirements, complementing the existing areas, so that a multi-site biosphere reserve may be constituted.

The biosphere reserve network which could be formed would represent the Oceanian Biogeographical Realm consisting of seven biogeographical provinces, i.e. the Papuan, Micronesian, Hawaiian, Southeastern Polynesian, Central Polynesian, New Caledonian and East Melanesian Provinces (Udvardy 1975). In addition to the existing protected areas mentioned earlier in Fiji (East Melanesian Biogeographical Province), Tonga and Western Samoa (Central Polynesian Biogeographical Province), in the Moluccas and Irian Jaya, Indonesia (Papuan Bio-geographical Province). More than a half of them are located in small islands whose insular environments are more or less similar to those in the islands of the Pacific.

The network in the Papuan realm can be linked with those in the Australian realm and Indomalayan realm and together they can eventually form a global network of biosphere reserves of small islands as has been proposed by Van Droste (1983). The application of the biosphere reserve concept is in fact a dynamic, gradual, systematic and opportunistic process within a biogeographical province until it includes all representative ecosystems (Gregg 1983) in order to achieve a multi-purpose conservation programme. Gregg (1983) rightly said that "by establishing biosphere reserves on a biogeographical basis, the reserves serve as symbolic integration of complementary land management units, unifying them in a manner not achievable by other means".

In May 1983 the Caribbean Conservation Association, UNESCO MAB Programme and the U.S. National Park Service organised a "Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands". In view of similar general environment settings (i.e. small islands in marine environment) between the Caribbean and Pacific regions, the recommendations (see Appendix) and proceedings of this workshop will be relevant as a reference to the present conference and for planning of the establishment of biosphere reserves and World Heritage sites in the Pacific region. The paper by Dr Allen D. Putney, (1983) in the proceedings, in particular, will be valuable as a guide in the selection of biosphere reserves and World Heritage sites as a complement to other general guidelines (e.g. UNESCO 1974, IUCN 1979). However, much more specific criteria for selection of biosphere reserves and World Heritage sites in the Pacific will certainly depend on local conditions and needs, and will perhaps require further detailed discussions.

The application of the biosphere reserve concept in the insular environment will certainly require co-ordination in the use of many islands that are ecologically, culturally and functionally complementary (Gregg 1983). An institutional framework for planning, establishing and managing the sites, and for co-ordinating regional activities will be required also. Experiences in Mexico (Halfpter 1981) and elsewhere indicate that the success of biosphere reserves depends a great deal on the involvement of, and association and mutual trusts among the parties who use and benefit from the reserve.

APPENDIX

RECOMMENDATIONS

WORKSHOP ON BIOSPHERE RESERVES AND OTHER PROTECTED AREAS FOR SUSTAINABLE DEVELOPMENT OF SMALL CARIBBEAN ISLANDS

Canell Bay, St. John,
U.S. Virgin Islands,
10-12 May 1983

The "Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands" met at Canell Bay, St. John, U.S. Virgin Islands, May 10-12, 1983. Participants included scientists, educators, resource managers and physical planners from the Lesser Antilles, as well as representatives from interested international, regional and U.S. organisations. The workshop provided an opportunity to discuss the vital role of protected areas in development and especially the potential contributions that could be made by UNESCO's Biosphere Reserve Project.

During the workshop, it was recognised that sustainable development depends on the interplay of many forces. The wants and needs of the region's people must be balanced with the productive capacity of the region's resources. If through lack of foresight, we abuse these resources or use them beyond sustainable levels, the well-being of future generations will be sacrificed.

In the Lesser Antillean region, the diversity of natural ecosystems is complemented by a diversity in the needs, conditions, value systems, knowledge and abilities of local communities. If we are to realise the full potential of the region's variety of natural and human resources, then we must study and document the different capacities and limitations of these resources. By sharing this information and experience we can more effectively manage natural resources for maximum long-term benefits to society. There is special concern in the region for improving the standard of living; creating employment opportunities; stimulating social, cultural and educational activities; and attaining social and political harmony.

UNESCO's Man and the Biosphere Programme, especially its project on Biosphere Reserves, provides an international framework for documenting and sharing this information. Through this programme, representative areas can form elements of a Biosphere Reserve in the region which will serve as laboratories and educational centres for understanding the potential and limitations of the natural and human resources of the region. Systematic documentation and diffusion of this information could allow us to share local knowledge with others in similar ecological zones world-wide. Synthesis of the knowledge would then provide the basis for teaching the management of natural resources based on the particular characteristics of the region.

After discussing the potential of the UNESCO Biosphere Reserve Project and the characteristics and needs of the region, the participants of the workshop agreed on the need to determine the feasibility of establishing and managing a system of sites as a single or several Biosphere (Reserve(s) representative of the region. To bring this idea to fruition, the workshop participants made the following specific recommendations which together form a coherent plan of action:

1. Recommendations to International Organisations

- 1.1 Being acutely aware of the difficulties of co-ordinating activities among the governments of the various nations and territories of the region, it is recommended that the Caribbean Conservation Association (CCA) be recognised by international organisations as the co-ordinating agency for the feasibility stage of establishing a single or several Biosphere Reserve(s) in the Lesser Antilles.
- 1.2 Recognising the diverse nature of the ecological, cultural and political systems of the Lesser Antillean Biogeographic Province (Sensu Udvardy), as well as the need for regional co-operation in establishing and developing a multi-island Biosphere Reserve or Reserves, it is recommended that international organisations provide the technical and financial support necessary to assist the CCA in determining the feasibility of establishing a Biosphere Reserve or Reserves representative of the Lesser Antilles.

2. Recommendations to the Caribbean Conservation Association (CCA)

- 2.1 Noting that the CCA has over a decade and a half of experience in promoting conservation in the region, and that all the islands and territories have membership of one kind or another in the organisation, it is recommended that CCA form a Consultative Committee for investigating the feasibility of establishing a Lesser Antillean Biosphere Reserve or Reserves. Such a committee would be made up of the government representatives to the CCA in the cases of government members, and by designated organisational members in the cases of islands which are not government members.
- 2.2 Noting the many separate tasks that will have to be carried out to determine the feasibility of forming a multi-island Lesser Antilles Biosphere Reserve or Reserves, it is recommended that the CCA establish working groups to advise the full committee on:
 - a. Critical environmental issues related to development and corresponding research needs, which are now or shortly will be facing the islands of the region;
 - b. Sites which potentially could form the core zones of a regional Biosphere Reserve or Reserves, and
 - c. Criteria for defining appropriate use zones for pairing with core zones and specific sites which might fit these criteria for inclusion in a potential Lesser Antilles Biosphere Reserve or Reserves.
- 2.3 Being aware of the very special characteristics and needs of the Lesser Antilles, it is recommended that the CCA Consultative Committee use the following criteria in recommending specific sites for inclusion:
 - a. Core and appropriate use areas should be representative of the natural marine and terrestrial ecosystems and human institutions and traditions of the region.

- b. Areas should be selected so as to encourage to the utmost the sharing of human resources of the region, especially the technical and scientific capabilities of the educational and research institutions.
- c. Areas to be included should include the full spectrum of zones recommended for a Biosphere Reserve. This would encompass a core zone to conserve the natural diversity and genetic resources of the region, appropriate use zones to study and document sound resource utilisation patterns, experimental zones to study and document new approaches to resource utilisation and rehabilitation zones to experiment with techniques to restore degraded ecosystems.
- d. Areas selected should include several islands in order to facilitate sharing of human resources and institutional capabilities.
- e. Approaches used for the preparatory phase and subsequent management should maximise local involvement so that activities meet the real needs of local communities and help to solve their most pressing problems.

3. Recommendations to Governments of the Region

- 3.1 Recognising the need for and utility of a regional approach to research, training and extension in natural resource management, it is recommended that the Governments of the region work with the CCA to determine the feasibility of a Lesser Antilles Biosphere Reserve or Reserves comprises of a network of areas on several islands.
- 3.2 Noting the utility of international programmes for standardising approaches, facilitating the identification and application of external financial and technical resources and for sharing resources available within the region, governments of the region are urged to become members of the World Heritage Convention and to participate in UNESCO's Man and the Biosphere Programme.
- 3.3 Cognisant of the prestige, international interest in and potential financial and technical resources for the establishment and management of World Heritage Sites, the Governments of the British Virgin Islands, Dominica and Martinique are urged to take note of the "Indicative Inventory of Natural Sites of World Heritage Quality" recently published by the Commission on National Parks and Protected Areas of the International Union for Conservation of Nature and Natural Resources, which includes important areas of their islands.
- 3.4 Mindful that the Government of the United States has taken the first step in establishing a Biosphere Reserve in the Lesser Antilles by dedicating the Virgin Islands National Park as a Biosphere Reserve, it is recommended that the Virgin Islands Biosphere Reserve serve as a focal point for U.S. co-operation in natural resource management in the region; and further, that the Virgin Islands Biosphere Reserve be expanded to include as many of the potential zones under recommendation 2.3 as possible.

4. Recommendation to Universities and Research Laboratories

Recognising the important contribution of universities and research laboratories in carrying out the education, training, research and documentation functions of a Biosphere Reserve, it is recommended that the research and educational institutions of the region take an active part in establishing and managing a multi-island Biosphere Reserve or Reserves in the region and that they, when possible, concentrate their field activities within designated areas of Biosphere Reserves.

KEY ISSUE PAPER: ENVIRONMENTAL MANAGEMENT THROUGH REGIONAL CO-OPERATION:
SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME

Jeremy Carew-Reid & David Sheppard,
South Pacific Regional Environment Programme,
NEW CALEDONIA

INTRODUCTION

1.1 The South Pacific Environment

The environment is everything about us, including our communities and what they produce. It is the land, sea, air and waters where we live, and the plants, animals and fish on which we depend. It touches on so many aspects of our life that we cannot afford to ignore it.

Management of the environment has usually been viewed as the conservation of nature and the prevention of pollution. However, the World Conservation Strategy takes a broader and more embracing view in defining conservation as "the management of human use of the biosphere (all life on the earth) so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations". (IUCN 1980)

Such a view is particularly relevant to the environment of the South Pacific which is particularly diverse with some 2,000 kinds of ecosystems. These systems support complex relationships between features such as tropical rainforests, mangroves, lagoons and reefs. Some ecosystems occur in every country of the region, and others are essential to island resources upon which local people depend. (Dahl and Baumgart 1982).

Even where ecosystems differ from country to country, they share many common features based on island type which allow the development of regional approaches to their management. The region is dominated by the Pacific Ocean, the largest feature on the earth's surface. While this ocean divides the South Pacific countries it also serves to unite them in a single environmental system. The waves, currents and weather do not respect national boundaries, and any major alteration or contamination could have widespread effects. The resources of this regional system are shared by all the countries. Migratory species such as the tunas, sea turtles and many birds pass in and out of many countries' jurisdictions. (Dahl and Baumgart op.cit).

All of the region is within the area of coral reef growth, and the presence of coral reefs is one of the principal characteristics of the South Pacific marine environment. Coral reefs are one of the most ancient and highly-evolved ecosystems on earth, and as such they are complex, dynamic and fragile if pushed beyond their limits.

The South Pacific is also characterised by the long history of custodianship of the environment, which has been a traditional feature of island culture. This care is expressed in local customs and rules of conduct and the overall spiritual heritage of the islands, which teaches respect for the earth and its productivity and the concept of stewardship for future generations.

In the past, traditional practices conserved fisheries, land and other resources. Today, however, there are a number of influences which are placing the South Pacific environment increasingly under threat.

1.2 The South Pacific - An Environment Under Threat?

The widespread image of the South Pacific is one of an unspoilt nature environment of great natural beauty. However, in many cases the reality does not measure up to this ideal. For example, the Pacific shares with the other island regions of the world, the unenviable reputation of having some of the world's highest rates and numbers of species extinctions. Many other species are presently at risk. (Dahl 1984). This situation is one implication of the increasing development pressures on the small land areas and surrounding coastal waters of islands with little capacity to absorb major environmental impacts.

1.3 A Regional Response to Environmental Problems

The most critical issue facing the countries of the South Pacific (see Appendix) is the sustainable use and management of limited island resources. Human activities are leading to an erosion in the resource base on which islanders depend for survival.

The resultant problems require responses that are tailored to the particular environment and unique circumstances of the South Pacific. Such responses include the formulation of clear government policies on environmental protection and enhancement, setting up effective legislation and applying it in decisive administrative actions. These aspects in turn will require management skills and a good scientific understanding of the island environment.

The nature of the environmental problems facing the region and the need for action was recognised by the countries of the South Pacific in the formation of the South Pacific Regional Environment Programme (SPREP).

SPREP is tailored to the unique characteristics of the South Pacific region and provides an example of the island countries working together to address a common problem.

HISTORY AND ADMINISTRATION

2.1 History

The history of SPREP can be considered in two phases; a "planning phase" and an "implementation phase".

In the Pacific during the 1970's there was a steady growth in the awareness of environmental problems prompting a number of countries to take action. The idea for a regional South Pacific Environment management programme came from the South Pacific Commission (SPC) in 1974. Consultations between SPC and UNEP led, in 1975, to the suggestion of organising a South Pacific Conference on the Human Environment. The South Pacific Bureau for Economic Co-operation (SPEC) and the Economic and Social Commission for Asia and the Pacific (ESCAP) soon joined SPC's initiative and UNEP supported the development of what became known as the South Pacific Regional Environment Programme (SPREP) as part of its Regional Seas Programme.

A co-ordinating Group, consisting of representatives from SPC, SPEC, ESCAP and UNEP was established in 1980 to co-ordinate the preparations for the Conference.

The "planning phase" was thus characterised by two factors. Firstly, a recognition by South Pacific countries that problems existed and that these problems should be addressed through regional co-operation and a pooling of resources. Secondly, a lengthy period of preparatory work, co-ordinated through the South Pacific Commission, involving documentation of environmental problems within specific island countries. For example, 18 "country reports" and 13 "topic reviews" on key problems were prepared between 1978-81. These papers demonstrated that there was a huge job to be done in the region and that many countries and territories were facing a major onslaught on the environment.

The information was gathered for consideration at the Ministerial Conference on the Human Environment in the South Pacific which was held in Rarotonga, Cook Islands, in 1982. This conference marked a turning point for environmental management in the South Pacific. The significance of the conference was two-fold; through adoption of the "South Pacific Declaration on Natural Resources and the Environment" and through the formal adoption of an Action Plan. This Action Plan serves as the blueprint for SPREP, identifying sixty areas of environmental assessment, management and law in which SPREP has a mandate to mount activities (SPREP 1982).

The Action Plan provides the under-pinning for the implementation phase and specific details of the work programme are outlined in Section III.

This paper now turns to the administrative arrangements and structure of SPREP, to provide a context to the sections that follow.

2.2 Administration

The basic structure of SPREP is shown in Figure 1. This structure has been developed to generate and implement a work programme to realise Action Plan objectives. The key points of this structure are:

- * The meetings of the South Pacific Conference and the South Pacific Forum have overall authority for policy decisions concerning all substantive and financial matters related to the Action Plan.
- * The SPREP CO-ORDINATING GROUP is chaired by the Director of SPEC with membership comprising the South Pacific Commission (SPC), (Implementing Agency), the United Nations Environment Programme (UNEP), and the Economic and Social Commission for Asia and the Pacific (ESCAP). UNEP fulfils a crucial role by providing expert assistance and information through the Regional Seas Programme Activity Centre.

SPREP is identified as one of the UNEP regional seas areas and consequently, during the first two years of the implementation phase UNEP was a major source of funding for the Programme. Since the Rarotonga Conference the Co-ordinating Group has met regularly and provided overall guidance on the implementation of the programme.

- * The SPC is the host organisation and executing agency for SPREP and is responsible for the overall technical co-ordination and supervision of the Action Plan. This function is carried out under the guidance of the Co-ordinating Group.
- * The SPREP section within the SPC facilitates the day-to-day implementation of the Action Plan. The SPREP regularly prepares a work programme for endorsement by the South Pacific Conference and South Pacific Forum. Project proposals are derived from country requests submitted throughout the year, from recommendations made at annual consultative meetings of research and training institutions in the Region and through directions of the SPREP Co-ordinating Group.
- * Projects are implemented through two SPREP Networks : the Research and Monitoring Network and the Education, Training and Information Network. Membership of these Networks is open-ended, expanding to include government and non-government organisations from the region. This builds upon local organisations by providing the framework for intra-regional co-operation and by channelling SPREP resources through the Networks.
- * As part of this administrative framework there are nominated focal points in each of the countries, who serve as high level government contact persons to assist in the implementation of Action Plan objectives within specific countries.

2.3 Funding

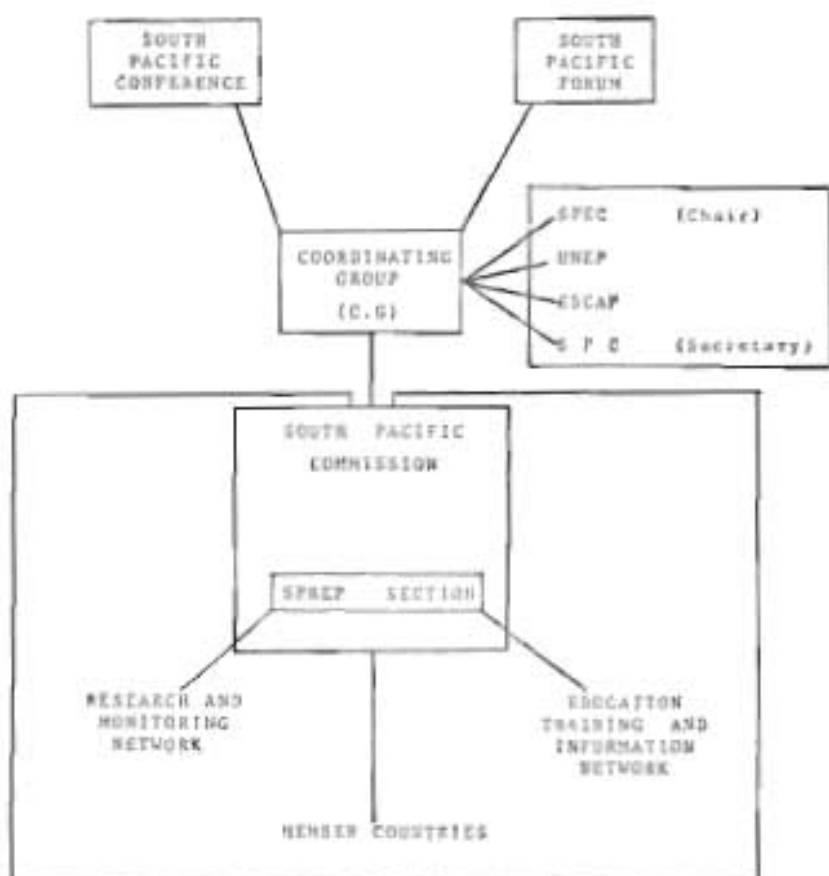
The programme is funded from a number of sources: UNEP, participating countries and a range of national and international donors. The total budget has been approximately US\$600,000 per year.

The funds from UNEP are channelled primarily through the Regional Seas Programme of UNEP. These funds are allocated to specific projects relating to monitoring and survey of the coastal and marine environment.

The other major source of funds is through annual voluntary contributions from member countries according to an agreed formula. During 1983, the first year of contributions, 74% of country funds were received, 92% in 1984, and for 1985, a record of fifteen countries pledged contributions at the 1984 South Pacific Conference. Additional funding is increasingly needed due to the comprehensive nature of the SPREP Action Plan and SPREP has been instructed by the Co-ordinating Group to seek other sources of funds to ensure its effective implementation.

For planning purposes SPREP activities are placed in three categories. The first includes those projects with highest priority to which UNEP funds, which are assured each year, are applied. Projects within the second category are prioritized for implementation as country contributions are received throughout the year. The third category of projects are those which have low priority or which require substantial funds beyond those available within the first two budget categories. For these projects specific funds are sought from aid agencies (Carew-Reid 1984).

FIGURE 1

SPREP STRUCTURE AND ADMINISTRATION

WORK PROGRAMME APPROACH

3.1 Guiding Principles

The overall aim of the South Pacific Regional Environment Programme is to assist Pacific Island countries to work co-operatively to maintain and improve their quality of life, by encouraging proper management of their environment and its resources.

The framework for achieving this aim is laid down by the detailed objectives in the Action Plan. Implementation of these objectives proceeds according to three guiding principles. SPREP activities should:

- (i) be undertaken by local organisations and people;
- (ii) include an on-the-job training component with specific training courses conducted in-country or on a sub-regional basis;
- (iii) be flexible with an emphasis on follow-up.

These first two principles aim to build upon existing island organisations and expertise. The first principle also ensures that projects do not lose touch with the needs of people they are intended

to serve. Where local expertise is not available and experts are commissioned from outside the region, they have local counterparts. The second principle requires that all SPREP projects should have a training component. Training courses on specific aspects of environmental management focus on development projects which are planned or underway so that course output will directly benefit the host country.

The third principle discourages the syndrome where consultants enter a country, undertake a project and leave a report without consideration of resources and guidance required to put it into effect. It is assumed that SPREP projects will continue as long as a Government and project team jointly consider that the need from which the project arose has been appropriately satisfied and that sufficient on-the-job training has occurred to impart an appropriate degree of self-sufficiency. This approach provides the opportunity within a country to develop over time a number of integrated activities which leads to a broader perspective on environment management problems.

3.2 Approach to Projects

The objectives in the Action Plan provide the basis for developing annual work programmes for SPREP. Projects are both generated and implemented through the two SPREP Networks - the Research and Monitoring Network and the Education, Training and Information Network.

This networking system serves to widen the pool of resources and expertise that are available to assist in addressing Action Plan objectives through co-operative activities. The "implementation phase" has been marked by the initiation of a large number of specific projects. The fields of activity under each network include the following:

Research and Monitoring Network

- (i) Watershed management, which includes problems of soil erosion and sedimentation related to poor land-use practices, for example, in the fields of forestry and agriculture. Projects here include the assessment of effects of the introduction of pine plantations in Fiji and Papua New Guinea.
- (ii) Inland and coastal Water Quality Monitoring and Control. Projects include the monitoring of fresh and sea water for biological and chemical pollutants, training in monitoring and analysis and establishing management programmes.
- (iii) The survey and monitoring of coastal ecosystems and their interaction, including mangrove, seagrass and coral reef communities. Projects include the preparation of training manuals, training exercises and the survey and mapping of coastal resources.
- (iv) The continued study of ocean conditions in the SPREP region, and the study of the feasibility of region-wide monitoring of potential ocean pollutants.

- (v) Problems related to the regulation and use of pesticides and other hazardous chemicals. One project involves monitoring of pesticides in agricultural workers.
- (vi) The environmental assessment of the effects of development proposals and training in project evaluation methods.

Information arising from these and other activities aim to provide South Pacific countries with practical responses to pressing environmental problems.

Education, Training and Information network

The Programme elements relating to education, training and information are closely linked to those of the research and monitoring network. The first aims to increase community awareness on environmental issues by developing projects involving radio and other media. Broadcasters from sixteen island countries participated in a six-week training course on the production of environmental programmes in local languages and on local issues. The broadcasters are currently preparing regular items for local broadcast on key problems supported by in-country training through SPREP. In addition, a SPREP set of fifteen radio programmes is being prepared by island broadcasters for regional distribution. PEACESAT satellite communication is also used for inter-country group discussion on environmental topics.

The strengthening of environmental aspects of teaching curricula and the preparation of environmental education resource materials is an important second work element for this Network. Fact Sheets have been prepared on aspects of Pesticide use, coral reefs, conservation, soil erosion and forests, for use by broadcasters, community groups and government departments.

Special emphasis is given to recording of traditional knowledge and practice in island communities where it has facilitated conservation and sustainable use of resources. Field studies on this subject have been conducted in New Caledonia and Tokelau. Audio-visual and written training materials also have been prepared and courses conducted on the integration of traditional and modern scientific methods of sustainable resource use.

A resource base of existing education material in the Region is being developed by SPREP and an annotated catalogue is being prepared to facilitate information exchange and preparation of new material. Resource people are provided, mostly recently in the Solomon Islands, to assist countries further in developing environment curricula and supporting material. A Regional Environmental Journal also is being produced. Numerous countries are approaching SPREP for advice on waste disposal problems particularly the recycling of aluminium cans. SPREP has assisted in establishing a successful can crushing project in the Solomon Islands which will be applied in other countries of the Region.

The SPREP/IUCN organised Third South Pacific National Parks and Reserves Conference (1985), comprising a technical session, ministerial meeting and training course for park managers was planned as a major activity in awareness raising in conservation, environmental education and the need for protected areas. The country reviews and case studies contributed by each country provide the first comprehensive information on the subject to be compiled in the South Pacific.

3.4 Implications for Protected Area Management

Conservation and protected area objectives are of concern to both Networks. Conservation is the basis of sustainable development of resources and the establishment and management of protected areas is a vital aspect of conservation in the Pacific. Yet the concept of protected areas needs to be applied in a manner appropriate to the unique Pacific environment and traditions. This issue provides the focus for the Third South Pacific National Parks and Reserves Conference (1985).

During 1983-1984, SPREP initiated a number of activities in this field. A study into the problem of feral cats in the bird sanctuary of Christmas Island examined a specific example of the broader problem of introduced species on small islands. A major review is underway into the effects of introduced species in the region. Another regional review assessed bird conservation and management needs. Stemming from this study a project for the conservation of the Cagou in New Caledonia is planned. In addition, SPREP is assisting countries in the development and management of protected areas. The establishment of a protected areas system with a distinctly Pacific character is an objective of SPREP.

THE FUTURE

4.1 Environmental Responses by South Pacific Countries

The role of SPREP has served to highlight the issue of environmental management in the South Pacific and many countries including Fiji, Niue, Solomon Islands and Vanuatu are planning appropriate legislation and administrative structures to treat the problems.

Despite such progress there is still much to be done by individual governments to include environmental considerations in development planning. It is seldom appropriate to transplant elaborate environmental procedures developed elsewhere. There needs to be specific responses tailored to the needs and aspirations of the South Pacific countries. Such responses should be at the regional as well as the local level, as most environmental problems and risks are shared by island countries and concern the region as a whole.

The regional approach inherent in the SPREP Action Plan and SPREP Draft Convention (Convention for the Protection and Development of the Natural Resources and Environment of the South Pacific Region) are thus critical in meeting the environment challenge.

The future direction of SPREP is directly linked to the SPREP Convention and thus it is worth examining the draft agreement in some detail.

4.2 Draft SPREP Convention

The SPREP Convention has its roots in the SPREP Action Plan which specifically requested "the development of regional agreements to provide for responsible and effective management of the environment" as one of the four main objectives of the Action Plan. The 1982 Rarotonga Conference on Human Environment clearly recognised the close relationship between the Action Plan it adopted and the Convention it recommended be developed.

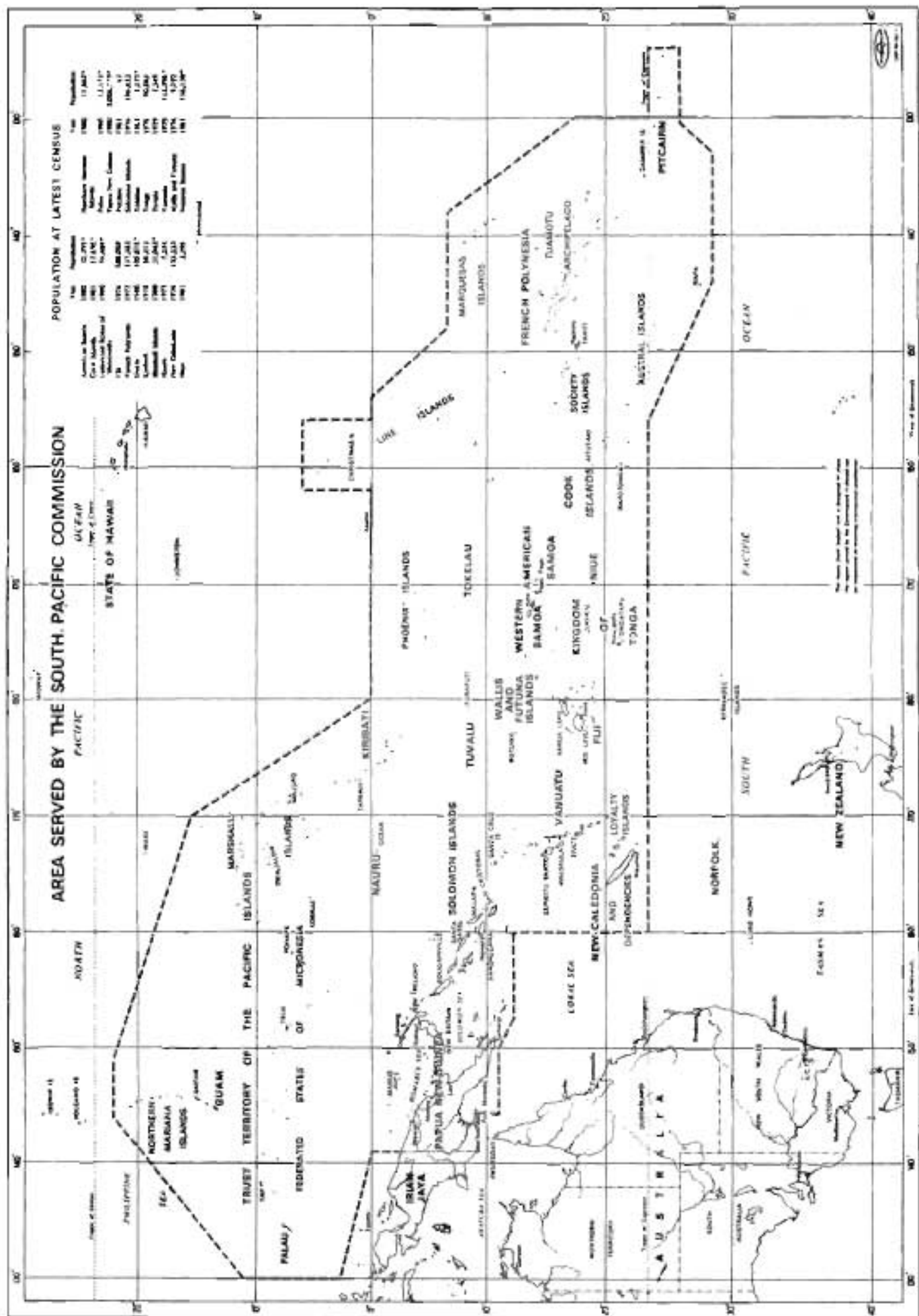
The Convention is seen as providing the basis for regional co-operation to protect the environment. The Convention establishes the legal framework for Action Plan implementation. Due to the wide range of approaches to environmental law and the very different stages of legal development in the South Pacific it is considered that the SPREP Convention should accommodate this diversity and where appropriate, be compatible with customary practices to ensure that national laws following from the Convention are effective and can be enforced.

Three meetings involving scientific and legal experts from twenty-seven countries have been held in Noumea, New Caledonia, to negotiate the draft SPREP Convention and many of the technical and legal issues have been clarified. A fourth and final meeting is scheduled for November 1985, prior to a plenipotentiary conference in 1986.

Once the Convention enters into force, it is likely that the countries participating in SPREP could assume overall authority for the implementation of both the Action Plan and the Convention. Experience in other regions of the world has shown that the number of states joining (ratifying or adhering to) a regional convention of this kind will progressively increase and the Contracting Parties will become one in the same grouping as that which participates in the related Action Plan.

The SPREP Action Plan and SPREP Convention aim to assist South Pacific Countries in maintaining and improving their environment, while ensuring sustainable resource development.

AREA SERVED BY THE SOUTH PACIFIC COMMISSION



CHAPTER 2: MARINE AND COASTAL RESOURCE MANAGEMENT

COASTAL ZONE MANAGEMENT AND CONSERVATION IN THE SOUTH PACIFIC
Graham Baines

COASTAL ZONE MANAGEMENT IN WESTERN SAMOA
Lui A.J. Bell

MARINE RESERVES IN NEW CALEDONIA
Jean-Louis Jourde

FRAGATELE BAY NATIONAL MARINE SANCTUARY
William J. Thomas

ESTABLISHMENT AND MANAGEMENT OF MARINE AND ESTUARINE
PROTECTED AREAS IN AUSTRALIAN WATERS
C. Murray Macdonald

THE STATUS AND CONSERVATION OF A NEWLY "DISCOVERED"
LEATHERBACK TURTLE (*DERMOCHELYS CORIACEA LINNEAUS, 1766*)
CHELONERY AT MAUS BUANG, PAPUA NEW GUINEA
Norman Quinn et al.

SUSTAINABLE BLACK CORAL HARVESTING POTENTIAL IN TONGA
Ministry of Lands, Survey and Natural Resources, Tonga

IMPACT AND CONTROL OF DYNAMITING IN PALAU
Division of Marine Resources, Ministry of National Resources, Palau

KEY ISSUE PAPER: COASTAL ZONE MANAGEMENT AND CONSERVATION IN THE SOUTH PACIFIC

Graham Baines
Commonwealth Science Council
GIZO, SOLOMON ISLANDS

INTRODUCTION

Conservation needs in the coastal zone are of particular importance. With the exceptions of Papua New Guinea, Australia and New Zealand virtually all settlement and development activities in the South Pacific region took place in the coastal zone.

Extensive changes in terrestrial ecosystems of the coastal zone began during the nineteenth century as one plant species, *Cocos nucifera*, became widely established as the basis of the copra industry. This species produces best, near to the sea. Here it now dominates - at the expense of the original lowland forests and strand ecosystems.

Marked changes in coastal marine ecosystems are a more recent development, associated with over-fishing, sedimentation, sewage entrophication, chemicals, explosives and freshwater discharges.

This paper addresses the topic of coastal zone conservation in two parts; first, a brief overview in which key issues are identified; and, second, proposals for a comprehensive coastal zone management programme for the region.

SPECIES PROTECTION

Most marine coastal conservation efforts have been species - focused and sea turtles have received special attention, efforts having been made to boost depleted populations by protecting nesting beaches and hatchlings. For all the dedication, time and money applied to turtle conservation projects their effectiveness in the South Pacific region remains uncertain. Apart from the ecological questions which arise there is one very important lesson to be learned from these efforts - that, without a firm commitment and involvement of all affected local communities such projects must eventually fail.

Populations of large cetaceans (whales) were long ago depleted by whalers. The whaling industry of the Cook Islands, Tonga and Australia have all ceased and, coupled with conservation efforts elsewhere, some recovery is anticipated. However, there remain some conservation problems with small cetaceans (porpoises). These are still killed in large numbers at a few locations in Malita, Solomon Islands - for food, but primarily for the teeth, used in strings as a form of traditional currency.

The Malsitan hunt is certainly a traditional activity. However, its cultural significance cannot compare with that of the bowhead whale hunt of the Inuit of the Arctic Region. In this latter case the hunt has been shown in social terms to be clearly the keystone of Inuit culture. Complete cessation of bowhead whaling could cause dramatically adverse changes in Inuit society. A cessation of porpoise hunting in Malaita would not be expected to have socially damaging consequences.

Another aspect of small cetacean conservation arises in Kiribati where these animals have interfered with the catches of fishermen. Attempts to frighten or even destroy these porpoises have failed. Kiribati's Fisheries Division is promoting an avoidance strategy, trying to encourage fishermen to shift their fishing effort from surface waters to deep bottom stocks.

Dugong conservation efforts in Papua New Guinea and Australia have achieved mixed results. Most dugong conservation activities in Papua New Guinea have been undertaken in Wildlife Management Areas - an innovative conservation area concept involving management by those people who have traditional rights to these areas. In Australia, where the dugong has absolute legal protection except for limited personal use by communities with traditional harvest rights it seems that "tradition" in the Torres Strait area has been used by some as a cover for excess harvest for commercial purposes. Dugong populations in this area are reported to be fast declining.

Some mollusc species are threatened. A conspicuous example is the giant clam. Until fairly recently many isolated reefs had populations of very large, old clams. Today, many of these reefs are clam graveyards, their breeding stock annihilated, following illegal visits by the vessels of distant water fishing nations. The conservation status of some of the rarer mollusc species, too, may be threatened in some of the areas visited by cruising shell collectors.

COASTAL AREA CONSERVATION

The "coconut overlay" has dramatically changed the appearance of coastal landscapes, making it difficult to locate relatively undisturbed areas for protection as examples of terrestrial coastal ecosystems. Some examples of the ecosystems of cliffed coastlines survive, not least being the dramatically beautiful black lava seascape of Western Samoa's O le Pupu Pu'e National Park.

Coastal dune systems outside Australia and New Zealand are few. A distinctive dune complex at Songatoka, in Fiji, has long been listed for conservation attention. It is an area of important archaeological value but has suffered severe ecological damage from cattle and goats.

Coastal marine area conservation is dealt with in a number of papers in this session. The conservation status and prospects of such areas vary. Often they are vulnerable to adjacent land-based activities over which conservation authorities have little control.

Coastal area conservation efforts are sometimes focused too intensely on efforts to rigorously exclude all use and impacts from a chosen area. Too close a fixation on this ideal of protection may mean that management of the area becomes nothing less than a continuing battle to preserve the area's integrity - against usually overwhelming odds.

In this respect, the model of protection and multiple use coastal area management developed by the Great Barrier Reef Marine Park Authority (GMRMPA) seems to be well suited to South Pacific conservation needs.

RECENT DEVELOPMENTS IN COASTAL AREA CONSERVATION

The GBRMPA model for nature conservation and resource management must rank as one of the major developments in coastal area conservation in the region since the Second South Pacific National Parks and Reserves Conference. On a less dramatic scale, useful coastal area conservation

management innovations have arisen in the course of establishment of a number of less extensive protected areas in the region. Some of these are reported on in this session.

There has been a marked expansion of interest and effort in coral reef research in recent years, and an increased application of basic coral reef research results to reef ecosystem management needs. Mangrove ecosystems also have benefited from increased research and management attention; seagrass areas to a lesser extent.

Sound ecological guidance for the selection and establishment of coral reef conservation areas has developed from the pioneering work of Ray, and the more recent efforts of Salm, both with IUCN support. Effective application of these reef conservation principles and methods in the South Pacific, however, is dependent upon adequate understanding of traditional South Pacific Island concepts of reefs and other coastal areas, their allocation for various uses, and the nature and social significance of traditional coastal tenure systems.

Improvements in knowledge and understanding of coastal ecosystems has been accompanied by very useful advances in remote - sensing technology and data processing. These are proving to be valuable aids in mapping; ecosystem identification, location and extent; and in the detection and monitoring of certain oceanographic conditions relevant for marine conservation area management.

The new focus on the oceans which results from the enthusiastic acceptance of the Law of the Sea Convention by over 150 nations provides a stimulus for marine conservation efforts in coastal areas. Several articles of the Convention provide for pollution control and for careful management of resources in the coastal zone (see Appendix).

COASTAL AREAS TO OPEN OCEAN

Whereas the terrestrial limit of the coastal zone may be defined in terms of a watershed boundary, its seaward limits cannot be so exactly defined. Ecologically, a continuum extends from shore to deep ocean. As the Law of the Sea Convention recognises, management of ocean resources effectively begins in coastal waters.

This paper focuses on coastal area conservation. Regional concerns for marine species and area conservation range further - to oceanic areas whose conservation needs have scarcely been recognised, let alone provided for. It is important that attention now be paid to oceanic features such as seamounts, ocean trenches, ocean canyons; perhaps even less discrete areas such as upwellings.

KEY ISSUES IN COASTAL ZONE CONSERVATION

Some of the key issues to be considered in coastal zone conservation are:

- * New and more comprehensive approaches to conservation of marine animal species such as cetaceans, turtles, dugong.
- * The challenge of developing multiple resource management regimes which provide for nature conservation and which effectively incorporate the knowledge and tenure systems of traditional communities.

- * Resolution of the problem of legal and administrative distinctions between land and sea which frustrate successful coastal zone management.
- * Slow progress in helping the public and governments of the islands region of the South Pacific to understand the importance of nature conservation and to make the necessary commitment.
- * Ocean features conservation needs.
- * Theoretical and practical considerations of the ecological viability of protected coastal areas, more especially marine.

REGIONAL APPROACHES TO COASTAL AREA CONSERVATION

The overall framework for environmental protection, resource conservation and nature conservation in the region is provided by the South Pacific Regional Environment Programme (SPREP). The action strategy being developed by the conference for the establishment and management of protected areas is designed to provide effective direction for the region's nature conservation objectives within the SPREP framework.

Concurrently, a regional programme in coastal zone management is being prepared by the Commonwealth Science Council as a component of the SPREP Action Plan. Within that proposed programme, which is outlined below, there is provision for a Regional Theme - Protected Coastal Areas and Species. No activities have yet been specified for this particular theme of the coastal zone management programme. Ideas and priorities in coastal zone nature conservation are awaited from the Conference.

COMMONWEALTH SCIENCE COUNCIL : COASTAL ZONE MANAGEMENT PROGRAMME IN THE SOUTH PACIFIC

At Papeete, Tahiti, 2-4 June 1985 representatives of South Pacific Island countries met, in the company of various coral reef scientists and coastal resource administrators, to consider a Commonwealth Science Council proposal to assist the region, through the South Pacific Regional Environment Programme (SPREP), to formulate a relevant programme of coastal zone management.

This meeting was planned following discussions between the SPREP Co-ordinator and the Secretary of the Commonwealth Science Council in which CSC sought to contribute towards full implementation of the SPREP Action Plan.

Prior to consideration by the meeting of an "ideas" paper put forward by CSC as a basis for discussion, representatives of island countries outlined the status of their coastal zone resources, management of these and problems arising. From these presentations it was obvious that:

- (i) there is considerable variation in living and non-living resources available to the different countries;
- (ii) the types of impacts are again varied and are principally:

land-based	e.g. domestic waste, industrial solid and liquid waste, increased sediment influx to the sea from increased land clearing, coastal building;
------------	--

- | | |
|-----------------|---|
| sea based | e.g. sand mining, increased fishing pressures, uses of non-selective fishing methods, pollution from boats and ships. |
| natural hazards | recent hurricanes and increased water temperatures have affected marine environments of the coastal zone as well as onshore vegetation; |
- iii) knowledge and relevance of traditional management practices in the coastal zone is varied, and the justification of claims for traditional rights to offshore lands and resources is not always easy to verify;
- (iv) while there is not clear agreement on some of the types of data that are necessary for a satisfactory data base to gauge the impact of changing coastal resource use patterns, one matter is clear - that data on water circulation is crucial for determining the nature and effect of land derived sediment on coastal resource productivity;
- (v) highly sophisticated equipment could not be justified for general use in the region. There was a preference for survey methods that could be implemented and maintained by local people, after training, and which could be generally applied throughout the region.

Participants subsequently considered the "ideas" paper, using it as a basis for discussion about what approach to coastal zone management best fitted the South Pacific island region's needs. An appropriate framework for a South Pacific regional programme in coastal zone management was agreed. This incorporated a "model" for site-specific coastal zone management projects and "themes" through which regional activities could be developed.

It was clear that no single project in any one locality could satisfy the requirements of all countries in the region. As a first step it was proposed, and agreed, that two site-specific projects, one, "low island", and another, "high island", should be undertaken. Interested governments would submit proposals for CSC's attention through the SPREP Co-ordinating Committee.

These two projects to some extent were seen as demonstration projects, in which provision would be made for monitoring and reporting on these so that other countries would have the opportunity to develop similar projects as appropriate to their needs.

The approach and the emphasis adopted in developing this coastal zone management programme framework differ from those of coastal zone programmes of other areas.

The approach is broad, encompassing social, technical, administrative and ecological factors, while the emphases are on:

- preventive coastal zone management, rather than remedial efforts;
- project formulation and implementation through existing institutions - village, provincial, national and international;
- developing the local capacity for coastal zone resource assessment, monitoring and balanced utilisation;

- using, wherever relevant, elements of traditional coastal resource management knowledge as a basis for modern management systems;
- development of simple survey and monitoring techniques and the harmonisation of such techniques through the region;
- the needs, perceptions and participation of the coastal zone resource user;
- gathering and reporting data in forms which are meaningful for decision makers at all levels - from rural community to nation.

1. A "MODEL" COASTAL ZONE MANAGEMENT PROJECT

A site specific project would be made up of a number of components, namely:

- the social context of the prevailing coastal zone resource management systems;
- the resource base;
- threats to sustainable use of coastal zone resources;
- administration for sustainable resource management;
- tradition for development; and
- education and training.

The Social Context

A coastal zone management project cannot be effective unless it is designed and implemented so as to fit into the local social context.

For this component of a project large and detailed study is not necessary. All that is needed is a modest survey from which an understanding might be obtained of:

- attitudes to resources and environment;
- the nature and social context of traditional reef-lagoon resource tenure;
- the relative importance to the local communities of various coastal zone resources;
- local decision-making processes and procedures; and
- means by which resource management knowledge and understanding is disseminated.

The social study should be so designed as to make it possible to:

- understand the structure of the society and the roles of its members in relation to coastal zone resource development;
- develop some capacity for predicting the social and economic implications of change in coastal zone resource exploitation and availability.

- identify effective means of involving local communities in the coastal zone management project and developing appropriate "tradition and development" activities.

The Resource Base

Basic to the assessment of the resource base is an examination of the physical structure and functioning of the coastal zone-lagoon water circulation, some bathymetry, sediment sources and dispersal.

Some understanding of the magnitude and seasonality of primary production may be necessary. Secondary productivity - in particular the standing stock and replacement rates of edible coastal resources - needs closer attention.

Simple techniques will be used for monitoring change and for determining "the health" of the resource base.

Aerial photographs, coupled with simple survey and planning techniques (for example, overlays), are useful devices for developing community participation in this component of the project.

Threats to Sustainable Resource Use

The project should identify and attempt to explain any existing or potential threats to the resource base from land-based activities and from those inshore and offshore. It seeks to guide the community and its local administration to recognise these threats and to determine appropriate management measures to avoid or curb them.

Administration for Resource Management

A project will always operate through effective existing institutions, largely via an individual of the culture/language area in question who will act as Project Co-ordinator and guide the contributions of any outsiders who become involved in a project.

Through a project the capability of the local administration - traditional and/or contemporary government - to administer its coastal zone will be strengthened. Complementary support and strengthening will also be made available for provincial or district, and national levels of administration.

An important basic element of improved coastal zone administration is a coastal zone resource management plan in the formulation of which, resource owners or custodians and users will actively have participated.

Tradition for Development

The cultures of South Pacific communities have much altered over the past 150 years of European influence but island societies have generally adjusted well. Present rates of social and environmental change, however, are much greater than before.

Tradition provides a stabilising element at a time of potentially socially disruptive change. Further, there is much in traditional knowledge and skills and approaches to coastal resource management, which is relevant for modern development. Yet unless particular attention is paid to supporting relevant tradition, "Western" forms of development are likely to overwhelm it.

There is widespread sympathy throughout the South Pacific island region for this theme of "tradition for development" and governments generally support this ideal - that is, the governments of independent nations of the region.

Incorporation of this theme in coastal zone management projects is a complex matter, and not particularly easy. The main drive for this component of a project must come from the local communities themselves. The project should be seen as providing a framework and an opportunity. Project personnel from outside the communities concerned might serve as catalysts and, where asked, provide some guidance and support.

Through a coastal zone management project, activities which might be undertaken include:

- establishment and recording of the basic fisheries tradition of the area;
- preparation of educational material summarising fisheries tradition and its accompanying ecological understanding, ritual, mythology and art - initially, at least, in the language of the culture concerned;
- encouragement of, and support for, local initiatives to foster understanding and transfer of tradition in the context of coastal zone management;
- transfer and recording of traditional skills for construction of canoes; and
- protection and possible restoration of coastal sites of cultural and/or historical significance.

Education and Training

Education and training as a regional theme is further considered in section 2. Those aspects which are relevant for site-specific projects include:

- local community education about coastal resource use and sustainable management;
- school education activities, using material developed through the project;
- training for local coastal resource managers/monitors - simple coastal resource statistics gathering, collection of samples for laboratory analysis, monitoring of change in coastal ecosystems; and
- promotion of training in traditional skills such as canoe construction.

2. THEME ACTIVITIES FOR A REGIONAL PROGRAMME

Results arising from site-specific projects can be applied on a regional basis through a number of coastal zone management themes. These are:

- Traditional coastal zone resource management.
- Resource assessment and monitoring.

- Coastal zone management policy, administration and legislation.
- Education and training.
- Protected coastal areas and species.
- ecological processes.

(1) Traditional Coastal Zone Resource Management

In developing the theme of traditional coastal zone management into a programme activity the following objectives are appropriate:

- (i) clarify and present the principles of coastal resource management as practised by traditional societies with a view to using these principles to develop systems of coastal resource management suitable for today's changed circumstances.
- (ii) obtain, record and assess traditional ecological knowledge of coastal resources, with a view to providing ecologists with new insights into matters such as fish behaviour which need to be better known for more effective management.

As a first step it is necessary to prepare clear guidelines for obtaining, recording and assessing traditional coastal resource management knowledge. This should be presented in a format suitable for use in the development of contemporary management regimes.

These guidelines should, among other things, address the following matters:

- definition of traditional fisheries;
- clarification of nature of coastal resource use rights;
- social unit(s) on which rights are based;
- principles of boundary delimitation;
- allocation and transfer of coastal resource use rights;
- procedures for sharing of resources with outsiders;
- traditional conservation practices;
- disputes resolution mechanisms;
- adaptability of traditional systems in the face of changes in perception, technology and society;
- the place of traditional knowledge in society - its role in social status and differing sex roles;
- responses to commercial development;
- adaptability of traditional fisheries management regimes;
- effective means of obtaining and recording traditional knowledge.

At a later stage of the CSC programme the results from investigations at island project sites could usefully be drawn together in the form of case studies for publication.

This would mean three activities for the Traditional Coastal Zone Management theme:

- Activity 1. Guidelines for traditional knowledge.
- Activity 2. Traditional knowledge investigations as part of site-specific projects.
- Activity 3. Publication of case studies of traditional coastal resource management and their adaptation for contemporary needs.

(2) Resource Assessment and Monitoring Techniques

An important emphasis of the proposed CSC programme is the involvement, in coastal zone management, of coastal communities - more especially those which have traditional resource use rights and management responsibilities.

To be properly involved in management and in decisions about resource use, these communities need an improved capability for monitoring the status of their resources. For this, they need relatively simple monitoring and assessment methods - simple in concept and application, not too demanding of time, requiring minimal equipment, and providing results which are easy to analyse and to comprehend.

Dahl (1978) has taken an important step in this respect, with the development of a simple technique for assessing the "health" of a coral reef through simple quantitative estimates of the relative abundance of a few indicator animal and plant groups such as fish predators, butterfly fish, coral forms, *Acanthaster* and *Trochus*. Even though developed for use by non-scientists and requiring only two species identifications, data provided by this technique have considerable potential scientific value.

As part of the proposed CSC programme simple techniques would be developed for assessing the status of exploitable resources of reefs, lagoons and mangroves and of the ecosystems from which they derive.

CSC's recent Report on Science and Technology for Development, in proposing coastal zone management programmes for the South Pacific and for the Caribbean, specifically recommended the use of remote sensing techniques. Photography at relatively low altitudes, from fixed-wing aircraft at scales to about 1:100,000 have long been proved effective in coastal zone management. The technique has considerable potential relevance for this proposed programme.

The value of low-level aerial photography for coastal zone management is, however, not generally recognised in the region. It would be appropriate to include in the programme an element of promotion of the technology and of training in its application.

A positive, but cautious, approach to the application of the more sophisticated satellite-based remote-sensing techniques is advocated. There have as yet been few applications of this technology to

tropical reef-lagoon systems but results have demonstrated that "Landsat" imagery has a role in low-resolution, first-order mapping of relatively large surface and shallow water features and of the extent and distribution of ecological "zones" such as seagrass beds. Sediment distribution in coastal areas can be readily detected. Some weather satellites provide imagery which can be useful in detecting and monitoring large water mass variations such as eddies and island wakes which are likely to be associated with local variations in nutrient transfer and productivity.

A Table of Landsat coverage for Commonwealth countries, included in CSC's Report on Science and Technology for Development, indicates very little current coverage of South Pacific island countries and territories. However, the proposed launch of a relay satellite will remove this restriction.

Resource assessment and monitoring activities suitable for the proposed CSC coastal zone management programme include:

Activity 4. Development of simple techniques for assessing the status of coastal zone resources.

Activity 5. Application of satellite-based remote sensing techniques to coastal zone management.

Activity 6. Training in resource assessment and monitoring for rural resource managers, fisheries extension workers, etc.

Activity 7. Education in resource assessment and monitoring for planners, decision-makers.

(3) Coastal Zone Management Policy, Administration and Legislation

The traditional South Pacific island society concept of land is that, submerged or emerged, it is a whole. Simplistically expressed, the reefs associated with an island, and lagoon bottoms which link those reefs with that island are as much "land" as that which is not covered by water. So, in tradition, the ecological continuum between island and reef is recognised and is administered uniformly, even though in some societies specialists may have resource allocation responsibilities particular to fishing areas or to food gardens.

However, jurisdictional concepts developed in European cultural contexts have been introduced to the South Pacific island region and are now integral components of formal administrative and legal regimes.

These concepts are inconsistent not only with traditional South Pacific island concepts but also with the ecological realities of the coastal zone. A rigid legal and administrative distinction between land and resources above and below high water mark or low water mark hinders the development of effective coastal zone resource management regimes.

To attempt to change this system now would be a radical move, and probably impractical in view of the far-reaching consequences of such a change. What is potentially achievable is a widespread recognition of the threat to effective coastal zone resource management posed by

this diverse and rigidly compartmentalised administrative regime. Such recognition by South Pacific island governments would open up opportunities for initiatives to ease the difficulties - reorganisation of administrative functions, use of ecologically appropriate coastal units for planning purposes, rationalisation and simplification of coastal zone legislation, incorporation of traditional resource management knowledge and roles into contemporary coastal customs.

In all South Pacific island countries except Papua New Guinea almost the whole population lives in the coastal zone, depends on its resources and exploits its environment for agriculture, industry, roads and towns. Clearly, improvements in coastal zone administration and planning would bring considerable benefits throughout the region.

In its report, Ocean Management: A Regional perspective, a Commonwealth Expert Study Group on Maritime Issues has urged review of administrative structures concerned with marine matters in order that new opportunities arising from resource jurisdiction in Exclusive Economic Zones, and obligations arising from adherence to the Law of the Sea Convention, and to other maritime conventions, might be more effectively addressed.

The obligations of parties to the Law of the Sea Convention begin near to the shore, in the coastal zone. This fact is explained further in the Appendix so as to demonstrate the relevance which this coastal zone management programme proposal has for maritime administration in its broadest sense.

Through the proposed CSC programme it may be possible to assist South Pacific island governments in developing coastal management regimes which mesh effectively with the oceanic element of the new maritime administration. Other agencies in the region are capable of contributing to this objective and any CSC role would be developed in association with these.

The following activities can be identified at this stage:

- Activity 3. Publication of case studies of traditional coastal resource management and their adaptation to contemporary needs.
- Activity 8. Formulation of coastal zone management policy, legislation and administration for specific locales, based on site-specific projects.
- Activity 9. Promotion of the idea that new forms of coastal zone administration and legislation are relevant for the changed circumstances of South Pacific island states.
- Activity 10. Assistance to governments in formulating maritime policy and legislation and establishing appropriate new forms of administration.

(4) Education and Training

This theme activity is crucial to the effectiveness of the whole programme. No matter how good the data obtained through scientific investigation, its value will be limited if the understanding derived

from it is not translated into practical application by resource planners and managers, among them those of rural communities with recognised traditional responsibility for coastal zone resources.

The traditional resource managers will be both teachers and learners. They are to be given opportunities to teach receptive investigators about matters such as traditional coastal resource tenure and management, and about the behavioural ecology of fish. In return, they are to be given opportunities to learn something of what others know about such matters as the vital interactions between mangroves and adjacent waters, and about the crucial ecological process of water exchange within the mangrove ecosystem - and of the resource disruption which can result from interference with this water exchange.

The latter are examples of ecological understanding which was not necessarily known to traditional South Pacific island societies - or which has been lost.

There is considerable scope and a largely unsatisfied demand for effective training of coastal zone resource planners, managers and extension agents in the South Pacific region. Emphasis in the early stages of the proposed CSC programme should be on generating a "demonstration effect" from its education and training activities - showing what can be done and how it might effectively be done, and assisting those agencies which wish to establish education and training programmes of the type developed in the context of the CSC programme.

Proposed education theme activities are:

- Activity 7. Education in coastal zone resource assessment and monitoring for planners, decision-makers.
- Activity 9. Promotion of the idea that new forms of coastal zone administration and legislation are relevant for the changed circumstances of South Pacific island states.
- Activity 11. Community education, as an integral part of site-specific projects, and in more general form on a regional basis.
- Activity 12. Curriculum development assistance, with the help of information arising from site-specific projects.
- Activity 13. Public awareness programme, at local (project) scale, and through existing SPREP activities in this area.
- Activity 14. Publications.

Training theme activities which might be developed include:

- Activity 6. Training in resource assessment and monitoring for rural resource managers, fisheries extension workers, etc.
- Activity 15. Training in the application of remote sensing techniques to coastal zone management.

Activity 16. Transfer of traditional maritime skills such as those of canoe construction.

(5) Protected Coastal Areas and Species

This activity theme is based upon the anticipated need for afford varying levels of protection to certain coastal areas to ensure that they continue to contribute to resource productivity (e.g. protection of areas critical for fish breeding); to protect the habitats of plant and animal species of special cultural or scientific interest; to preserve examples of coastal ecosystems as natural and cultural heritage for education, research and recreation; and to protect areas critical for the maintenance of certain ecological processes.

Species of the coastal zone which are in special need of protection and habitat management include whales - both large whales and porpoises - sea turtles, dugong and giant clams.

Among South Pacific island communities, awareness of the need to afford protection to some marine areas and to give special attention to threatened species is not well developed. Further effort is needed to bring people to realise that, in the face of increasing commercialisation of resources and rapid population growth, greater care is now needed than in traditional times to protect the bases of coastal resources production.

Activities which might be developed under this theme include those relating to species, habitat and ecosystem protection; and resource base preserves (such as fish breeding or nursery areas). It is important to make special provision for the protection of coastal streams, lakes and estuaries - emphasising their critical relevance for coastal species protection and for ensuring continued productivity of coastal resources.

Deliberations at the Third South Pacific National Parks and Reserves Conference are to be used as a basis for deciding which activities should be developed for the "Protected Coastal Areas and Species" theme.

(6) Ecological Processes of the Coastal Zone

Knowledge of the structure, function, species composition, population dynamics and other aspects of coastal zone ecosystems is crucial for an understanding of those ecosystems as a basis for their management for the resources which they provide.

However, at some risk of ecological impropriety, one could single out ecological processes as that aspect of ecology which has special importance in a development context; that the primary impact of development is on these processes.

This is because the effects of modern natural resource development - particularly those which involve large-scale landscape alteration (e.g. logging, reservoir construction, roads, mining) are often expressed in a dramatic way through interference with ecological processes such as nutrient transfer or water exchange. Such activities also may disrupt ecological processes through increased sedimentation of coastal waters.

Activities relevant to the theme "Ecological processes critical for proper coastal zone management" are to be developed in conjunction with initiatives already started through SPREP.

Appendix

SOUTH PACIFIC ISLAND STATES' COASTAL ZONE MANAGEMENT
OBLIGATIONS UNDER THE LAW OF THE SEA CONVENTION

Emphasis on the newly established rights of states to marine resources in sea extending 200 nautical miles from land and reef baselines (Exclusive Economic Zones) tends to have obscured the fact that these rights are accompanied by certain obligations to the international community and, in particular, to neighbouring states.

The outer limits of "coastal zone" for the purpose of the CSC programme are well inside the boundary of EEZs. Nevertheless, since there is a physical and ecological continuum between shore and deep sea, activities in the coastal zone can have effects on the EEZ itself. For this reason a state's obligations in respect of its EEZ begin with effective management of its coastal zone.

Some articles of the Law of the Sea treaty which embrace these obligations are:

Article 61: Refers to Total Allowable Catch (TAC) in an EEZ. Inshore productivity data of the coastal zone is an important element in determining TAC.

Article 61(2): Requires that the "best scientific evidence available" be used in determining TAC.

Article 63(1): Requires co-operation in the conservation and management of straddling stocks. This is a particularly significant requirement for South Pacific island states, to some extent catered for through the Forum Fisheries Agency. The coastal zone is directly involved in some cases e.g. between Papua New Guinea and the Solomon Islands.

Article 65: Deals with obligation to co-operate in the conservation and management of marine mammals, e.g. whales, dugong, for whom coastal zones are important.

Article 194(1): Invokes a duty to harmonise policies on pollution prevention, reduction and control. Some of the potential for pollution of the EEZs of neighbouring states lies in coastal zones.

Article 194(5): A duty to take measures respecting fragile ecosystems and certain habitats. Some of these ecosystems and habitats are likely to extend into coastal zones.

Article 200: States have a duty to conduct research and exchange data on marine pollution. Much of the necessary research will take place in the coastal zone.

Article 206: Duty to assess potential effects of planned activities in the marine environment. Many of the "activities" so defined will take place in the coastal zone.

Article 207: Imposes a duty to control marine pollution from land-based sources.

Article 208: Duty to control pollution resulting from sea-bed activities subject to national jurisdiction. Again, coastal zones will often be involved.

The CSC programme outlined here has the potential to contribute some of the knowledge and understanding required by South Pacific island states to meet their obligations under the 1982 UN Convention on the Law of the Sea.

CASE STUDY: COASTAL ZONE MANAGEMENT IN WESTERN SAMOA

Lui A.J. Bell
 fisheries Division,
 Department of Agriculture,
 Forests and Fisheries, Apia,
 WESTERN SAMOA

INTRODUCTION

Fishing has always been an important subsistence activity in Western Samoa. Referring to Samoa's marine fish resource Kramer (1888) wrote 'naturally, there are fishes throughout the whole year, for the sea is as inexhaustible as the land'. How much truth this statement holds for the present is open to speculation. Jordan and Searle (quoted in Crattan 1948) referred to Samoa's fish fauna as one of the richest on the globe. This may have been true in the past but is not so now. Gilson (1970) writes that 'considering the Samoan pattern of life, along with the population, the physical environment seemed indeed to have provided, in the past, an ideal basis for comfortable and convenient settlement'.

In the past, human subsistence was derived mainly from agriculture and fishing, and these two sources of livelihood were especially protected by customary rights. Utilization of these resources was carefully controlled by tapu (prohibitions). Fishing grounds, including the mangroves, had their owners which were communities, families or chiefs, while fishing outside the reef was free.

Today, the subsistence fishery continues to be crucially important to the majority of those living in rural areas. But the land below the high water mark is now public. This shift in marine tenure seems to coincide with abuses of the coastal zone resources; uncontrolled cutting of mangrove trees for firewood, use of dynamite, derris and chemicals to catch fish, dredging and direct discharge of pollutants from factories into the adjacent waters.

Johannes (1982) notes that 'at present, development in the coastal zone is not planned or managed in any integrated way'. The 1980-1984 Five Year Development Plan recommends the establishment of an Environmental Management Unit with tasks such as:

- * the establishment of procedures for the environmental assessment of development projects;
- * the promotion of inter-departmental consultations on environment management;
- * assisting in the further development of environmental education in schools, for the public and for decision-makers;
- * the formulation of environmental management legislation appropriate for Samoan conditions;
- * the collection and maintenance of data on the status of the Samoan environment.

The present Three Year Development Plan also recognises the need to protect the environment and conserve natural resources.

Johannes (1982) comments that 'plans for the acquisition and control of some of Western Samoa's few, precious and rapidly dwindling mangrove areas for national reserves are not proceeding satisfactorily at present'. Only one marine reserve is in existence at Palolo Deep in a fringing reef fold near Apia.

Zann (1983) notes that 'the documentation and the scientific interpretation of the traditional sea lore of the Pacific Islands is of crucial importance, particularly in the developing islands where many of the traditional ways have been lost, or will be lost, in this generation. Johannes (1981) further notes that traditional patterns of utilisation and of conservation may help in the formulation of modern reef (coastal) management strategies.

GEOGRAPHY AND HISTORY

Western Samoa (Map 1.) comprises four inhabited islands, two of which are small islands (Manono and Apolima). The main two islands are Savaii (1,810 sq km) and Upolu (1,115 sq km). The mountainous islands are volcanic in origin and lie below the equator between 13° and 15° South and between longitudes 171 and 173 West, just east of the International Dateline. They have a tropical maritime climate and pronounced wet and dry seasons. Narrow coral reefs, which fringe most of the coastline and enclose the mainly shallow lagoon, rapidly drop into very deep water.

The total population in the 1981 census reached 156,000, giving an annual growth rate of 0.6 as compared to the 3.3 annual growth rate in the 1961 census. The sharp reduction in the growth rate is attributed to the high level of emigration. About 21% of the total population live in the Apia urban area on Upolu while only 27% live on the biggest island, Savaii. The indigenous population is Polynesian and is relatively homogeneous. Approximately 89% are pure Samoans, but there is an admixture of Chinese, European, Fijian, Tongan and Tokelauan blood.

The Samoan Islands are believed to have been inhabited for about 3000 years. The pre-European population was estimated to be about 29,000 in 1880, and settlements were mainly on or near the shore, close to river-mouths or fresh water springs, with arable land readily accessible. Safe and easy access by seas was a determining factor in choosing a site for settlement as rocky coasts unprotected by off-shore reefs were sparsely populated, even where the land was capable of development. The basic social unit in a village was, and still is, the aiga (extended family), headed by the matai (chief). Like most others in Polynesia, Samoan society had no central political authority or government. Political organisation rested largely upon the village council in which the heads of the extended families and their chiefs joined in dealing with local problems and order. The staple foods from the land were taro, breadfruit and coconut while the supply of protein came from the lagoons, reefs and open sea where a great deal of edible marine life could be obtained. Pigs and fowls were kept mainly for feasts. The Samoans had a rich material culture which included a range of specialised canoes, hooks, traps and lures for fishing (Buck 1930).

Although Roggewein was the first European to sight Samoa in 1722, La Peronise was the first to set foot ashore in 1787 in Tutuila. Little was known about Samoa then, and Western impact was minor until 1830 when the London Missionary Society, traders, beachcombers etc, began to arrive. The whole group was supervised tripartitely by Britain, America and Germany under the Treaty of Berlin in 1889, up to 1900 when Britain withdrew.

Germany achieved dominance in Western Samoa and the smaller eastern islands were given to the United States. New Zealand troops took possession of Western Samoa in 1914 owing to the state of war between Germany and Britain. New Zealand rule continued after World War I, initially under the League of Nations. Political independence for Western Samoa was finally achieved in 1962.

Today, a National Parliament, which is elected by the matais governs Western Samoa. Although basic medical care and education are available, employment is limited and the majority of the population continue to live as semi-subsistence farmers and fishermen. Exports include coconut oil and cream, cropla meal, cocoa, bananas, taro, timber, veneer, fruit juices, beer and cigarettes and some re-export items. Imports include fuel, canned food and all consumer goods.

FISHERIES

Western Samoa has very few patches of mangroves on its coast. An estimation from Government maps of the total mangrove and swampy areas came to approximately 1,000 hectares. The island of Upolu is almost entirely surrounded by barrier reefs which enclose the mainly shallow lagoon.

In some places, the lagoons are shallow and require the rise of tide to allow passage of a canoe, while in other places, particularly where there are openings in the reef, they are a few fathoms deep. Barrier and patch reefs are well developed only along the northern and western coastline of Upolu. Johannes (1982) reported an estimated 23,100 hectares of total reef and lagoon area for Western Samoa, viz, the area of water less than 50m deep.

Traditionally, Samoans are known to be inshore fishermen and gleaners as well as ocean fishermen. Roggwein, seeing the natives move about so much in canoes, gave the group the name of the "Isles of the Navigators". Methods of fishing varied from simple groping between the rocks with bare hands to skilled devices with traps, nets and hooks. The canoe took men outside the reef to seek the deep sea fish. But the waters within the bounding reefs provided the main source of fish. The majority of Samoans today still rely on the sea-foods for subsistence. Because of the limited continental shelf area due to the steep decline just off the reefs, and the small Exclusive Economic Zone (EEZ) area (the smallest in the region, see Table 1), the feasibility of large-scale commercial fishing around the islands is still questionable. However, the introduction of motorised fishing using aluminium catamarans has been effective in supplying Apia with fresh fish. Fish aggregating devices, a United Nations funded project, have been moored around both Upolu and Savaii.

The 1978 Statistics Department Fishery Catch Assessment Survey for Western Samoa indicated an inshore catch of 666.233 mt, comprising 61.12% of the total.

A preliminary survey done in 1984 indicated that total consumption of local seafoods in the urban area averaged to about 100g/capita/day while in the rural area, the consumption of seafood was found to be about 240g/capita/day, and also, that reef fish comprise about 87% of total rural consumption but only about 60% of total urban consumption (Zann et. al in prep).

(a) Subsistence fishery:

Buck (1930) described a wide range of fishing methods that were used traditionally. These include groping between rocks with bare hands, various snares, lures, weirs and dams, fish spears, poisoning, nets, hooks etc. Dug-out canoes were used for fishing and a specially designed canoe (called a vaaalo) was used for bonito fishing.

Nylon, goggles and rubber and steel hooks have replaced the traditional gear.

Fishing involving the whole or most of the community has declined as the fisherman now thinks more of his personal gains.

The usual method used today, apart from the gleaning of invertebrates, involves diving underwater utilising a mechanically propelled spear, spearing (hand-thrown), gill-netting and fencing using chicken wire, handlining and trolling. However, the dug-out canoes are still used.

Almost everything from the sea is taken regardless of its size. The fish catch includes lagoon and reef species but mainly mullet, small snapper, scad and surgeon fish, while invertebrates include a variety of bivalves, snails, holothurians, jellyfish and seaweeds.

The everyday gleaning involves mostly the women and children while men are responsible for providing the fish.

(b) Commercial Fisheries:

The inshore small-scale artisanal fishery is based on one or two canoes with two to four fishermen, using a large fence trap or gill nets. The fence trap is usually fixed in one spot for one or two weeks, but sometimes months, and is then shifted. The installation and shifting is labour intensive and often inefficient. An estimated 100 short ton total catch from this fishery was taken in 1984 together with 30 tonnes of shellfish.

The offshore small-scale commercial fishery has recently been rapidly expanded. The present success of this fishery has come about because of two United Nations component projects, namely (i) fishing boat building (locally known as Alia) and (ii) fish aggregating devices. A repair workshop for outboard motors, fish holding refrigeration, a fish market, subsidised fuel, and fish coolers available to fishermen, also contribute. This fishery is based on the aluminium catamaran (Alia) equipped with outboard motors and line reels for tuna trolling or for offshore nightbottom fishing. Fuel is expensive, particularly for tuna trolling. The fishermen sell their own fish either direct to the government fish market or to the public at the government fish market.

The total catch of tuna in 1984 was estimated at 510 short tons worth WS\$363,600 as compared to the 2,550 short tons worth WS\$4,080,000 estimated for 1983. The drop was believed to be due to the shortage of fish aggregating devices deployed in 1984. The total catch for bottom fishing in 1984 was estimated to be 1,100 short tons worth WS\$2,640,000 compared to 850 short tons worth WS\$1,700,000 estimated in 1983 (see Table 2).

At present, these fisheries are not earning foreign exchange but are helping in import substitution.

SEA TENURE, LIMITED ACCESS, AND TRADITIONAL MANAGEMENT

(a) Past

For as long as Europeans have known them, the Samoans have been predominantly a coast-dwelling people. Easy and safe access by sea was a determinant in the establishment of a settlement (village). Traditionally, the village's bordering lagoon or shallow water was a special preserve in which the village maintained rights of use and access in much the same way as it controlled its lands (Gilson 1970), viz, the lagoon, as far as the reef, was considered to be the property of those near whose village it was situated. Furthermore, 'fishing grounds, like landed property have their owners' (Kramer 1888). It seems that the highest ranking chief or chiefs of a village regulated fishing by boat and net and imposed conditions upon outsiders who wished to use, or traverse, the villages' inshore waters, and travellers were given access as a matter of courtesy. Members of a village without a safe fishing ground could be permitted to use the fishing ground of a neighbouring village but were expected to give a portion of the catch to the villages that owned the fishing ground. Utilisation of most resources was carefully controlled by tapu. Von Bulow (1902) lists five general duties of a fishing ground owner as being:

- "(1) If he catches certain large species of fish (e.g. turtle) he has to turn them over to the village assembly or in some villages to particular chiefs or orators.
- (2) In addition he has to follow the orders of the village assembly if for a certain period it forbids the catching of atule (scad) in order for the assembly to gain time to prepare to catch this fish in the lauloa (large drag-net) or,
- (3) If the assembly declares the ocean 'forbidden' - sa - because a high chief has died or because during the transfer of the remains of a long-deceased person from the present grave to a new grave, his bones were 'bathed' by the sea.
- (4) The owner has to allow his own village or neighbouring localities to cast their large drag-net, but to do so without searching through the stone heaps he has set up himself.
- (5) As well, he has to allow everyone to cross his fishing ground while dragging a fish lure, pa, any time of day or night.

The open sea fishing is free for the use of all men, but there were valid rules even for fishing outside the reef, particularly for shark and bonito fishing. These were determined by the guild of fishermen, the tauti, and were enforced by the latter (von Bulow 1902).

When a chief died, traffic through the village by the lagoon was prohibited until the funeral rites had been performed. Fishing in general, except scavenging off the reef and lagoon-floor, was a communal effort led by the village's tautai (principal fisherman). Authority was given to this expert to restrict boat-fishing to parties which he organised or sanctioned. In turn, he was bound to

ensure that all catches were fairly divided among the households of the village and that species of fish reserved for chiefs were given only to those who had a right to them (Gillon 1970).

All persons using the reef or channel were required to bring a food offering to the ali'i (highest ranking chief in the village) or else they would lose their lives at sea!

(b) Present

By around 1850, fishing had become a much less essential occupation because the Samoans had acquired a taste for preserved beef, salmon and pilchards stocked by the trade store. Also, the property rights had been altered considerably by colonial governments as Europeans would not accept private restrictions upon the free use of Samoa's waters. Furthermore, 'in the 1870's it happened that native fishing grounds were surrendered to strangers' (von Bulow 1902).

Today, Article 104 of the Constitution provides that all land lying below the line of high-water mark is public land, and that all persons have a right to navigate over the foreshore and to fish in the sea within the limits of the territorial waters of the State. The public right rises by virtue of the ownership by the State of the soil of the territorial tidal waters.

Thus the law states that since the Constitution and Acts of Parliament, having vested all the soil below the higher-water mark in the State, the right of fishery therefore is common to all citizens of the country. But the public right to fish must be exercised reasonably and so as not to damage the fishery.

Generally today, the village adjacent to a lagoon and reef would be responsible for those areas - I have seen fishermen from a village chasing away fishermen from another village who were poisoning fish on the reef adjacent to the former fishermen's village. It is also sometimes broadcast over the radio that a village was banning certain fishermen, or certain methods from being used in the lagoon and reef adjacent to their village. But still, much of the 'my lagoon', 'my village reef' sense has gone.

As far as the very limited mangrove resource is concerned, three systems of ownership - each clashing with the other - seem to exist. Firstly, the State by law owns the land below the highwater mark, thus giving the public a right to the mangroves. Secondly, the individuals who bought land along the coast which had mangrove areas during German rule when the low-water mark was recognised, consider the mangrove area as their private land. Thirdly, the village or family in a village which has adjacent mangroves, regulates the cutting of trees - The writer has heard of a village stopping outsiders from cutting the adjacent mangrove trees. However within the village there seems to be no regulation stopping its villagers from cutting mangrove trees which are adjacent to an individual's land.

PRESSURES ON COASTAL RESOURCES

- (a) Dynamite Fishing - the seriousness of this is recognized in the Samoan name for dynamite - "fanala".

Von Bulow (1902) reported fishing using dynamite, so it seems that this has been a widespread problem for at least 80 years in Western Samoa. Dynamite is often set off on coral heads, reducing them entirely or in part to rubble.

Johannes (1982) describes two methods presently used in Samoa. "One method involves throwing dynamite from a boat at free-ranging fish schools (notably mullet and scads) in midwater. Three to four sticks are usually used. Matches are taped in the fuse and lit with a cigarette. Sometimes chopped up fish is used to lure schools near the boat". The second method is used for bottom fish and employs a larger charge (eight sticks), wires and detonator cap. "the charge is placed by a diver on a coral head - the wires leading from the charge to the boat are usually covered with sand for a distance of 10 - 20 metres from the charge. Four torch cells in the boat provide the power to detonate the blast" (Johannes 1982). This last type is the worst of the two, and inflicts considerable damage to the marine environment.

"Dynamiting fish was somewhat decreasing due mainly to reduced availability of dynamite and to the actions of the Pulenuu - village leaders who have been given more responsibility by the government in recent years to enforce government laws" (Johannes 1982). This is true in some cases but locals are known to smuggle in dynamite from American Samoa in ingenious ways. The writer is aware of a few cases where sons of Pulenuus were involved in the dynamiting.

Thus this problem remains as one of the greatest threats to the marine environment in Western Samoa. A number of fishermen have been prosecuted for selling dynamited fish at the Apia Fish Market.

- (b) Fish Poisoning

The plant *ava niukini* (*Derris elliptica*) thrives in the bush of Western Samoa. Its roots are pounded and used as poison to obtain fish for consumption. *D. elliptica* is known to kill small reef fishes, juvenile fish, shellfish and even corals at high concentrations. However, its usage has declined in the past few years probably due to the disappearance or decline of the target species fishery.

Barringtonia plant is also used as fish poison but is not as effective or widely used as the *Derris* root. Household bleach and the herbicide Paraquat, have been reported as being used to kill fish on occasions.

- (c) Manual Destruction of Corals

Breaking corals apart in order to extract fish and invertebrates for food has been a long-standing custom in Western Samoa (Johannes 1982) and still prevails today. In addition, a fishing method, locally known as faamo'a, involves a number of people equipped with wooden poles. The poles are driven into corals, smashing them, to drive the fish out and into a waiting net.

(d) Soil Erosion

Johannes (1982) states that "the soil that is a precious resource on the land becomes a pollutant when deposited on corals". Land clearing for development, bad land management and cutting of firewood along the banks of rivers in Western Samoa have contributed to accelerated soil erosion.

Destruction of reef communities and deterioration of fishing in some districts in Western Samoa are suspected as being associated with soil erosion due to land clearing.

Gauss (1981) reports that comparison of seabed depth contours from bathymetric surveys done in 1975 and 1981 for the Apia harbour, suggest that the seabed has shallowed by up to five feet in the central and eastern parts of the harbour in six years.

(e) Industrial and Waste Disposal and Pesticides

Wastes from the country's feed mill, brewery and recently the beef canning factory, are discharged directly into the adjacent marine environment.

The steady increase in population in the urban area of Apia has resulted in an increased load of human waste although at present, waste from septic tanks is still disposed of on land. There is a proposal for Apia's sewerage to be discharged of Mulinuu Point with a discharge point 800m clear of the reef in about 40m of water.

The urban area garbage disposal is on the coast in a mangrove marsh about half a mile from the city. There is also a new garbage disposal nearer to the city, at Fugalei, also in a mangrove marsh.

'Pesticides and herbicides are used widely and rather indiscriminately in Western Samoa' (Johannes 1982). Paraquat is available to everyone. Dr Karl Marschall of Western Samoa was reported by Johannes as performing some experiments demonstrating that exposures to low levels of DDT can, over a period of weeks, lead to the gradual deterioration and ultimate death of reef corals. The other threat of pesticides is that even at sublethal levels, they can concentrate in edible bivalves to the point where they become unsafe for human consumption.

(f) Crown of Thorns Starfish

Infestations of Western Samoa's reefs by the *Acanthaster* dates back to the early 1930's. A recent invasion was in the late 1960's through to the early 1970's. This occurred at several points on the south, west, and east coasts of Upolu.

Because focal points of infestation appear to be directly opposite villages, and Crown-of-Thorns starfish are rarely found on stretches of reef between the villages (Garlowsky and Bergquist 1970), it has been hypothesised that infestations appear to be associated with an upset of the reef environment and damage to the food chains due to the effects of pollution, dredging, reef-blasting operations, and soil erosion from land development.

(g) Over-fishing

Johannes (1982) reports that the catch rate from Western Samoa's reef was not low by the standards of coral reef fisheries, though in the same report he notes that the fish are much smaller on the average.

Certain stocks of fish species, particularly mullet and scad, are known to be decreasing and becoming scarce. Whether this is due to over-fishing using nets or other means, in particular dynamiting, or the pressures mentioned earlier, or a combination of these, remains unknown. In addition to these species there are a variety of sea cucumbers, a limcoid known locally as gau, as well as the edible seaweeds which are under threat.

However, populations of a number of the more vulnerable organisms have in fact declined because of over-fishing. These include the *Tridacna*s and certain other bivalves. Divers as well as fishermen almost invariably comment on the lack of large fish in the lagoon and reefs of a Samoan village. Turtles, which were formerly relatively common, have become uncommon to rare.

Heavy Crown-of-Thorns infestation was reported from Satoalepai village this month (June 1985).

(h) Cutting of Mangrove Trees

Western Samoa has a very limited mangrove area. It is estimated (from Government maps) that the total coastal swampy areas and mangroves come to less than 1,000 hectares. At present, the cutting and filling of the mangroves proceeds almost uncontrolled. Fortunately, there are indications of existing ownership rights over mangroves in some areas on Upolu.

(i) Dredging

The major dredging of lagoon sand for use in construction occurs in Mulinu. It is suspected that the failure of the gau (*Dolabella* sp) fishery in this area is due mainly to the extraction of the sand. Wells (1984) reports that "such activities increase turbidity, alter water circulation and even cause the destruction of entire reef systems".

6. COASTAL ZONE FISHERIES AND FISHERIES RELATED REGULATIONS

A number of laws and customs regulating aspects of fishing activities and coastal management are operating in Samoa at present.

Although traditional fishing rights have largely disappeared, there are indications that they still exist in some areas. Fishing for atule (scad) during its run is the exclusive right of the people of Satoalepai village, in their lagoon. But outsiders who are permitted to fish are not expected to give a portion of their catch, and they can even sell part of their catch to villagers.

Van Pel (1960) reports that around Manono Island only the inhabitants may catch mullet and atule, while in Savaii, "during the whitebait runs in Gataivai river, whitebait fishing is the exclusive right of one village".

The custom of 'protectorship' of adjacent lagoon and reefs is respected by people from a different village in some areas, i.e. a village may chase away fishermen who may be fishing destructively in the lagoon or reef adjacent to the village, or even ban certain fishing techniques e.g. diving on the reef at night using underwater torches.

Fearing damage to the reef and the small reef fish, the government has enacted legislation banning the use of *Derris* or poison to obtain fish. Section 2 of the Fish Dynamiting Act 1972 makes it an offence for any person to use dynamite or other explosives to catch fish. Under section 4(f) of the Police Offences Act prohibits the use of the plants *ava niukini* (*Derris*) or *futu* (*Barringtonia*) or any derivative thereof for the purpose of capturing fish. However, although the penalty for violation of the law is imprisonment, the law is rarely honoured in the villages away from the town.

"Where a right of navigation exists the right takes precedence over the right of fishing and a navigator may place his ship in a fishery and stay there as long as is reasonably necessary for the purposes of navigation, but he must not abuse his right by acting wantonly or maliciously so as to damage the fishery. It follows therefore that fishing must not be carried on so as to cause a nuisance or obstruct navigation" (Vaai 1984).

The general public has no common right to fish in waters that are not tidal even though such waters happen to be navigable. The owner of a fishery may, of course, give general permission to the public to use his fishery or he may by reason of ignorance, generosity, carelessness or indulgence take no steps to prevent the public fishing in his fishery. Even so the public as such cannot acquire a general right to fish (Vaai 1984).

In common law the public has a right to fish in the tidal reaches of rivers and in the sea and arms of the sea within the limits of the territorial waters of the State. This right also extends to the EEZ defined by Section 3 of Exclusive Economic Zone Act 1977. The public right to fish must, however, be exercised reasonably and in conformity with the law.

Section 4 of the Fisheries Protection Act 1972 prohibits foreign fishing vessels from engaging in fishing, possessing any fish or engaging in activities in support of a foreign fishery fleet within Western Samoan waters except as expressly provided in an agreement or convention to which Western Samoa is a party. Exemptions may be granted if they are for purposes of fishery research or otherwise in the national interest. The use of a foreign fishing craft for fishing in the Exclusive Economic Zone is prohibited by Section 4 of the Exclusive Economic Zone Act 1977 unless it has been issued with a licence under the Act. Section 5 of the Act authorises the Minister to issue licences to owners of foreign fishing craft subject to conditions specified under the Act. Section 13 of the Exclusive Economic Zone Act 1977 allows a foreign fishing craft to be used for fishing without a licence in the EEZ for the purpose of fishery research or for experimentation or sport provided that prior approval in writing is obtained from the Minister.

7. MARINE RESERVE

The 1974 National Parks and Reserves Act prompted the establishment of the Palolo Deep Marine Reserve. In December 1979, the Western Samoa Government approved the establishment of this reserve. The Palolo Deep Reserve (Map 2.) is located on the north coast of Upolu at Pilot's Point, Matautu, about a mile east of Apia city.

Palolo Deep is a 'hole' about 200m in diameter and 10m deep within a fold in the fringing reef which surrounds Pilot Point, but the reserved area extends to the surrounding reef to the north and north-east and 500m east off the fringing reef.

At present, the Palolo Deep Reserve is supposedly under the management of the Parks and Reserve sector of the Forestry Division of the Ministry of Agriculture Forests and Fisheries.

8. MARICULTURE

It is generally believed that as isolation increases from west to east in the tropical Pacific, there are possibly unoccupied habitats existing where the introduction of useful species would do little harm.

In 1981, investigation on the possibility of culturing the Philippine green mussel (*Perma viridis*) was initiated. Mussel spats were imported from CNECO AQUACOP, Tahiti (Bell and Albert 1983).

The failure of the initial trials near the city led to a second importation of spats in early 1983. These were then put in more remote areas (Safata Bay on Upolu and Asau Bay in Savaii). These second trials in the new selected sites were very successful and marketable size mussels of 5.0 - 8.0cm were obtained 5 - 6 months after implantation (Bell and Albert 1983).

A partial harvest showed promising production as well as a good local market (Bell and Albert 1984). Natural spatfalls from the imported mussels have been recorded in one site (Bell 1984) and the species offers promising development.

Surveys for locating other suitable areas for the culture of the green mussel are on the way, while a proposal had been submitted for funds to introduce mussel farming to villages with suitable sites, at a small-commercial level.

9. CONCLUSION

As Johannes and others have put it "development in the coastal zone is not planned or managed in any integrated way". Jordan and Searle (quoted in Grattan 1948) said that Samoa's fish fauna was one of the richest on the globe, and Kramer (1888) wrote that 'naturally, there are fishes throughout the whole year, for the sea is as inexhaustible as the land'. More recently Gilson (1970) said that "considering the Samoan pattern of life, along with the population, the physical environment seemed indeed to have provided an ideal basis for comfortable and convenient settlement". Unfortunately these views do not seem applicable to the present situation.

Apart from a recommendation in the Fourth Five Year Development Plan (1980 - 1984) to establish a small Environmental Management Unit to look into the environment situation and be responsible for setting up environmental management legislation, little has been initiated. Western Samoa's Fifth Development Plan (1985 - 1987) also recognises the need to protect the environment and conserve the natural resources (Government of Western Samoa 1984).

At present, the Palolo Deep Marine Reserve is under the National Parks and Reserve Section of the Forestry Division, and as Johannes (1982) notes, "the reserve is clearly being fished surreptitiously" and that "a swim around the periphery of the park indicated that the fish were more wary than they would be in a completely protected preserve" and that "there was a noticeable absence of larger fish". Whether the area was properly surveyed to protect the most important reef section in this area is also questionable.

Information on the coastal zone status as well as its resources is virtually non-existent.

There is a need for research on the marine resources in the country to include the status of coral reefs, fisheries and mangroves. Management-oriented research would also be of great benefit.

Enforcement of existing legislation concerning the use of dynamite and poisons (including chemicals) through the village Puleuu is highly desirable. It seems that the immediate improvement of Samoa's reef and lagoon resources depends on the reduction of marine pollution and destructive fishing practices (Johannes 1982).

Management of a multi-species fishery is complex and expensive but efforts should be made to monitor at least a few species (e.g. mullet) which form an important part of the catch. Sound coastal developments (e.g. the creation of marine parks) can only be well accepted when villagers themselves are involved and when traditional marine tenure is understood and recognised by government. Thus "efforts should be made to investigate and record the remaining marine tenure and fishing rights as they pertain to all coastal waters. Some of these traditions may prove to be of great value in terms of sound reef and lagoon resource management and if so they should be legally recognised". (Johannes 1982).

Although conservation and creation of marine parks looks attractive at present, there is a need to assess the implications of coastal conservation as for the majority of those in rural areas, about 70% of the nation's population, subsistence fishing is crucially important. Fairbairn (1973) reported that 72% of Samoans were engaged in village agriculture. Most of these households are also actively engaged in subsistence fishing. Mariculture, in addition to a reduction of marine pollution and destructive fishing practices, offers an alternative means of increasing marine production, particularly in places where there is no 'room' for conservation, Mariculture would also lessen the pressure on marine resources.

Western Samoa needs to conserve or at least manage its precious but very limited mangrove resource. But the traditional tenure concerning the mangrove areas must be documented and recognised before initiation of such a project.

The injection of environmental concern into education would greatly assist in creating public awareness of the importance of environmental management.

There may even be a need to establish a Research Unit to deal with the marine environment either in the Fisheries Division or as part of the Environmental Management Unit recommended in the 1980-1984 Five Year Development Plan (which has not materialised yet). Its tasks would include carrying out all research concerning the coastal environment, arranging for overseas organisations to carry out local research, providing materials for research, advising individuals or overseas organisations on local research, publishing research results, as well as drawing up and advising government on legislation concerning the coastal environment.

TABLE 1

Country	Land (Sq.m)	EEZ (Sq.m)	Population	Population Density (Sq.m)
Cook Islands	94	715,000	18,500	197
Micronesia	716	2,422,000	132,500	185
Fiji	7,138	504,000	619,000	87
Kiribati	270	1,387,000	57,300	212
Niue	14	105,000	3,500	250
Nauru	8	125,000	7,300	913
PNG	180,564	1,219,000	3,079,000	17
Solomon Is.	11,145	523,000	221,200	20
Tonga	273	273,000	95,800	351
Tokelau	7	180,000	1,100	157
Tuvalu	10	352,000	7,400	740
Vanuatu	4,641	266,000	114,500	25
E. Samoa	105	135,000	31,000	295
W. Samoa	1,146	37,000	158,000	139

(From Forum Fisheries Agency Report 1983)

TABLE 2WESTERN SAMOA ESTIMATED TOTAL CATCH

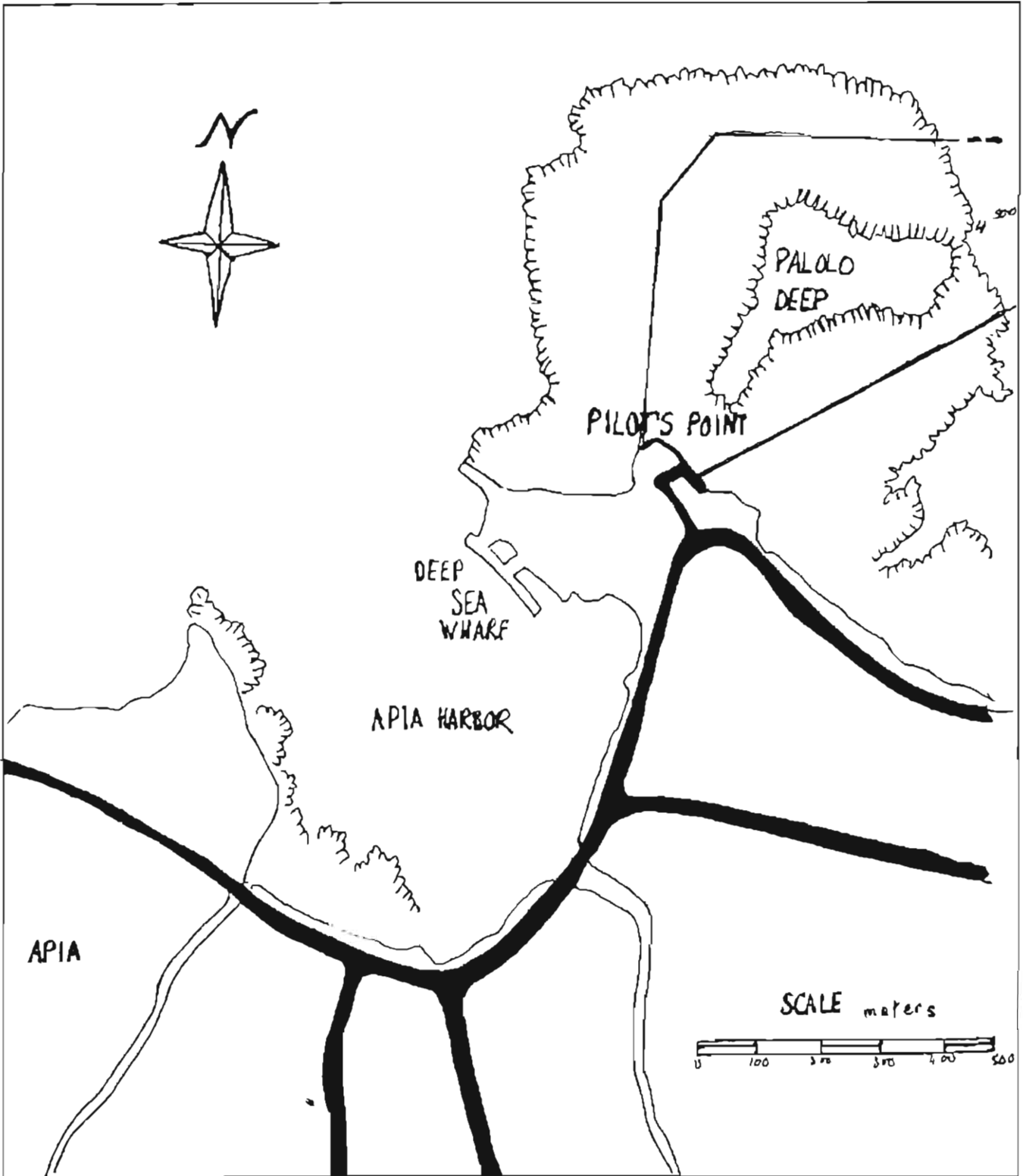
TONS = SHORT TON

\$ = WS TALA

<u>YEAR</u>	<u>TUNA</u>	<u>BOTTOM FISH</u>	<u>SHELL FISH</u>	<u>OTHERS</u>	<u>TOTAL</u>
1975	650	900	25	80	
Value	\$420,000	\$630,000	\$30,000	\$40,000	\$1,120,000
1976	700	950	20	100	
Value	\$525,000	\$760,000	\$35,000	\$50,000	\$1,370,000
1977	700	900	20	100	
Value	\$595,000	\$900,000	\$50,000	\$70,000	\$1,615,000
1978	750	850	20	100	
Value	\$675,000	\$1,020,000	\$60,000	\$80,000	\$1,835,000
1979	950	800	20	100	
Value	\$855,000	\$960,000	\$65,000	\$90,000	\$1,970,000
1980	1,800	800	20	100	
Value	\$1,620,000	\$1,040,000	\$80,000	\$100,000	\$2,840,000
1981	2,200	850	20	100	
Value	\$3,300,000	\$1,000,000	\$100,000	\$110,000	\$4,610,000
1982	2,400	600	20	100	
Value	\$3,840,000	\$1,000,000	\$100,000	\$120,000	\$5,060,000
1983	2,550	250	20	100	
Value	\$4,080,000	\$1,700,000	\$100,000	\$120,000	\$6,000,000

NOTE: Sustainable yield of bottom fish caught in known areas suitable for this type of fishing is estimated to be about 1,100 tons/year.

FIGURE 2.



CASE STUDY: MARINE RESERVES IN NEW CALEDONIA

Jean-Louis Jourde,
 Chef de Service
 de la Marine Marchand et des
 Pêches Maritimes, Noumea,
 NEW CALEDONIA

BACKGROUND

New Caledonia is surrounded by a large and rich lagoon which is enclosed by a barrier reef over 1,000 km long.

Exploitation of the living lagoon resources to meet local requirements for fish and other seafood has not, up to now, greatly affected the overall bio-ecological balance of the lagoon environment because New Caledonia's population density is very low.

The sea area near the capital of Noumea, where over half of the Territory's population lives is, however, a notable exception. Artisanal fishermen are far more active in this area than anywhere else in the Territory and their impact is further compounded by other activities such as recreational fishing, spear fishing and tourist related activities.

The New Caledonian authorities were therefore led to implement, in addition to the general fisheries legislation applicable to the Territory as a whole, a specific strategy for the protection of the sea areas close to Noumea. This involved the establishment, over a period of years, of several different types of marine reserves.

1. "Yves Merlet" Reserve

This reserve was established in 1970 at the south-eastern tip of the main island. It is a complex and very diversified ecosystem comprising many islands and reefs, whose unique wealth and beauty made it desirable to classify it as a strict nature reserve.

Not only are fishing, capture or collection of all animals, plants or minerals prohibited in this area, but it is also out of bounds to boats, which are not permitted to pass through it or to moor near any of the islands or emerging reefs. These regulations may, however, be waived for traditional canoes and customary fishing activities.

This protected area constitutes a living museum which is representative of the rich marine heritage of New Caledonia and is a valuable reference area for biological and ecological studies on reef and lagoon systems.

2. Special Marine Reserves Around Some Islands of Tourist Interest in the Noumea Area.

Among the recreational activities available to tourists visiting Noumea, launch trips to the Amedee Lighthouse Island and to Maitre Island, on which a hotel was built two years ago, are very popular.

The surroundings of these two islands, which are easily reached from Noumea, used to attract many weekend boating and fishing enthusiasts. However, when one considers that over 7,300 pleasure craft are registered in Noumea, one can easily imagine that the marine fauna and flora in these areas has been considerably depleted over the years.

This is why the two above-mentioned islands, the reefs enclosing them and the adjacent waters (less than 10 metres deep) were, in 1981, classified as special reserves, within which fishing, as well as the capture or collection of all animals and plants, whether on land, in the sea or in the air, is strictly prohibited.

When the environment has had sufficient time to regenerate, these reserves, access to which remains authorised, will offer tourists and the general public reef and lagoon sites of great interest. In addition to the protection of plant and animal life, these two reserves also have an educational and recreational purpose.

3. Special Rotating Reserve on the Barrier Reef opposite Noumea (see Map).

The barrier reef lying more or less opposite Noumea and its surrounding waters are among the most heavily fished areas in New Caledonia, being used both by recreational and commercial fishermen.

There are three distinct sections of reef, Annibal, Abore and Xue, separated from one another by channels used for navigation.

Divers from ORSTOM and the Noumea Aquarium, as well as local fishermen, had for some years reported that these areas were becoming noticeably poorer, particularly in their stocks of fish and crustaceans. It therefore seemed urgent to take measures that would lead to regeneration of stocks without unduly restricting access of fishermen to fishing grounds in the Noumea area.

This is the philosophy behind the special rotating reserve which was established in 1981 and operates as follows:

- on the date on which the law establishing the special rotating reserve came into force, one of the three reef sections referred to above and its surrounding waters (area B on the map) was closed to all fishing activity, with the other two sections remaining open to fishing without any restrictions (areas A and C);
- at the end of three years, area B was re-opened, while area C was in turn closed to fishing activity;
- this pattern is repeated every three years, with area A to be closed when C is opened, etc.

The major difficulty with this rotating system is to determine the most appropriate cycle for opening and closing the areas.

It is practically impossible to assess the exploitable stocks in and around any one reef section quantitatively because of the great species diversity and the interactions occurring between adjacent reef sections.

Furthermore, not enough biological data are at present available, especially on the reproduction and growth of the various commercial species, on which to base such an assessment. However, the three-year rotation that was chosen should normally lead to fairly good recruitment for most fish species.

Although there has been no proper scientific monitoring of this reserve so far, divers from ORSTOM and the Noumea Aquarium, as well as many fishermen, reported that a definite improvement seemed to have taken place in the first area to be closed for three years.

The system thus appears to have been effective. However, this is only a rough and subjective evaluation; a more precise assessment of the effects of the protective measure would need to be based on fishing statistics that are sufficiently precise to separate catches and efforts in each of the three areas.

Such a degree of precision in the recording of fishing results is not feasible at present.

4. Specific Fishing Zones

The provisions outlined above have recently been complemented by specific measures allowing for the exploitation of certain resources such as coral, aquarium fish, Bryozoa, and sponges in the protected areas.

It was felt that the possibility of initiating and developing new handicraft activities based on the commercial exploitation of these resources should not be automatically ruled out, although great caution had to be exercised and a thorough evaluation made of the impact of such exploitation on the reef and lagoon ecosystem.

4.1 Exploitation of Coral

Commercial exploitation of coral which had been prohibited, was authorised on a trial basis from 1984 in one section of the barrier reef (Tetembia) situated just north of the rotating reserve discussed under heading 3. At the same time, the territorial government asked ORSTOM to conduct a study on coral growth, colonisation processes, the impact of coral collection and an assessment of the coral stocks exploitable on this section of reef.

Coral collectors must hold a special permit and undertake to co-operate with the ORSTOM scientists. They must follow any new instructions that might be issued by the scientists or the territorial government as regards methods of exploitation, genera to be protected, or maximum allowable quantities, and submit monthly reports on their activities.

This trial programme should eventually lead to a precise definition of coral exploitation procedures that do not endanger the ecosystem and thus help to avoid the often irreversible damage done in the past in other parts of the Pacific through uncontrolled exploitation.

4.2 Aquarium fish

The New Caledonian lagoon contains numerous species of aquarium fish that are in high demand, especially on American and European markets. Small-scale exportation of this resource was begun recently. Capture of these fishes is permitted only by day and without scuba diving equipment, all fishing with the latter being in any case prohibited in New Caledonia.

However, in order to enable divers to catch sought-after specimens without damaging their natural habitat and without jeopardising their survival by rough handling, the territorial authorities are at present considering the advisability of authorising the use of scuba equipment for the capture of small aquarium species. The fishermen concerned would need to hold a special permit issued annually which identified those species whose capture was prohibited (in particular, juveniles of fishes marketed for human consumption).

In order to keep adequate control over this activity and limit its impact on the natural environment, capture of aquarium fish with scuba diving equipment would be authorised only in one area. The general idea is to combine the choice of this area with the rotating reserve on the barrier reef opposite Noumea. The capture of aquarium fish would be permitted only in one of the two "open" areas of the rotating reserve described under heading 3, and the fact that the area concerned would change every three years should reduce the risk of over-fishing in any one area.

Quarterly monitoring of catch statistics should enable appropriate restrictions to be applied if fishing pressure on any species was found to be too high.

4.3 Bryozoa and Sponges

Since there is a demand for certain species of Bryozoa and Sponges, both on the local souvenir and handicrafts market and for export, consideration is also being given to special provisions authorising capture with scuba diving equipment of these species which are generally found at depths of more than 10 metres. Two well defined lagoon areas would be opened on a trial basis for this type of fishing : one north of Noumea for the Bryozoa, one south of Noumea for the Sponges.

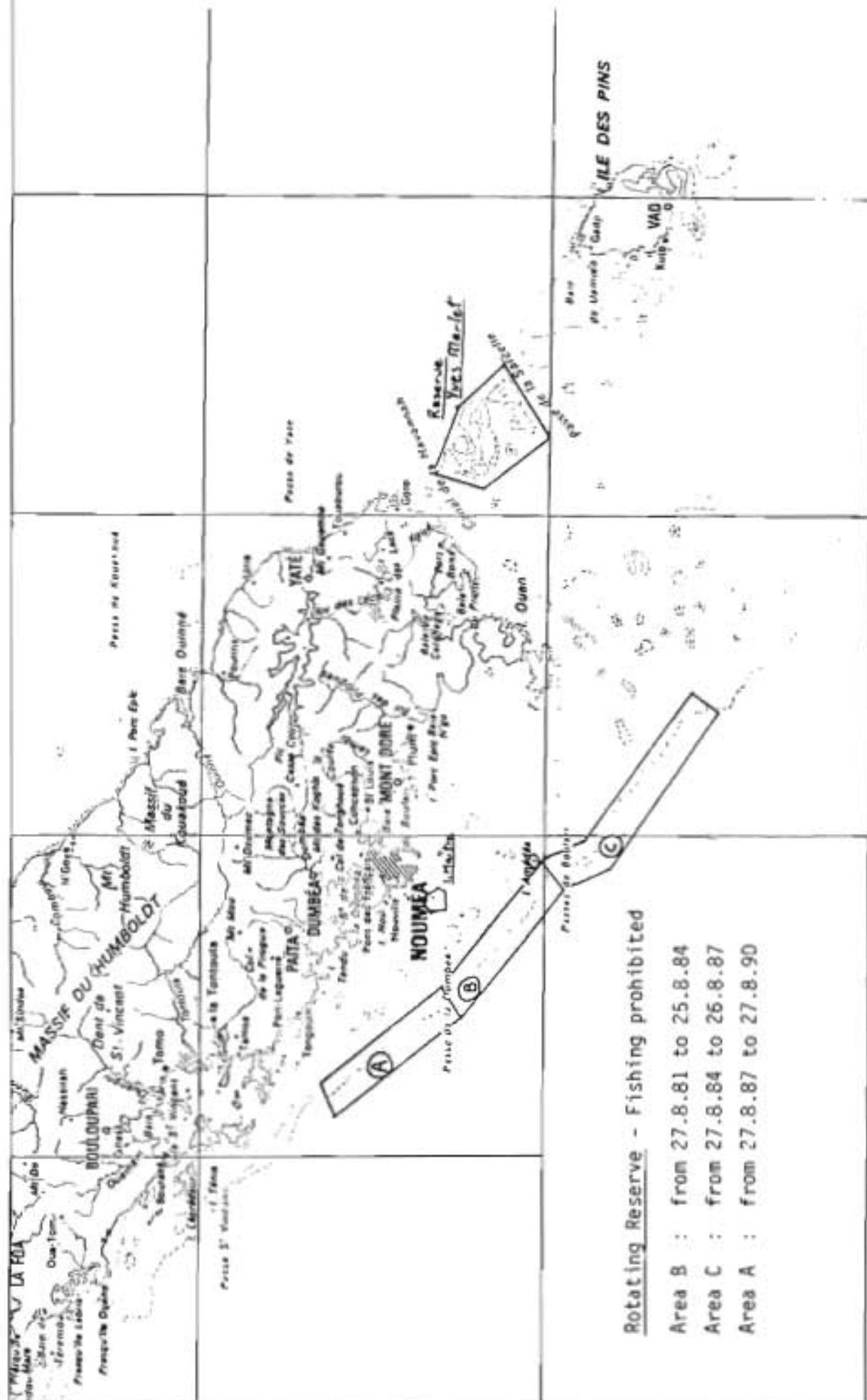
Fishermen wishing to engage in this activity will, as for the exploitation of aquarium fish, have to obtain a special permit and undertake to submit quarterly reports on their catches.

5. Conclusion

The lagoon and reef zones near the capital city of Noumea are under heavy fishing pressure from both recreational and commercial fishermen. Being easily accessible and suitable for a wide range of activities they are currently governed by a series of legislative provisions designed to enable the various users of the sea to live in harmony and to foster development of economic activities while preserving a natural heritage of great value and interest.

Close monitoring of activities in this zone, together with the implementation by ORSTOM of a comprehensive programme of identification and evaluation of biotopes in the New Caledonian lagoon using the most sophisticated interpretation techniques, (in particular satellite imagery) should, in the coming years, allow the effectiveness of these provisions to be measured very precisely.

ROTATING MARINE RESERVES - NEW CALEDONIA



CASE STUDY: FAGATELE BAY NATIONAL MARINE SANCTUARY

William J. Thomas
 Sanctuary Programs Division
 Office of Oceana and Coastal Resource Management
 Washington, D.C.
 U.S.A.

ABSTRACT

Fagatele Bay, a 163-acre embayment located on the southwest coast of Tutuila Island, American Samoa, was established as a National Marine Sanctuary by the United States Department of Commerce in April 1985. The designation is intended to protect and preserve, through co-ordinated research, education and regulatory programs, the natural resources and values of this pristine area. The designation process included co-ordination between Federal and Territorial agencies and an extensive public participation process. As a result, a Sanctuary Management Plan tailored to the specific needs of the area was developed and Federal regulations were promulgated. The plan calls for a comprehensive management regime that emphasises the co-ordination among agencies and programs responsible for and supporting plan development, research and education.

Many issues were considered, with traditional lifestyle and cultural attitudes being of paramount importance.

INTRODUCTION

The designation of Fagatele Bay, American Samoa, as a National Marine Sanctuary, demonstrates the use of a Federal program as a mechanism for enhancing the management of marine resources in the American flag territories of the Pacific and for promoting international co-operation. This paper serves to describe the need for the action, the authority to act, the range of issues addressed during the evaluation of the site, and the prescriptions resulting from the exercise.

Title III of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA) 16 U.S.C. 1431 *et seq.*, as amended, authorises the Secretary of Commerce, with Presidential approval, to designate ocean waters as marine sanctuaries for the purpose of preserving or restoring their conservation, recreational, ecological or aesthetic values. Marine sanctuaries may be designated as far seaward as the outer edge of the continental shelf, in coastal waters where the tide ebbs and flows, or in the Great Lakes and their connecting waters and are built around the existence of distinctive resources whose protection and beneficial use requires comprehensive planning and management. The National Oceanic and Atmospheric Administration (NOAA) administers the program through the Sanctuary Programs Division (SPD) within the Federal Office of Ocean and Coastal Resource Management (OCRM).

In addition to Fagatele Bay, six other national marine sanctuaries have been established since the program's inception in 1972 (Map 1):

- * The Monitor National Marine Sanctuary - This sanctuary serves to protect the wreck of the Civil War ironclad, U.S.S. MONITOR. It was designated in January 1975 and is an area one mile in diameter 16 miles southeast of Cape Hatteras, North Carolina.

- * The Key Largo National Marine Sanctuary - This sanctuary, designated in December 1975, provides protection and management of a 100 square mile coral reef area south of Miami, Florida.
- * The Channel Islands National Marine Sanctuary - This sanctuary, designated in September 1980, consists of an area approximately 1,252 square nautical miles off the coast of California adjacent to the northern Channel Islands and Santa Barbara Island. The sanctuary ensures that valuable habitats for marine mammals, including extensive pinniped assemblages and seabirds are protected.
- * The Looe Key National Marine Sanctuary - The Sanctuary consists of a five square nautical mile submerged section of the Florida reef tract southwest of Big Pine Key. The site includes a beautiful "spur and groove" coral formation supporting a diverse marine community and a wide variety of human uses. It was designated in January 1981.
- * The Gray's Reef National Marine Sanctuary - The site, designated in January 1981, is a submerged live bottom area located on the South Atlantic continental shelf due east of Sapelo Island, Georgia. The sanctuary, which encompasses about 17 square nautical miles, protects a considerably productive and unusual habitat for a wide variety of species including corals, tropical fish and sea turtles.
- * The Point Reyes - Farallon Islands National Marine Sanctuary - This 948 square nautical mile area off the California coast north of San Francisco contains a diverse array of marine mammals and birds as well as fishery, plant and benthic resources. The sanctuary was designated in January 1981 and ensures that the area receives long-term, comprehensive protection.

Management plans tailored to site-specific needs have been developed for each sanctuary to guide efforts to protect the resources and ensure maximum public benefit. The initial management plan for each sanctuary spans five years, is reviewed annually and is revised as appropriate experience is gained in operating a particular sanctuary.

PROBLEM STATEMENT

Fagatele Bay, a 163-acre embayment located on the southwest coast of Tutuila, American Samoa's largest and most populated island, has long been recognized as a unique resource of high ecological value (Map 2). The American Samoa Parks and Recreation Commission (1980) proposed establishing a conservation district at Fagatele Bay in recognition of the bay's "rich marine environment", while the United States Army Corps of Engineers Pacific Ocean Division (USACE) identified the bay as a pristine area (AF and AECOS, 1980), and in its Wastewater Data Evaluation Study for American Samoa, identified it as a critical (water) use area and proposed that it be made a Marine Preserve (USACE, 1978). The bay's pristine character, however, owes less to the exercise of local authority than it does to its physical inaccessibility. The steep cliffs which rim the bay make overland access difficult, necessitating water-borne access. As a result Fagatele Bay has remained virtually isolated and free from human impacts. This, however, did not prevent the partial devastation of the bay's coral reefs from natural causes.

During late 1978 and early 1979, approximately 90% of the bay's coral reef was destroyed by the crown-of-thorns starfish (*Acanthaster planci*). The starfish infestation, which has persisted for almost two decades, impacted

many other coral reefs in the high islands of the tropical Pacific. Over half of the coral reefs fronting Tutuila, for example, were destroyed by the starfish in the late 1970's (Office of Samoan Information, 1980). This natural phenomenon, albeit the devastating impact it had upon the live coral resource, presents a unique opportunity to study and document the restoration and recovery of such ecosystems. Since periodic infestations of *Acanthaster* are common throughout most of the Pacific, the results of such research could be valuable to furthering our understanding of the dynamics of coral reef recovery and contribute to the formulation of sound management policies and techniques.

Recognising the impact to the bay's resources resulting from the starfish infestation and the need to protect the site from additional human-induced perturbations, a proposal was submitted by the American Samoa Government nominating Fagatele Bay as a candidate for marine sanctuary designation in March 1982. After preliminary public and agency consultation, an Issue Paper was prepared and distributed by NOAA in May 1982. Subsequently, a public workshop was held in American Samoa to solicit further comments on the feasibility of the proposed sanctuary designation. Based on the comments received and in consultation with other Federal agencies and the American Samoa Government (ASG), a Draft Environmental Impact Statement and Sanctuary Management Plan for the Proposed Fagatele Bay National Marine Sanctuary (DEIS) was developed. A Public Hearing on the DEIS was held in January 1984 in American Samoa; the results, which in addition to written comments received on the DEIS, were used by NOAA and the American Samoa Government in the development of the Final Environmental Impact Statement and Sanctuary Management Plan (FEIS). The comments identified several major issues, which are described as follows:

- * Sanctuary designation may not blend with the traditional lifestyle and cultural attitudes of the Samoan people.
- * With introduction of the Federal program, local participation in the process may be eliminated.
- * Existing regulation of Samoa's marine environment might be enhanced through sanctuary designation.
- * The distance from Washington, D.C. may make management of the National Marine Sanctuary impractical from the Federal perspective.
- * The availability of native Samoans qualified to manage the Sanctuary may be a limiting factor in effective sanctuary management.

PERCEPTS FOR PLANNING

While working with the ASG, the major issues were raised early in the evaluation process. In dealing with the issues, NOAA and the ASG worked together to formulate operational precepts equitable to both the Federal and Territorial governments.

The concerns and lifestyle of the Samoan people were taken into account throughout the designation process. The plan developed for managing the sanctuary in American Samoa is the product of a co-operative evaluation process between the ASG and NOAA and is geared towards:

- (1) increasing co-ordination between Federal and Territorial resource protection programs;
- (2) promoting management-related research programs to improve the basis for decision-making;

- (3) establishing public awareness and education programs aimed at the long-term protection of Fagatele Bay's unique natural resources; and
- (4) continuing traditional use of the bay's waters.

Full financial responsibility for sanctuary management rests with the Federal Government.

Calling for a co-ordinated management regime between the appropriate ASG agencies, the plan recognised that existing controls may not be specific enough to fully protect and preserve the bay's resources. It therefore proposes a set of regulations to ensure adequate protection of the Sanctuary's resources. However, it also intends to promote the non-regulatory aspects of resource management, i.e., public education and awareness, promoting and co-ordinating research within the Sanctuary and making available any resulting product, and co-ordinating the activities of Federal and Territorial agencies in carrying out their respective roles in resource management.

The impact of implementation of this Plan will go beyond the territorial limits of American Samoa. Research and education elements have Pacific-wide applications: studies on the impacts of *Acanthaster* infestations in coral reef areas will contribute to understanding this prevalent problem and aid in the management of coral reef ecosystems; education programs that combine traditional values with modern practices and technology may help other Pacific islands to enhance their conservation efforts.

Protection of Fagatele Bay's resources was dealt with on several levels. Designation of the area as a Marine Park by the ASG provided protection to 10 fathoms. Sanctuary designation complements this by providing additional protection to the bay through a management plan tailored to the specific needs of the area, regulatory and non-regulatory (interpretive) regimes, and the funding needed to ensure adequate protection of the bay's natural resources. In addition, the Sanctuary will co-ordinate with the American Samoa Coastal Management Program to ensure that the water quality of the bay's near-shore waters are not degraded.

Since the Sanctuary represents the most distant member of the national system, its day-to-day management will depend on co-ordination with an on-site agency. For this purpose, the American Samoa Development Planning Office (DPO) has been identified as the lead agency. The sanctuary manager will co-ordinate daily administration of the Sanctuary with DPO, while NOAA will co-ordinate overall administration and program implementation with them.

Although it is recognised that the availability of qualified native Samoans to manage the Sanctuary may be limited, training of local personnel is an important mission of the Sanctuary. If it is necessary to hire a non-Samoan as manager, an assistant manager who is a native Samoan will be hired and provided with training such that he will eventually be fully capable of assuming the higher position. In turn, other Samoans will be trained as they assume the assistant manager position.

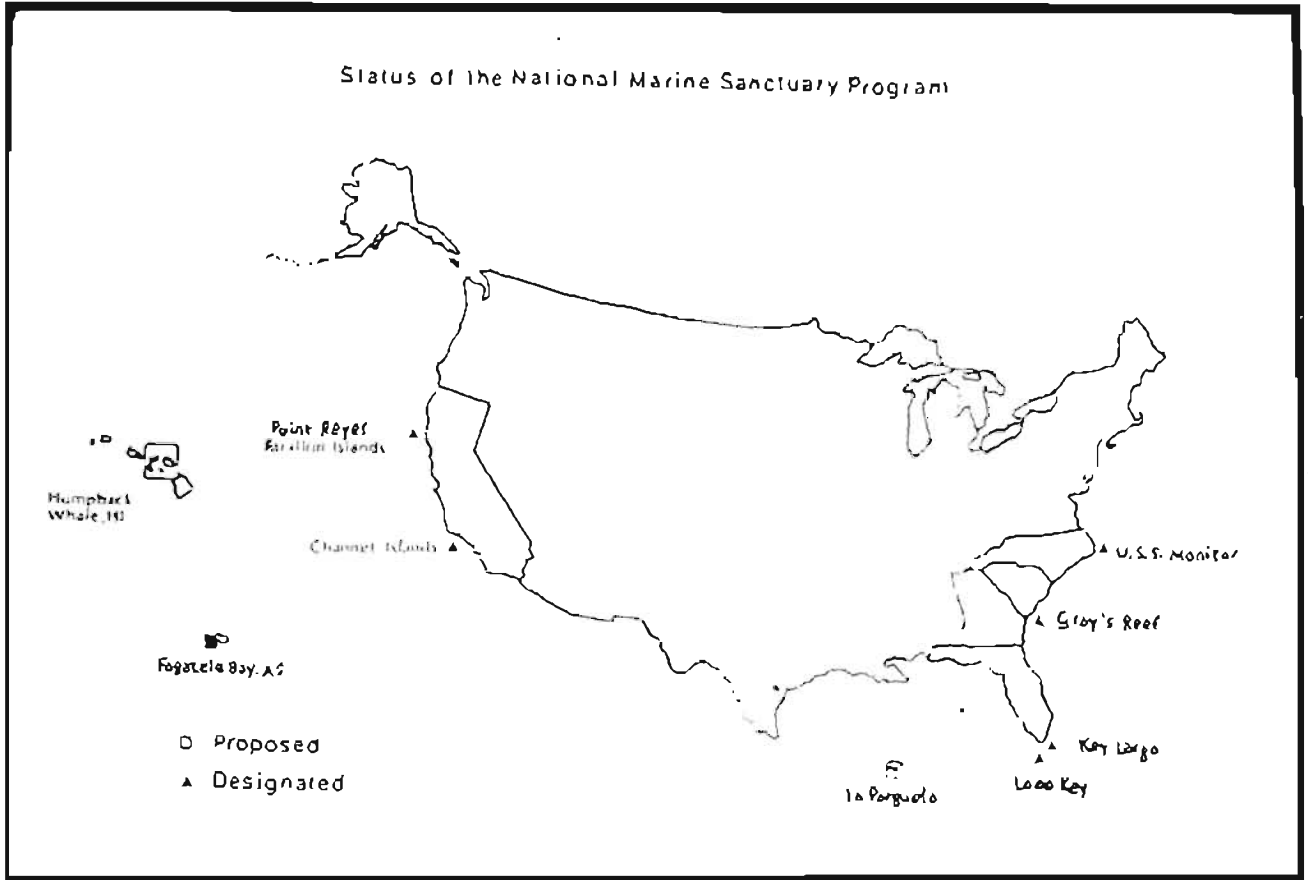
CONCLUSION

The case study illustrates the applicability of a Federal resource management program to co-ordinate and enhance marine resource protection in American Samoa. Ultimately, the goal is to protect and preserve the resources of Fagatele Bay, Tutuila Island, American Samoa while preserving traditional lifestyles. However, in dealing with this issue, it was also

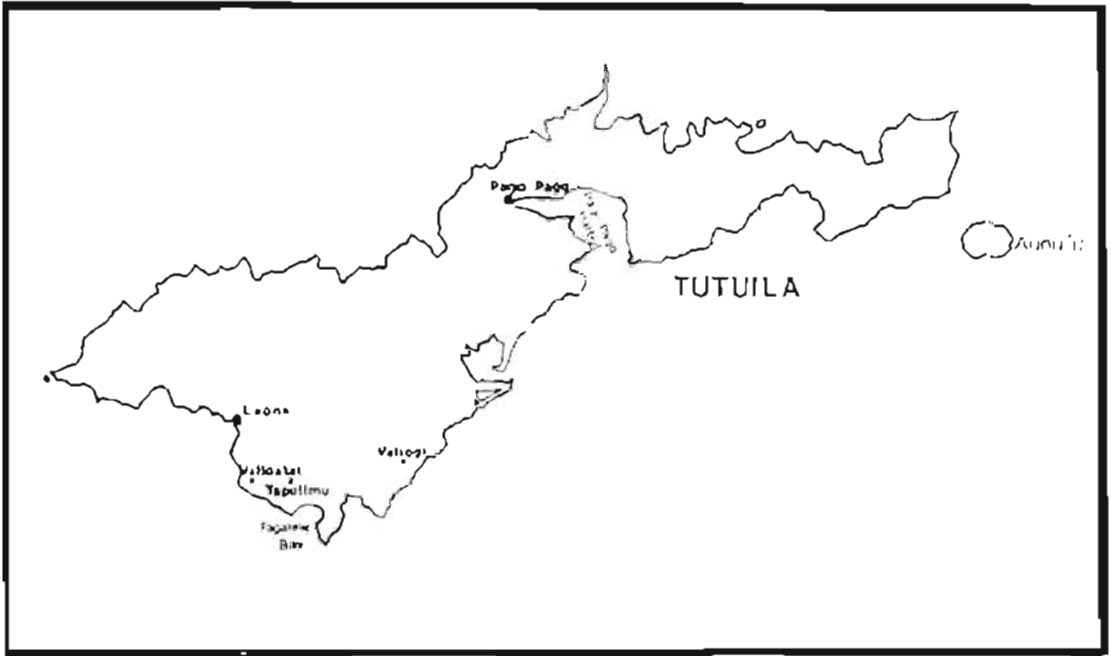
important to co-ordinate the activities of the various resource management entities in the evaluation and plan formulation stages.

The program is just beginning in American Samoa, but continued co-operation from both the Federal and Territorial Governments will enhance the chances of program success. It is hoped that through this program, the legacy this generation of American Samoans leave for the next generation will be one that improves the quality of life while maintaining the cultural heritage and identity that is uniquely Samoan.

MAP 1: NATIONAL MARINE SANCTUARY SYSTEM



MAP 2: LOCATION OF FAGATELE BAY



APPENDIX

ENVIRONMENTAL SETTING

located approximately 7.5 miles south of Pago Pago Harbour along the southwestern shore of Tutuila, the waters of Fagatele Bay can be characterized as a pristine environment with a highly productive coral reef community, a collection of threatened, endangered species, and endemic species, and a rich avifauna. The bay's marine environment is typical of the terraced coral reef ecosystems associated with high islands of the tropical Pacific and possesses a complex ecosystem with a naturally high level of productivity. The area around the bay provides sea and shore birds with comparatively remote, favourable physical environments for nesting, along with ready access to rich foraging areas that are necessary during the breeding season. Other than some subsistence fishing and low-level recreational fishing, human use of the area is minimal.

The avifauna are the dominant wildlife forms in American Samoa. Of the 60 species of birds listed by the United States Fish and Wildlife Service, 19 species use the shore, rocky cliffs and the surrounding heavily forested ridges of the bay for nesting and/or feeding. In addition to the birds, hundreds of flying foxes, or fruit bat (*Pteropus samoensis*) roost and breed along the surrounding ridges.

The bay and its adjacent waters are also important to a group of the endangered humpback whales (*Megaptera novaeangliae*) of the southern hemisphere breeding population. Each year, from July through to October, this population uses the waters around American Samoa for breeding and calving. Occasionally, endangered sperm whales (*Physeter catodon*) are sighted in the offshore waters surrounding American Samoa and may venture into the waters seaward of Fagatele. In addition to these two species of great whales, the waters of and in the vicinity of the bay also host other cetacean species including the Pacific bottlenose (*Tursiops truncatus*) and spinner (*Stenella* sp.) dolphins.

The bay and its surrounding waters also serve as important habitat for the endangered hawksbill turtle (*Eretmochelys imbricata*) and the threatened green sea turtle (*Chelonia mydas*). Other occasional visitors to the bay include the endangered leatherback turtle (*Dermochelys coriacea*) and the threatened olive ridley (*Lepidochelys olivacea*) and loggerhead (*Caretta caretta*) turtles.

Fish resources are abundant throughout Fagatele Bay. Because of the bay's configuration, the area provides a protective habitat for many fish species. Surveys of fish indicate that the fish fauna is very diverse, with species being moderately to highly abundant in the shallower depths (AEGOS, 1980). During the late 1970's, 86 species of fish were recorded from the reef flat area. Consistently abundant species include the damselfishes (*Steastes albofasciatus*, *Glyphidodontops cyanea*, and *G. leucopomus*) the surgeonfish (*Acanthurus nigrofuscus*), and the wrasse (*Thalassoma hardwickei*). Other conspicuous species include the surgeonfishes (*Ctenochaetus striatus*, *Acanthurus lineatus*, and *A. triostegus*), the butterflyfish (*Chaetodon reticulatus*), the damselfish (*Glyphidodontops glaucus*), adult and juvenile parrotfish (*Scarus* sp.), and the anemonefish *Amphiprion melanopus*). The waters off the southeastern tip of the bay harbour a highly diverse fish fauna of moderate abundance, with the damselfish (*Plectroglyphidodon dickii*) and (*Chromis acares*) being the most abundant of the 114 species recorded in this area. Green sea and hawksbill turtles also inhabit this area.

The most conspicuous members of the benthos in Fagatele Bay are the corals. The extensive coral reef system found in American Samoa, constructed by corals and coralline algae, is typical of shallow, clear tropical seas where the mean annual temperature is 70°F (AECOS and AF, 1980). This community is very diverse, with a wide variety of habitats supporting populations of larger fish which have traditionally supplied high-quality protein to native populations living near the sea where other sources of protein are often inadequate. The fringing coral reefs, such as those found in Fagatele Bay, also help to moderate shoreline erosion by buffering ocean waves.

The most conspicuous coral species in the bay are *Pocillopora verrucosus*, *Favia* sp., *Galeaxea* sp., *Goniastrea* sp., *Acropora humilis*, *Porites lutea*, and the soft coral (*Palythoa* sp.). Dominant algae include *Cheilosporum* sp., *Bryopsis* sp., and *Halimeda* sp.

Other species recorded in Loene Bay, just west of Fagatele Bay, and which may also be present in Fagatele Bay, include the hard corals *Leptastrea purpurea*, *Pavona frondifera*, and *Montipora* sp.; the encrusting coralline alga *Porolithon* sp.; and the thalloid algae *Halimeda* sp., *Dictyosphaera* sp., *Actinotrichia* sp. and *Ralfsia* sp.

The Sanctuary also possesses other invertebrates which serve as important subsistence food sources. These include anemones, lobsters, limpets, clams, octopi, sea cucumbers and sea urchins.

Although most of the coral was destroyed by the 1978-1979 *Acanthaster* infestation, recent surveys conducted by NOAA (1983-1984) and the University of Guam (1985) indicate that many coral are regenerating and coral cover is increasing.

CASE STUDY: ESTABLISHMENT AND MANAGEMENT OF MARINE AND ESTUARINE
PROTECTED AREAS (MEPA'S) IN AUSTRALIAN WATERS

C. Murray MacDonald
Melbourne,
AUSTRALIA

The need to set aside areas designed to protect and conserve native flora and fauna and their environment has been argued on many occasions in national and international forums around the world, and will be accepted here without further justification. Until recent years, however, the major emphasis in protection and conservation issues in Australia has been on the terrestrial biosphere because of greater competition for utilisation of the land than the sea. It is only in the last 20 years or so that there has been increasing consideration given to the protection of marine and estuarine areas because of a perceived increase in the diversity and extent of utilisation of Australia's marine resources.

The first MEPA to be declared in Australian waters was at Green Island off the north coast of Queensland in 1938. Very few further protected areas were declared until the 1960's. Since then some 120 MEPA's have been established in both tropical and temperate waters under a variety of State and Commonwealth government legislation. An Inventory and brief description of all MEPA's declared in Australian waters up to 1984 has recently been published by the Australian National Parks and Wildlife Service. This Inventory contains more than 120 declared areas, but closer examination reveals that some of the areas designated as MEPA's do not provide any effective protection for the enclosed marine or estuarine biota, and the status of these as genuine "protected areas" is questionable.

Nevertheless, the total area included in MEPA's listed in the Inventory is about 37 million hectares, representing less than 0.06% of the total marine area for which Australia is responsible. The biggest and best known of Australia's MEPA's is the Great Barrier Reef Marine Park, which alone contains about 94% of the total area included in all Australian MEPA's. If this Marine Park is excluded then less than 1% of Australia's coastline is adjacent to marine or estuarine protected areas.

In Australia conservation of living natural resources has become an increasingly popular and political issue in recent years. However, public perception of marine and estuarine environments as virtually inexhaustible sources of food and recreation and as unlimited receptacles for waste disposal and coastal development has persisted to a large degree, resulting in comparatively low awareness of the specific purposes and functions of MEPA's. This low level of awareness has been reflected at government levels in the fragmented nature of management responsibilities for MEPA's, and in the variety of management philosophies adopted by relevant State and Commonwealth government agencies.

Division of management responsibilities for MEPA's between State and Commonwealth governments was first determined in the 1979 Offshore Constitutional Settlement. Under this agreement any area proposed as a MEPA within State waters or the territorial sea (bays, inlets and up to three nautical miles from the nearest ocean coastline) would be established under State legislation. MEPA's straddling the territorial sea boundary would be jointly declared, and the Commonwealth has the power to establish MEPA's in the territorial sea where the area is of international importance and the relevant State does not wish to legislate.

Since the mid-1970's public acceptance of the need to declare more MEPA's has increased significantly. This has prompted government agencies to give more serious consideration to the role that MEPA's play in overall management strategies for marine and estuarine living resources, and has resulted in several attempts since 1979 to develop uniform national principles and guidelines for the selection, establishment and management of MEPA's. Inter-agency co-operation has been facilitated through a series of national workshops held under the auspices of the Council of Nature Conservation Ministers (CONCOM).

The principles and guidelines being developed as a result of these workshops include recognition of an IUCN listing of purposes for establishing MEPA's, development of criteria for identifying potential MEPA sites, and specification of criteria for determining priorities in the establishment of MEPA's. The principles and guidelines also make provision for the recognition of marine and estuarine areas which are of international importance as determined by inter-government agreements and by criteria such as those developed to identify Biosphere Reserves. Guidelines for the improvement of legislation relating to MEPA's, and for public participation in the management and use of MEPA's are also included. Copies of CONCOM documents relating to MEPA's may be obtained on application to the Australian National Parks and Wildlife Service, Canberra, Australia.

CASE STUDY: THE STATUS AND CONSERVATION OF A NEWLY "DISCOVERED"
LEATHERBACK TURTLE (*DERMOCHELYS CORIACEA* LINNEAUS, 1766)
CHELONERY AT MAUS BUANG, PAPUA NEW GUINEA

Norman, J. Quinn, B.L. Kojis, B. Angaru,
K.Chec, D. Keon and P. Muller
Papua New Guinea University of Technology,
Lae,
PAPUA NEW GUINEA

ABSTRACT

Previously unreported leatherback turtle (*Dermochelys coriacea*) nestings are documented from the south coast of the Morobe Province, Papua New Guinea. The Maus Buang chelonery has an estimated total female population of 300-500 turtles. We suggest that these turtles migrate to feeding grounds along the east coast of Australia. Basic reproductive data and estimation of the nesting female population size is presented. Further study is required on the large number of yolkless eggs laid by many leatherbacks. It is suggested that students returning home during the between year break may assist in leatherback turtle resource assessment. Exploitation of the eggs is documented. It is recommended that the chelonery be declared a marine park and international financial assistance be sought to implement necessary conservation measures.

SPECIES DESCRIPTION AND DISTRIBUTION

The leatherback turtle, (*Dermochelys coriacea* Linnaeus, 1766), is by far the largest turtle species with maximum carapace length of nearly 2m and a weight of over 600kg. This species is morphologically highly distinctive, notably in lacking scales on the carapace. The leatherback is ecologically unique among sea turtles in having a truly pelagic mode of life, but it shares with all sea turtles the need to nest on land.

The leatherback turtle is a circumglobal species whose nesting occurs on beaches of tropical seas in the Atlantic, Indian, Pacific oceans and occasionally in the subtropics and Mediterranean (Pritchard, 1979). Most nesting sites are located between 30°N and 20°S. Regular nesting has been reported from the north coast of New Guinea and on some of the larger islands, but always in low densities (e.g. a few adults nest each year). Regular nesting sites in PNG include Tulu and Timonai Village on Manus Island (Spring, 1981); Garu and Ganoi villages in New Britain; along the south-east coast of New Ireland; Long Island and parts of the mainland of the Madang Province; on Mormanby Island in the Milne Bay province; along the coast from Boiken to Turubu in East Sepik Province; around Aitape in the West Sepik Province and along the Papuan coast (Spring, 1980). Leatherbacks have also been sighted floating at sea.

It appears that most nesting occurs on relatively undisturbed beaches having a stable platform, deep water approaches and heavy surf (Pritchard, 1971). In 22 nesting beaches in the Solomon Islands, all were near river mouths and all had deepwater approaches (Vaughan, 1981). The presence of deep water close inshore may ease the beach approach of this mainly pelagic species. Such conditions are similar to the beaches south of Lae at Maus Buang (Fig. 1).

NESTING BIOLOGY

The nesting female emerges from the sea at night and ascends the beach mainly by simultaneous heaving of the powerful fore flippers. Papua New Guinea villagers often use lights to guide the turtle to a suitable nesting location on the beach. The actual nesting process conforms to the stereotyped pattern shared by all sea turtles (Carr, 1982). The age at sexual maturity is not known.

Mean number of fertile eggs per clutch in other areas ranges from about 66 (Costa Rica) to 104 (South Africa) (Table 1), typical clutch size is around 85 (Hirth, 1980). At Maus Baung clutch size ranged from 12 eggs by the first nesting turtles of the season (October) to 145 eggs during the season peak (January) with a mean of 98 eggs. Eggs are white, usually spherical, about 53mm in diameter. Mean incubation period ranges from 56 days to around 65 days (Hirth, 1980). Hatching success ranges from 63% (Trengganu) to 76% (South Africa) (Pritchard, 1971). Hatchlings are 55-63mm in length, usually around 58mm. Leatherbacks are notable in producing fewer but larger eggs and hatchlings in comparison with other sea turtles.

POPULATION ESTIMATES

Population estimates for sea turtles can be based only on an estimate of the total number of mature nesting females. Females or their nests or nesting tracks, can be counted readily. Males do not leave the water, are rarely identified at sea and are thus impossible to count. Immature animals are similarly impossible to count at sea. The nesting track of leatherbacks is distinctive in that it is usually wider than that of other sea turtles.

In 1952, Carr stated that the leatherback appears to "nest nowhere in numbers" and a decade later major cheloneries were found in Trengganu, Malaysia and Matina, Costa Rica. While widely considered to be on the point of extinction a few decades ago (Fitter, 1961), continuing survey efforts allowed the minimum world population of breeding female leatherbacks to be estimated at around 29,000 in 1971 (Pritchard, 1971), with a maximum of 40,000 allowing for undiscovered or uninvestigated nesting beaches. More recently, a survey carried out under World Wildlife Fund assistance has confirmed and extended the earlier report and has raised the estimate of breeding female leatherbacks to over 100,000 (Pritchard and Clifton, 1981). This figure may be an under-estimate as "many areas of Mexico and Melanesia have not been surveyed".

In the early 1980's after a more complete assessment of the cheloneries in the Pacific coast of Mexico the estimated total breeding female population for that area was 75,000 (Pritchard, 1982). Likewise Salm (1981) reported a major chelonery on the Vogelkop Peninsula of Irian Jaya (Indonesian New Guinea). The results of the aerial survey yielded evidence of about 3,500 sea turtle nests, many of them leatherback, in a 30km stretch of coast. The population was compared with the 4,000 animals at Trengganu. The new estimate for the worldwide population of breeding female leatherbacks was increased to 115,000 (Pritchard, 1982). In short, as a result of surveys in regions with suspected cheloneries the world estimate has increased from 40,000 to about 115,000 in about 11 years.

Although the total population of leatherbacks is larger than was once thought, it remains true that breeding populations are mostly of relatively small size (with only a few hundred, or fewer, females nesting

annually), are widely scattered through the tropics, and are often subject of heavy exploitation for food (Pritchard, 1982; Ross, 1982). There are only four documented major leatherback nesting areas with over 1,000 females nesting annually: the Pacific coast of Mexico with about 30,000 females nesting annually (Pritchard and Clifton, 1981), French Guiana with about 4,500 - 6,500 (Pretey and Lescure, 1979), Malaysia (Trennganu) with about 1,500 females nesting annually (Pritchard, 1979). The Kepala Berung region of Irian cheloneries hold a few hundred females per year and the remainder hold only a few individuals.

It is generally recognised that leatherbacks nest along the northern coast of New Guinea, as well as certain localities in the Bismarck Islands, Solomons, New Hebrides and Fiji (Pritchard, 1982). However, this population is considered very dilute. Considering the proximity of the Maus Buang chelonery to the second largest town in Papua New Guinea, Lae, and the seasonal occurrence of thousands of turtle eggs in Lae's markets, it is surprising that this chelonery was not reported sooner. Furthermore it is likely that other distant, secluded cheloneries also exist only known to local villagers. We suggest that Melanesia contains a much larger breeding population of leatherback turtles than generally recognised and that more extensive and intensive surveys are required. A cost-effective survey method would be to utilise local village knowledge to assess local resources.

Many villagers have an impressive knowledge of marine resources near their village but have little comprehension of its national or global importance. We suggest that a broad resource assessment questionnaire could be taught to students at high schools and tertiary education institutions. During school breaks students armed with questionnaires and an illustrated guide would return to the villages to interview village elders. The questionnaires would be returned to the teacher at the beginning of school and the results discussed in biology or social science class. The teacher could then forward the results to a central data collection centre. A similar survey was recently conducted on the urban wildlife of Brisbane, Australia.

MAUS BUANG INVESTIGATIONS

For two seasons (November 1982 to January 1983 and October 1983 to January 1984) observers counted nesting turtles at Maus Buang (6°50'S, 146°50'E) near Lae, Morobe Province in Papua New Guinea. The first season observers also were placed 30km further down the coast at Lokano. From reports in the first season about another large nesting beach further down the coast an inspection visit was made to Lababia village and the adjacent beach in December 1983. The number of turtles nesting, number of eggs laid, size of the turtle and time of nesting were recorded at Maus Buang. Four hundred and ninety-two nesting female leatherback turtles were observed in 1982-83 and the results are summarised in Table 2. The mean size of the turtles observed was 1.65m with a mean of 92.3 eggs laid per successful nesting. During the week of 17-23 December 1983 the number of small yolkless and yolked eggs were counted with the resultant ratio of about 1:5 (30 nests). This is a comparatively high ratio and further investigation is required.

From these observations and anecdotal evidence from villagers we are able to make an assessment of the chelonery. On the stretch of beach from Busama to Labu Butu, it is estimated that 10 turtles nest each night of the season from November to January. Nesting turtles first appear around September, but November to January is the major nesting period. Less quantitative evidence at more southern beaches suggests that a larger

chelonery exists at beaches at Lababia with maximum nesting occurring from January to April. Allowing for re-nesting of each turtle after about 10 days, the total number of nesting turtles at Maus Bung is conservatively estimated at 125-200 depending upon whether it is assumed that a given female nests 5, 6 or 7 times in the course of a season. Multiplying by 2.5 to allow for a two or three year nesting cycle, the total breeding female population ranges from 300-500. This 20km stretch of beach conservatively contributes 1/10th of the estimated 3,000 adult females that are expected to nest in Melanesia. If the Lababis chelonery and other suspected cheloneries are added, close to 1/3 of Melanesia's nesting leatherback turtles may exist along 50km of coast in Morobe Province. Rather than this being the case we suggest that the Melanesian population is larger than currently estimated and we would suggest a figure of 6,000 as a closer estimate for Papua New Guinea alone.

It must be recognised that estimates of this kind are based on several unproven assumptions (Pritchard and Clifton, 1981), notably about re-nesting and remigration frequency. Some tagged females have been shown to re-nest on several occasions within a season and to make nesting remigrations in different seasons (Hirth, 1980). The predominant re-nesting interval appears to be 9-10 days. There may be six nestings per season at Trengganu (Siow, 1978). At least some tagged females have been shown to remigrate to nest at one, two or three year intervals (Hughes, 1982). However, since most females tagged while first nesting are never seen again, the extent to which remigration is typical of the whole female population has been questioned (Hughes, 1982). It should be stressed that there are no data to indicate how typical the re-nesting and remigrating intervals used in the analysis are for the female population as a whole. It cannot be assumed that remigration occurs in the entire female population (Pritchard, 1979). If a high proportion of single-season breeders occurs, then estimates of total mature female numbers - derived by multiplying the number of nesting females in one season by a factor expressing assumed multiple breeding - will be excessively high. However, in order to compare our results with other published accounts we will assume multiple breeding.

The leatherback turtle does not commonly nest in Australian waters. Nesting is mainly restricted to Mon Repos where 1 - 2 turtles nest per year (Limpus, 1982). However, numerous adult and near-adult leatherback turtles pass through coastal waters from south Queensland to central New South Wales each summer. Limpus and McLachlan (1979) assume that these turtles migrate from around the islands of New Britain and Solomon Islands. We suggest that many of the turtles on the Morobe south coast migrate to feeding grounds in Australia.

THREATS TO SURVIVAL

Even though the estimated world population of the species has tripled, it is still considered necessary to keep the species on both the endangered species lists of the United States Department of the Interior and the Convention on Trade in Endangered Species of Flora and Fauna (Pritchard, 1982). It is generally recognised that there are fewer leatherbacks than loggerheads (*Caretta caretta*), green turtles (*Chelonia mydas*) and the olive ridley (*Lepidochelys olivacea*). However, it is probably more common than Kemp's ridley (*L. kempi*), the flatback (*Ch. depressa*) and black turtles (*Ch. agassizi*). Comparisons with the hawksbill (*Eretmochelys imbricata*) are impossible due to the lack of reasonable population estimates.

Prospects for the continued survival of the leatherback would seem to be better than for other sea turtles. The global intensity of exploitation is certainly less than that directed at the green turtle, olive ridley or hawksbill. There is virtually no international trade in leatherback parts or derivatives (Pritchard and Cliffton, 1981). Adult leatherbacks are not consumed by man as widely as some species, notably green turtles and olive ridley, since their oily flesh is generally considered unpalatable.

In Papua New Guinea, turtle hunting methods have been traditionally passed down from generation to generation with a few modifications in the process (Quinn *et al.*, 1984). Hunting techniques for adult turtles and their associated rituals differ in various regions but can be grouped as follows: netting, harpooning from canoes and platforms and catching by hand. The traditional net is rarely used today except on Ponam Island in Manus Province. Harpooning is the most commonly used method of hunting turtles, but is not used for leatherbacks nor is the platform or the "by hand" method.

In Morobe Province, leatherbacks are not killed or eaten. However, all the eggs of observed nesting leatherbacks are taken by villagers who camp on the beach during this period. The eggs are then sold in Lae markets for 10 toea (\$US0.11) per egg. We were told that approximately 70% of the collection goes to the Lae market, 20% eaten by the family and 10% left for hatching. We suspect that all are collected and that home consumption varies depending on the perceived need for cash by the adult male member of the family. Consumption is commonly less than 20%. After the eggs are collected they are reburied at another location until a large cache exists, normally 3-4 days, and then transported to the Lae market. Should a turtle nest be unobserved its tracks will identify the nest for searching villagers the next morning. Nests from which eggs have been removed are marked by sticks by the villagers. We have no estimate of the numbers of nestings that produce hatchlings.

Eggs and hatchlings are taken by crabs, pigs, sharks and crocodiles (Pritchard, 1971). Adults may fall prey to sharks and to crocodiles while nesting. The tracks of crocodiles are commonly seen along the nesting beach at Maus Buang and occasionally the turtles are attacked and killed. We estimate from discussions by villagers that about three turtles are taken each season. Turtles killed by crocodiles are either dragged into the sea or to the nearby estuary. Rarely is the carcass left on the beach for more than a few days. A significant proportion of nests are laid below the high tide mark and would be lost to flooding from high seas. Villagers report that the numbers of turtles nesting now are fewer than in the past. This decline is probably due to excessive egg harvest.

CONSERVATION MEASURES TAKEN

The leatherback is nominally protected by legislation in most countries where nesting occurs including Australia, Costa Rica, Dominican Republic, French Guiana, Indonesia, Malaysia, Mexico, Mozambique, Papua New Guinea, South Africa, Sri Lanka, Surinam and the U.S.A. Traditionally in Papua New Guinea the right to fish certain reefs and beaches is controlled by individuals, families, clans or chiefs. In certain cases also, the right to fish particular species such as turtles, fish and dugongs, belong to certain families within the village and thereby enables traditional owners to regulate the exploitation of their resource (Spring, 1981).

In the Manus Province, egg gathering is a traditional practice with associated rules, but along the Morobe coast any traditional regulation

has apparently been lost as villagers have found a market at Lae. In Manus, there is a widespread practice of calculating when nesting females will return to lay a second clutch of eggs. When an individual needs a turtle for a household occasion he asks the village elder if he can catch a nesting female using this method. If fresh tracks are seen on the beach, the nest is dug up and the number of eggs inside counted. According to a formula which varies from one location to another, a number of small sticks are planted in the ground, each stick representing one day. When two or three sticks are left, the hunter returns to the site of the original nest and awaits the female turtle.

In Tulu village, in the Manus Province, there is a strong traditional link between the leatherback and two clans. The people believe that the turtle belongs to these clans and that it will not return to nest if this ownership is not recognised. Only members of these clans can use the stick technique to predict the return of the nesting families. When the female returns it is killed and each clan gets half. All the turtle is eaten and the oil is collected from the shell and used for wick lanterns (Spring, 1981). In 1978, one leatherback was eaten out of each five nesting (Pritchard, 1979).

This pattern of ownership relies heavily on traditional authority and respect for that authority within the village and by other villages. In pre-colonial times transgressions were handled by force. Today there is little physical enforcement of traditional boundaries between villagers as disputes are settled in courts. Hence, the necessity for the introduction of Wildlife Management Areas.

Special legislation was passed by the Papua New Guinea House of Assembly in April 1974, to create Wildlife Management Areas (Kawapena, 1982). These are large tracts of natural wildlife habitats remaining in customary ownership, but with the people co-operating with the government to manage the wildlife and its habitat for continued production and preservation. Each area would be governed by a Wildlife Committee appointed by people living near the management area. Its function is to make and enforce the rules for the protection of wildlife in a way in which it will be understood by the people. The decisions of the committee are brought into effect by recommendation to the Minister of the Environment. As soon as the government gazettes these areas the Committee's rules become law.

Under the Wildlife Management Area system the onus for conservation work is placed on the traditional owners who introduce and enforce laws in the areas. Through this system, the Wildlife Division has given traditional landowners the legal framework to reinforce traditional understandings. Unfortunately, although the need for turtle conservation is appreciated by the Maus Buang village elders they do not possess the knowledge nor perhaps have the support within the village to implement a Wildlife Management Area. Management areas for marine turtles have been set up in other areas of Papua New Guinea such as Crown and Long Island. In those areas most people were either sympathetic or indifferent to the Wildlife Management Area (Sinba, 1981).

In the 1983-84 nesting season we initiated a programme that would buy eggs as the turtle laid them for the current market price of 10t (US0.11) per egg. The eggs would then be reburied at another location near the village so that villagers could watch to make sure that others would not dig the nest. Problems with this technique included:

- 1) some villagers dug up the reburied eggs,
- 2) jealously that individuals were getting paid when it was thought that funds should go to the entire village, and
- 3) concern that villagers were only being encouraged to collect eggs rather than being encouraged to conserve the resource.

However, as a result of our interest our informants indicated that a village law had been created declaring certain sections of the beach taboo for collecting eggs. No evaluation of the effectiveness of this law was made.

CONCLUSION

In the words of David Ehrenfeld (1982):

"...a combination of our incomplete knowledge about sea turtles and the numerous constraints imposed by their biology dictates a very conservative conservation strategy. I conclude that the best we can do is to concentrate on the protection of existing wild populations, using the simplest and least risky techniques of conservation. Highest conservation priority should be given to the following items: 1) protection of nesting grounds and aquatic habitats, 2) use of hatcheries and short-range transplantation of nests to protect eggs at the nesting beach, 3) conservation education, 4) control of international trade, 5) national and international co-ordination of conservation strategies....".

In consideration of the proximity of the Maus Buang chelonery to the native food markets of a growing urban centre, Lae, we strongly recommend that item 1 be adopted and that a marine park be rapidly established to protect the nesting grounds. Insufficient funds and manpower are currently available in Papua New Guinea to carry out conservation items 2, 3 and 5 on a scale adequate to achieve reasonably swift preservation of these cheloneries. International aid for this purpose seems necessary.

ACKNOWLEDGEMENTS

This project was funded by the Papua New Guinea University of Technology research grants 295 and 351. The following people kindly assisted with the project: V. Bogren, M. Sappu, B. Anguru, K. Chee, O. Keon, P. Muller, S. Connelly, E. Mueller and J. Burt.

Figure 1.

MAP A Papua New Guinea and Northern Australia

MAP B Location of chelonery at Maus Buang in Papua New Guinea.

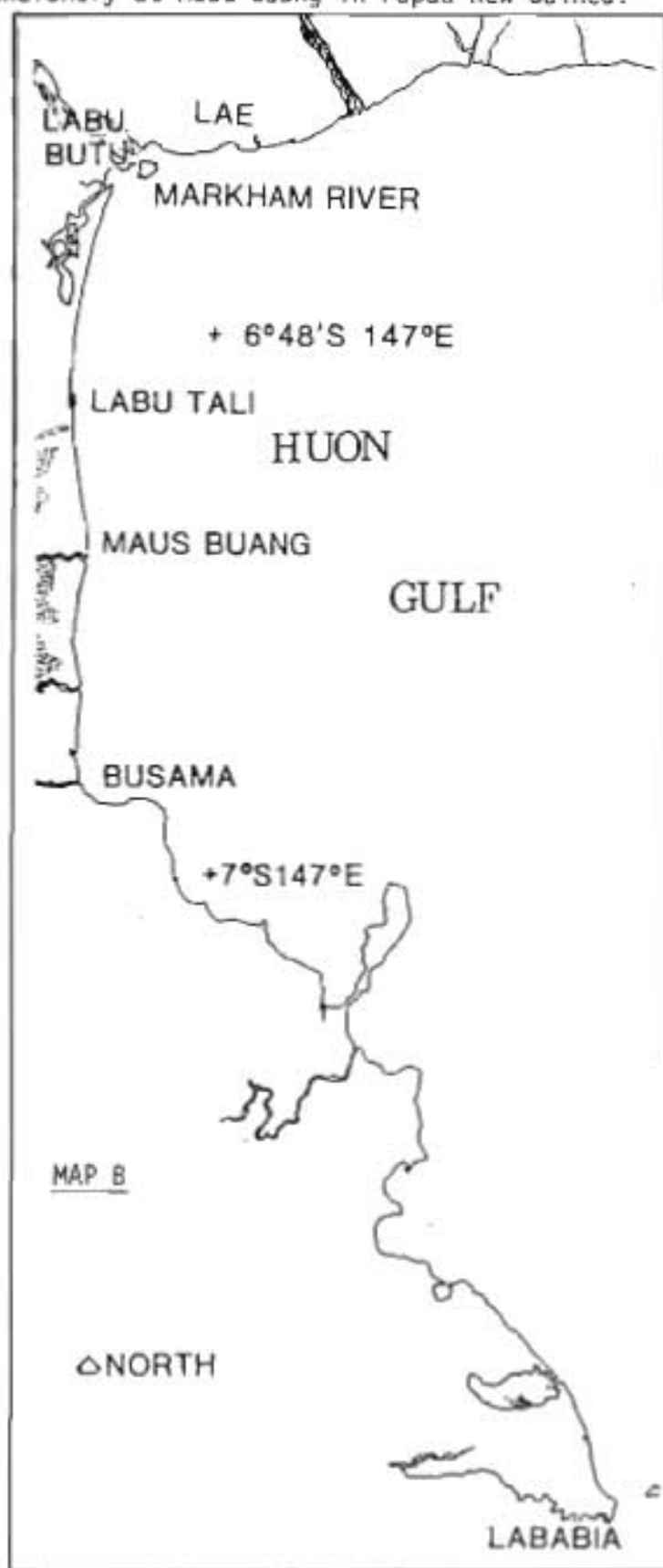
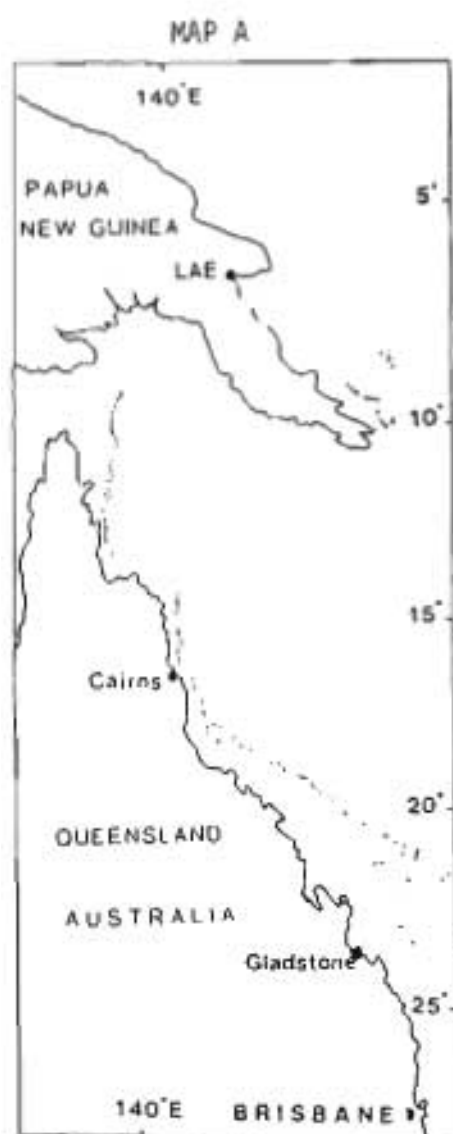


TABLE 1

TABLE 1. REPRODUCTIVE BIOLOGY OF *DERMOCHELYS CORIACEA* (modified from Hirth, 1980)

Locality	Carapace length of nesting females (cm) \bar{x} , (range)	Nesting season	Diameter of eggs (mm) \bar{x} , (range)	Clutch size \bar{x} , (range)	Resting interval (days) \bar{x} , (range)	Length of incubation (days)	Carapace length of hatchlings (mm)	Source
Sri Lanka	ca. 147 (121-161)	May-June	(50-54)	(90-130)	-	(58-65)	(58-60)	Deraniyagala 1939
Matina, Costa Rica	-	Apr-July	53.6 (50.1-59)	80 (45-121)	-	ca. 65 (51-74)	62.8	Garr and Ogren, 1959
Trinidad Island	ca. 152 (121-181)	Mar-Aug	(52-65)	(65-130)	-	-	-	Pritchard, 1971
Surinam	(150-165)	Feb-June	53 (50-57)	85 (5-128)	10	ca. 65 (60-70)	58.3 (56-60)	Pritchard, 1971 Schulz, 1975
Silebache, French Guiana	ca. 157 (137-180)	May-Aug	-	88.1 (51-112)	9.7	-	-	Pritchard, 1971
Trengganu, Malaysia	-	May-Sept	-	ca. 83.5 (35-140)	9	56 (52-61)	-	Balasingam Pong, 1972
Playa Niranjo, Costa Rica	141 (128-151)	Dec-May	51	65.6	10	-	55	Cornelius, 1976
Maus Buang, Papua New Guinea	165 (110-190)	Oct-Mar	-	97.4 (58-145)	-	-	-	this study

TABLE 2

Weekly Leatherback nestings at Maus Buang, Papua New Guinea, 1982-83

Week	Mean number of turtles observed per night	Mean number of eggs per per night per turtle	N
10-17 November 1982	2.8	113.0	11
18-24 November 1982	4.0	103.7	28
25 November - 1 December 1982	4.2	83.9	29
2- 8 December 1982	3.9	89.5	26
9-15 December 1982	5.0	102.4	25
17-24 December 1982	6.6	111.0	46
25-31 December 1982	3.5	92.8	14
1- 7 January 1983	5.4	94.3	27
8-14 January 1983	4.2	93.6	27
15-21 January 1983	3.4	92.8	24
22-29 January 1983	3.7	92.2	22
Year Mean	4.2	97.2	N = 279
10-20 October 1983	1.7	28.6	17
1 -7 November 1983	0.9	78.2	6
8-14 November 1983	1.5	67.8	11
15-21 November 1983	3.6	98.9	25
22-28 November 1983	5.1	92.4	36
29 November - 5 December 1983	6.0	100.9	31
6-12 December 1983	8.3	106.5	30
13-15 December 1983	9.0	107.0	27
17-23 December 1983	5.0	92.9	30
Year Mean	4.6	85.9	N = 213
Grand Mean	4.1	92.3	N = 492

CASE STUDY: SUSTAINABLE BLACK CORAL HARVESTING POTENTIAL IN TONGA

Department of Lands, Survey and Natural Resources
Nuku'alofa,
TONGA

INTRODUCTION

Black corals (*Antipathes dichotoma* and *A. grandis*) have long existed in Tonga but were traditionally either left untouched or only lightly utilised, mainly for the decoration of houses. Generally only young black corals found mainly in shallow areas were used for this purpose.

Despite this, the pressure on the resources was insignificant and there was never any obvious indication that the corals were becoming endangered. Today, this is no longer the case in Tonga as the resource has acquired great commercial value resulting in its over-utilisation and threatening its survival. There is therefore a need for proper management of this resource to rule out any possibility of its extinction.

This paper attempts to highlight the current problems associated with coral management and discusses various prescriptions for its future conservation. Through an understanding of the problem it is anticipated a management programme can be designed which will ensure utilisation of the resource on a sustainable basis and its continued availability to future generations.

THE PROBLEM

At present, the most important problem facing the black coral species is the fact that they are becoming endangered. The severity of this problem was expressed by the Superintendent of Lands, Survey and Natural Resources in 1981 when he wrote to the South Pacific Regional Environment Programme (SPREP) indicating that there was a need for suitable legislation to protect the corals (Chesher, 1984). In this respect, it became clear there was a need for a survey of the stocks of black coral in Tonga so that effective recommendations on methods for resource management could be made. A preliminary survey was subsequently funded by SPREP and undertaken by an environmental consultant, Dr R. Chesher.

CAUSES OF THE PROBLEM

Three principal factors are believed to have contributed to the black coral problem:

1. Over Exploitation

Commercial exploitation of black coral in Tonga began in 1973 when a local entrepreneur learnt by chance of the suitability of black coral for manufacturing jewellery. He started to utilise it for this purpose and began a one-man operation specialising in sales to tourists and local people. As a one-man operation, all phases of the project from the collection of specimens to the sale of finished products were carried out by an individual whose demand on the resource was well within its natural capacity to renew itself. Such a situation would rarely lead to the resource becoming endangered.

However news of the success of this project quickly spread and more people became interested and were prepared to risk investment in this field.

Although there was uncertainty as to the extent of the resource, the result of this new entrepreneurial activity was an increase in resource utilisation with the objective of maximising economic profit. Very little consideration was given to resource conservation. Harvesting of the coral was concentrated in the most accessible areas and ultimately gave rise to over-exploitation of these stocks. Furthermore, there was no resource information available to provide the basis needed for the development of a proper resource management programme, the lack of which also contributed to the over-exploitation of the coral.

2. Low Recruitment

Given proper management, all renewable resources are capable of sustained utilisation. However, proper management requires a clear understanding of the ecology of the resource so its utilisation can be managed to ensure in particular, that the recruitment of juveniles is sufficient to sustain the population. In the case of black corals (*A. dichotoma* and *A. grandis*) only mature specimens (over 1 metre in height) should be harvested to ensure replacement. (Chesher, 1984).

Unfortunately, this has not been the practice in Tonga and to date harvesting has been based primarily on availability rather than on principles of resource conservation. The end result has been the exploitation of immature black coral and a low level of recruitment in many populations.

3. High Mortality

Generally speaking, black coral stocks suitable for commercial utilisation require a hard substrate and adequate water flow. (Chesher, 1984). Water pollution in the form of siltation or sedimentation can be detrimental to black coral growth and can lead to high mortality. In this respect, adequate water movement is necessary to prevent suspended materials from settling. Similarly, water pollution arising from pesticides can be equally detrimental and an adequate water flow is also needed to disperse and dilute its effects.

Thus high mortality and impaired growth in black coral stocks can arise from the siltation of waters and sedimentation, and from pollution by pesticides where water movement is inadequate to prevent suspended materials from settling or to disperse pesticides.

In Tonga it has also been discovered that a method employed to survey black coral stocks is considered detrimental to its long-term survival (Chesher, 1984). This involves the use of an anchor line which is dragged along the ocean floor until it snags on a rock. The line is then shortened and a dive is made to ascertain if any black coral is present. Reliable sources have indicated this method of survey has so far caused considerable damage wherever it has been employed (Grigg, 1976). In Tonga, it has been proved to contribute very much to the high-mortality problem that is plaguing the black coral stocks (McLean, 1983). (See Appendix 2 & 3).

SOLUTIONS

Despite the fact that black coral is now considered endangered in Tonga, it still has considerable commercial potential provided that regulatory measures are taken as soon as possible. These should revitalise the resource thus ensuring its continued availability on a sustainable basis. However, they must be employed in conjunction with a comprehensive programme of resource management, some of the elements of which are discussed below.

1. Resource Conservation

From an environmental perspective, any resource management programme for the black coral should be based on knowledge of the ecology of the species concerned. In this regard, the distribution, abundance, growth and mortality rates and reproductive behaviour of the black coral species should be known. (Grigg, 1977). In Tonga, this initial information gathering stage has been largely completed following survey work carried out by Dr R. Chesher, a consultant funded by the South Pacific Environment Programme in 1984. The survey was limited by constraints on time and finances and not all aspects were covered.

It is considered that coverage of a wider range of areas would have been desirable to more accurately assess the resource and additional surveys for this purpose may be necessary before a resource management programme can be established.

2. Replanting Programme

Reliable generalisations as to the abundance, distribution, growth and mortality rates and reproductive behaviour of black coral in Tonga cannot be made on the basis of only one survey and it is considered at least two further surveys of similar areas will be necessary before effective comparisons can be made.

However, should re-survey not be possible, estimates of the growth rates (length and width) of specimens can be considered adequate for the formulation of a management programme. In this regard two leading experts in the field of black coral ecology have independently determined these to be 5 centimetres (length and) 1 millimetre (width) annually, (Grigg, 1977 and Chesher, 1984). Using these estimates as a basis, utilisation of the resource can be regulated to prevent over-exploitation.

At present, there are clear indications that large specimens of commercially valuable black corals are becoming rare especially in the Nuku'alofa Harbour. This information together with growth rate estimates will be valuable in devising and implementing a replanting programme to rejuvenate the black coral stocks in this area. (See Appendices 4 & 5).

3. Pollution Control

For the last 3 - 4 years, the Government of Tonga has been implementing various developments along the Nuku'alofa seafront. Most notable of these were the extension of the Queen Salote wharf at the eastern side of the town, and the construction of a new sea-wall along most of the sea-front.

These works necessitated dredging and extensive filling using coral rocks. In both cases considerable amounts of silt were generated leading to plumes of silt being formed and working their way into the Nuku'alofa Harbour. (See Appendix 6). As siltation is known to be extremely detrimental to black coral survival it can be said that it contributes significantly to the high mortality rate in Nuku'alofa. (See Appendix 2). Another contributing factor is the increasing use of pesticides and herbicides in homes. Applied on the land but transported into the coastal waters by surface run-off, these add to the general problem of water pollution in the harbour and again, have a detrimental effect on the black coral.

Thus, as Chesher (1984) points out, any attempt to reduce the extent of these problems would be a step forward in reducing the high mortality in the coral stocks within the Nuku'alofa Harbour.

4. Off-Shore Patrolling

According to a reliable source there is a strong possibility that a large amount of black coral is being smuggled out of the country each year, mainly to Hawaii. This problem is believed to be particularly serious in Vava'u where a yacht repair business is now operating. At present, the smuggling of black coral out of Tonga is prohibited under the Territorial Sea and Exclusive Economic Zone Act, 1978. Enforcement of the legislation through the provision of more patrol boats would reduce this problem and could possibly lead to a reduction in the harvesting of black coral for illegal gain.

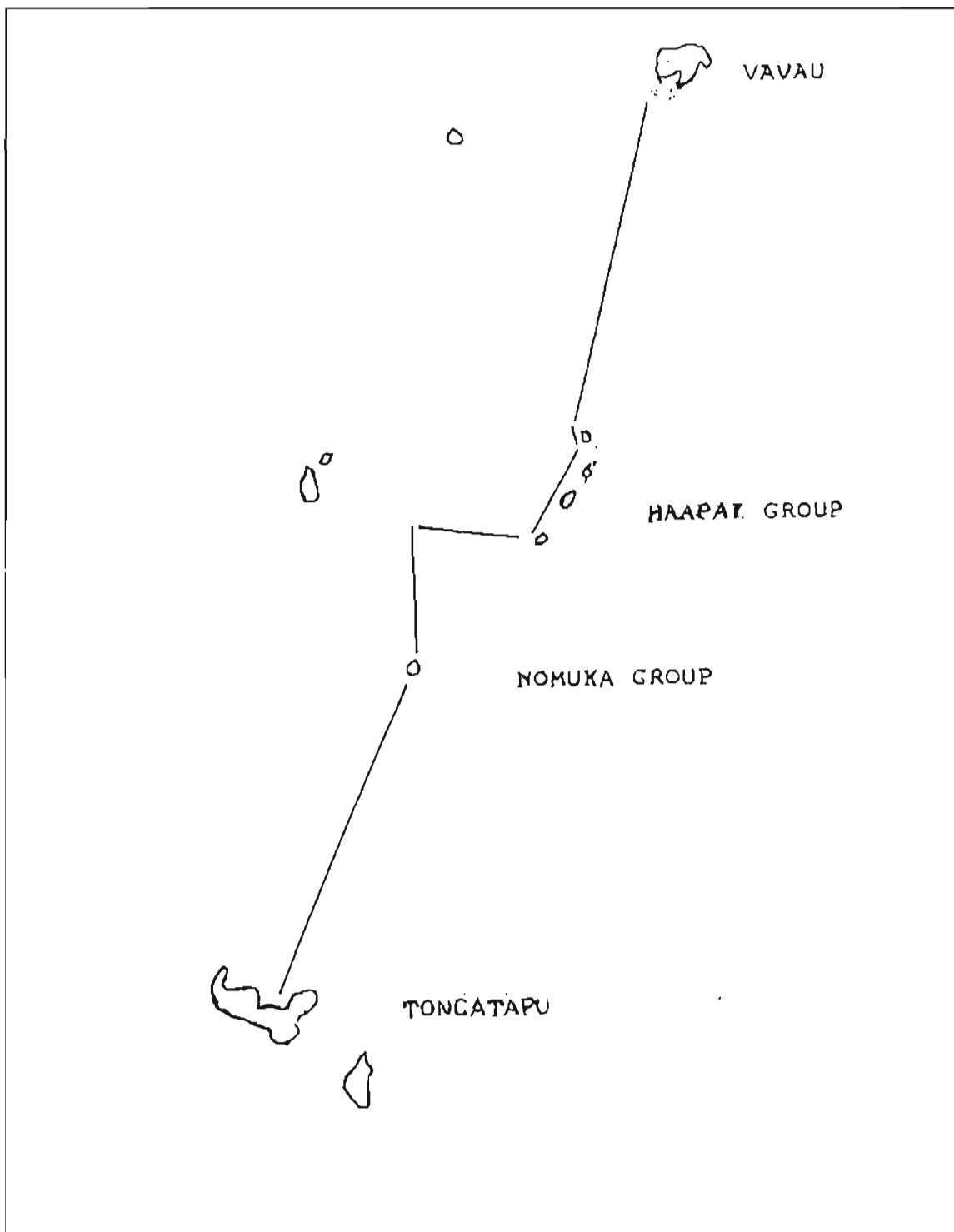
CONCLUSION

The black coral dilemma in Tonga once again reminds us of the need to consider and balance conservation and development in the interests of achieving sound environmental management. If the black corals of Tonga are left untouched, then they will survive but a potentially profitable resource will be lost to the Kingdom.

Unwise utilisation, as has happened in many countries around the world, would not only seriously degrade the resource and threaten its survival but would deny its use to future generations of Tongans. Clearly the appropriate management objective for this valuable resource must be its sustainable utilisation and this must be achieved before the resource becomes too depleted.

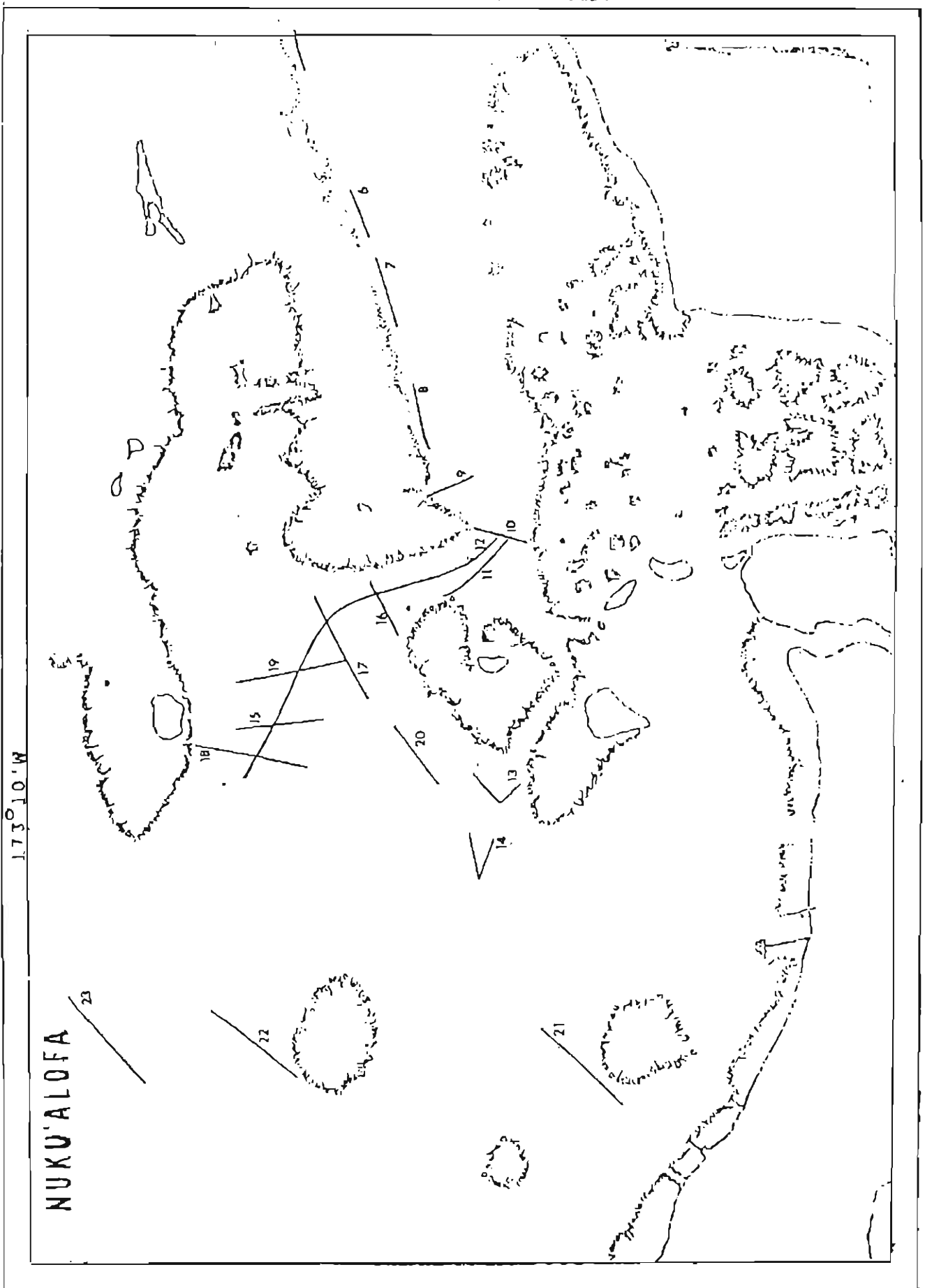
The result of the SRREP sponsored black coral survey indicated that despite the fact that the resource is endangered, it still has considerable economic potential. However, if this potential is to be realised, immediate steps must be taken to:

1. Legislate against the harvesting of live specimens of black coral and the export of any black coral, raw or as carved products except via sales to tourists.
2. Undertake explanting/replanting experiments to determine if colonies can be grown from branch tips in Piha Passage, and at Ha'apai and Vava'u.
3. Take preventative measures against siltation of the harbour areas through the use of dikes and plugs, silt screens and by the immediate planting of construction areas along the waterfront.
4. Prohibit pesticide use in waterfront areas. (Chesher, 1984).



The Kingdom of Tonga showing the cruise plan of the Research Vessel Moira from May to September 1984.

Source: Black coral Survey of Tonga by Chesher.



Black Coral Transects in Nuku'alofa Harbour.

Source: Black coral survey of Tonga by Chesher.

APPENDIX 3

TONGATAPU BLACK CORAL TRANSECTS

TRANSACT	SPECIMENS SEEN	LENGTH (KM)	COMMENTS
1.	NC	.370	Off MonoTapu Beach area.
2.	NC	.463	N.W. Tip of Ilnad.
3.	0	.370	Phia Passage, North Wall.
4.	0	.110	East (Windward) Coast.
5.	2C, INC	.740	Phia Passage.
6.	NC	.463	Phia Passage long wall.
7.	2DC+NC	.648	Phia Passage along wall.
8.	0	.592	Phia Passage along wall.
9.	0	.407	Phia Wall + Bottom.
10.	0	.592	Narrows Entrance.
11.	1DC	.925	Narrows Entrance.
12.	9DC,10C,7S	3.44	Narrows to Fafa
13.	0	.740	Pangaimotu Pass
14.	1D	.555	Lagoon, Pangzimoto Ridge
15.	0	.407	Faga, South
16.	0	.352	Narrows Lagoon Entrance
17.	1S	.888	Narrows Lagoon Entrance
18.	2DC,4C,5S	.925	Fafa, South
19.	1DC,2C	.925	Fafa, South
20.	0	.185	Alert Shoal
21.	0	.740	Monu Reef
22.	0	.555	Ualanga Lulu Reef
23.	0	1.11	North of Ualanga Reef

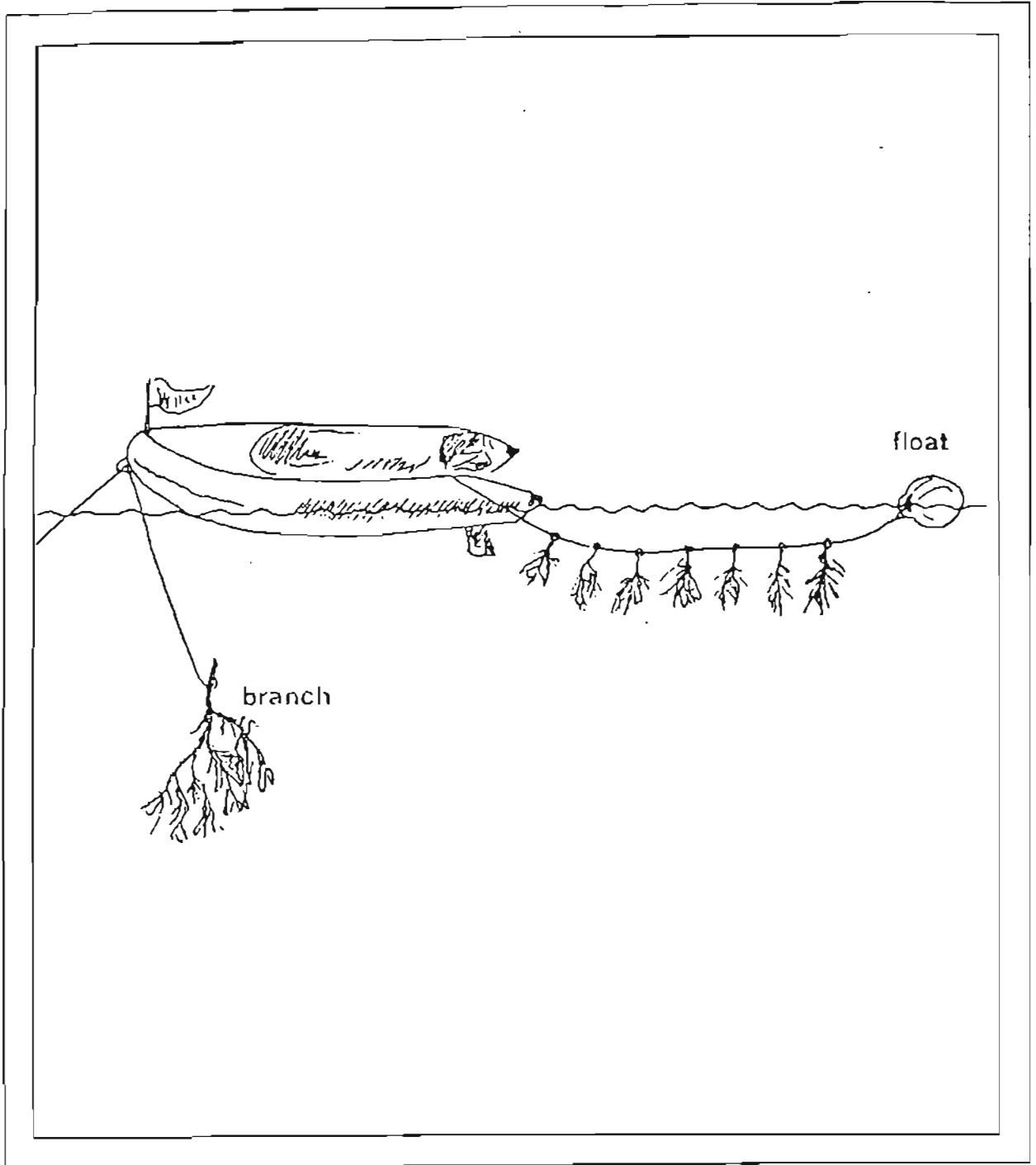
S = Commercially Valuable specimens .5 to 1 metre high, too small for commercial harvest.

NC = Non-commercial species or specimens.

C = Commercially valuable specimens over 1 metre high.

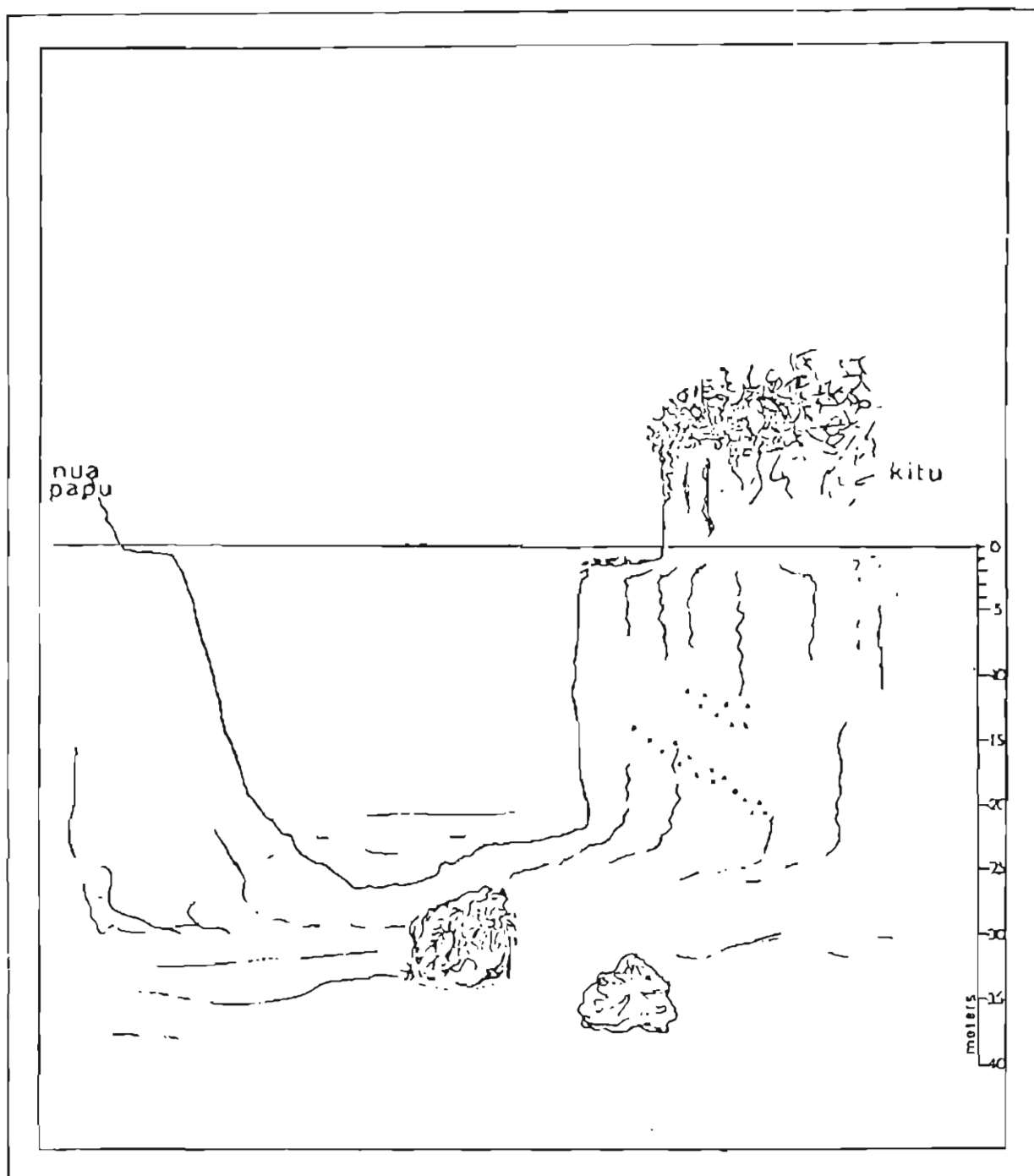
D = Dead.

Source: Black coral survey of Tonga by Chesher.



Replanting technique with branch and cuttings suspended underwater to prevent damage to the delicate polyps.

Source: Black Coral Survey of Tonga by Chesher.



Replanting station area between Nua Papua and Kitu Islands showing the rock wall on which the branch tips were placed.

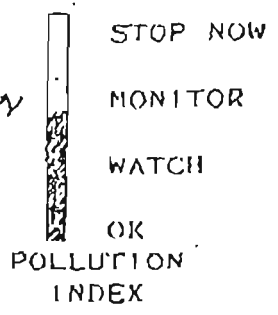
Source: Black Coral Survey of Tonga by Chesher.

POLLUTION SOURCES

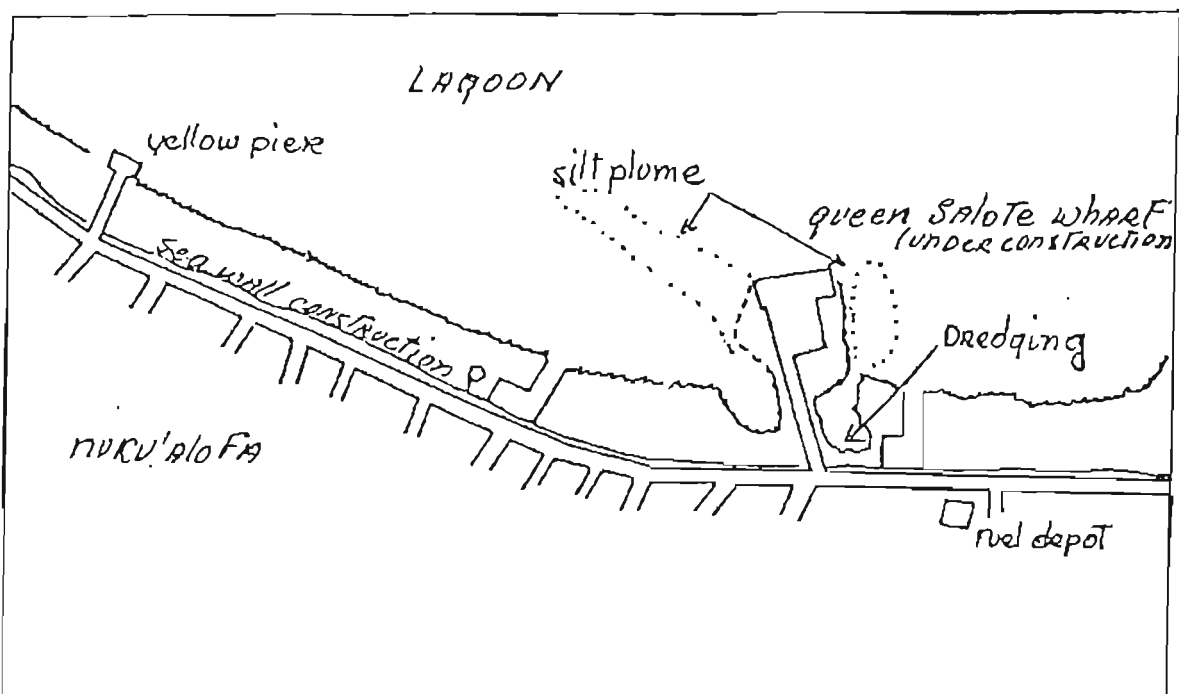
STATION NUMBER 109..... MAP REF NUKU'ALDEA.....

NAME AND LOCATION WATER FRONT CONSTRUCTION
and Fuel Transfer.....

MEANS OF DISCHARGE run off and oil spills.....



MAP OF DISCHARGE SITE



(Indicate: Wind Direction, North, currents, Wave Action)
P Photograph taken from here, arrow shows angle of view

TYPE OF WASTE silt oil
AMOUNT OF WASTE considerable with heavy RAIN OR N WIND
PERIODIC DANGERS oil spills.....

DELETION AT DISCHARGE POINT = GOOD..... Bad Poor.....
COMMENTS: NUKU'ALDEA HARBOR BASIN collects fine silt
in deep water.....

BIOLOGICAL AND PHYSICAL CONDITIONS OF RECEIVING WATER:
coral lined lagoon average depth 30m black coral
population in deep water.....

HEALTH HAZARD

ECOLOGICAL HAZARD Death of silt sensitive reef and
Black corals

Source: Field Notes from Chesher's Black Coral Survey of Tonga

CASE STUDY: IMPACT AND CONTROL OF DYNAMITING IN PALAU

Division of Marine Resources
Ministry of National Resources
REPUBLIC OF PALAU

INTRODUCTION

This paper specifically addresses the problems the Republic of Palau is facing as a result of widespread illegal dynamiting in its waters. The purpose of the paper is to identify problems created by illegal dynamiting and to propose some viable solutions to those problems. It is hoped that the paper will raise public awareness of this detrimental practice and contribute towards its eventual curtailment.

PROBLEMS

The Republic of Palau is experiencing the environmentally degrading effects of dynamiting. The main target of this activity is a species of mackerel (*Retrelliger canagurta*) which is disappearing quickly, even though it is not under pressure from commercial fishing. Large numbers of dead scads have washed up on the beaches and examination of gills and rib bones reveal evidence common to fish killed by dynamite blasts.

The reef itself is being destroyed and with it the coral that serves as fish habitat. Perhaps more serious is the long term damage to fish populations resulting from the death of thousands of fish larvae and the disruption of their habitat. The destruction of the reef also serves to diminish the island's main source of physical protection from the ocean.

The fish in the waters of Palau are its main source of export income and there have been numerous attempts to develop a fishing industry to exploit this resource. However, aside from the few individuals who fish for an income, there is no known group or organisation pushing for the conservation of the marine waters and their protection from extensive exploitation, either through dynamiting, poisoning, or any of the so-called modern fishing techniques.

The Republic of Palau has legislated to restrict and control the use of dynamite and to make fishing with explosives illegal. Currently, enforcement of this law is difficult because of a lack of manpower and because of the absence of a specific agency for marine law enforcement brought about by a recent re-organisation of government functions. Even so, prosecution of the few arrests made in the past has usually run into legal difficulties due mainly to witnesses being reluctant to testify because of extended family ties.

INTERVENTION

At present there is no valid program designed to control, or at the very least retard, illegal dynamiting in the Republic. However, a newly established Marine Patrol Division is expected to be fully functional this year and will be well equipped for the enforcement of marine laws.

The Olbill Era Kelulau (National Congress) Senate has passed, in its first reading, a bill intended to stiffen fines for dynamiting violations (Bill No. 2-9). Another bill, still in its formative stage, is intended to let each State share an active part in creating and enforcing marine laws

within their jurisdiction. Koror is the only State that has an active conservation programme.

SETTING/BACKGROUND

Illegal dynamiting is not just a problem in the Republic of Palau. It is a widespread problem in the Pacific region and unfortunately Palau has not been able to escape from its ills and the practice is very common, especially in the waters surrounding Koror State where the problem is serious.

The net wealth of Palau lies in its unique and beautiful waters, including the Rock Islands. However, underwater channels, fish breeding grounds and habitats which are important attractions to scuba divers have been damaged. Furthermore, the marine lakes on the Rock Islands which are unique natural wonders located several metres above sea level and a prime tourist attraction, are being destroyed.

The Rock Islands, laced with beaches and topped with lush green vegetation including coconut palms and breadfruit trees, could be further developed for tourism and could boost the economy of the Republic. However, because of the dynamiting problem, these areas, their beaches and their coastal waters, are not fully exploited by either tourists or the local people.

The marine waters have always been the main source of income and food for the Palauans. Today, with much improved fishing techniques Palau is exporting tons of fish to Guam and other areas in the Pacific. However, with illegal dynamiting on the rise further development of the fishing industry is being undermined with the result that fishermen now have to fish further away from the inshore coastal waters that were once abundant with all marine species.

CONSTRAINTS

Although there is a public law specifically prohibiting "placement of explosive in any waters of" the Republic of Palau, the practice is not being curtailed. Rather, due to a shortage of personnel in the Bureau of Public Safety in the Ministry of Justice, dynamiting appears to be increasing. The Division of Marine Resources is now trying to develop an awareness campaign, utilising the media to inform the public of the negative effects of dynamiting on the marine environment.

CONCLUSION

Although there is no detailed study of the effects of dynamiting available, Palau is becoming increasingly aware of the detrimental effects of this illegal form of fishing. It is hoped that the formation of the Marine Patrol Division, combined with a public awareness campaign, will deter, if not completely halt this practice.

CHAPTER 3 : TRADITIONAL USE AND PROTECTED AREAS

TENURE AND TABOO : CUSTOMARY RIGHTS AND CONSERVATION
IN THE SOUTH PACIFIC
Peter Eaton

TRADITIONAL USE OF PLANTS OR ANIMALS IN PROTECTED AREAS IN
NEW CALEDONIA
Jacques Kusser

ABORIGINAL CUSTOMS AND KNOWLEDGE AND ITS RELEVANCE TO PROTECTED
AREA MANAGEMENT IN NEW SOUTH WALES
New South Wales National Parks and Wildlife Service, Australia

TRADITIONAL RIGHTS AND PROTECTED AREAS - THE NEW ZEALAND EXPERIENCE
Department of Lands and Survey, New Zealand

RESOLVING CONFLICTS BETWEEN TRADITIONAL PRACTICES AND
PARK MANAGEMENT
Iosefatu Reti

KEY ISSUE PAPER: TENURE AND TABOO : CUSTOMARY RIGHTS AND CONSERVATION
IN THE SOUTH PACIFIC

Peter Eaton
University of Papua New Guinea

SUMMARY

This paper examines land and marine tenure systems in the South Pacific and analyses some of the main features relevant to conservation and protected areas. In many countries of the region a dual system of tenure has evolved. There is a customary system with its emphasis on ownership by the kinship group and with a multiplicity of different rights, and there is the alienated section with land owned by the government and private interests.

Traditional conservation practices have often been closely associated with customary tenure in which communal control is retained over land use and the exploitation of natural resources. Taboos have also been an important means of protecting wildlife and sacred areas.

Existing legislation to establish protected areas is described and an appendix to the paper gives a list of the protected areas in the region. Past development of parks and reserves has been dependent on the availability of public land. This is generally in short supply and subject to competing land use needs. Governments have powers to acquire additional land for public purposes either by negotiation or by compulsory processes, but have generally been reluctant to purchase large areas for conservation purposes. An alternative is the protection of areas held under customary tenure.

In Papua New Guinea wildlife management areas have been established on customary land, while in Fiji the National Trust has made an agreement with land-owners to establish a crested iguana sanctuary.

In future it should be possible to increase the number of protected areas on customary land. However, it is important that conservation must not be seen as something which blocks progress for rural land-owners, but rather as the basis for sustainable development.

INTRODUCTION

Land tenure is concerned with rights to use land and access to natural resources; as such it is of special relevance to conservation and the establishment of protected areas. This was recognised by the 1982 Conference on the Human Environment in the South Pacific which emphasised the need for "the study of traditional land and marine tenure systems and their reconciliation with environmental management, especially in relation to conservation and the designation of and management of reserves". (South Pacific Commission, 1982).

- My own research on the subject has been concentrated on Papua New Guinea, but has also included fieldwork in Fiji, Samoa and Tonga. In addition I have attempted to collect information on land tenure and protected areas from the other countries that make up the South Pacific region, which for the purposes of this paper, is defined as those

countries belonging to the South Pacific Commission region: see Appendix I. This paper is a summary of the study to date. It is divided into three parts. In the first I examine land and marine tenure systems and attempt to analyse some of the main features relevant to conservation and protected areas. In the second part I describe the development of parks and reserves in the region. In the final section I discuss the practicability of establishing protected areas on customary land.

LAND TENURE

The land tenure systems of South Pacific countries tend to reflect the variety of geographical, social, political and economic conditions within the region. Nevertheless it is possible to identify common characteristics of the traditional or customary systems which still persist in spite of the changes caused by the introduction of foreign concepts of law and land-ownership. Traditionally these systems were associated with subsistence economies where a community's land was the source of its food, shelter, clothing and other necessities of life. The land was also the basis of social organisation, culture and religion. It gave the group identity and provided a common link with its ancestors who were buried there. It provided security for the old and opportunities for the young. The importance of land in Vanuatu has been expressed in this way: "The clan is its land, just as the clan is its ancestors. Each man must have some place, some land which belongs to him, which is his territory. If he does not control any land he has no roots, status or power." (Bonnemaison, 1984).

In most customary systems rights to land are held by a kinship group who have inherited them from a common ancestor. These rights might have been originally acquired in a number of different ways. Sometimes the ancestor was the original pioneer who had made the first landing on an island or who had cleared an area of forest and cultivated the land. Many of the group's myths and legends concerned the way the land had been acquired with special heroic, mystical or god-like qualities being attributed to the original ancestor. Animals and birds might also be involved in these myths and become identified with the group as a totem which must not be killed or eaten. Rights were also acquired by warfare or conquest with stronger more numerous groups forcing the weaker less organised ones off their land.

Within the land-owning group, rights to occupy the land are usually inherited by birth through membership of a particular lineage. The system is also flexible enough to cater for particular cases such as adopted children and outsiders marrying into the group. Location, the fact of living with a group, participating in its economic and ceremonial activities, observing its customs and fulfilling group obligations and responsibilities are all factors which help to give at least temporary rights to land.

Customary tenure is characterised by a multiplicity of different rights. These include rights to clear and cultivate land, to build houses, to hunt, to pick fruit, to fish, to fetch water and to have access to particular localised resources such as salt or potting clay. The rights vary in their strength and permanence; some are held by individuals and others by the whole group. Several people may have different rights over the same piece of land; rights to trees and to ownership of the land on which they are planted may be held separately. Areas held collectively include those reserved for ceremonial and sacred purposes. Control over the allocation of land rights varies in different societies. In some areas

the whole group is involved and decisions are made by consensus; in others, powers are concentrated in the hands of a chief. The importance of land means that there are generally strict controls on permanent transfers outside the kinship group.

The definition of land rights within the customary system is often influenced by the distance from a group's permanent settlement. Generally rights to use land near the village tended to be more definite and individualised whereas those to land further away were vaguer and belonged to the whole group. In Western Samoa this occurred with the village house lots and plantation plots near the settlement and village and district lands in the more remote areas. For New Caledonia Saussol (1971) writes "The land surrounding hamlets had very clear patterns of tenure...but further away were areas of "no man's land" little used except for gathering or wood-cutting. The precise nature of indigenous rights to such lands in pre-contact times is not known, but available evidence suggests that they were limited, and that the right-holding units were large, usually tribes or groups of related clans.

In New Caledonia these areas of uncultivated land were later to be taken by the French colonial administration because they were regarded as "vacante". Many of the British colonies also had "waste and vacant" ordinances which enabled similar land to be taken by the government because it was regarded as unoccupied. Indigenous groups often maintained territorial claims to this land based on past historical associations, present hunting and collecting rights and future needs for cultivation.

In most parts of the Pacific the arrival of Europeans resulted in alienation of some land from the customary system. Land was acquired for plantations, missions, trading and administrative purposes. Most colonial governments established some control over the sale of land to foreigners, but the degree to which indigenous rights were protected varied considerably. Foreign land-ownership was sometimes encouraged as a supposed means of bringing about economic development. In some cases, notably Fiji and New Caledonia, labour was imported from other countries and eventually came to outnumber the indigenous populations.

New systems of land tenure were imposed on alienated land. Rights were no longer dispersed but concentrated in the ownership of leasehold and freehold titles. Land became a commodity that could be bought and sold; its price subject to the market forces of supply and demand. It also assumed financial value as a form of security for obtaining loans.

In many countries of the South Pacific a dual system of land tenure evolved. There was the alienated section which included land owned by government and private interests; this land was held under registered titles and its boundaries were surveyed and marked. In contrast, customary land was unregistered and had boundaries formed by natural features; knowledge of these inherited rights were handed down orally from one generation to the next.

Most Pacific countries have legislation which allows the government to acquire customary land either by negotiation or by compulsory procedures. This power is often subject to certain conditions. The most common is the requirement that it must be for public purposes. In the Papua New Guinea Land Act these purposes are specified. In the Solomon Islands the Land and Titles Act provides for compulsory acquisition for public purposes, but the Constitution requires that there must have been prior negotiations with the land-owners and they should have had access to legal advice.

Similarly in Western Samoa, the Takings of Land Act gives compulsory acquisition powers but the Constitution states it must be for a public purpose. In Vanuatu, Article 81 of the Constitution allows the Government to own land in the public interest. Generally, as in the case of the Fijian statute, the Crown Acquisition of Land Act, the legislation states that a negotiated purchase must be attempted before compulsory acquisition takes place. In nearly all cases of acquisition, compensation is paid based on both the unimproved value of the land and on the improvements (usually buildings and plants) that have been added to it. Payments are not always in cash; occasionally exchanges of land takes place or land-owners are offered a share of future profits. They may also receive part of the royalties from forestry and mining projects. In the past, payment was often in trade goods or by traditional means of exchange such as shells.

The acquisition of customary land tends to be a lengthy procedure. There is a need for investigation to determine land ownership, something which may involve the compiling of genealogies. Negotiations may require consensus approval and be delayed by absentees. The land has to be valued and surveyed; the need for the latter is frequently the cause of long delays in land transactions. Often administrative delays may be caused by the involvement of several government departments in the acquisition procedure.

In relation to compulsory acquisition, a final point that should be emphasised is that governments are very reluctant to use their particular powers in this respect. This is not only due to the legal and constitutional restraints, it is also politically unpopular and may give rise to law and order problems if the land-owners refuse to give up their land. The result is that in the newly independent countries of the South Pacific compulsory acquisition of customary land rarely occurs even if it appears to be in the public interest.

MARINE TENURE

Marine tenure is of particular significance in the South Pacific region. In the traditional system a village or kinship group may claim exclusive use of an area of sea, beach or lagoon. Outsiders are excluded or may only fish with the permission of the group; this may be restricted to certain times of the year and be conditional on some form of payment, gifts or a proportion of the catch. Rights to gather shells and other products are safeguarded in a similar way.

Additional rights may also be involved. These include access and rights of passage through gaps in reefs and between islands. Unless there was enmity between groups, this right has usually been freely granted although again, permission may have to be requested. If damage results this can lead to dispute and rights being refused. This happened recently on Manus Island when villagers claimed that canoes with outboard engines using the passage between Los Negros and the main island were frightening away the fish and that the wash was causing erosion along the shores.

Another right is the use of stretches of beach as landing places for canoes. In Vanuatu these landing rights are inherited by each head of family, although chiefs may also allocate general landing rights where reefs make it difficult to come ashore by one's own land (Taurakoto, 1984).

The addition of improvements can also give special rights. Examples are the making of fish traps or fences such as those used off the Tongan coast, or the construction of stone enclosures for clam gardens in places such as Manus. In Atiu in the Cook Islands the people feed fish with pieces of taro and coconut flesh and claim that by fattening and attracting the fish they have acquired special harvesting rights. On the other hand, if no labour has been involved in developing a resource, claims to it may not be as strong. The strength of territorial claims will also be partly dependent on the monetary value of the resources involved. When a resource assumes commercial importance, there may be more attempts to assume rights to it and more possibilities of disputes.

The boundaries and extent of traditional marine territories are in many cases an extension of those on land. The ownership or use of adjacent land is generally regarded as the basis of rights to the beach, reef and sea.

The question of how far these rights extend out to sea is a more open one. For many Pacific islands the outer edge of the fringing or barrier reef is regarded as the limit. This is how marine boundaries are described for Atiu in the Cook Islands: "Boundaries were determined by the boundary lines on the dry land (which ran from inland to the coast and continued across the lagoon to the reef) and sea-passages on the reef. For some places special rocks on the cliff edges were used to mark the inner borderlines. Beyond the reef, just a few feet from where the waves break on the reef, is the end of the boundary line. This is marked by the site where men fished for mackerel (*koperu*). The boundary is known as *taunga koperu* because the *koperu* remain in the same area throughout the year". (Mokoroa, 1984).

Similarly in Fiji it is stated that "fishing rights were maintained from the beach to the seaward edge of the outer reefs" (Kunatabu, 1983). Sometimes sea boundaries might extend even further. In Vanuatu they might "extend as far out as one can fish or dive for shells" (Tuaarakoto, 1984) and in the Marshall Islands property rights extended out as far as the area where the people could stand, usually waist-deep, to fish. In some places the use of larger boats and new fishing methods has enabled traditional claims to be extended further out to sea than in the past.

Marine territorial boundaries make use of a variety of natural features. This description of boundaries is from Fiji: "These tend to be straight lines joining distinctive geomorphological features observable from the surface. Thus, a boundary may begin from the tip of a rocky promontory, bear along a straight line to a patch of reef perhaps a kilometre offshore, change direction at this reef to continue several hundred metres to a pass in the main reef, then follow the seaward edge of the main reef to a conspicuous reef hole before re-crossing reef and lagoon to intersect the coast. (Raines, 1980).

Occasionally special markers are also used to show boundaries on reefs or beaches. Large stones, posts or sticks are often used. The latter, with coconut fronds attached, may indicate an area under taboo where no fishing is allowed.

Control over traditional fishing rights varies. In Papua New Guinea it is often decided by the clan or village; in other countries more power has traditionally been with the chiefs. In the past in the Marshall Islands, a chief might claim a particular reef as his property and place a taboo on others fishing around it. Today, chiefs rarely have such complete powers although they may still have considerable control and allocate rights of usage.

Just as the introduction of western legal systems by colonial governments resulted in dual system of land tenure, so also did it result in the application of two sets of rules for marine tenure, in this case affecting the same areas. The laws of Britain, France, the United States and Australia all stated that all land and sea below the high water mark or mean high tide level was government or crown land. These principles were incorporated into the colonial regulations and ordinances and perpetuated in the legislation of the countries when they became independent. In practice, the conflict between introduced and customary laws has often been solved by government recognition of traditional fishing rights but not ownership of the marine areas involved. Compensation has also been paid for damage to or loss of traditional fisheries as a result of development projects. Problems have occurred when commercial fishing takes place in coastal areas; local fishermen are often anxious to exclude outsiders in order to protect their fisheries.

TRADITIONAL CONSERVATION

Traditional conservation practices have often been closely associated with customary tenure. The identity of the group with its land and the concept of land as something which is held in trust for future generations led to careful management of natural resources. The importance of the immediate environment as the source of all sustenance meant there was need for it to be carefully looked after and maintained. People in Vanuatu say: "The ground is like our roof. If we do not care for it, it will not shelter us and we will die out". (Lane, 1981).

In customary tenure a large degree of communal control is retained over land use and the exploitation of natural resources. Certain rules and procedures have to be followed in agriculture, hunting and fishing. Methods have evolved of maintaining soil fertility such as shifting cultivation, composting, building mounds and using pits. Economic trees, for example those used in making canoes, taps and kava, were all carefully looked after and protected from indiscriminate felling. Wildlife and fish numbers were maintained by temporary bans on hunting and fishing during breeding periods or times of scarcity. Owen (1969) writes about American Micronesia: "Chiefly decrees, clan and island taboos and other means of control were apparently effective. The taking of turtles, turtles' eggs, sea bird eggs and dugongs were so regulated. The necessity to have island sanctuaries for certain birds and turtles was also recognised and such sanctuaries did exist. Some of the old conservation practices of long ago still persist in parts of the Trust Territory, but the impact of cultural changes is gradually breaking down the old chief and clan systems and the conservation practices which were part of the old system".

The imposition of taboos was one of the main means by which wild life and areas could be protected. These prohibitions, often known as *tambu* in many parts of Melanesia and *tapu* in Polynesia, were invested with supernatural powers and sanctions. In the Cook Islands "access to land or crops could be controlled or denied by the use of *ra'wi* or customary prohibition, by the appropriate chief"; this might be shown by a sign such as "a coconut leaf tied around a tree on the path leading into a prohibited area" (Croccombe, 1964).

Taboos were often used to protect sacred areas. These were sometimes burial places and as the abode of the ancestors, often formed the core of a group's territory. In other cases they were the site of old villages or battlefields. Sometimes the sacred areas were used for particular ceremonies but not at other times. In other areas no specific taboos had

been imposed but there was general fear of the spirits or supernatural beings who dwelt there. These places are known as *ples masalai* in Papua New Guinea and may be associated with deep forest, mountain tops, large stones, caves or lakes.

Areas may be declared taboo for a number of different reasons. Sometimes it may follow a person's death; for a certain period no hunting or collecting of food is allowed. The taboo may be also the result of a communal decision to protect wild life and its habitat. On Niue there are *tapu* forests which include the remnants of the primary forest which covered the island; these are important as the homes of flying foxes and edible land crabs. Taboos may also be placed on areas of reef to conserve the fish for important feasts.

Particular wildlife species and types of food are subject to taboos. The animal concerned may be the totem of the clan or moiety or it may be protected for reasons associated with its supernatural origins. It may also have particular qualities which make it undesirable as food. In Papua New Guinea women sometimes will not eat crabs because they are afraid of having children which are deformed in similar ways; in Tuvalu pregnant women may not eat rays or flatfish or their babies will have flat deformed heads. In Kiribati there are taboos on young boys eating cowries, which it is believed prevent body hair from growing and also on eating damselfish which will make them nervous adults (Zann, 1983).

Taboos are still often effective in giving protection to specific areas or species of wildlife. Villagers are aware of them and the sanctions, both supernatural and secular, ensure that they are observed. They have the strongest influence in isolated areas where animistic beliefs are dominant and are generally not so widespread where Christianity has been established for a considerable period as in Tonga. Nevertheless, in many islands people may belong to Christian churches and also observe traditional taboos and rules.

Other changes have tended to diminish the self-regulatory mechanisms of traditional environmental management. The weakening of the traditional authority of chiefs has reduced the controls over hunting, fishing and agricultural activities. The introduction of the cash economy has meant the catching of fish and killing of wildlife beyond subsistence levels. This has been facilitated by new technologies in transport, storage, hunting and fishing. In some areas land-owners have reacted to these threats by making their own regulations to discourage or forbid practices such as the use of dynamite, outboard engines and pressure lamps in fishing, and shotguns for hunting. A return to traditional methods is seen as the best way of protected scarce resources against exploitation.

Internal controls are one means by which land-owning groups safeguard their natural environment. Another is by excluding outsiders and jealously guarding access to resources within their territory. The restriction of hunting and fishing rights to members of the group is a feature of the customary tenure system which often helps to prevent over-exploitation. It is significant that customary land-owners may welcome conservation measures which give them greater security of tenure and formal recognition of their rights. In their own areas these land-owners often prove the best guardians or wardens of their environment.

EXISTING PROTECTED AREAS AND LEGISLATION

Only a few South Pacific countries have specific national parks legislation. In many cases the powers to establish reserves are linked to forestry or wildlife laws.

In Papua New Guinea there are three statutes: the National Parks, Conservation Areas and Fauna (Protection and Control) Acts. The National Parks Act provides for the conservation of sites and areas of special scientific, scenic or historical purposes. It contains powers to reserve government land, lease and accept gifts of land. Seven areas have been officially declared and gazetted, but these are small in area, only two are over a thousand hectare.

The Conservation Areas Act has similar objectives but attempts to be more flexible in that the areas can be established on public, private or customary land. It contains provisions for local representation on a management committee. It requires a management plan for each area; land use changes can then only be in accordance with the plan or with ministerial approval. This statute has not yet been implemented and there are no conservation areas at present.

Under the Fauna (Protection and Control) Act sanctuaries, protected areas and wildlife management areas can be established. For the management areas there are local committees responsible for drawing up and enforcing the rules. These areas can be established on customary land. There are at present 11 wildlife management areas, 2 sanctuaries and one protected area.

The Solomon Islands has a National Parks Act which contains provisions for the declaration of national parks and the control of land use within them. There is one park, the Queen Elizabeth National Park, which is of limited conservation value; part of it has been returned to customary owners and much of the rest has been affected by squatters' gardening activities. Under the Forest and Timber Act, vegetation can be protected in controlled forest areas and there is one such reserve on Kolombara Island. In addition, local authorities may develop sanctuaries and one has been established by Santa Isabel provincial government in the Arnavon Islands, an important turtle-breeding area.

Vanuatu has Forest Regulations which provide authority to declare forest reserves. There are no national parks although wrecks around the coast, such as the "President Coolidge" sunk during the Second World War, are protected.

In Fiji the Forests Act provides for reserved forest areas and nature reserves. At present there are 24 forest reserves and 10 nature reserves. The National Trust Act gives the National Trust powers to acquire land for conservation purposes; the Trust has been involved in the establishment of a crested iguana sanctuary and one reserve.

New Caledonia has a number of decrees under which parks and reserves have been established. At present there are 2 territorial parks, 2 marine reserves, 1 nature reserve and 5 fauna and flora reserves. These have all been established on public land.

Western Samoa has a National Parks and Reserves Act which provides for the establishment of parks and reserves on public land. There is at present one full national park and 5 reserves of different types. The Forests Act also enables the protection of forest and water catchment areas.

Tonga has a Parks and Reserves Act and 5 marine reserves have been gazetted under this statute. Two areas of lagoons are also protected in that only subsistence fishing is allowed and the discharge of effluents and destruction of mangroves is forbidden. There is also a Preservation of Archaeological Interest Act and several historical sites are protected.

The Cook Islands have a comprehensive Conservation Act. Under it any land, lagoon, reef, island or part of the territorial seas and the seabed can be declared a national park, reserve or world park. There are not yet any national parks in the Cook Islands; a world marine park was proposed for Manuae Atoll but it was not established, partly because of objections from the land-owners. Three fishing reserves have been established under the Trochus Act; diving and fishing for trochus shells is prohibited in these areas without a licence.

The other small Polynesian territories of Tuvalu, Tokelau, Wallis and Futuna and Niue have no protected area legislation or reserves. In French Polynesia the Forestry Act contains provisions for the protection of vegetation and wildlife which enable nature reserves to be established. Five reserves have been listed by Dahl (1980).

American Samoa has a Parks and Recreation Act and a variety of relevant federal legislation such as the Coastal Zone for recreational purposes but there is also one national wildlife refuge, Ross Atoll, and a national marine sanctuary is being developed at Fagatele Bay.

American federal legislation also applies to Guam. In addition there is Parks and Recreation Enabling Legislation which provides for natural preserves, conservation reserves, territorial and community parks, recreational facilities and historical and prehistoric sites. Altogether there are 110 sites listed in the Guam territorial system, although most of them are small recreational sites and of limited conservation value. There is also a larger area of territorial seashore park.

The former American trust territories also came under federal jurisdiction but are now developing their own legislation. Under Section 2, Article XIV of the Constitution of the Northern Mariana Islands, two islands, Sariguan and Maug, are to be "maintained as uninhabited places and used only for the preservation of bird, fish, wildlife and plant species". Palau has the Ngerukewid Islands Wildlife Reserve. There are two bird sanctuaries, Bikar and Pokak, in the Marshall Islands.

Elsewhere in Micronesia, Kiribati has a Wildlife Protection Ordinance under which sanctuaries for birds and sea turtles can be established. There is also a Prohibited Areas Ordinance which could be used to restrict access for conservation reasons. Seven sanctuaries and four prohibited areas for birds and turtles have been established.

At present there are no sites in the South Pacific Commission region which are protected under the World Heritage Convention, although several areas have been identified as being suitable for inclusion. There is one international biosphere reserve in French Polynesia.

THE ESTABLISHMENT OF PROTECTED AREAS ON CUSTOMARY LAND

Past development of parks and reserves has been dependent on the availability of public land. This is generally in short supply and subject to competing land use needs. Furthermore, government rights to this land may be disputed, especially in cases where it was acquired because it was

considered waste and vacant. The return of alienated land to the original indigenous owners, as in Vanuatu, is another restraint on the use of public land.

Governments have powers to acquire additional land for public purposes either by negotiation or compulsory processes, but have generally been reluctant to purchase large areas for conservation purposes.

An alternative to the establishment of parks and reserves on government land is the protection of areas held under customary tenure. The 1975 South Pacific Conference on National Parks and Reserves recommended that the governments of the region should "provide machinery to enable the indigenous people involved to bring their land under protection as national parks or reserves without relinquishing ownership of the land, or those rights in it which would not be in conflict with the purposes for which the land was reserved". (IUCN, 1975).

In Papua New Guinea wildlife management areas provide examples of development where the land has remained under customary tenure and the land-owners themselves have made the rules to protect threatened wildlife resources. At present there are eleven of these areas although a large number of others have been proposed and recommended.

The first and largest wildlife management area to be established was Tonda, approximately 5,900 square kilometres in size and located in the sparsely populated south-west of the country. It is a region which is rich in wildlife; there are large numbers of wallabies and deer, a great variety of birds and abundant fish. The management committee have made rules that control hunting by outsiders who must now buy licences and pay royalties to hunt deer, shoot duck or catch fish.

There are two wildlife management areas in West New Britain province at Pokili and Garu. The main aim of these areas is to protect the megapodes who lay their eggs in ground warmed by volcanic action. The eggs have traditionally been a source of income and food for the local land-owners, who have recently become perturbed about over-collection of eggs, hunting of the birds and destruction of their habitat by tree felling. The rules of the areas now forbid shotguns, dogs and logging; the number of eggs gathered is controlled and collecting by outsiders is not allowed.

There are also two management areas on islands in the Milne Bay province. One is around Lake Lavu on Ferguson Island. It covers an area of approximately 50 square kilometres, about a third of which is water. It is in a region of rugged relief and generally unsuitable for agriculture. There is considerable wildlife, much of it concentrated in and around the lake; it include crocodiles, fish, eels, waterfowl, pigs and possums. The local people were concerned that some species were becoming scarce; there were also complaints that, in the past, European hunters had killed crocodiles and then, after removing the valuable skins, had thrown the meat in the lake causing putrefaction and pollution of the water. These and other outsiders had also failed to pay royalties to the land-owners for crocodiles and other animals killed. A committee was formed with representatives from each of the seven villages in the region. The rules they made stated that only the traditional hunting methods should be used; they also forbade the collecting of any crocodile eggs.

The only management area in Milne Bay province is located at Sawataetae on the northern side of Normanby Island. It is 700 hectares large and is a coastal area of plantation, forest and mangroves. It has an especially

interesting range of birds including egrets, ospreys, hornbills, parrots and goura pigeons. Many of these species were becoming scarce partly as a result of indiscriminate shooting by outsiders. The rules only allow the land-owners to take firearms into the area. They also forbid the starting of fires except those to clear gardens and make the land-owners responsible for the control of the burning.

Another management area where the lighting of all fires is forbidden is at Zo-oimaga, an area of low hilly land to the north-west of the town of Kwikila in Central province. It has a vegetation of lowland rain forest, secondary regrowth and grassland. The fauna of the area includes agile and forest wallabies, cuscus, megapodes and birds of paradise. Both the Raggiana and King Birds of Paradise are found and fifteen of their display trees have been identified. It was concern about the intensive hunting of the birds of paradise that led the local people to establish a management area. In addition to the prohibition on fires, the rules state that no shotguns are allowed in the area or within $1\frac{1}{2}$ kilometres of it, and that nobody is allowed to hunt wildlife except the land-owners who are allowed to kill one or two animals a month for food during April, August and December.

The Mojirau wildlife management area was established after people from five villages in the East Sepik province complained about wildlife becoming scarce because too many shotguns and dogs were being used, and that outsiders were hunting on their land. The latter problem had become worse since a road had been built from Wewak to Angoram which enabled hunters to use vehicles. The management area is 5,079 hectares and is in a flat undulating lowland of rain forest and grassland. The wildlife includes birds of paradise, goura pigeons, hornbills, cockatoos, cassowaries, megapodes, wild pigs, cuscus and tree kangaroos. The rules of the area state that only customary land-owners are allowed to hunt and have shotguns; also that no dogs or camping should be allowed. There are proposals for a two-mile buffer zone around the area where hunting should only be allowed on special occasions and for ceremonies.

The wildlife management area at Rauba on Long Island, off the coast of Madang province, is a region of considerable scientific interest. It is the site of a large volcanic explosion which left a crater lake. It has a variety of wildlife including green, hawksbill and leatherback turtles. The rules restrict the killing and sale of turtles which may only be caught by those with customary rights to do so or those authorised by the traditional land-owners. Turtle sales are controlled and forbidden during the breeding months of May, June and July. Other fauna may only be hunted by the land-owners, and the use of shotguns is forbidden. Unfortunately these rules do not always seem to have been followed and there have often been cases of turtles being disturbed and killed during the breeding season. There has been criticism of the management committee for not enforcing the rules and failing to prosecute offenders. Another problem is that Long Island is a place where the people feel they have had few of the advantages of development and recently there has been pressure to allow logging operations which would bring some employment and income from timber rights purchase fees and royalties. These pressures have been resisted to date but they do illustrate the problems of maintaining protected areas where the local people have few sources of income and employment.

The Bagiai wildlife management area on Karkar Island is also in Madang province. It covers the centre of the island including the high volcanic peak and crater of Mount Uluman. The area also includes coastal waters and

reefs plus two small islands and is approximately 13,760 hectares in size. The initiative for the establishment of this management area came from the islanders themselves and their local government council. They were concerned at the increase in the number of shotguns in the area, the decline in wildlife, over-fishing and soil erosion resulting from deforestation. The committee drew up a list of rules which prohibited the use of firearms except for killing wild pigs on one's own land and eagles when they were attacking poultry. Otherwise traditional methods of hunting had to be used and these only by people with customary rights to the land. In the case of fishing, commercially manufactured nets were not to be allowed nor were kerosene or hurricane lamps for the purpose of attracting fish at night. Additions to the rules were also later discussed. These include size restrictions on the mesh of nets and the use of derris root poison for fishing. It was decided to leave these issues to the discretion of the groups owning the reefs. There was also a suggestion that entrance fees should be charged to visitors who wished to visit the volcano, traditionally a sacred place; this has not yet been implemented.

In an effort to increase participation and educate people in the aims of the area, conservation meetings were held in the villages of the area. As in other wildlife management areas there was some dissatisfaction that local courts had failed to prosecute those breaking the rules; officials and magistrates were often uncertain of the rules and the relevant sections of the Fauna (Protection and Control) Act.

At present there is only one wildlife management area in the Highlands region; this is at Siwi-Utame in the Southern Highlands. It is an area with a wide range of birds and animals which are protected by rules forbidding most types of hunting and the felling of trees. In contrast to most other areas, offenders have been frequently fined by the management committee or village courts.

The final area, Maza, is of particular interest because of its marine environment. It is an area of approximately 184,230 hectares of sea and coral reefs to the west of the mouth of the Fly River off the coast of Western Province. The rules of this area are mainly concerned with the management and control of dugong. In the area dugongs can be caught with traditional hand-harpoon methods from canoes, but there are restrictions on size of dugong that may be sold in the local markets.

Wildlife management areas provide one model for the involvement of land-owners in the establishment of conservation areas. Different alternatives have been attempted or suggested by other South Pacific countries. In Fiji the National Trust have made an agreement with a land-owning group, the Nakorolevu matagali, to establish a nature reserve for crested iguana on a small island known as Yadea Taba. The land-owners were to receive regular annual payments and in return act as wardens and prevent unauthorised people from landing on the island. The land-owners agreed not to endanger the iguana and their habitat; there was to be no burning of vegetation and grazing of goats on the island. Compensation was to be paid for the removal of the goats from the island. The agreement seems to have been successful, although it should be noted that several factors seem to have favoured the development of the sanctuary. These include the relative inaccessibility of the island and its lack of permanent settlement. The crested iguana itself had traditional significance to local people as a totem; it was not hunted or killed by them, but generally feared and avoided. The rarity of the crested iguana and the scientific interest it created also facilitated the raising of funds, at national and international level, for the establishment of the sanctuary.

In Fiji another attempt by the National Trust to come to a similar agreement with land-owners has not yet been successful. This was an attempt to develop a 120 hectare forest reserve on the island of Vanua Levu. The area was part of a large timber concession, but the company involved had agreed to surrender their rights to this section. Under the proposed agreement the reserve would be leased from the land-owning group, the *Waisali matagali*, with a premium being paid in addition to the annual rent. However, the negotiations came to a standstill when the land-owners also demanded compensation for the timber royalties they would have otherwise obtained. The problem of compensating land-owners for not developing their land is not unique to Fiji or indeed, the South Pacific. However, it does have special significance in cases where the land-owners are among the poorest sector of the community and the natural resource to be conserved represents their only opportunity of obtaining a cash income. If the resources are not to be exploited, alternative opportunities for earning income should be made available.

In Western Samoa the existing parks and reserves have been developed on government land, but any proposed expansion in their number would need considerable government expenditure on land acquisition or else the use of alternative approaches which would leave the land under customary ownership. One report (Dahl, 1978) suggests that it may be necessary to amend the existing legislation "to permit the extension of conservation measures to important national features that are not in public ownership". Another proposal (Holloway, 1975) is the dedication of customary land. Under this procedure the land-owning group, the *aiga*, would retain ownership of the land but dedicate the rights of usage to a park management authority. The dedication of church land which has occurred in Samoa was suggested as a precedent for this type of arrangement.

We have seen that the establishment of marine reserves may cause particular tenure problems arising from government control over territorial waters and traditional fishing and collecting rights. In the Palolo Deep Marine Reserve in Western Samoa local land-owners have been involved in the management of the reserve, but some illegal fishing (not necessarily by those with traditional rights) has occurred. In the proposals for the Fagatele Bay Marine Sanctuary in American Samoa, local land-owners and fishermen were consulted about the project and were reported to be in favour and interested in being involved in its management. Although all fishing and collecting of marine life will be prohibited in the inner core area of the bay it is proposed that subsistence fishing should be allowed in an outer zone.

In Papua New Guinea fishermen from two neighbouring coastal villages were consulted over proposals to establish the Horseshoe Reef Marine Park. They were reported to be in favour of the establishment of the park and agreed that spear-fishing and any collection of shells or coral from the reef should be forbidden. In addition they said that they wished to be consulted and involved in any economic ventures associated with the park.

CONCLUSION

In many South Pacific countries customary land-owners are concerned about the environmental degradation of their home areas, the decrease in wildlife and the threats to marine resources. Experience has shown that customary groups are likely to support conservation measures that reinforce their own rights and exclude outsiders from exploiting local resources. The fact that customary land is unregistered makes the declaration of a conservation area an alternative means of defining and

securing their territory. The problem then becomes one of deciding which rights are compatible with environmental protection. Should hunting, fishing and collecting be allowed in the conservation area? In strict national parks and reserves these activities will generally be excluded but in conservation areas on customary land they form an important element in the life-support systems. Nevertheless there must be some control over the activities to prevent over-exploitation. This can sometimes be achieved by an insistence on traditional methods as happens in Papua New Guinea under the Fauna (Protection and Control) Act. Often there are prohibitions on the use of shotguns, nylon nets and other modern devices such as pressure lamps as an aid in fishing. Moratoria on hunting and fishing when wildlife or fish become scarce or during breeding seasons are traditional controls that should continue to be used. Taboos which protect wildlife and parts of the natural environment should be continued, even although the sanctions may become secular rather than supernatural. Niue seems to be one example where taboos or tapu protecting areas of forest have been effective and it has been suggested they should be used as a basis for conservation on the island (Leonard, 1977).

Commercial logging operations are often a threat to the conservation of customary land and it is important that programmes for establishing parks and reserves should be closely integrated with those for the management and protection of forest resources. At present land-owners who agree to the felling of timber receive considerable financial benefits in the form of royalties, rentals and timber rights purchase fees. It would be more equitable and reduce local pressures to log important conservation areas if a proportion of the payments went to land-owners whose forest is protected.

The management of customary areas is likely to be most effective where traditional group controls on land use rights are strongest. The fact that many potential conservation areas are in uncultivated and isolated areas is fortunate because it is in these areas that individual rights are less defined and there are collective rights of hunting and collecting. Traditional authority may be exercised in different ways: hereditary or elected chiefs, councils or by general consensus. Whichever method is used it is important that it should be incorporated into park and reserve management. Individuals may be employed in the role of wardens, rangers, guardians and caretakers; their authority can be reinforced by the issue of badges and uniforms.

In future it should prove possible to increase the number of parks and reserves on customary land. There needs also to be a strengthening of both traditional and modern environmental controls on other areas of customary land. A realistic model for protected area development in the South Pacific region would seem to be as follows:

- (a) A limited number of full national parks established on government land (e.g. O Le Pupu Pue). These would be fully protected, adequately staffed and have recreational and interpretative facilities.
- (b) Nature reserves and sanctuaries strictly controlled by government with access limited and wildlife species protected (e.g. Rose Atoll).
- (c) A network of traditional conservation areas on customary land (e.g. wildlife management areas in Papua New Guinea). These would be managed by local land-owners who would make their own regulations. Some hunting and fishing would be allowed, but the emphasis should be on the use of traditional methods for subsistence purposes. This category could also include recreational sites, such as beaches and waterfalls, on customary land.

- (d) Larger areas which would stay under customary tenure but which would be subject to land use and development controls. In particular primary forest, water catchment areas and coastal zones would be protected in this way. In some countries of the region legislation exists to provide this protection although it is not always fully implemented, as in the case of the Papua New Guinean Conservation Areas Act.

Development of these four types of protected areas should be co-ordinated as closely as possible, preferably within a regional planning framework. It would be equally applicable to marine and terrestrial areas. It has the advantage of operating within the tenure system and represents an evolution from the existing protected area systems in some countries. It is development that should prove practical with present resources and would not involve excessive additional public expenditure. However, there is a need for strong and consistent government support; staffing must be understood and enforced, education programmes are essential. In particular, conservation must not be seen as something which blocks progress for rural land-owners but rather as the basis for sustainable development.

APPENDIX I

COUNTRIES OF THE SOUTH PACIFIC COMMISSION REGION

County	Area sq. kms	Population
American Samoa	200	35,000 (1982)
Cook Islands	240	18,000 "
Federated States of Micronesia	699	81,477 "
Fiji	18,376	671,712 (1983)
French Polynesia	4,000	164,000 "
Guam	550	111,000 (1982)
Kiribati	890	60,000 "
Marshall Islands	181	33,000 (1983)
Nauru	20	7,000 (1982)
New Caledonia	19,000	145,000 (1983)
Niue	260	3,000 (1982)
Northern Marianas	477	16,000 (1980)
Palau	492	12,173 "
Papua New Guinea	461,690	3,329,000 (1982)
Solomon Islands	28,450	239,000 "
Tokelau	10	3,000 "
Tonga	700	99,000 "
Tuvalu	26	8,000 "
Vanuatu	14,760	124,000 "
Wallis and Futuna	200	10,800 (1980)
Western Samoa	2,836	159,000 (1982)

Source: U.N. Fund for Population Activities, Suva, 1984.

APPENDIX 2

LIST OF PROTECTED AREAS IN THE SOUTH PACIFIC REGION

Country Name	Area (hectares)	Date Established	IUCN Category
<u>Papua New Guinea</u>			
National Parks:			
Varirata	1,063	1969	II
McAdam	2,080	1962	II
Baiyer River	120	1968	IV
Cape Wom	105	1973	IV
Namenatabu	27	1979	II
Nanuk Provincial Park	4	1973	II
Talele Nature Reserve	40	1973	IV
Wildlife Management Areas:			
Tonda	590,000	1975	IV
Maza	184,230	1979	IV
Zo-oimago	1,488	1981	IV
Lake Lavu	5,000	1981	IV
Sawataetae	700	1977	IV
Pokili	N.A.	N.A.	IV
Ranba	41,922	1977	IV
Garu	8,700	N.A.	IV
Bagial	13,760	1977	IV
Majorau	5,074	1978	IV
Siwi-Utame	12,540	1977	IV
<u>Solomon Islands</u>			
Queen Elizabeth National Park	6,080	1965	II
Kolombangara Forest Reserve	N.A.	N.A.	VI
Arnavon Wildlife Sanctuary	N.A.	1980	I

Country Name	Area (hectares)	Date Established	IUCN Category
<u>New Caledonia</u>			
Montagne des Sources	5,870	1950	I
Riviere Bleue	9,054	1960	II
Thy	1,133	1980	II
Yves Merlet	16,700	1970	I
Maitre and Amedee	874	1981	V
Haute Yate	15,900	1960	IV
Pau Island	460	1966	IV
Aoupinie	5,400	1974	IV
Mont Panie	5,000	1950	IV
Lepredour Islet	760	1980	IV
Marine Rotating Res.	30,000	1981	VIII
Mont Mou Botanical Reserve	675	1950	IV
Mont Humboldt Botanical Reserve	3,200	1950	IV
Southern Botanical Reserve (7 areas)	8,932	1972	IV
<u>Fiji</u>			
Nadarivatu Nature Reserve	93	1956-8	I
Naqaranibuluti Nature Reserve	279	1956-8	I
Tomanivi Nature Reserve	1,323	1956-8	I
Vunimoli Nature Reserve	18.7	1966	I
Draunibota and Tabiko Nature Reserve	2.18	1959	I
Vuo Island Nature Reserve	1.2	1960	I
Ravilevu Nature Reserve	4,020	1959	I
Yadua Taba Island Crested Iguana Sanctuary	70	1981	IV

Country Name	Area (hectares)	Date Established	IUCN Category
<u>Fiji (Cont'd)</u>			
Garrick Memorial Reserve	427	1983	II
Koroutari Nature Reserve	18.7	N.A.	I
Kioba Nature Reserve	14	N.A.	I
<u>Tonga</u>			
Ha'atafu Beach Reserve	8	1979	I
Hakaumana's Reef Reserve	126	1979	I
Malinoa Reef Reserve and Island Park	73	1979	I
Monaufe Reef Reserve and Island Park	32	1979	I
Pangaimotu Reef Reserve	48	1979	I
Ha'amonga Trilithon	23	1972	V
<u>Western Samoa</u>			
O Le Pupu-Pu'e National Park	2,800	1978	II
Stevenson Memorial Reserve	1/2	1958	II
Mt Vaea Scenic Reserve	52	1958	II
Valima Botanical Garden	12	1978	II
Palolo Deep Marine Reserve	22	1979	II
Togotogiga Recreation Reserve	N.A.	1978	II
<u>American Samoa</u>			
Rose Atoll National Wildlife Refuge	656	1973	I
To be declared in 1985: Fagatele Bay National Marine Sanctuary	66		IV
<u>Kiribati</u>			
Sanctuaries:			
Birnie Island	N.A.	N.A.	IV
Kiritimati Island	N.A.	N.A.	IV
Malden Island	N.A.	N.A.	IV

Country Name	Area (hectares)	Date Established	IUCN Category
<u>Kiribati</u>			
Sanctuaries: Cont'd			
McKean Island	N.A.	N.A.	IV
Phoenix Island	N.A.	N.A.	IV
Starbuck Island	N.A.	N.A.	IV
Vostock Island	N.A.	N.A.	IV
Prohibited or restricted areas:			
North West Point Reserve Kiritimati	N.A.	N.A.	I
Motu Tabu Reserve, Kiritimati	N.A.	N.A.	I
Cook Island Reserve, Kiritimati	N.A.	N.A.	I
Ngaon te Taake Islet Reserve	N.A.	N.A.	I
<u>Northern Mariana Islands</u>			
Maug	N.A.	N.A.	I
Sariguan	N.A.	N.A.	I
<u>Palau</u>			
Ngerukewid Island (Seventy Islands) Reserve	N.A.	1958	IV
<u>Marshall Islands</u>			
Bikar	N.A.	N.A.	IV
Pokak	N.A.	N.A.	IV
<u>French Polynesia</u>			
French Polynesia Coral Reef Park	N.A.	1972	II
Atoll de Taiaro Biosphere Reserve	2,000	1977	IX
Ei'ao	5,180	1971	IV
Hatutu	1,813	1971	IV

Country Name	Area (hectares)	Date Established	IUCN Category
<u>French Polynesia</u> (Cont'd)			
Mohotani	1,544	1971	IV
Ilot de Sable	N.A.	N.A.	IV
Fenuaura Atoll	N.A.	1971	IV

CASE STUDY: TRADITIONAL USE OF PLANTS OR ANIMALS IN PROTECTED AREAS IN
NEW CALEDONIA

Jacques Kusser
Ministere de l'Environnement
Noumea,
NEW CALEDONIA

The protection of nature in a country is effected by long-standing traditions and precise regulations and restrictions, the purpose of which is always to manage a stock of living plants and animals with a view to:

- preserving the genetic resources that ensure the perpetuation of the natural heritage of mankind for future generations
- and,
- enabling populations to utilise the often bounteous, but generally fragile, resources of nature for their benefit.

The indigenous Melanesian population of New Caledonia has, in this respect, always been very sensitive to matters relating to the protection of the natural environment and it has always practised wise management of natural resources both before historic times and after European colonisation. It therefore seemed logical for the people who are responsible for running the country to take into account, without fear of over-exploitation that would jeopardise the aims of environmental conservation and protection, the time-honoured practices of the traditional population groups.

As regards the environmental regulations now in force, those governing protected areas in New Caledonia, whether strict Nature Reserves, Territorial Parks or Special Reserves, have been established in accordance with the definitions proposed by the International Union for Conservation of Nature and comply with the standards set by that body.

Thus, Resolution 108 of 9 May 1985 specifies that:

- a) a "Strict Nature Reserve" is an area over the whole extent of which every kind of hunting or fishing, forest exploitation, agricultural and mining activities, any works liable to modify the appearance of the land or vegetation, any act liable to harm or disturb the fauna or flora, any introductions of zoological or botanical species, whether indigenous or imported, wild or domestic, and collection of botanical or geological samples are strictly prohibited; where it is forbidden to enter, move about or camp without a special written permit from the appropriate authority; over which it is forbidden to fly an aircraft, and where scientific research may only be undertaken with a written permit from the appropriate authority.

Strict nature reserves may only be established on areas where all mining, prospecting investigations or exploitations have been prohibited.

- b) A "Territorial Park" is an area set aside for the propagation, protection and conservation of animal and plant wildlife, established for the education and recreation of the public, and in which hunting, killing or capture of the fauna, destruction, mutilation and picking

of the flora, collection of botanical or geological samples are prohibited, except with a written permit from the appropriate authority and for scientific purposes.

The appropriate authority may, for the education and the recreation of the public, authorise the construction of roads, tracks, restaurants, hotels or any other facilities necessary for the operation of the park.

c) A "Special Reserve" is an area where certain activities may be prohibited or restricted for specific environmental protection purposes:

- the "Special Fauna Reserve" is an area in which special measures are taken for the protection of one or more animal species.
- the "Special Botanical Reserve" is a protected area established for the regeneration, preservation and conservation of plant species that are rare, remarkable or becoming extinct.

In both these reserves it is forbidden, except with a special permit issued by the Head of the Forestry Department, to carry out works that are liable to modify the appearance of the vegetation as well as any act liable to harm or disturb the natural flora, such as forest exploitation, destruction, collection, picking and mutilation of plants or parts of plants.

None of the above defined reserves at present lies in an area of exclusively Melanesian settlement.

In other words, it has not so far been necessary to provide for special waivers to the law to allow utilisation of the plant and animal life existing in these reserves.

On the other hand, before the 1980 reform of the terminology concerning protected areas, there was a "national park" on the Isle of Pines within which certain rights were reserved for the benefit of the traditional communities. One of the articles of the regulations governing this park stipulated: "the indigenous people shall continue to exercise their traditional rights over the whole extent of the island, with the exception of Oro peninsula which has been classified a strict nature reserve; in particular exploitation of sandalwood and felling of *Araucaria* pines for the building of canoes shall continue in accordance with the legislation in force". Practice and jurisprudence have furthermore included in these traditional rights the felling of trees for the building of houses and special hunting rights, in particular for flying-fox and native pigeons.

For the exploitation of sandalwood and building timber, the legislation in force closely involved the customary authorities in the management and exploitation of these timbers.

The respective duties and rights of the responsible administration and the Melanesian owners were clearly specified in Resolution No. 59 of 20 January 1968 which read as follows:

"To ensure both the protection and conservation of timbers and forests located on land belonging to Melanesian communities and their rational exploitation for the benefit of these communities, the Forestry Department is responsible for the management of these

timbers and forests with the agreement of the local customary authorities.

- Exploitation of the timbers and forests existing on such community land can only be carried out with the consent of the local customary authorities;
- Members of these communities have priority for the exploitation of the timbers existing on community land;
- Members of these communities are authorised to fell, without paying any tax, for their own requirements and within the boundaries of their community, any timbers needed for their agricultural activities, the building of their fences, houses and canoes, as well as for firewood".

Today, because the national park status of the Isle of Pines has been abrogated, the Melanesians inhabiting this island exercise full ownership rights, without any legislative restrictions other than those resulting from the common law forestry provisions applicable in New Caledonia.

The practice of allowing Melanesians to utilise the resources of nature for traditional purposes has nevertheless been incorporated into all the regulations governing hunting for partly protected animal species. Thus regulations protecting the notou (*Ducula Goliath*), the flying-fox (*Pteropus* sp.), or the dugong provide for the issuing of special hunting permits to Melanesian communities, at their request, for customary festivities such as the Yam feast, or celebrations marking highlights in the High Chiefs' life (wedding, birth, death, official establishment).

In practice, these requests are always approved. They are fairly rare moreover and therefore do not have detrimental implications for the conservation of animals species.

In conclusion, the flexible system that has been in force for about 35 years in New Caledonia and combines traditional practices of resource management with more modern concepts of environmental protection can be regarded as effective and exemplary.

CASE STUDY: ABORIGINAL CUSTOMS AND KNOWLEDGE AND ITS RELEVANCE TO
PROTECTED AREA MANAGEMENT IN NEW SOUTH WALES

New South Wales National Parks and Wildlife Service,
Canberra,
AUSTRALIA

The Aborigines were the first people in Australia to manage land and set aside protected areas to which special rules applied. Their expertise in this field was built up over the more than 40,000 years that they had occupied the continent.

During their occupation the Aborigines practised an economic strategy based on extracting diverse resources from a broad environmental spectrum and using mobility to overcome supply problems. They have therefore been characterised as nomadic hunter/gatherers, and sometimes contrasted with agriculturists and horticulturists, whose economics are based on manipulating the growth patterns of a small number of edible plants and tiddable animals. Farmers and gardeners need to settle down close to their crops, and supply problems have to be solved by working harder or improving techniques. These factors have caused the agricultural way of life to diverge greatly from that of the hunter/gatherer, to the extent that when English colonists arrived in Australia in 1788 they were incapable of recognising Aboriginal land management activities for what they were - a system of conserving and enhancing natural resources within their environmental settings.

Fundamental to Aboriginal economy was a very comprehensive and detailed knowledge of the Australian environment and of the techniques for extracting sustenance from it. Edibility was broadly defined. All except the smallest mammals, reptiles and birds were regularly eaten, and even very small animals were eaten by children when they could catch them. Many creatures that modern Australians would balk at - flying foxes, possums, snakes, lizards, mangrove worms and witchetty grubs - contributed protein to the Aboriginal diet.

Hunting depended more upon familiarity with the prey's habits and habitat than on technology, which was generally simple. Nomads have to carry their equipment with them, which encourages restraint in the accumulation of material possessions. The Aborigines travelled with a few basic tools and weapons in their hands, and a wealth of knowledge in their heads.

They were particularly expert in applied botany. As well as recognising plant products like fruit and nuts that can be picked and eaten, they also knew how to process less obvious plant resources like grass seeds and tubers. They could even transform certain plants that are positively dangerous in their natural state. For example, a rich starchy "bread" was made from cycad kernels. These are grown on *macrozamia* palms and are, in their untreated state, extremely poisonous. But the Aborigines used a variety of complex processes that removed the toxins from the kernels, leaving a very nutritious food that contains 1,300 calories per kilogram, of which 43 percent is carbohydrate and 5 percent protein.

In fact, when the diet of Aborigines still living on "bush tucker" has been analysed by nutritionists, it has proved to be very adequate in terms of calories and essential minerals and vitamins. Aborigines ate better than most peasant agriculturalists. If anything, their diet was somewhat low in fat and carbohydrates. Aboriginal physiology had probably adjusted to this

during their long occupation of the Australian continent, because some of their present health problems seem to relate to the massive carbohydrate intake of "flour, tea and sugar" that circumstances thrust upon them.

They occupied, or at least visited, all the environmental zones of the continent, including some that are now perceived by most modern Australians as intrinsically perilous. The most arid deserts of Central Australia, where modern travellers regularly "do a perish" were the beloved tribal homelands of the Pintubi and Pitjantjara, who knew the location and capacity of every source of water, both permanent and ephemeral.

The highest peaks of the Australian Alps were visited in summer by tribesmen from the surrounding country. They came to gather an unusual harvest - aestivating swarms of Bogong moths that cluster in caves and crevices where they were easily gathered in quantity. Grilling on a hot stone reduces their bodies to the fat-rich abdomen, a valuable source of energy. The ancestors of the Aborigines even occupied the freezing cold highlands of Tasmania during the peak of the last Ice Age, where they hunted wallabies within sight of the glaciers. These successful adaptations to extremes of climate show the versatility of the Aboriginal relationship with the land, and how their economic system was based on an intimate knowledge of the country rather than upon technology.

This evidence contradicts traditional ideas about hunter/gatherers being 'children of nature', whose behaviour is rigidly determined by the vagaries of environmental conditions. It is now known that many "marginal" lands were first occupied at a time when the climate was becoming drier, and that various groups showed a population increase at times of declining resource abundance. The development of complex social organisations, including widespread marriage alliance networks, elaborate trading relationships, and intensification of resource exploitation, were the principal mechanisms which supported these anomalous behaviour patterns.

An important aspect of this system was religion. Aboriginal theology gave the land a central place in the spiritual dimension. The landscape was permanently animated by the creative forces that formed it, along with all living creatures, during the Dreamtime. All the laws of human behaviour were established during the Dreamtime, and many of them regulated the relationships between human beings and the environment. The Aborigines held themselves responsible for maintaining, by means of songs and ceremonies, the creative forces that sustained the natural world. All human groups were spiritually associated with the land they inhabited, so strongly that it has recently been said that the land owns the people instead of the other way around.

Food taboos expressed social status but were also a way of relieving pressure on vulnerable animal populations. The totemic system set up spiritual affiliations between people and animal species and created an interlocking network within the human community, because each totem group, although prohibited from eating its totem species, was responsible for performing ceremonies that enabled it to propagate and increase so that other people could eat it.

In Central Australia, despite the scarcity of reliable water sources, some of them were designated as places of peculiar sanctity where no animals could be killed. In times of drought these sacred sites functioned as refuges for animal species that might otherwise have suffered critical pressure - an easy example of protected area management.

This spiritual concern for land and environment distinguishes Aboriginal religion from most other belief systems that focus on man's relationship with God or other men or the inner self. Adam was told to subdue the earth and was given dominion over the beasts. The world's eco-systems might be in a better shape if he had been given responsibility for them.

As well as these abstract attributes of knowledge, versatility and responsibility, Aboriginal land management had one active, manipulative feature - fire. Throughout the continent Aboriginal groups subjected their homelands to regular and extensive burning. These fires produced short and long term benefits - open and snake-free country for travelling, game animals flushed by the flames or roasted in their burrows and afterwards the green shoots that attracted more game. In a variety of habitats regular burning adjusted the vegetation in ways that suited its Aboriginal managers. The ephemeral plants that flourish after fires include many edible species, and root vegetables are more palatable in the form of fresh shoots. The food yield of *Macrosamia* groves was increased by a burning regime.

Burning strategies were not haphazard, but took account of season, the immediate weather and the special requirements of different vegetation types. For example, the Anbara people of Arnhem Land start the dry season by burning fire-breaks around jungle thickets containing fire-sensitive edible plants. In south-eastern Australia regular light burning by the Aborigines produced vast tracts of open woodland that reminded the English settlers of their parklands at home - that is, they consisted of trees and grass through which one could ride a horse. When the Aborigines were driven off their land and their regular burning regime lapsed, the woodlands were re-invaded by permanent understorey species that vastly increase the fuel content of these forests and make bushfires harder to control.

In recent decades bushfire authorities have re-introduced the concept of controlled winter burning of selected areas to reduce summer wildfire intensity.

40,000 years of Aboriginal land management came to an end with the invasion that began in 1788. When English colonies were established in India, Africa and New Zealand the native inhabitants were at least perceived and treated as landowners and managers. This was partly because they were agriculturalists with visible crops or gardens and permanent settlements. The fact that they had visible military forces also affected their colonial destinies, which even in defeat were considerably better than that of the Australian Aborigines who were not acknowledged as landowners.

In the eyes of many early colonists the Aborigines were viewed as a nuisance to be removed by the most convenient methods as the colony expanded outwards from Sydney. Many died of introduced illnesses, some were massacred, and the survivors were denied access to all but tiny scraps of their tribal territories. In these circumstances the ancient skills of land management became irrelevant and were almost forgotten along with many other aspects of the traditional culture. Almost, but not quite.

It is not within the scope of this paper to trace the history of the Aboriginal people of New South Wales from the time when they lost custody of their land to the present when they are just beginning to be once more involved in land management. The National Parks and Wildlife Service of

New South Wales is pleased to be able to play a small part in the latter process, with which the rest of this paper is concerned.

Since 1969 the Service has administered legislation that protects Aboriginal sites in New South Wales. Most sites consist of the tangible remains of Aboriginal land management. Occupation sites are identified by the presence of stone artifacts and food remains such as bones and shells, sometimes incorporated into deposits that have accumulated as a result of long-term use of the same place. Resource extraction sites include stone and ochre quarries and trees scarred by the removal of bark for canoes and containers. Ceremonial sites are delineated by stone arrangements or the earthen rings associated with initiation rites. Rock surfaces were decorated with paintings and engravings whose meaning and purpose are now unknown.

All these relics are of particular significance to archaeologists, who study them in order to infer the events and patterns of Australian prehistory. Archaeologists initiated the protective legislation and at first the Service employed only archaeologists to carry it out. No one thought then of consulting Aboriginal people - a politically impotent minority at the very bottom of the social order, who in any case were presumed (on the advice of anthropologists) to be completely detached from their traditional culture.

This perception was proved wrong when the Service undertook, in 1973, a survey of sites of cultural significance to Aboriginal people in New South Wales. These turned out to include, as well as places with recent historical associations such as missions, reserves and burial grounds, a large number of sacred sites whose identity and continuing importance derive from the old Aboriginal religion. These are mythological sites that are believed to embody the creative events of the Dreamtime and to retain their power to affect the natural order.

One example is a headland on the north coast that Aborigines believe to be the transformed body of a gigantic Dreamtime goanna. This goanna made the adjacent river by chasing a snake through the landscape. The snake fled out to sea and the goanna "sat down" to guard the coast. This highly significant site is 3 kilometres long and incorporates a cave where ceremonies to propagate rain were performed by "clever men" who had been initiated into the highest levels of Aboriginal religious knowledge. A beach which forms part of the goanna's tail is the site of an extensive deposit of beach pebbles from which stone tools were made, often on the spot to judge from the huge quantities of waste material from flaking activity. Goanna Headland displays the variety of material evidence and spiritual significance that is typical of important Aboriginal sacred sites.

The survey of sites of significance demonstrated that the Aboriginal people of New South Wales had, in the face of many hostile forces, preserved at least part of their old and multifarious association with their tribal landscapes. Many of the details had slipped away but the bond remained. It is one of the foundations of a contemporary Aboriginal movement called "cultural revival" which seeks to consolidate the remnants of local traditional knowledge and combine this with elements of Aboriginal people in New South Wales.

From the middle of the seventies the National Parks and Wildlife Service responded in various ways to the growing Aboriginal political movement that focussed on land rights and sacred sites. An amendment to the

relevant Act provided for the identification and protection of Aboriginal Places that are or were of special significance to Aborigines, that is, sacred sites. Interaction between the Service and Aboriginal communities increased with the appointment of eight Aboriginal site officers and five Aboriginal rangers. A statutory committee which advises the Director of the Service and the appropriate Minister about Aboriginal sites and relics was reconstituted so that Aborigines instead of archaeologists formed its majority. Service policy has evolved to the point where local Aboriginal communities are regularly consulted about the following matters:-

- * the recording of sites of significance and their gazettal as Aboriginal Places;
- * archaeological research including excavations;
- * pre-historic Aboriginal burials that are accidentally disturbed or otherwise exposed;
- * sites that are threatened by development or natural deterioration;
- * sites that the Service wishes to open to the public.

The last item arises because the Service manages a great many Aboriginal sites within protected areas under its control. Some reserves are gazetted primarily because of the cultural value of the Aboriginal sites they contain.

One such is Mootwingee Historic Site in western New South Wales. Dedicated in 1967, it consists of 486 hectares of sandstone escarpment and gorge. Semi-permanent waterholes and underground catchments provide the habitat for a greater variety of animal and plant life than exists on the surrounding waterless plains. Its oasis nature seems to have attracted the Aborigines, because the historic site contains plentiful and unusually spectacular evidence of their occupation. The pale walls of numerous rock shelters have been decorated with paintings and stencils, and smooth sandstone surfaces near the rock-holes have been engraved with many and varied motifs. This art, combined with the natural beauty of the site explains its current popularity as a visitor destination. This was well-established with detrimental effects, before the site came under Service control. The main rock engraving site in particular suffered from a combination of unstable geology and the impact of unsupervised visitors.

The Service installed fencing, a reservoir, roads, camping and picnic facilities, a ranger's residence, an air-cooled visitor centre and enough re-planted natural vegetation to screen these developments. These amenities were in general of high standard, well designed, with minimal impact on the environment and were, in the seventies, considered to be a model for appropriate conservation of such sites.

Attracted by the excellent facilities, 20,000 visitors per year came to admire the model site, which crumbled visibly under their admiration. In retrospect these developments did not solve the basic problems of visitor over-use of a comparatively small area in a fragile, arid-zone environment. The Aboriginal sites suffered some vandalism but were in greater danger of being eroded out of existence by the pitter-patter of visitors' feet.

While these problems matured, so did the Aboriginal land rights movement in New South Wales, and in August, 1983 it came to Mootwingee. The

newly-formed Western Aboriginal Land Council set up a blockade on the road into the Historic Site under a banner reading 'Mootwingee - Closed by the Owners'. Aboriginal protesters camped outside the site for three days and turned away visitors. They demanded closure of the Historic Site, participation in the writing of a new plan of management and ownership, with the implication that they would lease the site back to the Service to manage under revised guidelines.

After several months of negotiation, and in the face of considerable hostility from the local white community, the site was closed pending the preparation of a new plan of management in which the Western Aboriginal Land Council is currently involved on an equal footing with other consultants in the fields of biology, archaeology and history. As a first step the Land Council helped to select alternative sites in an adjacent National Park that could be opened to visitors, for whom they provided Aboriginal guides. They have written the brief for the section of the plan that deals with the Aboriginal significance of Mootwingee. The brief includes identification of sites of significance and requirements for their management, the continuing involvement of the Aboriginal community in planning, the employment of Aboriginal staff at the site and proposals for hunting and gathering of food and medicinal plants.

Resolution has not been reached concerning ownership of the site. It is not possible for the site to be returned to Aboriginal ownership without an Act of Parliament, which is not favoured by the Government at this stage. The Aborigines have also demanded recognition of their traditional rights to hunt and gather which are currently prohibited activities in all Service-managed lands and this is also an unresolved issue.

Nevertheless, Mootwingee is a microcosm of the process by which the Aboriginal people of New South Wales are once more becoming involved in the management of protected areas. It is evident that the National Parks and Wildlife Service through its legislation possesses that which Aborigines desire, namely, control of Aboriginal sites and the land surrounding them. Pending review by Government of policy on this subject the Service has taken steps to include effective and comprehensive consultation with Aboriginal people in its planning for sites and to involve them as much as possible in the active process of site and land management.

CASE STUDY: TRADITIONAL RIGHTS AND PROTECTED AREAS - THE NEW ZEALAND EXPERIENCE

Department of Lands and Survey,
Wellington,
NEW ZEALAND

How has the protected areas system catered for the traditional rights and uses in New Zealand?

Are present policies of means flexible, sensitive and adaptable enough bearing in mind the renaissance in Maori values and culture?

INTRODUCTION

This case study examines the differing perceptions to land held by the Maori people of New Zealand, looks at examples where traditional rights have been protected and draws conclusions on whether there is sufficient flexibility and sensitivity to handle these matters.

BACKGROUND

Before European settlement, all land in New Zealand was held by the various iwi (tribes) and hapu (groups) of the Maori people in accordance with various traditional customs and usages. While there was an individual right of occupation there was only a communal right of alienation. The traditional Maori, apart from spiritual and communal ties with land, also used it to gather plants, trees, animals for food, clothing, building and to make objects used in the meeting and greeting of guests to the tribe - an important facet of Maori life.

The Maori people today maintain and enhance traditional practices and this has led to special means being employed to recognise this interest in land while at the same time protecting areas in the wider public interest under the various protective mechanisms available in New Zealand viz; the Reserves Act, the National Parks Act and the Queen Elizabeth the Second National Trust Act.

The major proportion of customary or communally held land has been converted to other forms of tenure but there are significant areas (in both size and diversity of natural resources) still held in Maori ownership.

MAORI PERCEPTION OF LAND

The Maori view of land is tied around concepts of "mana" (status) which is the life force of the Maori people. Land is not automatically imbued with mana but rather is an extension of the people owning it. The Maori view of land is that it has a significance that reaches beyond the physical benefits that may be derived from it. It has spiritual, mythical and historical significance. A significant attribute of the Maori attitude to land is that land is held as a life interest and is to be passed onto future generations. The New Zealand Maori Council in a publication "Kaupapa: Te Wahanga Tuatahi" has commented "our land interest is an inheritance from the past entrusted to the future in which we have no more certain rights to enjoy the fruits of the land in our own life times and a duty to convey those rights to succeeding generations". A Maori proverb "Ko te whenua te waiu o te tangata" catches the essence of that attitude,

i.e. "land is the very sustenance of man". The reverence of, and links to land, are emphasised by the fact that the word "whenua" means both "land" and "afterbirth" which is traditionally buried in the earth.

This intense attachment to the land has survived into modern times and the late Sir Apirana Ngata (1874-1950), Maori leader, statesman and scholar, has described Maori people without land as "refugees wandering the surface of the land".

Hand in hand with a communal ownership of land go certain obligations and rights. Some of these rights are tied around the idea of "tapu" (not to be touched or entered onto) which is used to preserve areas of special significance, whether in long term or short term, or to protect the Maori resource gatherers from aspects which may upset their traditional food gathering customs. For instance, where a drowning took place the area round was declared tapu and this meant that no food could be gathered from this place.

Land is important also as an income producing, community sustaining resource and there is often a conflict between the desire to use land and its existing resources to promote Maori life and culture, and the destruction of some of the resources in order that land might be developed for farming or forestry to achieve economic independence.

MAORI RENAISSANCE

There has been a renaissance in Maori values.

Government Initiatives

The economic and spiritual revival in Maori values is a major aim of government fostered through the Department of Maori Affairs. Activities which have received government support and guidance include the promotion of language, the arts, kokiri centres (set up to enable elders to teach Maori youth their cultural and spiritual heritage), marae subsidies (to renew and renovate buildings on marae) and a whole range of other activities designed to strengthen Maoridom under the Tu Tanga ("stand tall") policy.

Tribal Initiatives

Government support has provided the impetus and given confidence to groups within the Maori community such as tribal authorities, trusts and incorporations to take a direct role in the enhancement of their cultural heritage.

Much of this growth can be attributed to the use made of job creation schemes administered to help the unemployed gain skills. A very positive benefit from Maori unemployment is that it has provided an opportunity for Maori youth to undertake activities which would not normally be regarded as 'economic'. Many work skills schemes allocate significant periods of time to the acquisition of Maori culture. A number of the schemes themselves have been devoted to a particular Maori project often involving traditional sites or areas. Tribal authorities have also fostered a wide range of tribal "Wananga" or tribal schools, hui and so on which have focussed on the traditional Maori relationship with land. Land which is protected under national parks and reserves systems is of very great interest to tribal communities because their history, their names etc., are contained within the land heritage and therefore there is a continuing

relationship with that land even though it may not be held in direct Maori ownership.

Uses of Crafts and the Role of Land and People

The desire for greater economic autonomy in the Maori community has led to an emphasis on the role of land for development and conservation, restoration and ongoing maintenance of marae and the preservation of traditional sites. The restoration of marae has meant the learning of traditional crafts such as ukutuku work (woven panels in meeting houses), carving of lintels for meeting houses, kete (flax kits/baskets) and skills needed to make special gifts for ceremonial occasions. This has created a demand for raw materials for arts such as pingao, kiekei, flax and totara (plant and trees species).

An important facet of the renaissance has been the involvement of Maori women - particularly in the uses of harakiekie for weaving. This upsurge of interest has given rise to their involvement in the promotion of policies and practices to ensure that raw materials are cultivated, located and protected. A plant inventory of these special (taonga) plants will probably confirm that these raw materials are often located in protected areas.

The achievement of economic autonomy through use of land, and the rebirth and continuing awareness of Maori culture are important and are linked. The desire for self reliance is 'spurred on' by the knowledge that public or government funding can often carry with it unacceptable conditions which if adhered to, can lead to the tawing, domestication or dilution of the culture itself.

The Impact of the Renaissance on Government and its Advisers

There have been endeavours to recognise, welcome and cater for this upsurge in interest. there has been government involvement in the 'taonga' plant inventory. The Department of Lands and Survey has initiated a continuing programme for staff at a local Polytechnic school of languages involving language and culture and this has helped to raise the understanding and sensitivity of staff.

INTERVENTION

It can be seen there are therefore many important strands running through the Maori perception of land. There is the importance of maintaining close spiritual and physical links with the land itself - ownership giving a sense of identity ... giving mana. Also important is the protection or conservation of this land and the flora and fauna it supports so that it can provide a sustainable resource of food, clothing, building and taonga (treasures) for Maori purposes. As well as this is the development of land and resource utilisation to provide direct income and to provide funding for the renaissance.

A paper prepared for the South Pacific Commission as a contribution to the South Pacific Regional Environment programme by Lucas, Gorio and Poai (1981) recognised that the South Pacific conservation tradition involving tapu was long established before the western concept of setting aside areas for conservation of nature. The conservation effect of tapu goes hand in hand with dependence of societies, including the ancient Maori society, on natural resources to provide a sustained yield from those resources. The paper identified the need to look at this customary

ownership not as a barrier to conservation but as a benefit. The desire of owners to retain their land and involvement in its management is only a problem if outright purchase or lease of the land is demanded in order to bring it under a formal protected area system.

Similarly traditional rights based on tapu and conservation through sustainable use are problems only if a strict preservationist attitude is adopted to plants and animals in a formal protected area system.

These two attitudes exist in New Zealand and the case study will give some examples by which the differing views have been accommodated and give an idea of the range of options which have been agreed to by the Maori owners and the Crown.

The issues are discussed first in relation to means achieving legal protection while respecting ownership rights, and secondly in relation to access to traditional plants etc. in Crown owned protected areas.

MANAGEMENT AND PROTECTION MECHANISMS FOR PRIVATELY-OWNED LAND

Various mechanisms are used in New Zealand to provide legal protection for Maori land along with other privately-owned land.

Legislation and Policy

National Parks Act 1980

The National Parks Act recognises that Maori cultural, historical and spiritual perspectives are significant. In two instances, Tongariro and Egmont National Parks, specific provision for Maori representation on the appropriate National Parks and Reserves Board has been made. This representation has been effective. Maori involvement has been important as the protected area system contains large elements of Maori cultural relationships with land in terms of place names, sacred areas and as well the major symbolic and spiritual identification with other elements in national parks.

There is support in Government for Maori representation as of right on all other National Parks and Reserves Boards to provide the same dimension.

The Act also contains authority to lease land for national park purposes.

The Reserves Act 1977

This contains provisions for protected private land agreements, conservation covenants, control and management of land that is not a reserve, leasing of land, and cross lease. This Act also provides administrative mechanisms for Maori reservations under the Maori Affairs Act 1953. Details of the various types are set out in the Appendix.

Queen Elizabeth the Second National Trust Act 1977

The Queen Elizabeth the Second National Trust was established to commemorate the Silver Jubilee of Her Majesty the Queen. The Trust has a responsibility to enhance, preserve and protect open space in New Zealand and to ensure that open space is provided for the benefit and enjoyment of new Zealanders. It does this through the negotiation of open space covenants.

Maori Affairs Act 1953 - Reservations

This Act provides for the creation of Maori reserves over Maori land for a variety of purposes including places of historical or scenic interest. Such reservations can be held for the common use or benefit of the Maori owners or for the common use and benefit of all New Zealanders.

The Reserves Act 1977 extends its provisions to Maori reservations in two ways. Firstly, they can be administered for any of the purposes of the Act subject to such terms and conditions as to the use of land as the Maori owners and the Minister approves. In such cases the offence provisions of the Reserves Act apply while retaining the rights of the owners to do any act or thing forbidden by the Reserves Act. Secondly, where a Maori reservation is held for the common use and benefit of the people of New Zealand, the Crown can meet in whole or part of the rates (land tax) levied on the land.

SPECIFIC EXAMPLES:

Some examples of the varying types of agreements reached are given. There are a wide range of situations which policy has adapted itself to encounter. There are many other current issues where agreement has not yet been able to be reached but where there is goodwill and a resolve to negotiate by both Maori owners and government departments.

LEGAL PROTECTION AND OWNERSHIP RIGHTS

The Gifting of Land for Tongariro National Park

A Ngati Tuwharetoa proverb states:

"Ko Tongariro te maunga
Ko Taupo te moana
Ko Te Heuheu te tangata"

"Tongariro is the ancestral mountain
Taupo their own lake and
Te Heuheu the paramount chief of Ngati Tuwharetoa"

In 1887 the paramount chief, (Te Heuheu Tukino IV) on behalf of Ngati Tuwharetoa and associated tribes, gave the central area of the Tongariro National Park to the nation to be preserved in its natural state forever. This was the origin of New Zealand's first national park. An indication of the depth of the gift is given by the proverb and recognition that the mountain itself is a temporary resting place for the spirits of the ancestors who then travel on their way to Hawaiki.

This is an example where the ownership has changed but the tribe still maintains a direct link through legislation which ensures that a lineal descendant of Te Heu Heu Tukino is a member of the National Parks and Reserves Board covering the present extent of Tongariro National Park.

The Leasing of the Bed of Lake Waikaremoana (Sea of Rippling Waters)

The lake bed comprises 5,210 ha and is the focal point of the Urewera National Park. The lake is one of the most beautiful in New Zealand. The Crown had been anxious to ensure preservation of the natural beauty of the lake and that any recreational use and development associated with the lake was integrated with, and in keeping with, the surrounding national park land and park principles.

Because of their traditional links with the area, the Maori owners were not prepared to sell. They (the Tuhoe and Ngati Kahungungu people) did, however, agree to lease the lake to the Crown for 50 years from 1 July 1967, renewable for similar terms. The rent is reviewable every ten years and is based on 5.5% of a special government valuation for the lake bed. The rental is presently \$23,650 p.a. based on a rental value of \$430,000.

This is an example of broad society goals being achieved while the Maori owners have retained ownership and a management role through membership on the parks and reserve board responsible for the national park as well as the leased area. In addition, the rent paid for the lake can be channelled into the work of the two tribal trust boards.

Makatiti Dome

In 1977 the Department of Lands and Survey was alerted to the imminent clear felling of part of a Maori owned area called the Makatiti Dome. The dome is a volcanic area covered with fine indigenous forest. Initial attempts were made to arrange an exchange of land between the Crown and the owners but this was not acceptable to the owners who did not wish to lose ownership. The matter was complicated because a timber company had negotiated a lease of the total dome with the Maori owners.

However, after negotiation between the Crown, the owners and the timber company agreement was reached on an exchange of leases. The Crown has leased for reserve purposes an area of 2,470 ha of Maori land until 31 October 2070 at a peppercorn rent. In exchange, the Crown has leased an area of Crown land to the Maori owners who have in turn sub-leased it to the timber company which is developing a commercial forest on behalf of the Maori owners. A special feature is the setting up of an advisory committee consisting of representatives of the Crown and the Maori owners to guide on management issues on the land leased by the Crown for protection.

Access to Traditional Products on Crown-owned Protected Areas

It will be noted that the mechanisms used to achieve legal protection of specific areas range from gifting to leasing to exchange of leases. These reflect the wish of the Maori people to retain ownership of the land.

There are, however, ways in which, on a smaller scale, traditional rights can be preserved. These traditional rights include the gathering of shellfish, of toara, flax and material for tukutuku weaving as well as in some cases the use of traditional forms of food and historic forms of transport. The National Parks and Reserves Authority has a policy that "traditional uses of indigenous plants or animals by the Maori people for food or cultural purposes will be provided for in the management plan where such plants and animals are not protected under other legislation and demands are not excessive."

There have been examples of historic practices being preserved in the Urewera National Park where horses are allowed to be used. This recognises the fact that in many of the remote Maori settlements in the Urewera area the horse is the major form of transport. Within Urewera National Park, there are enclaves of Maori land and in some cases access to these areas is required across national park land. The Maori people therefore are still able to use their horses even though horse use is prohibited in national parks generally. In fact, one Tuhoe group Te Rehuwai Safaris, operates a guided tourist operation using both park and Maori land and is able to use pack horses in support of tourists undertaking the walk.

As far as the traditional uses of indigenous plants or food are concerned, the Maori people are able to gather the succulent fronds of the pikopiko, a form of fern in the park which is used as a delicacy (it tastes very like asparagus).

Traditional Maori uses of scenic reserves are recognised in their management. Under the Reserves Act Maoris may be authorised to take or kill birds within any scenic reserve which immediately before reservation was Maori land. Indigenous species may not be taken commercially unless this was a condition of establishment of the reserve.

Ancestral Maori burial grounds within scenic reserves may continue to be used for interment of Maoris.

In the lease of the Makatiti dome there is a right preserved to the Maori owners to take out fallen totara for carving and other uses, to hunt and fish and to look after burial areas.

Another form of recognition of traditional rights is the non-interpretation of Maori features. For instance, the sacred nature of burial leads to an understandable reluctance to allow interpretation of sensitive features even though this may be of interest to the general public. An example of this has occurred in the Fiordland National Park where some archaeological finds which would be of great interest are not being publicised at all for reasons of preservation and in deference to Maori feelings.

Another example occurred when there was a proposal to lift an old Maori canoe from the bed of Lake Waikaremoana. This project was strongly resisted by the Maori people. The same project involved the lifting of an old military cutter. This too initially was resisted by the Maori people who felt that these were relics of a less happy time and should be allowed to remain without disturbance.

On the other hand, scope is seen through interpretation of Maori place names, for example, to communicate positively Maori attitudes to land and places. This is of significance not only in "educating" the general public but also in enhancing Maoritanga among the Maori people themselves.

RESULTS

The same strengths or problems identified by Gorio, Poai and Lucas, (1981) have been found in New Zealand. There has been recognition that land is a special feature of Maori life and of the desire to maintain Maori ownership of land. There has been acceptance that it is not necessary for the land to be in Crown ownership to ensure its legal protection as evidenced from the cases quoted.

The continuation of traditional uses of land and of the resources it produces is not less important and policies now cater for these in national parks and other protected areas.

CONCLUSION

Notwithstanding the success of the approaches mentioned, there may be a need to develop more innovative strategies to recognise the traditional love the Maori people have for their land. There is also a need for this love to be interpreted to a wider audience so that there is an awareness of the meaning of the land to the Maori and the reliance of Maori people on conservation. This should lead to greater understanding between New

Zealanders of different cultural backgrounds and, in turn, could mean less resistance to the traditional Maori rights to flax, totara and other plants and animals which under strict conservation approach would be totally protected.

Finally, there is a story from the Tuhoe tribe, which illustrates the Maori love of nature, the need to protect and cherish it and provides an insight into effective Maori ways of achieving this protection.

The story was told after the presentation of greenstone earrings to the wife of the then Minister of Maori Affairs. The earrings were named after two pools, Otara and Rongo-te-mauriuri on the top of the mountain Maungapohatu, an enclave of Maori land in the Urewera National Park. These two pools are forever guarded by two kaitiaki or protectors of some renown.

Otara is the place of abode of a huge subterranean monster of the species 'tuoro', the same which formed the valley of the Wai-kare Stream some time ago.

Rongto-te-mauriuri takes its name after one of the supernatural offspring of Taneatua and is the dwelling place of a taniwha or water monster. The story is told that at one time there lived one of the Tuhoe ancestors, Rongo-tauaha by name, who one day and with certain conceit ascended the mountain. On reaching the summit he nonchalantly approached this pond but such offensive behaviour exceeded the patience of the elements. The peculiar red waters of the pond agitated violently and then a large and fearsome creature appeared on the surface. In order to save himself from an early and ignominious end and, with more resourcefulness than St George, Rongo quickly plucked a hair from his head, cast it into the waters and recited a charm upon which the demon disappeared and the waters became calm. Discretion being the better part of valour, Rongo then went down the mountain in earnest haste and by the village fires at night he tells for posterity how he had such a very close call with the awesome supernatural powers of the enchanted mountain. It is best not to doubt this story because those two pools are still there.

The teller of the story, himself a Tuhoe member and employee of the department, commented "the story of course was more effective than rangers or by-laws", in ensuring the continued protection of the area.

APPENDIX

(a) Reserves Act 1977

(i) Protected Private Land

This form of protection is for private land that has such qualities of natural, scientific, scenic or other importance that it would qualify for reserve status if it were in public ownership. A voluntary agreement between the land owner and Crown will give the land the full protection accorded a reserve. The agreement may cover all or part of the land and may be in perpetuity or for an agreed term and is binding on successors in title. Surveying and protection costs will normally be met by the Crown, which may also contribute towards the payment of rates.

(ii) Conservation Covenants

These may be used to protect any natural landscape, riverbank, lake or seashore or natural feature of particular interest. A land owner can enter into a covenant with the Crown, a local body or any other body approved by the Minister of Lands. A covenant is registered against the title to the land and is binding on the owner or subsequent owner for an agreed period or in perpetuity. The owner can stipulate conditions for its use or public access. Survey and initial fencing costs may be met by the Crown, which as well may contribute towards the payment of rates.

(iii) Control and Management of Land that is not a Reserve

Where a land owner does not have the resources to manage any part of his land that needs protection, the Crown or a local body which administers an existing reserve may assume responsibility. The offence provisions of the Reserves Act 1977 then apply and maintenance, operations, improvements and upkeep become the responsibility of the Crown or local body as the case may be. The owner may terminate the arrangement at any time. In most cases the arrangements would place little or no restriction on the existing use of the land by the land owner.

(iv) Leasing

This is an option which has been in successive legislation dealing with reserves. The terms and conditions relating to leases are negotiated by the Crown with the land owners. Rent is payable usually based on a percentage of the current land value with regular review of rent. During the term of the lease it is subject to the provisions of the Reserves Act.

(v) Cross Leasing

The same leasing arrangement as in (iv) above except that the Crown agrees to lease an area of Crown land in exchange for the lease required for reserve purposes. The rent for both leases is normally at current rates.

(b) Queen Elizabeth the Second National Trust

Open Space Covenants

The Trust works with land owners, through the negotiation of open space covenants to protect areas of scenic, scientific and recreational value. To date thousands of hectares of privately-owned forest, swamp, estuaries, historic sites and landscapes are protected by open space covenants.

The terms and conditions of open space covenants are negotiated between the parties and can be for a specified term or in perpetuity and are registered against the land title. Rental is not payable nor as a matter of policy does the Trust make a contribution towards rates. It meets legal costs with the Department of Lands and Survey arranging and meeting survey costs.

CASE STUDY: RESOLVING CONFLICTS BETWEEN TRADITIONAL PRACTICES AND PARK
MANAGEMENT

Iosefatu Reti
Department of Agriculture, Forests and Fisheries,
Apia,
WESTERN SAMOA

INTRODUCTION

Like several other forms of land use, national parks and reserves are the subject of conflicting views and traditional practices. The extent of these conflicts may vary from country to country depending on the nature of their land tenure systems, the effectiveness of legislation designed to regulate, manage and control such conflicts and finally the degree of public acceptance accorded the concept through national, educational and promotional activities. But why must there be conflict and what (if anything) can be done to resolve them?

This paper sets out to discuss some common conflicts between national parks management and traditional practices and suggests several ways these might be resolved.

While it is necessary to scrutinise and carefully select approaches aimed at resolving conflicts, depending on their effectiveness and applicability to the facts surrounding the problems, the approach suggested in this paper involves a close analysis of the concept of national parks and how it affects traditional practices. After all, this relatively new concept in the Pacific region, when applied strictly, could require changes to traditional practices and ways of life established over countless decades.

The need for a truly "South Pacific" national parks concept to be implemented over a period of time, and to be effectively supported by education and interpretive programmes, is discussed. It is suggested the concept could be modified to suit changes in life style and practices between the sub-regions of the Pacific (i.e. Polynesian, Melanesian and Micronesians). The inclusion of some other types of land uses within protected areas is also discussed.

The paper also attempts to relay the message that perhaps it is high time to consider how the concept of national parks could be adapted to accommodate traditional life styles rather than vice versa. The paper is restricted to traditional practices however, it does pose a question that perhaps the biggest threat to national parks management might not be from traditional farming practices but rather the modern technologies and development strategies.

The national parks concept, which emerged just over a century ago, has spread widely around the world but perhaps at a much slower pace in the South Pacific region. Naturally, such an international concept cannot be met in full by all countries and authorities involved in conservation promotion and some other means of implementing it have therefore been developed.

Many have pointed out that perhaps the concept was the product of western governments and was designed to meet the needs of those countries and societies. Be that as it may, it is desirable that individual countries be given the flexibility to be able to decide for themselves a design through

which their natural and cultural heritages can be best protected for the benefit and enjoyment of their people.

This paper attempts to identify major problems in the implementation of the national parks concept with particular reference to the small island countries of the Pacific region. Some means of resolving these problems are also recommended:

SOME PROBLEMS WITH THE NATIONAL PARK CONCEPT

The Concept

A national parks definition was adopted by the General Assembly of IUCN in New Delhi in 1969:

"A national park is a relatively large area,

1. where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contains a natural landscape of great beauty and,
2. where the highest competent authority of the country has taken steps to prevent, or to eliminate as soon as possible, exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment and,
3. where visitors are allowed to enter under special conditions, for inspirational, educative, cultural and recreative purposes"...

Obviously, the definition is an attempt to arrive at a universal standard for the setting up of national parks world-wide. At times, it seems very important to achieve uniformity in the use of the term "national parks" and its application to any areas not meeting the rigid requirements of the definition is discouraged. However, it can be argued that the rigidity of the very high standards which are implicit in the concept could be counter-productive and serve to discourage efforts in setting aside other areas which might have important features worth protecting.

A very good example can be found in our Pacific Island communities where it might be impossible to reconcile our customary land ownership system and our need for continued use of land in traditional ways with the definitional requirements. Similarly, the "relatively large area" criterion will immediately require justification based on values which unfortunately are seen in the terms of dollars and cents. These same requirements might therefore prevent countries which are anxious to implement nature conservation programmes from doing so either because:

1. they could not justify, in financial terms the setting aside large areas for national parks, or;
2. the areas are not large enough.

Management Authority over Parks

National parks are a relatively new concept and are therefore little understood especially in the South Pacific countries. Where the concept has been introduced, several conflicts with the traditional use of land have been encountered.

Perhaps the most important of these is in the nature of land ownership. In Western Samoa and many other countries of the Pacific, most of the land area is held under customary ownership with the chiefs (matai) having the sole right and authority for control and use of the land. Thus the preservation of these areas for national parks or for any other use without prior agreement by these people can be seen as imposition on their rights and authority and could result in unending conflicts and unpleasant differences which could eventually lead to violent and disruptive events.

The enforcement of conservation principles by the "highest competent authority" in the country on village land could cause friction with traditional rules and by-laws and continuing disputes could therefore be expected.

Many land tenure systems in the Pacific are complex and are imbedded in the very heart of their culture and traditions.

In some countries including Western Samoa, the land grabs associated with early European settlement are still fresh in the minds of people thus making them very cautious and reluctant to support long-term government projects on their land. National parks, as a new concept requiring large land areas, will be immediately looked upon with suspicion especially if they are to be established upon village lands or land under dispute by villages.

Negotiations will take an enormous amount of time and patience which even then, might not be enough to secure the success of the project.

Forests have often been considered a constraint to farming, and forest produce a free commodity at the peoples disposal. Hence the protection of forest areas could be looked upon as a means of depriving the people of their traditional rights and access to these commodities.

It is suggested here that perhaps to a certain extent in the Pacific island countries, the involvement of the highest authority i.e. laws, statutes etc. may not be necessary to achieve protection of suitable areas and that were it is enforced, it could create more problems than it can solve. Alternatively, village authority could generate the interest and support that is desirable to ensure the success of national parks and reserves programmes.

Traditional Use of Land

Perhaps the most common "problem" of conservation programmes is attributed to the traditional use of land. Shifting cultivation by subsistence farmers has been identified as a continuing danger to protected areas and has been outlawed in such areas.

Admittedly, the peoples need for food deserves the highest consideration and wherever possible this priority use of land is encouraged. Hence in selecting areas for conservation purposes, this need should always be borne in mind.

In our small island nations in the South Pacific, conserving huge areas may appear to undermine the desire for agricultural development and the need to sacrifice one for the other without compromise appears to be unavoidable. Unfortunately for conservation, it is often the protection of land that is sacrificed in favour of development. Ironically enough, the restrictions implicit in the definition of national parks, which often prevent compromises being made, are in many cases the very reason people vote against conservation measures.

With limited farming capital, the village farmers will continue to rely on traditional methods of clearing forested land (shifting cultivation) for better soil and yields. Hence, a protected area often has to exist under the threat that at some stage it could lose some of its area to cultivation.

Where parts of national parks or protected areas have been cultivated and settled, the problem becomes an emotive and at times, political one and is much more difficult and sometimes dangerous to resolve. In some cases, small areas cleared by subsistence farmers inside protected areas are in our experience, a result of a lack of boundary survey marks. However, the farmers often peacefully withdraw after being made aware of the situation. The fact remains, however, that the damage has been done and the park managers may have to decide on whether or not the case calls for prosecution.

Perhaps the most difficult situation to resolve is one where permanent settlements and dwellings have been created on protected areas - this being not an uncommon problem in the South Pacific region.

Obviously, the apparent permanency of such developments mean that the situation is beyond an amicable resolution and more drastic measures may have to be enforced. Usually, this means prosecution under law which alienates the offender and his family from future co-operation with the park management. However, one often wonders whether the law could ever achieve the best solution to the problem: one which enables the encroacher to agree to settle elsewhere but equally importantly, assures the park managers of his co-operation in future. I feel strongly that it fails badly in meeting this requirement.

SUGGESTED SOLUTIONS TO THE PROBLEMS

Arriving at an amicable solution on land issues is by no means an easy undertaking especially in those Pacific island countries where the land tenure systems are complicated and involve several types of land ownership. A universal solution in such circumstances would be "wishful thinking" on the part of park authorities and unpleasant as it might be, there is often no alternative but to resolve each case individually based on the facts surrounding the respective problem.

The solutions suggested here are not therefore, an attempt to propose a universal approach to resolving identical problems common to park managers. The reader will note that the approach taken here is first and foremost, a self analysis of our role as managers.

Everyone belongs to one type of society or another. Park managers are firstly, members of a society before they become administrators of protected areas. Unfortunately, many unconsciously consider themselves park managers for eight hours of the day, five days of the week, and family men or members of society during their off-duty hours. (I have seen

an example where an employee in a protected area became an encroacher on the same area in his off-duty hours).

Our understanding of our own role as members of a society could go a long way in resolving some of the common problems of park management. For example, it would be much easier for us to solve disputes involving members of our own societies than it would be for a stranger who is not accepted by the society and who does not fully appreciate the needs and traditions of the society.

The Need for a Flexible Concept

A close analysis of the National Parks concept will reveal that the rigidity of the definition makes it difficult for managers and villagers alike to arrive at a satisfactory compromise in implementing the concept.

It is eminently desirable, however, that national parks are designed and implemented without imposing unnecessary restrictions on the rights and authority of the people over their land. More importantly, the support and co-operation of the people must be ensured in order to guarantee the success of conservation programmes on their land. Perhaps it might be desirable or even necessary, for villages to undertake conservation projects such as national parks as village projects with limited authority being assigned to government or conservation bodies. After all, with the villagers having complete authority over the land it is unlikely its protected status would be revoked without severe recriminations. Such an approach could decide the success or otherwise of protected area programmes.

Size of the Area

Although this may vary from country to country, an area of 1,000 hectares has been widely accepted as the minimum size of a national park. This immediately places our small island nations at a disadvantage in view of our limited land areas. It would therefore be in the interest of the small islands and the promotion of the national parks concept, if a more flexible size criterion was declared to allow for the protection of valuable resources under the national park status.

It is accepted that the reserves concept could take care of areas of less than 1,000 hectares and provide them with the protection required. However, it can be argued that the small size and the likely scattered nature of the reserved areas on Pacific islands could mean that successional ecosystem patterns and species distribution are interrupted. Hence it is suggested that wherever possible, individual countries should have the flexibility to decide for themselves, appropriate sizes for their protected lands, based on their available land areas, while being aware of the need for protected features to be as far as possible, representative of existing natural and cultural heritages.

Government Authority versus Village Management

The exercise of Government authority over village lands may create more problems that it can resolve, particularly if such authority requires the village people to desist from traditional practices and ways of life.

Where government authority is exercised over village land, the following requirements must at first be assured:

1. That funds are available to buy, rent/lease or compensate the people for the land.
2. That Government can count on village support for the establishment and protection of the parks.
3. That there is adequate guarantee that the area can be protected in perpetuity.

Whilst some countries may be better-off than others, it is generally believed that the Pacific island countries are faced with considerable difficulties in allocating funds for "non-developmental" projects. Similarly, village support for government projects imposed on village land can be at best be expected to be temporary, thus making the long-term security and success of such projects doubtful.

However, national parks and other conservation projects involve only comparatively modest capital outlay and can be undertaken by village people with technical and professional guidance provided by government.

Under this community involvement approach, the much needed village support can be counted upon as village rule can be called upon to enforce the conservation measures and ensure the village people abide by them. Furthermore, the villagers' suspicions that they may eventually lose their land to government can be eliminated and the long-term protection of the area is therefore assured.

Whatever incentives and benefits are offered, it is crucial that village support is assured, and, there may be no better way of getting this than encouraging a feeling of belonging and a sense of responsibility through involvement in the actual establishment of protected areas. Without this support, the capital and effort spent on establishing areas on village lands can be a waste of resources.

Accommodation of Traditional Practices in Protected Areas

Perhaps the most common and widespread threat to national parks and reserved areas is the encroachment of land clearing and other farming activities. On the other hand, the restrictive nature of protected areas is the major cause of refusals by farmers to support conservation projects.

Obviously, such a confrontation should not be allowed to continue and some degree of accommodation must therefore be sought because as long as the two land uses are at conflict, there will be no end to the problems facing national parks management.

We have to admit that the national parks concept is relatively new and little understood in our region and that it will take many years of education and promotional work before it is fully accepted and appreciated. In the meantime, the problem of encroachment is continuing if not increasing, as a result of growth in population. As long as the problem exists, and as long as we continue to outlaw traditional farming practices from protected areas, we have to be prepared to accept the fact that our protected areas will continue to diminish in size and may be totally lost over a period of time.

Until conservation education and promotional programmes are underway and their results evident in changing community attitudes, it is desirable

that serious consideration be given to methods of accommodating certain traditional practices within protected areas. This may call for comprehensive research into land capability and potential uses. It might also be feasible to set up a "core area" for perpetual protection. Other land areas could then be subjected to other forms of land uses based on their capability.

Naturally such an arrangement will require close supervision and strict adherence by farmers to restrictions on their activities within the protected area and their conformity to certain traditional practices. However, by reducing the number of people in the protected areas the problem will become easier to handle. Also the identification of the farmers working within the protected areas will tend to prevent other people from trespassing into the core zone.

Farming techniques, like other technologies, are undergoing rapid changes. Current practices will become outdated just as practices of the past are now being called "traditional" despite the fact that truly "traditional" methods may well have disappeared.

We may be fortunate that the advanced farming technology has not yet reached our rural societies because, when it does, the threat to our protected areas could be much more serious than at present.

In the likely event of future mechanisation of farming activities, and the potential danger to protected areas associated with it, the inclusion in a protected area of a variety of land uses using traditional practices could be appropriate to illustrate farming practices acceptable (compatible) with national parks principles. Hence, a consideration of the inclusion of some types of farming practices within protected areas may be necessary now in the interests of future national parks promotion and development.

THE NEED FOR LONG-TERM COMPREHENSIVE EDUCATION AND PROMOTIONAL PROGRAMMES

How do we go about getting the support of people for a concept that they hardly understand and which may require them to give up their hunting rights and access to commodities which have been available to them for ages?

This is probably the biggest question faced by park managers and administrators in our region.

Some countries may have practical and effective legislation which could ensure the support and co-operation of the people. Others might have opted for long and/or short-term training and educational programmes.

However, I believe that in our small island countries with limited land masses and relatively high rates of resource depletion, it may be necessary to look at establishing pilot national park areas for demonstration and for these to be backed by extensive educational programmes.

The availability of demonstration projects will make the teaching of protected area concepts much easier and will provide opportunities for demonstrating the effect of incompatible practices. However, undertaking educational and promotional programmes is also crucial if the interest of the people in conservation is to be encouraged and developed and if there is to be national acceptance of protected area concepts. Thus, the long-term success of the methods proposed here to resolve conflicting

practices can only be ensured by co-operation achieved through full understanding of the benefits of conservation work, and the likely effect on these benefits if incompatible practices are allowed protected areas. This understanding can be obtained through extensive education, interpretation and training programmes.

In our small island countries, the concept of national parks cannot be promoted through trial and error. We have to understand right from the beginning what we need and what we wish to achieve. It is in this context that the need for demonstration areas becomes of critical importance.

The protected area examples in Western Samoa appear to be assisting, albeit slowly, the realisation of this goal and it is expected that on-going educational programmes will eventually lead to full acceptance and adoption of the concept.

CONCLUSION

The "conflicts" between traditional practices and national parks management are perhaps not unique to the South Pacific island countries, although their smallness in size may have created other problems which are uncommon in other countries of the world. The challenge of reconciling conventional national parks values and attitudes towards protected area management, with the fundamental and legitimate interests of landowners, is perhaps the biggest issue now faced by park managers and administrators.

I believe a desirable goal, in fact, will be to identify and describe a form of national park which is truly "South Pacific" in its nature and I hope that this paper has subscribed to the development of such a concept.

CHAPTER 4: TRAINING & EDUCATION

TRAINING FOR CONSERVATION AREA MANAGEMENT
IN THE SOUTH PACIFIC REGION
Peter Eaton

RESOURCE MANAGEMENT AND CONSERVATION IN THE PACIFIC ISLANDS:
RELATED ACTIVITIES AND CAPABILITIES OF USP AS A
REGIONAL UNIVERSITY
Harley Manner

OPTIONS FOR TRAINING OF PROTECTED AREA MANAGERS IN
THE PACIFIC
James Thorsell

AN APPROACH TO TRAINING PARK MANAGERS
IN THE SOUTH PACIFIC REGION
Rex Mossman

TRAINING ABORIGINAL PARK MANAGERS IN AUSTRALIA
Peter Taylor

KEY ISSUE PAPER: TRAINING FOR CONSERVATION AREA MANAGEMENT IN THE SOUTH
PACIFIC REGION

Peter Eaton
University of Papua New Guinea

INTRODUCTION

National Parks throughout the South Pacific region are still regarded as being at an early stage of development. Nevertheless there are already a number of different types of conservation areas. Using the standard IUCN method of classification (IUCN, 1982) a survey for the South Pacific Commission region (Eaton, 1985) listed 15 areas as national or provincial parks (Category II), 39 areas as nature reserves and sanctuaries (Category IV), 24 strict nature reserves (Category I), 2 protected landscapes (Category V), a multiple land use management area (Category VIII), a forest reserve (Category VI) and a biosphere reserve (Category IX). There are also a large number of other areas which have been proposed as suitable sites in need of protection (Dahl, 1980; Holloway, 1975).

A major problem in the management of the conservation areas and a restraint on the development of new ones has been the shortage of trained specialist staff. Very few of the countries in the region have a national parks service. Many of the others rely on other government agencies, particularly Departments of Forests, to manage their protected areas. Some countries have declared parks and reserves but have no staff to look after them. The shortage of staff is partly due to financial constraints and the low priority given to conservation in most government public expenditure planning, but it also reflects both the lack of training facilities and poor career prospects for those involved in conservation area management. None of the countries of the region has a comprehensive in-country training programme specifically for protected areas staff. Instead, any training is either in other disciplines such as forestry, or else takes place outside the region, in either case the training may for obvious reasons be only of partial relevance.

At present it is doubtful whether any of the individual countries of the region is large enough to justify a national training centre or regular specialist courses. However, there are possibilities for more training within the region and these are discussed in the conclusion of this paper.

TRAINING NEEDS

Training needs will be partially dependent on the character of the protected area and the nature of its management. In some cases the duties of staff will be those of a caretaker, in others they will be those of a forest guard. Staff may be concerned with policing and guarding a particular natural resource with all the problems of enforcing restrictions (Chambers, 1976). Alternatively on land still under customary tenure, as in the case of the wildlife management areas of Papua New Guinea, it may be the land-owners themselves or members of an elected committee who are responsible for drawing up and enforcing conservation policies. In the latter case formal training may be minimal but the role of extension services may be significant. Demonstration methods are often successful and the organisation of trips for land-owners of potential conservation areas to ones that have already been established is often particularly effective.

Where government departments and agencies are involved in managing protected areas as a subsidiary function, as in the case of forest officers, their training is often directed towards their principal function and mainstream activities. Here specialist training in protected area management is usually not feasible, although there may be possibilities of including conservation units into pre-service courses, or at a later stage, organising in-service courses and workshops.

In spite of the important roles of land-owners and different government departments in protected area management, the establishment of an effective system of parks and reserves must ultimately depend on the development of a specialist organisation and staff, often in the form of a national parks or wildlife service. This type of organisation may have a number of different functions; a classification of these suggested by Kenton Miller (1974) is to be found in Appendix A to this paper.

In a large and established national parks service the different functions are carried out by specialists. However, in the South Pacific where park management is still at an embryonic stage and the number of personnel employed is relatively small, such specialisation will be necessarily limited. Instead individual rangers are often responsible for a park, island or province. The ranger who is responsible for a particular area will need to perform many different functions. He must be prepared to often work in isolation and deal with a local population who are suspicious of any development that may infringe upon their land rights. He is responsible for both public education and park interpretation. Often he finds himself short of funds, equipment, transport and administrative guidance. To be successful he needs to demonstrate the knowledge and skills of the natural scientist, sociologist, engineer, administrator, teacher and law enforcement officer.

What sort of training is needed to produce such a polymath? I would suggest the following as a list of some of the specific knowledge and skills needed by a ranger who should be considered in establishing the objectives of any training courses:

- (a) An understanding of national parks philosophy and organisation.
- (b) A working knowledge of the planning of park services.
- (c) An understanding of customary land tenure and of the land administration procedures necessary to acquire land for parks.
- (d) A knowledge of relevant environmental legislation.
- (e) A working knowledge of law enforcement procedures relating to search, seizure, apprehension and arrest.
- (f) An understanding of the basic principles of ecology; a knowledge of the elements which make up the natural environment of the park; an ability to identify the main plant and wildlife species.
- (g) A knowledge and understanding of park interpretation, education and extension skills.
- (h) An ability to read maps, interpret aerial photographs and make simple chain and compass surveys.
- (i) An elementary knowledge of road, footpath and building construction and maintenance.

- (j) A practical knowledge of search and rescue, fire-fighting and first aid.
- (k) The ability to drive and maintain vehicles and outboard engines.
- (l) An ability to correspond with headquarters, other government departments and the public, to write reports and keep simple accounts.

Some of these skills may be acquired through practical experience and on-the-job training, others are best learnt as components of either general educational or specific training courses. In the next section of this paper I shall look at a case study of one country in the region, Papua New Guinea, and outline the courses that are at present available for national parks staff.

PRESENT TRAINING PROGRAMMES IN PAPUA NEW GUINEA

In the past, pre-service training for most rangers has taken place at the Papua New Guinea Forestry College in Bulolo. Students are selected for this college after passing their School Certificate at the end of the fourth year of secondary education. The courses are of a two or three year duration leading to either a Certificate or Diploma in Forestry. The course outline can be seen in Appendix B. The subjects taken include those of a general academic type, natural sciences and ecological studies, and applied forest science. Much of the course has direct relevance to the training needs of national park rangers; the exceptions would seem to be some of the units in the applied forest science dealing with timber utilisation.

Any training immediately after the ranger is appointed to the National Parks Service is generally of a practical nature and often involves working with senior staff. Here a major problem is the lack of experienced staff to provide guidance to young recruits.

Further training is often overseas. National Parks Service staff have attended a number of short courses and workshops in different countries, notably Australia, the United States and Indonesia. The most comprehensive programme is provided by New Zealand and this has become part of the in-service training and staff development of rangers. It involves taking the Diploma in Parks and Recreation at Lincoln College, Canterbury, and a course of practical training at Turangi Ranger Centre. Outlines of these two courses are to be found in Appendices C and D. While much of the material taught in them is based on New Zealand conditions and experience, efforts are also made to relate what is learnt to the situation in overseas students' home countries.

In addition to overseas training, a number of in-service courses are available for national parks staff in Papua New Guinea. Some of these are held at the Administrative College which provides both training and general education for all categories of public servants. These are generally of short duration and concerned with administrative, procedural and managerial training. The college also runs a three-month Certificate in Land Administration course which is of value to rangers and other staff concerned with investigations.

A one-year Diploma in Land Administration is conducted at the University of Papua New Guinea and has been attended by National Parks staff. Topics covered by the core land administration course include land tenure, land

acquisition procedures and natural resource management. A part of the course deals specifically with national parks and involves field excursions to the nearby Varitata and Namenatabu parks.

It is also possible for staff based in Port Moresby to take other university courses on a part-time basis. At present the most relevant would seem to be those in Biology, Environmental Science, Geography and Environmental Law.

Apart from being dependent on the continuation of bilateral aid, the programme of overseas training in New Zealand would seem to have two disadvantages:

- (a) The trainee is away from Papua New Guinea for a relatively long period, usually at least two years. This means that the National Parks Service, already short of staff, is without competent personnel for this time. The long period overseas may also cause domestic problems as rangers are not usually able to take wives and children with them.
- (b) The second problem area lies in the relevance of the New Zealand courses. Although trainees are encouraged to relate what they have learnt to the situation in their own country, they will have to work in very different conditions and face different problems when they return to Papua New Guinea.

In spite of these difficulties, the New Zealand programme at present provides the most realistic way of meeting Papua New Guinea's training needs. However, there are a number of alternatives that should be considered for the future. One possibility would be the creation of specialist options in either the Forestry or Land Administration diplomas. A second alternative would be to have short induction and in-service courses based on the Administrative College but also using University, National Parks and seconded overseas staff. Other possibilities would be participation in regional training courses designed specifically for the South Pacific area. These are briefly discussed in the conclusion to this paper.

CONCLUSION

Facilities for training conservation area staff within the region are at present inadequate. Use can be made of courses already existing in neighbouring countries such as New Zealand, Australia and Indonesia. However, eventually training programmes must be developed within the region. The limited size and resources of most Pacific states mean that this training will necessarily be of an international or regional character. It is possible to hold short courses and workshops such as the one being held in conjunction with this national parks conference and organised through the South Pacific Regional Environmental Programme (SPREP). Longer courses which require permanent staff and facilities pose rather different problems. One possibility would be to use one of the existing institutions, such as universities and training centres, and the creation of an additional department and courses within the structure of that institution. The alternative would be the establishment of a regional conservation areas training centre. Similar institutions have been developed in Africa and South-East Asia, such as the College of African Wildlife Management at Mweka in Tanzania, the School for the Formation of Wildlife Specialists at Garous in Cameroon, and School of Environmental Conservation Management at Ciawi in Indonesia. A regional training centre

in the South Pacific would have the advantage of being able to teach long and short-term courses. It could also serve as a base for research and the dissemination of information and environmental education.

The organisation of any training programme requires careful planning. Thorsell (1982) has recommended the following steps as being necessary for any action plan.

1. Identify and document the resource management concerns in the region.
2. Assess current legal and institutional framework.
3. Survey training needs of existing staff.
4. Project future training requirements.
5. Review existing training programmes and curricula.
6. Recognise the array of target groups requiring training.
7. Be aware of the various options for training methods.
8. Consider establishing special training programmes in selected resource management disciplines.
9. Co-ordinate efforts in resource management training with neighbouring countries.
10. Expand marine resource management agreements to consider terrestrial issues.
11. Design detailed course syllabus for key programmes.
12. Establish a formal public environmental education programme.

This type of action plan would also seem relevant in drawing up a checklist of our needs in the South Pacific region. Work has already been done through SPREP with regard to the first two steps in this list. The next stage would seem to be a comprehensive survey of training requirements and it is recommended that this should be carried out as soon as possible to provide the basis for further planning.

APPENDIX A

FUNCTIONS RELATED TO NATIONAL PARK PROGRAMMES

-
- | | | |
|----|----------------------------|--|
| 1. | Decision-making functions: | Direct and guide the necessary steps to achieve the objectives of the parks. |
| 2. | Major programme functions | <ul style="list-style-type: none"> a. Protect park resources and park visitors. b. Design and construct park facilities. c. Interpret park resources to park visitors. d. Maintain installations within the park. e. Administer park programmes. |
| 3. | Key associate functions | <ul style="list-style-type: none"> a. Understand the resource(s) of the park. b. Understand the people who visit, or in some way make use of, the park. c. Understand the allocation of the resource(s) in relation to the users and the objectives of the park. d. Understand specific aspects of the resource(s), the people, and their relationship. e. Guide legislative and policy matters. f. Analyse land tenure, and guide the acquisition of lands. g. Project the image of the programme outside the parks to the legislature, national and local leaders, and the public at large. h. Open and maintain clear communications within the park service, and among related public agencies, private institutions, and the public (nomenclature, terminology, documentation, lines of communication). |
| 4. | Planning functions | Plan the management, development, operation, organisation and control aspects of park programmes (including the integration of all the above). |
-

Source: K.R. Miller, "Development and Training of Personnel - the Foundation of National Parks in the Future", op. cit.

APPENDIX B

PAPUA NEW GUINEA FORESTRY COLLEGE DIPLOMA COURSE CONTENT

The course is broadly divided into three main streams:-

ACADEMIC STUDIES	TIME ALLOCATION		
	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
Mathematics	160	64	-
English	192	-	-
Science	80	-	-
These are largely of a remedial nature			
Additionally:-			
Economics 1 - an introduction	16	-	-
Office procedures	-	64	64
Administration	-	-	16
Bookkeeping	-	-	32
NATURAL SCIENCES AND ECOLOGICAL STUDIES			
Botany - basic botany	160	-	-
- dendrology - natural species	-	256	-
- plantation species	-	-	32
- ecology	-	-	112
Forest Entomology	-	-	16
Forest Pathology	-	-	16
Geology and Soils	-	64	-
Wildlife Ecology	48	32	-
APPLIED FOREST SCIENCE			
Fire Protection	-	-	64
Forest Engineering	-	-	208
Forest Finance	-	48	48
Management - Man management	-	-	32
- Forest management	-	-	112
Mensuration	128	224	-
Policy and Law	-	-	32
Project	-	-	64
Silviculture	96	112	128
Survey	96	128	-
Wood Science and Utilisation	208	192	160
SPECIAL COURSES			

Special courses are conducted in the following:-

Airphoto interpretation and map reading
 Driving Instruction
 Extension Methods
 First Aid
 Introductory Management and Critical Path Analysis
 Meteorology
 Appropriate Technology.

APPENDIX C

LINCOLN COLLEGE DIPLOMA IN PARKS AND RECREATION COURSE OUTLINE
(PARK RANGER OPTION)FIRST EXAMINATION

BOTANY A
 EARTH SCIENCES A or
 RECREATION AND LEISURE A
 ZOOLOGY
 INTRODUCTION TO SOCIOLOGY
 PARKS AND RESERVES SYSTEMS
 MANAGEMENT A
 ECONOMICS
 BOTANY B
 ECOLOGY A
 WATER AND ATMOSPHERE
 EARTH SCIENCES B or
 POLYNESIAN STUDIES
 NEW ZEALAND SOCIETY
 MANAGEMENT B
 ENGINEERING A
 SEMINARS

SECOND EXAMINATION

MAN IN THE BIOSPHERE
 NATURAL HISTORY A
 EARTH SCIENCES A or
 RECREATION AND LEISURE A
 ECONOMICS OF THE PUBLIC SECTOR
 LANDSCAPE TECHNOLOGY
 LANDSCAPE DESIGN
 LANDSCAPE STUDIOS A
 ENGINEERING B
 NATURAL HISTORY B
 EARTH SCIENCES B or
 POLYNESIAN STUDIES
 FIELD STUDIES
 SAMPLE SURVEY METHODS
 PARKS AND RECREATION ADMINISTRATION
 LANDSCAPE STUDIOS B

THIRD EXAMINATION

ECOLOGY B
 NATURE CONSERVATION
 MANAGEMENT C
 PRINCIPLES OF PLANNING
 COMMUNICATIONS A
 PARKS ENGINEERING
 INTERPRETATIVE STUDIES
 RECREATION AND LEISURE C
 PARKS AND RECREATION PLANNING
 MANAGEMENT D
 FIELD STUDIES

APPENDIX D

RANGER TRAINING CENTRE
TURANGI, NEW ZEALAND

PROVISIONAL TRAINING COURSE FOR OVERSEAS PARK STAFF

This course is to be taken in six parts:

1. Administration
2. Visitor Protection
3. Resource Protection
4. Construction and Maintenance of Facilities
5. Office Management
6. Interpretation and Communication

The following course is designed to give a good basic grounding in the knowledge and skills required to help a ranger be an effective part of a total team effort.

This programme is subject to change: as and when change is found to be necessary.

The total time allocated is 29 weeks.

1. Administration

(1) History of National Parks and Reserves Concept

Series of lectures and discussions about the system of land use for conservation and recreational use throughout the world.

(2) N.Z. System of Parks and Reserves

Lectures and discussion about New Zealand national parks, forest parks, urban parks, maritime parks and reserves, etc.

(3) New Zealand Policies and Management Plans

Lectures, discussion and study of current New Zealand policies, management plans and policies and relevant documents.

(4) Field Visits to Parks and Reserves

Up to six weeks will be spent in visiting various parks and reserves throughout New Zealand. Visits will be spread over the total period of training.

2. Visitor Protection

(1) First Aid

Lectures and practical work for a St. John's first aid certificate.

To gain practical experience at Tongariro National Park during winter season.

(2) Public Health

Lectures and visits to cover all normal aspects of public health problems likely to be found in a park.

(3) Visitor Safety Inspections

Practical experience with inspections relating to visitor safety.

(4) Search and Rescue

Lectures and practical experience of techniques of search and rescue.

(5) Mountain and Bushcraft

Practical training and experience.

(6) Seamanship, Water Patrol, Canoeing

Lectures and practical experience to a level that is appropriate.

(7) Law Enforcement

Lectures and practical work in all aspects of laws, regulations and practices including half-day attendance at court.

Handling of offences
Patrol
Apprehension
Arrest and Seizure
Report writing

3. Resource Protection

(1) Firefighting

Lectures and practical experience with use of equipment and various techniques for control of fire.

(2) Radios

Practical experience in use of VHF, MF and CB radio sets.

(3) Firearms

Lectures and live shoot demonstrating safe use of firearms including both low and high calibre rifles and shotguns.

(4) Weed Control

Lectures and practical work in controlling various types of weeds.

4. Construction and Maintenance of Facilities

(1) Roads, Tracks and Bridges

Practical work and inspections of different types of roads, tracks and bridges. This section will be expanded during time spent in various parks and reserves around the country.

(2) Buildings and Structures

Lectures and inspections of various types of building methods and designs; as well as maintenance.

(3) Signs and Labels

Practical work in design, location, preparation and maintenance of various types of signs and labels.

(4) Utilities

Lectures and inspections of various types and methods of design, installation and maintenance of toilets and underground services. To be relevant to the possible use of such facilities in overseas countries.

(5) Explosives

Lectures and practical demonstrations on safe use of explosives for a variety of purposes.

(6) Maintenance of Tools and Equipment

Lectures and practical work on the care of various types of tools and equipment.

To include workshop practice.

(7) Technical Drawing

Practical exercises in preparing drawing and sketches etc, for Park planning.

5. Office Management

(1) Estimates

Lectures and practical exercises in preparation of estimates for individual projects and annual expenditure. Expenditure control.

(2) Wages

Lectures and practical exercises in preparation and payment of wages.

(3) Correspondence

Lectures and practical exercises in preparing reports, general correspondence and filing.

(4) Staff Duties

Lectures and practical exercises in handling staff, allocation of duties and control.

6. Interpretation and Communication

(1) Public Speaking

Lectures and practical experience in giving talks to the public.

(2) Use of Equipment and Aids

Lectures and practical experience in using projectors, flip charts, cameras, chalkboards, etc.

(3) Photography

Lectures and practical exercises in use of cameras for both interpretative and management work.

(4) Displays, Exhibits and Demonstrations

Inspections and discussions on the preparation of, and types of displays and exhibits.

(5) Guided Trips

Practical work and experience in organising and leading parties on guided trips.

(6) Communication

Experience in preparing news releases, meeting park users, press, radio and TV staff.

(7) Visitor Reception

Experience in visitor reception at both HQ and field situations.

CASE STUDY: RESOURCE MANAGEMENT AND CONSERVATION IN THE PACIFIC ISLANDS: RELATED ACTIVITIES AND CAPABILITIES OF USP AS A REGIONAL UNIVERSITY

Harley I. Manner
University of the South Pacific,
Suva,
FIJI.

INTRODUCTION

With the increasing pressures for economic growth and the rapidity of social and environmental change in the South Pacific region, the conservation and management of natural and cultural resources is often given lower priority than economic considerations. While the reasons for economic growth are recognised by almost all sectors, the necessity for conservation and resource management are less well known. This state of affairs suggests that an environmental education which stresses the broad objectives and themes of the conference is of prime significance, if the conference objectives are to be realised. Indeed it is imperative that such an education be given high priority as statements such as "to exploit the development potential of each region according to its human and natural resource base to the maximum extent economically possible" (Fiji, 1980) are not uncommon in the development plans of South Pacific countries and contradict the basic definition of conservation: "the rational use of the environment to provide the highest sustainable quality of living for humanity" (Dasmann, 1975).

At the University of the South Pacific, the importance of research and an education which stresses ecologically rational resource use and management for the maintenance of the environment and the development of the South Pacific region is clearly recognised. The objectives of this paper are:

1. to highlight the areas of teaching and research at the USP indicative of the themes and objectives of the conference; and
2. to indicate some of those areas where USP can provide support in conservation and resource management activities necessary to the future well-being and development of the South Pacific region.

USP BACKGROUND INFORMATION

The University of the South Pacific (USP) with its main campus at Laucala Bay, Suva, Fiji, is a regional university which serves, and is supported by the governments of the Cook Islands, Fiji, Kiribati, Nauru, Niue, the Solomon Islands, the Tokelau Islands, Tonga, Tuvalu, Vanuatu and Western Samoa. The USP was established in 1966

"for the maintenance, advancement and dissemination of knowledge by teaching, consultancy and research and otherwise and for the provision at appropriate levels of education and training responsive to the well-being and needs of the communities of the South Pacific region.

These objectives and involvement in environmental and human ecological research and education are evidenced through the development of:

1. a regional network of schools, institutes, centres, administrative entities, support services, facilities and personnel for the University's education and training programmes;
2. research, consultancies and publications in the areas of environment, ecology, resource management and conservation; and
3. involvement with the development and participation in a regional environmental data exchange programme.

Further details are given below.

ENVIRONMENTAL TEACHING AND TRAINING AT USP

The teaching and training function of the University is primarily accomplished by the Schools of Social and Economic Development (SSED), Natural Resources (SNR), Education (SOE), and Agriculture (SOA), the nine regional extension centres and the institutes. These sections of the University offer a wide range of courses, some with an environmental focus. Students who pursue a bachelors degree at the USP are required to major in two subject areas. During the course of their study most enrol in at least one course that has a strong environmental component. In SSED, all courses in Geography have a strong environmental or resource management perspective, and most if not all, stress a holistic approach to development in the South Pacific region. Of special note, the role and significance of conservation and resource management and the role of traditional conservation practices are stressed in SE 344 (Resource Conservation and Management) and SE 342 (Applied Rural and Agricultural Geography of the Pacific Islands). A Land Management degree also has a strong focus on resource management and environmental concerns.

Many students who undertake a degree in Education, often take Geography or a natural science as a major. The result is a greater environmental awareness and concern in the education systems throughout the University region.

The School of Natural Resources offers undergraduate degrees in Biology, Chemistry, Physics and Earth Science. Some of the courses with a distinct environmental bias include NR 106 (Earth Science), NR 201 (Soil Science), NR 231 (Ecology), NR 222 (Environmental Physics), NR 334 (Environmental Biology), and NR 314 (Geochemistry and Marine Chemistry).

At the March 1982 South Pacific Conference on the Environment held in Rarotonga, the regional representatives stressed the need to develop relevant education and technical training for the management of the environment. Implicit in this approach was the recognition that technical and scientific expertise in environmental management had to be combined with a similar expertise in the social sciences in order to produce well qualified resource managers. In response, the USP developed a BSc degree in Environmental Studies consisting primarily of courses from the School of Social and Economic Development and the School of Natural Resources. Students enrolled in this programme receive a multi-disciplinary background in the nature and social sciences,

"which presents a balanced but integrated education focusing on environmental limitations and problems, and the economic and social realities of Pacific Islands development." (Manner and Thaman, 1983).

For this degree, coursework is primarily undertaken in Geography in combination with Biology, Chemistry or Physics. To date the response to this programme, in terms of students supported by government scholarships, has been disappointing.

At the pre-degree level the USP offers diploma courses in Science, Rural Development, Social Welfare and Education, some of which have a significant environmental content. Some of these courses are offered through the extension mode. In addition there are more than ten students studying an environmental related topic as part of their Masters programmes at the USP.

In recent years, the USP has hosted a number of environmentally related workshops. These include the SPREP Regional Training Course of Environmental Management for Resource Development, the Role of Agroforestry in the South Pacific sponsored by the German Foundation for International Development, and the Commonwealth Science Council's Workshop on Water Resources for Small Islands.

The USP has a number of institutes which conduct short courses and carry out basic and applied research in environmental topics. These are the Institute of Social and Administrative Studies (ISAS), Marine Resources (IMR), Natural Resources (INR), Education (IOE), Pacific Studies (IPS), Rural Development (IRD), and the Institute for Research Education and Training in Agriculture (IRETA). In addition the University operates the Atoll Research Unit (ARU) on Kiribati, and a Population Studies Unit based at the Laucala Bay campus will soon begin operation. In-service courses of short duration are offered by the institutes and the extension centres. Some examples include Marine Geology for Technicians, Basic Earth Science, Basic Microbiological Techniques, and Soil Survey Techniques.

FACILITIES

The USP has a range of facilities and equipment required for environmental analysis and research. The IMR has a marine sciences field station on the Astrolabe Reef in Fiji's Kadavu group and four vessels. The INR, IMR, IRETA, SNR, and SOA have well-equipped laboratories, capable of analysing a wide range of environmental parameters. The INR also has a portable water testing laboratory and a herbarium of more than 50,000 specimens for referencing purposes.

The USP Library system consists of the main library at the Laucala Bay campus, a branch library at the SOA, and eight centre libraries. The current stock of volumes exceeds 300,000. Approximately 20,700 volumes are housed in the Pacific Collection. The Library also maintains a map collection and conducts computer searches for staff research projects. Copies of all staff research publications are routinely deposited in the Library.

Back-up services at the USP include illustrators, cartographers and cartographic facilities. The various schools and institutes own environmental sampling equipment and vehicles. There is a fully operating meteorological station and the Computing Centre is in the process of replacing its ICL mainframe computer with a DEC Micro Vax II. Each school and institute has a number of micro-computers which will be augmented by the addition of 60 more micro-computers by the end of the year.

ENVIRONMENTAL RESEARCH AND CONSULTANCIES

An important function of the USP is research and consultancy work relevant to the South Pacific region. The USP firmly believes that research by staff members is a necessary component of effective teaching, and encourages its staff to participate in these activities. High priority is given to research and consultancy work on environmental concerns such as environmental impact assessment, the collection of basic environmental data, and the monitoring of environmental systems. The IOE is involved in the development of curricula with some environmental components, while the IPS has published widely on the topic of land tenure throughout the region. USP staff have been very active in environmental research and consultancies, either through their schools or associated institutes. Some of these studies include: agroforestry in the Pacific, vegetation and soil survey of Nauru; water resources and water quality in Fiji, Tonga, Niue, Western Samoa, Solomon Islands and Kiribati; flora and fauna of mangrove ecosystems; coral reef studies; renewable energy resources development; pesticide pollution; and vegetation surveys of the Sigatoka sand dunes and the tropical rainforest ecosystems.

Through the institutes and the schools, the staff at USP have completed consultancies on a number of environmental impact assessments. These include assessments of sugar cane development schemes, hydro electricity development, *Pinus caribaea* reforestation projects, sewerage system development on marine ecosystems, port facility development on Butaritari (Kiribati), and commercial agricultural development in Tonga. Last year a UNEP sponsored report of environmental education in the South Pacific was completed, and this year the Fiji Ministry of Primary Industries asked the USP to assist with a survey of agriculture on Viti Levu, Fiji.

Under the umbrella of the South Pacific Regional Environmental Programme based in Noumea, New Caledonia, the USP is currently collaborating with a number of institutions on the collection of environmental data and the monitoring of environmental systems. These programmes include: Watershed Hydrology, Inland Water Quality, Coastal Water Quality, Coastal Ecosystems Management and Pesticide Residue Monitoring. The collaborating institutions include the University of Papua New Guinea, University of Technology at Lae, Papua New Guinea, University of Guam, University of Hawaii, the Guam Environmental Protection Agency, the Laboratoire d'Etudes et Surveillance d'Environnement (LESE) located in Tahiti and the USP.

These research projects and consultancies on environmental topics have been funded from the USP Research Committee's recurrent budget, grants from the United Nations University, USAID, ADAD, EEC, SPC, FAO, UNDP, IDRC, ESCAP, UNEP, SPREP, Fiji Pine Commission, Fiji Sugar Corporation, the governments of Fiji, New Zealand, Tonga, Nauru, Solomon Islands and Kiribati, region based private companies and consultancy firms based in Australia, the United Kingdom and New Zealand. A selected list of environmental projects and consultancies conducted by the institutes, centres, schools and units of the USP is found in Appendix I.

PUBLICATIONS AND INFORMATION EXCHANGE SYSTEMS

The environmental research and to a lesser extent, consultancy reports (indicated above) are published in both international and regionally-based journals and report series. The USP publishes *The South Pacific Journal of Natural Science*, the *Review*, *The Journal of Pacific Studies*, the *Alafua Agricultural Bulletin*, the *SPACHEE Newsletter* and the *INR Environmental Studies Report* series. The Institute of Rural Development has a *Technical Bulletin* and an *Occasional Paper* series while the Atoll Research Unit and the IMR both have a *Technical Report* series. Most of these publications are available from the various units of the USP, either free or at nominal cost. A selected list of environmental reports and publications is presented also in Appendix 1.

Copies of these publications are routinely lodged with the USP Library in Fiji and some are distributed to USP centre libraries throughout the region. A listing of research of an environmental nature can be found in the USP's Pacific Information Centre bibliographic series entitled *Environmental Issues in the South Pacific*. The *South Pacific Research Register* contains information on researchers and their research on the South Pacific region.

Exchange of information is also facilitated through USP's satellite communications system (USPNET) which connects the USP nine regional centres with the Laucala Bay campus. Through PEACESAT the USP has participated in the dissemination of environmental information and seminars on environmental issues. The near future acquisition of a DEC Micro Vax II computer will further facilitate data exchange throughout the Pacific and with other research and teaching institutions throughout the world. Finally, the USP has a Memorandum of Understanding with the Pacific Post Secondary Education Committee to facilitate research and collaboration with tertiary institutions in the Pacific and maintains close educational and research relationships with the University of Papua New Guinea and the University of Technology at Lae, Papua New Guinea.

Further information concerning the items presented above can be obtained from the USP *Calendar*, the Pacific Information Centre, the USP journals and publications cited earlier and the bibliography and Appendix 1.

CONCLUSION

This paper has highlighted and documented the USP's concern and programmes on environmental conservation and management. This concern is reflected in the research and teaching programmes of the USP and its staff. The USP has the facilities, the staff capabilities and the interest necessary for the attainment of the broad aims and objectives of this conference, and through this paper I have suggested that environmental education is necessary if goals and objectives of this conference are to be achieved.

Some of you here today will probably return to your home islands with the idea of enacting laws and regulations concerning the use of your natural resources and instituting more rational plans for the development of your islands. These laws and plans will not be enough. Baines (1981) has stated that while legislation as a basis for legal action to curb wilful resource destruction and environmental damage will always be necessary, "education is the ultimate key to genuine appreciation of how each person relates to environment and resources and what that person's obligations are..." There is, however, the question as to what kind of environmental education is required to ensure the rational use and development of the region's resources.

Bryant (1984) has suggested that for environmental education programmes to be effective -

"they must seek to reach the whole community and not only those people who are privileged enough to attend to all levels of schooling."
(Bryant, 1984).

That very few people in the South Pacific region have or will be able to attend the USP suggests that the USP and other agencies in the region must become more fully involved in non-formal as well as formal environmental education at all levels. Otherwise, the efforts of USP in environmental education and research and the aims and objectives of this conference will not be realised as the exploitation of the South Pacific will proceed at an even more rapid rate... and conservation as defined earlier in this paper, will be impossible. The USP is more than willing to help the Region achieve a rational plan for the conservation and development of its natural and cultural resources.

ACKNOWLEDGEMENTS

I am indebted to R.R. Thaman and R.J. Morrison for allowing me to cite certain sections from their papers (Thaman, 1981; and Thaman and Morrison, 1983).

APPENDIX 1

A selected Bibliography of USP Publications on Environmental Topics Primarily since 1983.

Atoll Research Unit

- Groves, G. 1982 High waves at Makin in December 1979. *ARU Technical Report*.
- Groves, G. 1982 Flow through Tarawa Channels. *ARU Technical Report*.
- Groves, G. 1983 Opportunities for scientific research at Kirimati Island. *ARU Technical Report*.
- Silver, H. 1982 Bech-de-mer in the deeper waters of Tarawa Atoll. *ARU Technical Report*.

Institute of Marine Resources

- Halapua, S. 1981 The islands of Ha-apai: Utilisation of land and sea. Consultancy report for the Central Planning Department, Kingdom of Tonga.
- King, M.G. 1980 The water hyacinth, *Eichornia crassipes* in the Ba River, Western Viti Levu, Fiji. *IMR Technical Paper*.
- King, M.G. 1981 Deepwater shrimp resources of Vanuatu. *Marine Fisheries Review* 43(12): 10-17.
- Kott, P. 1981 The Ascidians of the reef flats of Fiji. *Proceedings of Linnean Society of N.S.W.* 105 (3): 147-217.
- Kunatuba, P. 1983 Traditional knowledge of the marine environment in Fiji. 2. Traditional sea tenure and conservation in Fiji. *IMR Technical Paper*.
- Penn, N. 1982 The environmental consequences and management of coral sand dredging in the Suva region. *IMR Technical Report*.
- Raj, U. 1977 Turtle farming for the South Pacific. *South Pacific Bulletin* 27(3): 14-16.
- Raj, U., and Seeto, J. 1983 A new species of the Anthiine fish genus, *Plectranthias* (Serranidae) from the Fiji Islands. *Japanese Journal of Ichthyology* 30(1): 15-17.
- Zann, L.P. 1981 Subsistence fisheries of Tuvalu. *IMR Technical Report*.
- Zann, L.P. 1981 Canoes of Tuvalu. *IMR Technical Report*.
- Zann, L.P. 1982 The marine ecology of Betio Island, Tarawa Atoll. *IMR Technical Report* submitted to UNDP.

- Zann, L.P. 1982 Traditional management and conservation of fisheries in Kiribati and Tuvalu Atolls. UNESCO Workshop on Traditional Coastal Management.

Institute of Natural Resources

- Ash, J.E., and
Ash, W. 1984 Freshwater wetland vegetation of Viti Levu, Fiji. *New Zealand Journal of Botany* 22: 376-391.
- Brodie, J.E. 1983 Report on a water testing visit to Nikunau Island, Kiribati. *IMR Environmental Studies Report*, No. 14.
- Brodie, J.E., Chand, K., and
Morrison, R.J. 1984 An appraisal of the UNEP methods for determining pollutants in coastal waters for use in the Pacific Islands. *IMR Environmental Studies Report*, No. 18.
- Brodie, J.E. and
Morrison, R.J. 1985 The management and disposal of hazardous wastes in the Pacific Islands. *Ambio* 13 (5 and 6): 331-333.
- Baynes, A. 1984 *Guide to the Brackish and Freshwater Gastropods of Fiji*. Institute of Natural Resources.
- Manner, H.I., Thaman, R.R. and
Hassall, DC. 1984 Phosphate mining induced changes on Nauru Island. *Ecology* 65: 1454-1465.
- Manner, H.I., Leslie, D.M., Makatani, K., Tora, T., Prasad, R.A., and
Morrison, R.J. 1985 Soils of the Fiji Pine Forests. I. Soils of Vatuma and Masi catchments, Nadi Forest. *IMR Environmental Studies Report*, No. 24.
- Morrison, R.J., and
Brodie, J.E. 1984 Pollution problems in the South Pacific: fertilisers, biocides, water supplies and urban wastes. In Dahl, A., and Carew-Reid, J. (eds.), *Environment and Resources in the South Pacific: a Regional Approach*. UNEP Special Publication.
- Morrison, R.J., Seru, V.B., and
Widdowson, J.P. 1983 Sulphur in the agriculture of some South Pacific atolls. In Blair, G., and Till, R.A. (eds), *Sulphur in S.E. Asian and S. Pacific Agriculture*. Armidale, University of New England Press.
- Naidu, R., and
Morrison, R.J. 1984 The clay mineralogy of a Haplustoll and Haplustox from Viti Levu, Fiji. *South Pacific Journal of Natural Science* 5: 71-85.
- Parkinson, S.V., Lovelace, C., Whitney, P.J. and
Madhoji, K. 1984 A traditional method of food preservation in the South Pacific Islands—fermentation in pits. *IMR Technical Report*, No. 84/1. Report prepared for the Commonwealth Foundation for Technical Co-operation.

- Thaman, R.R., Manner, H.I., and
Hassall, D.C. 1985 Naruan plant names., *IMR Environmental Studies Report*, No. 21. A report prepared for the Nauruan Government.
- Vodonaivalu, S., and
Ash, J.E. 1984 *Erythrina* in the vicinity of Batiri, Vanua Levu, Fiji. *IMR Environmental Studies Report*, No. 20.
- Yee, C.W., and
Looyd, C.R. 1985 Energy use in Aitutaki, Cook Islands. Report for the Pacific Energy Development Programme.

Institute of Rural Development

- Marjoram, T. 1983 Pipes and pits under the palms: water supply and sanitation in the South Pacific. *Waterlines* 2(1): 14-17.
- Marjoram, T. 1984 Directory of appropriate technology of the South Pacific. *Institute of Rural Development Occasional Paper*, No. 4.
- Thaman, R.R. 1984 Trees, Tongans and reforestation in Tonga 1956 to 1984. *Institute of Rural Development Occasional Paper*, No. 4.

School of Natural Resources

- Gibbons, J.R.H. 1984 A brief environmental history of Fiji. I. The situation before human habitation. *Comodomo* 2(1): 23-33.
- Gibbons, J.R.H. 1984 Iguanas of the South Pacific. *Oryx* 18(2): 82-91.
- Gibbons, J.R.H., and
Guinea, M.L. 1983 Observations on development of the Fijian tree frog, *Platymantis vitiensis*. *Herpetofauna* 14(2): 83-86.
- Morrison, R.J. 1983 The Fragility of some South Pacific ecosystems. *Review* 10: 44-49.
- Prasad, R.A. and
Morrison, R.J. 1984 Analysis of soils from the Lololo forest area, N.W. Viti Levu. Consultancy report prepared for the Fiji Pine Commission.
- Raj, U., Seeto, J., Puloka, S.T., and
Fakahau, S. 1984 Mass mortality of marine life in the Kingdom of Tonga. Consultancy report.
- Ryan, P.A. 1984 Fiji Amphibia. *Comodomo* 2(2): 87-98.
- Singh, Y.N. 1983 Arrow poison in your own backyard: muscle paralysing action of the juice of the banana tree trunk. *Fiji Medical Journal* 11: 149-151.
- Skinner, N.J. 1983 The occurrence of waders at Suva Point, Fiji. *Notornis* 30: 227-232.

Sundaraligam, K. 1984 Petroleum exploration. *Journal of the Fiji Institute of Technology* 1: 51-56.

School of Social and Economic Development

Bryant, J.J. 1984 Environmental education and training in the South Pacific. *IMR Environmental Studies Report*, No. 22. Report prepared for UNEP.

Claeson, A., Manner, H.I., and Nakatani, K. 1984 Regression analysis of the above ground biomass of Fijian plantation *Pinus caribaea* var. *Hondurensis*. *South Pacific Journal of Natural Science* 5: 46-59.

Clarke, W.C. 1985 The fabric of the world farm. In Farrington, I.D. (ed.), *Prehistoric Intensive Agriculture in the Tropics*. Oxford BAR International Series.

Durutalo, S. 1984 Fiji's throwaway forests: Factory forestry in Fiji. In Utrecht, E. (ed), *Essays in the Political Economy of Fiji*. Sydney, University of Sydney.

Manner, H.I. 1984 Institutional agroforestry in the Pacific: A preliminary survey. In Schirmer, A. (ed.), *The Role of Agroforestry in the Pacific*. Berlin, German Foundation for International Development.

Manner, H.I., Thaman, R.C., and Hassall, D.C. 1985 Plant succession after phosphate mining on Nauru. *Australian Geographer* 17: 185-195.

Thaman, R.R. 1984 The environmental impact of nuclear radiation on the Pacific region. *Science Journal (Fiji)* 1(2): 45-48.

Thaman, R.R. 1984 The poisoning of paradise: Pesticides, people, environmental pollution and increasing dependency in the Pacific Islands. *South Pacific Forum* 1(2): 165-200.

Thaman, R.R. 1984 Microparks in the Pacific Islands: The relevance of traditional and modern small-scale conservation areas in the context of nature conservation in the Pacific Islands. Paper presented at the SPREP Third South Pacific National Parks and Reserves Conference, June 24 to July 3, 1985. Apia, Western Samoa.

Thaman, R.R., and Rizer, J.P. 1983 *Environmental Management for Resource Development*. South Pacific Regional Environmental Training Course, 16-26 November 1982: Final Report. University of the South Pacific.

Others

Chow, H. 1983 Environmental information in the South Pacific. *Fiji Library Association Journal* 10: 42-53.

- Gunasekera, H.M.,
et al. 1983 Seaqaqa sugar cane farmers and Fijian villagers
in the Seaqaqa periphery: a household survey.
Ministry of Economic Planning and Economic
Development (Fiji) Technical Paper.
- Kautai, N.,
et al. 1984 *Atiu: An Island Community*. Institute of Pacific
Studies, Cook Islands Ministry of Education and
the Atiu Island Trust.
- Larmour, P. (ed.). 1984 *Land Tenure in Vanuatu*. Institute of Pacific
Studies.
- Maas, J.P. 1983 The role of forestry in the environment. *Domodomo*
1: 5-7.
- Pule, R.T. 1983 Binabina: the making of a Gela war canoe. Solomon
Islands Centre, USP (Honiara).
- Ravuvu, A. 1983 *Vaka i taukei: The Fijian Way of Life*. Institute
of Pacific Studies.
- Valasi, S. 1982 Bibliography on taro. IRETA, Western Samoa.
- Wickramasekera,
H.T. 1983 Energy utilisation of agricultural production
systems in the Cook Islands. IRETA, Western
Samoa.
- Young, J.A. 1983 The Lovoni land-purchase project: a case study in
native Fijian agricultural development. *South
Pacific Forum Working Papers* No. 2.

CASE STUDY: OPTIONS FOR TRAINING OF PROTECTED AREA MANAGERS IN THE
 PACIFIC

J.W. Thorsell,
IUCN Commission on National Parks and
Protected Areas
Gland,
SWITZERLAND

INTRODUCTION

Effective staff training is essential for the successful management of any protected area system. At present a lack of suitably qualified staff and resources limits the opportunities for "in country" training in the Pacific region and it is therefore necessary to look towards developing a co-ordinated regional approach to this task. This paper briefly discusses training concepts and identifies a range of training options either presently available in the region or suitable for further development.

EDUCATION, AWARENESS AND TRAINING

It is useful to begin a discussion on this topic by distinguishing between Education, Awareness and Training (E.A.T.). The term education is used most often to refer to structured settings in schools and usually to young age groups. The techniques for raising public awareness are less formal and targeted at the general population. Training, by contrast, implies the acquisition of practical skills and the process by which manpower for conservation work is developed.

TRAINING IS FUNDAMENTAL

The World Conservation strategy has identified limitations on the human capacity to manage as a major constraint to effective conservation. At the same time, it is a recognised principle of effective management that a complement of trained and committed staff are the foundation of the operation of any protected area system. Clearly, we must give high priority to further efforts in strengthening our manpower base.

LEVELS OF TRAINING

In continental settings, three levels of training are usually identified:

1. senior headquarter-level planners and administrators,
2. middle-range warden or superintendent-level field staff, and
3. operation level field support staff such as guards, rangers, etc.

In small island nations these distinctions are blurred as staff are few and much less specialised. One person is even often asked to perform the functions at all these levels. Training efforts in the Pacific thus need to be much more oriented to providing generalists capable of tackling the full spectrum of protected area management tasks.

METHODS OF TRAINING

Ten options for training can be considered:

- * University level opportunities. These are available within the region at the Universities of the South Pacific, Papua New Guinea, Guam and

Hawaii. There appears to be little need to send people outside the region for advanced training.

- * Technical Colleges. Relevant programmes are available in Papua New Guinea and at Lincoln College, New Zealand. The School of Conservation Management in Bogor, Indonesia is also growing in importance as a regional school.
- * Regional Training Facility. This is not likely to be justified at this time in the Pacific region as the above-mentioned institutions are performing this function.
- * Seminars. Two recognised one month training seminars for park managers are relevant to participants from the Pacific. These are the International Seminar on National Parks held every year in Canada and the USA and the Summer School of Park Management held in Australia. The latter is probably more relevant to the region.
- * In-service and counterpart training. Good examples of this are provided by New Zealand's efforts in the establishment of parks in Western Samoa and by the U.S. National Oceanic and Atmospheric Agency's efforts in marine sanctuary development in American Samoa. The Peace Corps also is an important contributor in transferring technological expertise in park and wildlife management.
- * Attachments. These take the form of short-term secondments of key officers to work with colleagues in another country. An example is provided by the joint staff exchange between Australia's Great Barrier Reef Marine Park Authority and the parallel agency in Belize.
- * Workshops and Conferences. These provide valuable "re-training" functions and allow certain topics to be explored in depth. A good example was the recent SPREP/IUCN-sponsored workshop on coastal zone management in the Northern Marianas, as well as this Third South Pacific National Parks and Reserves Conference.
- * Short Courses. Special operational courses can provide concentrated training in a short period of time but costs can be substantial. New Zealand's training facility at Turangi is offering an 18 week short course as part of its Centennial Activities in 1987.
- * Provision of Reference Materials. Many field staff are in great need of basic reference manuals on the practical aspects of protected area management. Each park office should have a set of basic reference materials and all should be on the mailing list for relevant periodicals such as *Parks* magazine.

SUPPORT FOR TRAINING

This is available through bilateral assistance programmes (especially those of New Zealand and Australia) as well as through donor organisations such as WWF and IUCN. Another source not currently exploited in the region is the World Heritage Fund of UNESCO.

CASE STUDY: AN APPROACH TO TRAINING PARK MANAGERS IN THE SOUTH PACIFIC REGION

Rex Mossman,
Hauraki Gulf Maritime Park
Auckland,
NEW ZEALAND

INTRODUCTION

Perhaps the two most important needs at present facing conservation in the Pacific are environmental education and staff training. Environmental education is important if an awareness and understanding of the need for conservation is to be developed by the community. People are not born with attitudes: attitudes are developed and environmental education is aimed at creating a responsible social attitude towards the environment. To achieve this, environmental education programmes need to be directed at, and available to, all levels of society.

Staff training is important for park managers because they are the people who will carry out the environmental education function as well as the management of the protected areas.

Training is the key to the success of protected area management. Protected area management staff need to understand their role and functions, be able to plan and organise their work and most importantly, be able to communicate the values of their work to the public.

ESTABLISHING A PARKS AND RESERVES SYSTEM IN WESTERN SAMOA:

The 1979-1980 (Project) Approach

Between 1979 and 1980 I took part in a project in Western Samoa which had three principal objectives:

- to establish and develop example protected areas in Western Samoa
- to prepare material for public awareness and education
- to train staff to a level where they would be able to continue the work started.

Four active supervisors were employed throughout the project (plus one in New Zealand undergoing training) together with 28 casual employees. Although the supervisory staff were reasonably stable there was a high turnover of casuals. Early in the project regular staff meetings were initiated and training sessions covering such subjects as organisation, public speaking, report writing, track construction and maintenance, financial estimates, the guiding of large groups and first aid were undertaken. The opportunity was taken to have visiting experts talk with staff on a diverse range of subjects including marine ecology and botanical garden management. Three of the supervisors undertook study trips to observe the New Zealand National Park and Reserves system in operation. These visits were low key in nature and proved most successful as each trip was designed specifically for the needs of the individual involved.

Throughout the project every opportunity was taken to explain and provide training in the various facets of protected area management, this being done informally and continually. The "thinking out aloud" approach was also adopted and staff were encouraged to talk to local schools and groups.

Some of the management concepts were well outside the previous experience of the staff and were difficult for them to grasp. However, over the period of the project I felt that definite progress was made as a result of the staff training programme and I feel that any training scheme in the region must first start with the basics and build up gradually to deal with the higher levels of management. No advantage is gained by sending staff without a basic understanding and knowledge to "high powered" courses aimed at levels beyond their abilities.

AN APPROACH FOR TODAY

Within the protected area management field in the Pacific region there are many urgent needs requiring attention. Little money and a limited and varied staff resource indicate that the first priority must be to broaden the staff base, and then raise its standards. Without a broad staffing base there exists the possibility that the training effort will be directed towards one or two persons with the danger that if they move on, nothing will have been achieved. Therefore, I suggest it is prudent to move slowly but surely in the area of staff training.

There are several possible approaches to staff training which could be applicable in the Pacific. These include:

1. Sending staff to established training courses in countries like Australia and New Zealand.
2. Arranging short courses on a country or regional basis such as the one that follows this conference.
3. Sending staff on informal and practical training trips, e.g. to work in an established National Park for experience.
4. Long term assignments, e.g. aid assistance such as the project in Western Samoa which was carried out under New Zealand's bilateral assistance programme.

In all cases it is important - in fact vital - to the success of the training programme that both the teacher and student are committed and sympathetic to the development of conservation objectives in the region. Follow up work is important in all training schemes and it is essential to maintain contact with, and provide assistance to past students who may find it very difficult working in isolation with no back-up support.

I consider that a blend of the approaches outlined above is needed to provide the base, knowledge and support required for a comprehensive multi-level training programme for the Pacific region. In addition, resource material such as the Draft Training Manual being prepared for this conference can provide a permanent source of reference for both trainers and students alike. The manual is a training guide aimed at establishing concepts and principles. It is divided into sections covering:

1. The Resource
2. The Visitor (which includes public relations and interpretation).
3. Facilities.
4. Management.

A section on field skills is to be added later.

It is intended the manual will provide a basis for protected area management training in the Pacific. The proposed New Zealand training course in 1987 to coincide with the country's National Park Centennial is based on the content of the manual as is the course to be held next week here in Apia.

Using the material provided in the manual as a standardised base on which to develop a training programme it should be possible to utilise the approaches discussed above to meet the training needs of specific countries or individuals.

Thus, the training manual is intended to provide the material and the approaches needed for the development of a flexible training programme to meet regional needs and to produce the well trained staff needed to achieve progress in protected area management.

CASE STUDY: TRAINING ABORIGINAL PARK MANAGERS IN AUSTRALIA

Peter Taylor
Australian National Parks and
Wildlife Service
Canberra,
AUSTRALIA

INTRODUCTION

The Australian National Parks and Wildlife Service (ANPWS) is established under the National Parks and Wildlife Conservation Act 1975, and is responsible to the Minister for Arts, Heritage and the Environment. As the principal adviser to the Commonwealth Government on national nature conservation and wildlife policies, ANPWS works in close co-operation with other Commonwealth authorities and relevant State and Territory agencies.

One of the major land management responsibilities of ANPWS concerns Kakadu National Park, in the Northern Territory. Through its involvement in the management of this national park, ANPWS has developed, implemented and evaluated three Aboriginal Ranger Training Programmes, which have successfully resulted in Aboriginal employment in the natural land management field.

Due to the success of these training and employment programmes ANPWS has become involved in similar programmes and proposals in South Australia and Western Australia.

This paper will outline the programmes that have been conducted at Kakadu and in the Gammon Ranges, South Australia. A description of these programmes and their outcomes will also be made in relation to the impact they have had on Aboriginal communities and the nature conservation agencies that have been involved.

THE ISSUE

Australian Aborigines have inhabited the country for over 40,000 years. The impact Aborigines had on their environment, was insignificant compared to the changes that have occurred to the Australian landscape in the last 200 years, following the arrival of Europeans.

Although there is no accurate figure for the Aboriginal population of Australia in 1788, it is known that white settlement impacted severely on both Aborigines and their environment. Until recent years, there has been a decline in aboriginal numbers, but these are now on the increase. Nevertheless, Aborigines now constitute only about 1% of the current Australian population.

Despite the impact of white settlement, many Aborigines still have strong traditional and cultural relationships with their land. Some Aboriginal communities through Land Rights campaigns have secured freehold title over land their forefathers lost, and there is a rising interest in Australia in traditional Aboriginal culture and lifestyle.

Government nature conservation agencies in Australia are increasingly recognising the importance of involving Aboriginal people wherever appropriate and possible in the management of reserved natural areas, such as national parks. Two objectives of these initiatives are to ensure the

integrity of Aboriginal culture (including situations where the Aborigines do not hold title to the land) and to combine traditional Aboriginal knowledge with modern non-Aboriginal conservation practices.

BACKGROUND TO THE ESTABLISHMENT OF THE FIRST RANGER TRAINING SCHEME

The processes involved in establishing the first Aboriginal ranger training programme in Australia were lengthy and complex. As early as 1965, proposals to establish a national park in the Kakadu area in Northern Australia were put forward. There were a number of conflicting interests, including national park qualities, minerals and Aboriginal land claims. A decision was finally made to grant Aboriginal land rights over much of the area, but with the agreement of the traditional owners most of the land was to be proclaimed as the Kakadu National Park under lease to the Director of the ANPWS.

Following the passage of appropriate legislation to implement the Government decision, a Lease Agreement was signed by the Director and the Northern Lands Council (NLC). As part of the agreement, the Director ANPWS accepted, inter alia, obligations to:

- i) train local Aborigines in skills necessary to enable them to assist in the management of the park;
- ii) employ as many traditional Aborigines as practicable under conditions that recognise their needs and their culture;
- iii) promote among non-Aborigines a knowledge and understanding of Aboriginal traditions, culture and languages.

The Director ANPWS was required to commence an Aboriginal Ranger Training Programme within six months after the national park was declared. Preparatory work had already begun when the lease was signed.

As a direct result of ANPWS involvement in this and subsequent programmes at Kakadu, other programmes have also been developed for South Australia and Western Australia.

ANPWS ABORIGINAL RANGER TRAINING PROGRAMMES

- Kakadu National Park

Programme 1, 1979

The Programme began with the Service selecting a Training Officer who had extensive experience as an educator with Aboriginal communities in the Arnhem Land region. This person spent considerable time discussing the concept of national parks and Aboriginal involvement in their management. In addition, the Training Officer liaised with and sought advice from relevant organisations and Government Departments as well as the NLC and the traditional landowners themselves.

The selection of trainees was a co-operative effort between the NLC, the traditional owners and ANPWS and took place over a number of months. The fact that the trainees were so carefully selected indicates the seriousness with which the Aboriginal people view Aboriginal involvement and participation in the management of Kakadu National Park. Six trainees commenced with the course.

The training programme as developed was a one year course providing experience in law enforcement, wildlife management, protection of Aboriginal art sites, the interpretation of park features for visitors, communication skills and practical day-to-day park management skills, (including visitor management and visitor facilities maintenance). Short components of work experience giving trainees an opportunity to practice new skills was also built in. Because of the trainees' special experience and knowledge of the land and its components the course emphasised a two way flow of information ensuring a mutual learning process that greatly assisted ANPWS understanding of the park.

When developing the non-Aboriginal components of training, the training officer needed to design programmes that accounted for Aboriginal learning styles, which often differ from those of non-Aborigines.

Programme 2, 1980

The success of the first course encouraged ANPWS to initiate a second programme, which commenced in September, 1980. The graduates from the first course and the Training Officer recommended that the number of trainees for the second course should be reduced because of the intensity of training and the need to cater for each trainee's particular needs. Four trainees was thought to be a more appropriate number. The smaller number enabled the programme to be more flexible in tailoring and adjusting to the ongoing needs of the group.

Programme 3, 1982

By this time, widespread interest in training had been expressed from Aboriginal groups both within the region and from other States.

The third programme was modified to incorporate the experiences gained from both the previous courses. A significant addition was the involvement of the Gagudju Association, a newly formed group representing traditional Aboriginal owners in the Park and liaising with ANPWS in all matters of mutual interest. The Association selected the trainees and participated in the oversight of the conduct of the course and monitoring of progress of the trainees.

A fourth programme at Kakadu is scheduled to commence in June 1985. This programme will be further revised insofar as content and conduct is concerned in the light of experience and the greater involvement of the Gagudju Association.

Of the 14 Aboriginal trainees in the three programmes, 11 Aborigines graduated (3 women, 8 men). Seven of those graduates have remained in employment as Rangers to date. The remaining 4 graduates not currently employed by ANPWS resigned (for reasons such as ill health and alternative employment) after each had completed a minimum of two years employment as Rangers.

- Gammon Ranges, South Australia

The Programme, 1983

Based on the success of the Training Programmes in Kakadu formal requests from the South Australian Government were made for ANPWS assistance in the co-ordination of a similar scheme for the Gammon Ranges National Park in South Australia, to train members of the Adnyamathanha people who have traditional ties with the land in the Park.

ANPWS supplied a Training Officer to work with the South Australian National Parks and Wildlife Service (SANPWS) to run the programme.

This programme, although tailored to the needs of a very different situation, followed similar lines to the Kakadu programme. Four trainees were selected by SANPWS and ANPWS in co-operation with the local Aboriginal community. The programme was based in the Park and commenced in March 1983 and ran for 12 months. Three trainees graduated in March 1984.

Where possible, course components were taught by local rangers and were relevant to the Gammon Ranges. The programme also highlighted a good deal of public contact among tourists and special interest groups. Trainees were often placed in situations of promoting cross cultural awareness with non-Aboriginal people (including SANPWS staff).

Like the Kakadu programmes, travel to other parks (including Kakadu) was important in exposing trainees to a wide range of park management issues.

ANPWS is about to assist Western Australia with a training programme. The South Australian Government has also requested a second programme to be conducted in the south east of their State.

BASIC OBJECTIVES OF TRAINING PROGRAMMES

Even though the Gammon Ranges programme differed from the Kakadu programmes, several training objectives have remained constant. ANPWS considers these objectives as basic to all Aboriginal Ranger Training Programmes that it co-ordinates. The objectives are:

- i) to design a programme that is negotiated between Aboriginies, training agency and training officer, that reflects the needs of those involved;
- ii) to promote long term meaningful employment opportunities for Aboriginal graduates;
- iii) to promote a new awareness of Aboriginal culture and lifestyle among Government Departments and the public;
- iv) to equip Aboriginal trainees with the practical skills required in park management;
- v) through training and public contact, to raise trainees' confidence and self esteem emphasising their existing Aboriginal knowledge;
- vi) to equip trainees with the knowledge of European land management principles for conservation;
- vii) to promote a cultural dimension to park management and develop a greater understanding of traditional natural resource management;
- viii) to promote improved relationships via negotiation with Aboriginal communities and the Government agencies involved;
- ix) to bridge any learning gaps trainees may have from their previous education.

THE IMPACTS OF TRAINING PROGRAMMES

The impacts training programmes have had on the training agencies and communities are many and varied. They include:

- * Mutual respect and understanding has evolved between Aboriginal communities and National Parks Services.

The liaison role of Aboriginal graduates between their communities and NPWS has been important in achieving co-operative park management.

- * The opportunity has occurred for Aborigines to participate in a realistic and relevant non-formal training programme which equips them for future employment as well as a chance to promote their own culture.
- * The opportunity for Aboriginal people to interpret their own culture and lifestyle to tourists has been established. Unprecedented interest and enthusiasm from tourists in meeting and talking with Aboriginal Rangers has clearly supported these ventures in the Gammon Ranges and Kakadu National Parks.
- * The promotion (on personal merit) of two Aboriginal graduates to Senior Ranger positions in Kakadu National Park. These men graduated from the first Kakadu Training Programme in 1979.
- * A new era of positive community relations has emerged between ANPWS, SANPWS and the local Aboriginal communities involved. This has occurred as a result of co-operation, management and mutual sincerity in the negotiating processes.
- * In South Australia co-operative park management ventures between SANPWS and Aboriginal communities have been established. These ventures have seen the formation of a committee to address the rights and problems associated with Aboriginal people foraging for protected flora and fauna species on and off national parks.
- * At Kakadu the ANPWS policy of employing non-Aboriginal staff who demonstrate sensitivity to working with Aboriginal people, has provided meaningful opportunities for the development of confidence and personal advancement for Aboriginal rangers.
- * Pride and self esteem have improved in the Aboriginal communities that have been involved in these programmes. The recognition that traditional and cultural knowledge and practices are important to park management is a major contributing reason for this important development.

CONSTRAINTS

Many initiatives aimed at assisting Aborigines have had strong overtones of paternalism and patriotism. It is far too easy for a "dominant" culture to make assumptions as to the needs of the culture they are "assisting".

In these Aboriginal Ranger Training Programmes ANPWS officers have had to continually monitor and question training approaches to guard against assumptions being made that have not been negotiated. Negotiations and discussions with Aborigines reviewing training are often lengthy and at

times complex. Whilst some may see these exercises as time wasting and non-productive, participation of Aborigines in course structure and progress is fundamental - as they own the programme as much as the training agencies.

Apart from Kakadu, where non-Aboriginal staff are selected according to their sensitivity to working with Aborigines, some attitude problems from non-Aboriginal rangers have occurred. The problems are generally focussed on a lack of cross-cultural understanding or awareness.

In response to these problems, ANPWS is in the process of developing cross cultural awareness programmes in co-operation with Aborigines aimed at identifying and resolving issues that non-Aboriginal staff perceive as problems.

ESSENTIAL COMPONENTS FOR SUCCESSFUL CROSS CULTURAL RANGER TRAINING PROGRAMMES IN NATURE CONSERVATION

Based on experience in Aboriginal training programmes, the following components or issues are seen as necessary for the success of Aboriginal Training Programmes. (These principles also apply to any non-formal cross-cultural education programme).

- * A total commitment from the training agency to the funding and operation of such programmes. Any compromise will seriously jeopardise training outcomes and effect relationships between the facilitating agency and Aboriginal communities.
- * A total commitment to permanently employ graduates at the completion of training.
- * Selection of a Training Officer for such Aboriginal ranger training programmes based on their experience in adult Aboriginal education, with qualifications or experience in the biological sciences. In addition, the Training Officer must demonstrate a high degree of empathy and flexibility.
- * The Training Officer must be acceptable to the Aboriginal communities involved in the proposed programme.
- * A long term commitment from each agency is required to follow up and assess the needs of graduates from each programme.
- * The involvement and participation of the relevant Aboriginal communities from which trainees have been selected. This includes participation in trainee selection, programme design and all decisions that affect trainees and their community.
- * A commitment to integrating graduates into existing ranger categories and avoiding the creation of separate employment categories.
- * A commitment to cross-cultural awareness programmes for non-Aboriginal staff working with Aboriginal communities or individuals.
- * Programmes to be park based and combine experiential and theory learning. 'Classroom teaching' needs to be kept to a minimum.
- * The involvement of park staff as teachers of park management and related practical skills.

CONCLUSION

In conclusion, ANPWS wishes to highlight the following key issues concerning Aboriginal ranger training:

- * The contribution Aboriginal people can make to the management of national parks in Australia is unique. Coupled with an increasing concern for the management of our natural resources has come the need to conserve the cultural heritage that is often found only in these natural areas. Australia has recently seen an increase in the number of national parks and the growth of a new awareness about conservation. It is logical that Aboriginal people have an important role to play in the management of these natural resources and their own cultural heritage.
- * Programmes to date have highlighted the valuable contributions Aboriginal people have made to national park management, based on their knowledge and skills in cultural resource management, natural environments and liaison with the public.
- * The recognition and involvement of Aboriginal skills and knowledge of park management has had a profound effect on the Aboriginal rangers. This increased awareness has also had positive effects on the communities from which Aboriginal rangers have come.

The European conservation ethic, combined with knowledge of traditional land management, has been the medium through which community awareness has occurred.

- * The success of the ANPWS programmes is also attributable to the non-institutionalised (non-formal) teaching methods used. The personalised involvement of the ANPWS Training Officers in these schemes has been crucial in supporting and facilitating trainees and graduates through the difficult transitions encountered in employment.
- * Fundamental to the success of an Aboriginal training employment scheme is a total commitment from the training and employment agency. Any compromises in funding or commitment (also for employment) for such schemes will seriously jeopardise the success of programmes and may affect Aboriginal community relationships.

CHAPTER 5: TOURISM

ENVIRONMENTAL EFFECTS OF OFFSHORE TOURIST
DEVELOPMENT ON THE GREAT BARRIER REEF

Graham G. Kelleher and
Ian M. Dutton

CASE STUDY: ENVIRONMENTAL EFFECTS OF OFFSHORE TOURIST DEVELOPMENT ON
THE GREAT BARRIER REEF

Graham G. Kelleher and Ian M. Dutton
Great Barrier Reef Marine Park Authority
Queensland,
AUSTRALIA

ABSTRACT

There is an increasing level of commercial interest in providing tourist facilities at various locations on the Great Barrier Reef. It is envisaged that some of these facilities will comprise either fixed or floating structures. They will have a primary purpose of enabling extended, low-hazard appreciation and experience of coral reefs. Together with related facilities, they are intended to improve and enhance the accessibility of coral reefs to tourists.

The potential environmental effects of such facilities are likely to vary significantly, according to the proposed scale of the structure, its design, location and operating regime. The Great Barrier Reef Marine Park Authority, which is responsible for the care and development of the Great Barrier Reef Marine Park, uses a system of initial classification of offshore tourist facilities when determining their potential environmental effects. This represents a framework for the development of guidelines, and the checklist of factors, to be considered when designing or undertaking environmental impact studies of a particular development proposal.

The paper notes some of the special problems of environmental assessment posed by these types of development, such as the potential localised effects of structural components, wastewater discharge and monitoring requirements. It is suggested that the advantages of increased accessibility and the enhancement of tourist experience offered by such facilities may generally outweigh their adverse effects, provided careful design, siting and operational criteria are applied. One of the environmentally beneficial effects of such developments may be a reduction in tourist pressure on coral cays and continental islands.

INTRODUCTION

Offshore tourism developments (henceforth OTDs) is a generic term which was used by Dutton and Woodley (1984) to describe the range of tourism-oriented structures and facilities which involve some element of construction below low water mark. They include, but are not necessarily limited to, facilities such as permanent vessel and aircraft moorings, landing areas, underwater observatories and floating, bottom-supported and submerged structures.

In the Great Barrier Reef Region, (Figure 1), OTDs are becoming important foci for both day and overnight visitors to the Great Barrier Reef. This trend is expected to be reinforced by both the high level of growth within the tourist industry centred on the Great Barrier Reef Region (Driml and Kermond, 1984), and the increasing demand for reef-based recreational experiences (Whitten, 1983).

OTDs can significantly extend the opportunities for reef users to engage in recreational activities such as diving, snorkelling, reef-walking, photography and fishing in a range of settings. Traditionally such opportunities have been centred on island resorts, or linked with services provided from mainland centres.

Zell (1981) noted at that time there was an unfulfilled demand for the types of opportunities provided by OTDs. He pointed out, however, that a number of major constraints to the provision of OTDs exist. Amongst these, in the Great Barrier Reef Region, the environmental constraints to OTDs are of predominant concern in view of the World Heritage status of the Great Barrier Reef and its inclusion in the world's largest marine park. The Great Barrier Reef Marine Park Authority (the Authority) has the primary responsibility for developing and caring for this marine park.

TYPES OF OTDs

Figure 2 classifies the types of OTDs which exist or may be constructed within the Great Barrier Reef Region. Figure 1 indicates their distribution within the Region. OTDs which exist within the Region at present include moorings for vessels and aircraft, self-guiding under-water trails, helipads and marked landing areas, pontoon docks (used by semi-submersible vessels), permanently moored vessels and under-water observatories.

Several proposals exist for more substantial forms of OTDs, such as floating and bottom-mounted accommodation structures.

Floating accommodation hull complexes may involve refitted vessels, or specially designed modular units in a purpose-built hull. These may be anchored to the seabed. Bottom-mounted complexes may require substantial sub-sea construction or emplacement works. Their construction frequently requires the use of caissons or piling and fill and hence, the maximum practical depth for their construction is 40m (Institution of Engineers Working Party 1984).

POTENTIAL ENVIRONMENTAL EFFECTS

The potential impacts associated with OTDs vary considerably, according to factors such as the scale of the development, its location, usage and purpose. It is possible to classify broad types of impacts common to all levels of development, such as:

- Physical: effects on seabed, water and air quality, geomorphological processes, cyclone hazard, wave action, currents, due to activities such as construction (e.g. drilling, pile driving, structure emplacement), operation (e.g. waste discharge) and accidental events (e.g. oil spills) etc;
- Biological: effects on local/regional ecosystems, individual organisms, unique/endangered species, due to activities such as construction (e.g. displacement of species, effects of shading), operation (e.g. increased fishing pressure), maintenance (e.g. ecotoxicological effects of anti-fouling provisions) and accidental events.
- Social: effects on conservation value, management, user attitudes, perceptions, adjacent communities, accessibility of reef areas, due to construction (e.g. loss of wilderness

atmosphere), operation (e.g. alternative to island resorts, opportunities for low-hazard coral reef experiences, greater user awareness of reef-based recreational opportunities); and

Economic: effects on existing operations, employment/income, local economy, demand for onshore services, multiplier and cumulative effects, due to construction (e.g. demand for construction materials), operation (e.g. regional income generation) and maintenance (e.g. slip requirements) activities etc.

In each of the above broad impact types, it is possible to recognise different periods of impact significance. All phases of OTD development from initial construction to long term operation and maintenance therefore need to be addressed in impact assessment studies.

Isolation and identification of impacts according to type and phase simplifies their subsequent assessment. However, the nature and significance (e.g. positive or negative) of individual impacts is often less clear. While adverse impacts such as loss of species, decrease in ambient air quality, reduction in conservation value can be easily identified, some such impacts may over time convert to beneficial or positive impacts. For example, initial loss of habitat may be compensated by longer term recolonisation of artificial substrate, displaced species may return and locally new species may be attracted (e.g. seabirds and fishes). Loss of conservation value may be offset by consequent benefits in terms of user education and awareness. Similarly, initially positive impacts may become negative, particularly if, over time there is a diminution in the relative attractiveness of the facility to users. These types of changes should, if possible, be identified in the course of environmental assessment and incorporated as appropriate into ongoing management and monitoring programmes.

Quantification and prediction of many of the types of impacts outlined above is rendered difficult because of lack of knowledge about biophysical and socio-economic patterns and processes affected by OTDs within the Great Barrier Reef Region. This is a recurring problem in impact assessment studies, as noted by Beanlands and Duinker (1984) in a review of the experience of three nations (U.S.A., U.K., and Canada) with offshore impact assessment studies.

A further complicating factor in many cases, is the lack of precedent elsewhere. For these, and reasons such as the need to evaluate and identify long-term impacts, monitoring of relevant parameters prior to, and during both the construction and operational phases of major projects is considered essential. A preliminary study on the effects of navigation tower construction in the Hydrographers Passage area of the Central Section of the Great Barrier Reef Marine Park (Fig. 1) by Ayling and Ayling (1984) is indicative of the type of information necessary for baseline and construction-phase monitoring.

It should also be noted that each type of development within the Region poses specific managerial and legal problems which complicate mitigation of the environmental impacts generated by OTDs. The report of the Working Party of the Institution of Engineers (1984) notes that in many cases, OTDs raise issues of State, national and international jurisdiction. These complicate the control of environmental impacts and other areas such as quarantine, health, taxation, safety and building standards. These matters

are presently being considered by the Authority and other Commonwealth and State Government agencies which have responsibilities in such areas, with a view to co-ordinating the application of administrative procedures and legislative powers.

APPROACH THE AUTHORITY

In considering the desirability of allowing an OTD to proceed in the Marine Park, the Great Barrier Reef Marine Park Authority takes the following considerations into account:

- * The Marine Park covers an area of about 350,000 sq. km - larger than the United Kingdom. It would not be sensible to attempt to exclude development totally from such an area.
- * The Marine Park is not a national park in the conventional sense, although it contains national park zones. It is a multiple-use area conforming to Category VIII in the IUCN classification system for protected areas.
- * The Authority's principal goal, derived from the enabling legislation, is to provide for the protection, wise use, appreciation and enjoyment of the Great Barrier Reef in perpetuity, through the development and care of the Marine Park.
- * Activities permitted in the Marine Park should be sustainable - in accordance with the World Conservation Strategy to which Australia subscribes.
- * Developments should be easily removable, in both a physical and economic sense, to provide for failure of the enterprise or changing circumstances (e.g. market influences).
- * OTD's provide a means of allowing people to use and enjoy the Great Barrier Reef without affecting or depending on the comparatively scarce islands of the Region.

The Authority, in consultation with relevant local, regional, State and Commonwealth agencies is developing a systematic approach to environmental management of OTDs. Applications for permission to construct and/or operate an OTD within a zoned section of the Marine Park or in an area where Regulations made pursuant to the Great Barrier Reef Marine Park Act apply, are initially evaluated internally on a case-by-case basis, using the schematic approach outlined in Figure 3.

After identification and definition, proposals are classified and evaluated according to whether they are:

- a. Projects of minor environmental significance - these include projects which are unlikely to significantly alter existing conditions, e.g. boat moorings.
- b. Projects of potential environmental significance but with clear solutions to potential problems - projects where solutions or controls are available through design, construction controls or management, e.g. permanently moored platforms.
- c. Projects of potential environmental significance but without clearly identifiable solutions, or requiring input of expert knowledge -

often requiring more detailed evaluation. These projects may require major design, siting and management controls, e.g. large floating accommodation structures.

- d. Projects of obvious environmental significance - major projects with obvious impacts requiring detailed environmental impact assessment, e.g. bottom-mounted accommodation structures.

The above evaluation may involve both in-house as well as independent study. In this regard, the Authority is funding a study designed to develop guidelines and methodologies for environmental assessment of offshore developments (Cameron McNamara, 1985). It is proposed that the information derived from this study will be of use to OTD proponents/operators, and the Authority in environmental assessment, management and monitoring of OTDs.

Following evaluation, and having regard to the predicted effects of a proposal, the Authority may then approve or refuse an application. If approved, a permit is issued which may impose conditions upon the construction and operation of the proposal. These conditions may be monitored to ensure compliance, and test the validity of previous predictions. Future permits can then be amended to take account of this updated information, as indicated in Figure 3.

In common with other facets of its work in the Great Barrier Reef Region, the Authority has integrated its approach to environmental assessment and management of OTDs with its other programmes, particularly research, planning and park management. As noted previously, the Authority has also sought to integrate its approach and procedures with the operations of other agencies. This co-operative approach is intended to maximise the potential benefits of OTDs consistent with "reasonable use" of the Marine Park, while minimising the potentially adverse effects.

CONCLUSION

OTDs offer new, and often unparalleled opportunities for visitors to see, experience and appreciate the Great Barrier Reef Marine Park. In providing these opportunities, OTDs have the potential to contribute to management of the Great Barrier Reef through increasing understanding of, and the need for, conservation of the resources of the Marine Park. Management through careful environmental assessment, planning and monitoring can help to ensure that the effects of OTDs on the natural attraction upon which they are based are acceptable. In a strategic sense, OTDs can also help to alleviate the environmental pressures on the islands of the Region.

ACKNOWLEDGEMENT

The authors wish to acknowledge the assistance of Pauline Caterer in the preparation of the manuscript and Trevor Shearn who prepared the figures.

Figure 1 Great Barrier Reef Region Showing Spatial Range of Existing and Proposed Offshore Tourist Developments.



Figure 2 Citisnore Tourist Development Spectrum

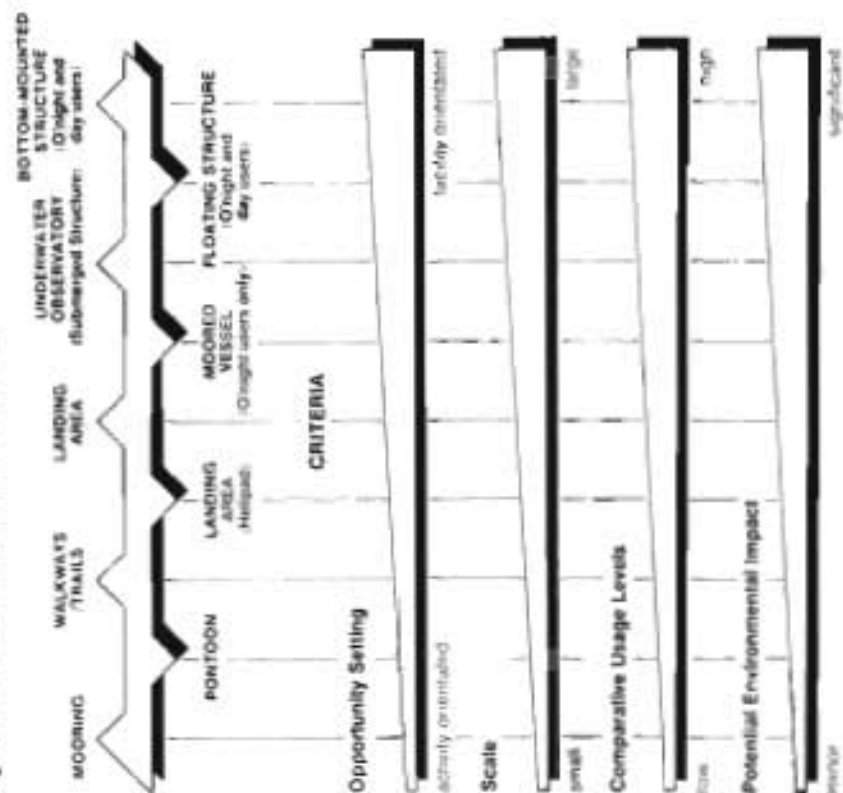
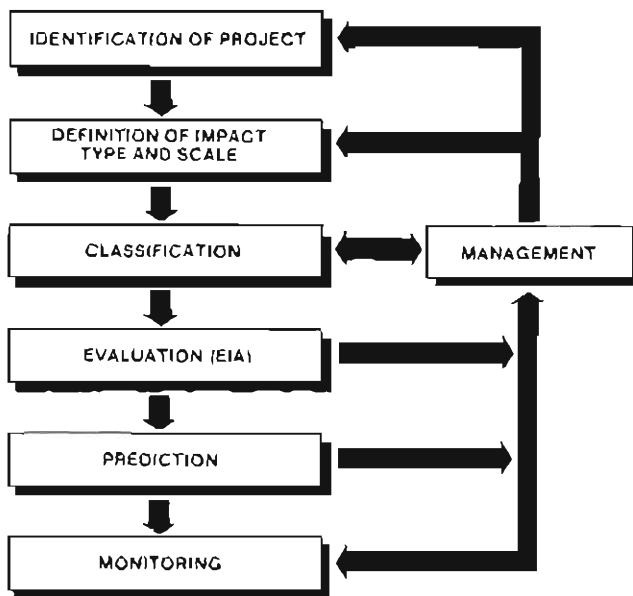


Figure 3 Systematic Approach To Environmental Assessment And Management of QTDs



CHAPTER 6: PROTECTED AREA MODELS AND RESOURCE MANAGEMENT

TECHNICAL ASPECTS OF SUB-REGIONAL CO-OPERATION
ON THE MANAGEMENT OF PROTECTED AREAS
Masahiro Ohta

MICROPARKS IN THE PACIFIC ISLANDS - THE RELEVANCE OF TRADITIONAL
AND MODERN SMALL-SCALE CONSERVATION AREAS IN THE
PACIFIC ISLANDS
Randy Thaman

IRIAN JAYA - THE OTHER SIDE OF NEW GUINEA:
BIOLOGICAL RESOURCES AND RATIONALE FOR A COMPREHENSIVE
PROTECTED AREA DESIGN
Ronald Petocz

WILDLIFE MANAGEMENT AREAS IN PAPUA NEW GUINEA
Office of Environment and Conservation,
Papua New Guinea

NEW ZEALAND FOREST PARKS: A MULTIPLE USE MANAGEMENT MODEL
FOR THE SOUTH PACIFIC
John Holloway

OWNER INVOLVEMENT IN THE ESTABLISHMENT OF PARKS
Birandra Singh

ENDANGERED SPECIES MANAGEMENT NEEDS IN THE COOK ISLANDS
Conservation Service, Cook Islands

FERAL ANIMAL ERADICATION PROGRAMME
KIRITIMATI, KIRIBATI
Wildlife Conservation Unit, Kiribati

KEY ISSUE PAPER: TECHNICAL ASPECTS OF SUB-REGIONAL CO-OPERATION ON
MANAGEMENT OF PROTECTED AREAS

Masahiro Ohta
United Nations Environment Programme (UNEP)
Regional Office for Asia and the Pacific

I believe one of the purposes of the Third South Pacific National Parks and Reserves Conference is to encourage collaboration amongst governments on ways and means of achieving protected area objectives in South Pacific countries through sub-regional co-operation. My office, in collaboration with ASEAN countries, has had some experience with a sub-regional environment programme in the field of nature conservation and protected area management. This paper discusses the ASEAN experience which I believe has some relevance to the Pacific region and is concerned in particular with the more technical aspects of achieving co-operation in protected area management.

ASEAN countries have established new categories of protected areas known as ASEAN Heritage Parks and Reserves. They selected a group of national parks and nature reserves having outstanding wilderness and other values which were identified by the ASEAN Experts Group on the Environment at their sub-regional meeting first held in December 1978 in Jakarta, Indonesia. The Expert Group members were keenly aware of the uniqueness of a number of their national parks and reserves and recommended that they be given the highest recognition so that their importance as protected areas would be appreciated nationally, sub-regionally and internationally. This approach was endorsed by the Second ASEAN Ministerial Meeting on Environment held in November 1984, Bangkok, Thailand, which made the official ASEAN Declaration on Heritage Parks and Reserves which included the following areas:

1. Brunei Darussalam
 - a) Tasek Merimbun

2. Indonesia
 - a) Leuser National Park
 - b) Kerinci - Seblat National Park
 - c) Lorentz Nature Reserve

3. Malaysia
 - a) Kinabalu National Park
 - b) Mulu National Park
 - c) Taman Negara National Park

4. Philippines
 - a) Mt. Apo National Park
 - b) Iglit - Baco National Park

5. Thailand
 - a) Khao Yai National Park
 - b) Kor Tarutao National Park

The Second ASEAN Ministerial Meeting also accepted the ASEAN Agreement on Conservation of Nature and Natural Resources. Official signing of the Agreement is scheduled for the ASEAN Foreign Ministers' Meeting in July 1985 at Kuala Lumpur, Malaysia.

ASEAN countries have already formulated Appendices I and II of the ASEAN Agreement on Conservation of Nature and Natural Resources. Appendix I is the ASEAN Endangered Species List which is considered very important as it provides a means by which ASEAN countries are able to regulate the trade of endangered species and help protect valuable fauna and flora, especially those species found in protected areas.

The ASEAN countries have also undertaken to formulate a master plan for each ASEAN Heritage Park or Reserve. These master plans or general management plans explain the basic concept of each protected area and the manner in which it will be managed. Although some ASEAN countries have already formulated master plans, UNEP, in collaboration with the U.S. National Park Service, will provide countries with an expert to develop a model master plan framework for either modifying existing master plans and/or forming a basis for developing new plans. The expert will also participate in the Fourth ASEAN Meeting on Nature Conservation which will be held at Kuala Lumpur, Malaysia in October 1985. I believe the master plan framework will become a most important tool in ensuring the effective future management of these protected areas.

Each protected area has a specific purpose or purposes and I would like to introduce, as an example, the approach to selection developed by the ASEAN countries. Under Appendix II of the ASEAN Agreement on Conservation of Nature and Natural Resources ASEAN countries have established Principles, Criteria and Guidelines for the Selection, Establishment and Management of a (Regional) Network of Reserves. These are:

- (1) maintenance of the essential ecological processes and life-support systems;
- (2) preservation of genetic diversity;
- (3) maintenance of species diversity of plants and animals within their natural habitat;
- (4) ensurance of sustainable utilisation of resources;
- (5) provision of opportunities for outdoor recreation, tourism, education and research to improve public recognition of the importance of natural resources.

The ASEAN approach emphasises the wide range of management objectives to be achieved by protected area management authorities. Most important in this respect is the identification of zones within protected areas to be managed for specific purposes. For example, the entrance area should be used for visitor facilities such as parking lots, toilets and restaurants. Access trails should be developed in areas of outstanding scenic quality and/or rich native flora, fauna and natural habitat to assist visitors to enjoy protected areas and understand their importance. Zones containing fragile ecosystems can be designated as strictly preserved areas with entry restricted to authorised people. Similarly, entry to breeding places such as bird colonies, bird nesting areas and spawning grounds could be prohibited during the breeding season.

Other areas can be designated as buffer zones providing for local community use under specific conditions. Thus the zoning of protected areas is one of the important components of master plans for protected areas and each protected area management authority should formulate a land-use planning or zoning approach to management based on an appropriate scientific survey of the area and the identification and protection of its special features.

I assume that the objectives of most national parks in the South Pacific sub-region have already been identified and that governments in the region are making efforts to achieve these objectives. However, in spite of their best efforts, there appears to be a number of problems associated with protected area management in the South Pacific. These are not necessarily peculiar to the South Pacific region and it is unfortunately common that park authorities in developing countries often do not have enough technical knowledge, equipment or financial and staff resources to achieve their objectives effectively.

Another of the biggest and most common problems facing park management authorities in developing countries is the conflict between visitor use of protected areas, local people's demands to utilise natural resources within the areas, and the major objective of protected areas; the preservation of natural and cultural resources for future generations.

In some countries encroachment by local people into protected areas has created many problems for the effective conservation of valuable natural resources. Local people often illegally hunt and/or trap animals, cut trees for charcoal production and for fuel wood for cooking and graze their cattle in protected areas. These activities may cause serious damage to the natural ecosystems within protected areas but nevertheless, it must also be recognised that the natural resources within protected areas are often essential for the survival of local people and the maintenance of their quality of life. In many cases their utilisation of these natural resources is in accordance with their traditional lifestyle. There is therefore, a need for an educational programme for local communities on the impact of these practices on protected areas.

In this regard, I would like to introduce some examples of the Japanese national park management system. The basic concept of the Japanese park system is very much different from those in most countries of the world. The Environment Agency is primarily responsible for the management of national parks and other protected areas but does not own the land. Most of the lands within protected areas are owned by the National Forestry Agency and other national government ministries, agencies and departments, local governments, private sector organisations and individual citizens. The Natural Parks Law clearly states that all concerned people and organisations are also responsible for the management of parks. In this respect the Environment Agency plays an important role as co-ordinator of protected area management.

When a landowner within one of the protected areas wants to build structures such as houses, buildings, dams, roads, etc, and/or cut trees, mine minerals and undertake any other activities which may have an adverse effect on the natural environment, he/she must obtain permission to do so in advance from the Minister of the Environment Agency. In a case where the Environment Agency does not give permission to the landowner because of the likely impact of the proposal on the ecology or landscape of the area, the Environment Agency should compensate the landowner for the loss he/she suffers.

All the national parks have their own master plans which guide their management. Each national park is divided into three categories; specially protected areas, special areas and ordinary areas. The specially protected areas are predominantly strictly regulated areas where permission must be obtained even if people want only to take a plant specimen, a fallen leaf or a fallen branch. In an ordinary area, local people may be allowed to utilise natural resources only on a sustainable basis, examples being a traditional crop farming/forestry operation which is combined with replanting after harvesting and outdoor recreational activities.

The special areas are divided into three categories; the first class, the second class and the third class, each of which has its own criteria for the regulation of landowner's activities.

The national park management system in Japan stresses the importance of the role of the park system in contributing to the development of local communities through sound watershed management, promotion of tourism, provision of outdoor recreational opportunities, the strengthening of local and traditional handicraft industries, the provision of educational opportunities for local school students, and many other benefits. However, within the South Pacific countries and in other developing countries generally, utilisation of the resources of protected areas by local communities should be confined to clearly defined buffer zones, or special use areas and should not encroach upon the important core natural areas which form the key elements for preservation in the area.

I would also like to stress the importance of scientific surveys of the natural, physical and cultural resources for protected area management. Clearly master plans or management plans should be formulated on the basis of scientific data on the natural and physical resource characteristics of the area, e.g. the vegetation, forest type, diversity of fauna, together with the relationship of species and communities to the various ecosystems. Data on geomorphological and other physical characteristics such as climate, rainfall etc. is also important in the formulation of the resource data base for management planning. The traditional lifestyle and culture of local communities is another of the important elements of national park planning and can be a source of strong visitor interest.

The collection of scientific data on natural and cultural resources usually takes time and manpower. Unfortunately, most park authorities have insufficient manpower to conduct surveys and collaboration with universities and other institutions may be essential if this task is to be completed. Most national parks have typical island, coastal areas and/or mountain ecosystems which are very attractive to scientists from all over the world. I suggest therefore, that if they have not already done so, protected area management authorities in the region encourage overseas scientists to carry out field research in their parks and reserves. Such research should be permitted only on the condition that the scientists submit a copy of their report to the park authorities. Similarly, when TV crews and/or movie crews utilise parks to film the environment or unique ecological features of a particular park, the managing authority should authorise their activities on condition that the producer provide a copy of the film and/or tapes. Thus the utilisation of outside assistance can help park authorities to collect scientific data and other information. When new data comes to hand it may be necessary and appropriate to improve and revise the master plans and/or management systems.

Another important element of national park management is the visitor service programme. It is desirable that all visitors should recognise the national and international significance and the dynamic nature of the ecosystems of protected areas while enjoying their stay in these areas. They should be educated to appreciate the need for the protection and maintenance of important natural and cultural environments. It is also important that education programmes do not neglect local people who should also be aware of, and appreciate, the significance of these areas.

In formulating the visitor service programme, scientific data on aspects of the resource such as geology, topography, vegetation, fauna and cultural features is essential. Analysis of the visitor use pattern and local people's needs are also necessary. The programme planners should analyse the existing conditions of the parks and should identify the programme's objectives and interpretive themes. Interpretive aids such as wayside exhibits, visitor centres, publications and conducted tours of the area aimed at the local people, local students, domestic visitors and foreign visitors should then be developed.

Although it is very common to identify the names of trees, mountains, rivers, etc. in protected areas, this type of information is not enough. Visitors should be able to understand the ecosystem relationships in the area and be interested in nature itself as well as local culture. For example, stranglers, liana, plank buttress and cauliflory are very popular features in tropical forests in this region. Visitors may be very interested to learn about the unique characteristics of the strangler tree. Similarly they may also be interested in Nepenthes which are popular species of insectivorous plants. Visitors from urban areas may be interested in plants which could be used as medicines, while other visitors may be interested in local uses of native plants. Local history, particularly where this highlights changes in the conditions of and patterns of use of a protected area is also of considerable interest.

Another important aspect of an education and interpretation programme is the importance of sustainable natural resource use and this should be stressed. Exposure to education and interpretation programmes will greatly enhance visitors' appreciation of protected areas and the important scientific, cultural and economic role they play in society.

As mentioned earlier, it is apparent that park authorities in South Pacific countries often need experienced staff, equipment and financial and other essential resources to manage their protected areas. I believe, that effective co-operation in areas such as the exchange of information, management experiences and park staff can help to overcome these problems. In this regard, the workshop for park managers which follows the conference and the ministers' meeting will be most beneficial and are positive steps towards fostering regional co-operation as is the formulation of the Action Plan for the Establishment and Management of Protected Areas in the South Pacific.

KEY ISSUE PAPER: MICROPARKS IN THE PACIFIC ISLANDS - THE RELEVANCE OF
 TRADITIONAL AND MODERN SMALL-SCALE CONSERVATION AREAS
 IN THE PACIFIC ISLANDS

Randy Thaman
 University of the South Pacific
 FIJI

INTRODUCTION

All undeveloped or developing nations want "development". It seems to be the political imperative of their leaders. Development, however, often refers to western-inspired, capital-intensive urban-industrial development which has so often only served to widen the gap between the rich and the poor. As argued by many, such development has in fact led more to the "under-development" rather than to the "development" of these societies and their natural and cultural resources. Under-development has occurred in the sense that resources have been plundered, environments destroyed, land alienated, labour exploited, social organisations weakened, time-tested resource-use systems and empirical knowledge lost, malnutrition increased, and the young and bright being lost in the "brain drain" to urban areas in the name of "modern development".

The purpose of this paper is to examine the possible role of a system of "microparks" as one means of reversing this trend of "under-development" and in spreading the benefits of modern development more widely to the many Pacific Islanders who seem to benefit little from current capital rather than labour intensive development strategies adopted by many Pacific Island governments.

More specifically, the paper examines how a system of "microparks" (small-scale traditional and modern systems of parks or conservation areas) could, when considered along with a system of large-scale national parks and conservation areas, provide a basis for a more appropriate multi-scale strategy for development and for the conservation of nature and natural and cultural resources in the small island states of the Pacific.

It attempts:

- 1) to briefly examine the development dilemma, where development on the national or international level seems to result in under-development at the local level;
- 2) to briefly examine the wider conservation movement and the development of systems of national parks and conservation areas as a positive step in minimising such under-development;
- 3) to define what the "microparks" are or could be, and to briefly examine the state of existing "micropark" development in the Pacific Islands;
- 4) to suggest how the promotion and development of extensive systems of "microparks" in both rural and urban areas, could be an important component in furthering the objectives of national park and conservation area development in the Pacific Islands; and finally;
- 5) to suggest strategies for micropark establishment and development which might best facilitate the conservation of nature in the South Pacific in the most equitable and economically, culturally and ecologically appropriate manner.

THE DEVELOPMENT DILEMMA

Where "development" comes in the form of the "Green Revolution", the introduction of new cash crops and associated imported agricultural inputs, luxury tourism, industrialisation, containerisation of sea cargoes, improved academic (or even technical) education or urbanisation in general, most of the benefits seem to accrue to the already well-off people in urban areas rather than to poorer people in rural areas. This is the development dilemma; how do we ensure that "development" develops everyone rather than developing some while under-developing others?

There are ominous signs of an over-emphasis on economic and commercial development by the managerial elite in the Pacific and associated environmental degradation and social and economic deterioration are increasingly visible in the region. However, the situation does not seem to have reached the critical, perhaps irreversible stage, that it has in other regions. As Klee (1980) suggests, although many traditional cultures and their ecocultural strategies have disappeared from the earth, some including many Pacific Island cultures, have maintained a high degree of cultural integrity because "several of their ways of life have assets which seem especially valuable to modern-day ecological problems".

The critical question, however, is whether the rapidly emerging Pacific Island "managerial elite" (Pacific politicians, policy-makers and community leaders) will, like the Mayans be "blind to the environmental signs of our times" (Brown, 1982). Thus, the time is right for the Pacific islands managerial elite to capitalise on the wealth of traditional, social and scientific technologies still existing in the Pacific, to evolve development strategies based on a synthesis of appropriate traditional and modern models. The road is fraught with problems, yet the prospects in the Pacific islands for sustainable future ecologically and sociologically appropriate eco-development are considerable, perhaps greater than in any other region on earth.

THE CONSERVATION MOVEMENT

The conservation movement is seen by many as one type of "development" which could play a very major role in reversing this trend of the ecologically- and socially-destructive over-emphasis on commercial development for short-term gain, which seems to be under-developing "developing countries". The conservation movement is different because its stated objectives are "the management of environmental resources (plants, animals, air, water, minerals and even man) to achieve the highest quality of human life ..." (thus protecting) "nature, particularly natural systems of plants and animals, from change or destruction so that they can continue to be of service to man (human societies) into the future" (Dahl, 1980).

In short, conservation is long term, with its very focus being to control or stop the thoughtless, short-sighted plundering of often irreplaceable plant, animal, human and physical environment resources. The conservation movement, in fact, may be even more critical in the island environment where resources are limited, ecosystems exceptionally fragile, and where because of the isolated and fragmented nature of the islands, human societies have, out of necessity, had to remain truly inter-dependent components of their island ecosystems. One of the most visible aspects of the conservation movement is the move to establish systems of national parks and conservation areas.

THE NATIONAL PARKS AND CONSERVATION AREA MOVEMENT AND MICROPARKS

The increasing interest on the part of Pacific Island governments in the establishment of systems of national parks and reserves constitutes a very positive trend in the world-wide conservation movement. The widespread support given by Pacific Island governments to the South Pacific Regional Environmental Programme (SPREP) Action Plan is also a welcome indication of an increasing recognition of the need for conservation and maintenance of both natural and cultural island resources as a basis for any sustainable long-term development.

As with any "modern development", however, including the conservation movement, it is important to ask whether such development will "trickle down" to, and benefit rural and poor people, or, as with many other types of developments, will it develop only the few and "under-develop" the many? In short, who benefits and is this the best way to achieve the stated development objectives of the conservation movement? More specifically, is large-scale, often capital-intensive and national-level park and conservation development the best way to ensure that the perceived benefits of conservation are spread equitably throughout a society or country? It is argued in this paper that perhaps a re-orientation of thinking away from, but not excluding larger park and conservation area development to a greater emphasis on small or local-level micropark development may in fact lead not only to a wider distribution of benefits, but also could cost less, could result in greater total conservation, and may have a more long-lasting impact on Pacific Island societies.

MICROPARKS IN THE PACIFIC

1. A Definition

A micropark is defined as any small-scale, local-level park or conservation area which does or could serve the purpose of preserving important natural and cultural resources for the long-term sustainable use of local people. The protection of cultural as well as natural resources is stressed.

Although, some isolated islands, native mountain forests, stands of coastal strand forest, isolated reef patches, and the reef slopes of most islands are often considered "natural" or wildland areas, most other areas bear very clearly the imprint of thousands of years interaction with Pacific societies. In short, most islands in the Pacific, particularly those of the eastern Pacific, are now cultural ecosystems which have evolved over millennia as a result of the inter-dependence of Pacific societies and their natural resources.

Thus, microparks could range from village or community reef and lagoon reserves, forest and wildlife reserves, uninhabited resources islands and seabird rookeries to rural and urban subsistence agricultural reserves, village fish or crocodile ponds, fuel wood plantations, village or community and school germ plasm collections and nurseries, ancient village sites, botanical gardens and pesticide-free or fire-free agricultural zones (see Table 1). In all cases, whether in natural or in highly humanised areas, such microparks would hopefully ensure that these areas and resources would be preserved from exploitation or used on a sustained-yield basis.

2. Marine and Aquatic Resource Reserves

Marine and aquatic micropark development could include village or community reef and lagoon reserves, stream, river or lake sanctuaries, and fish or crocodile ponds. (Table 1).

2.1 Community Reef and Lagoon Reserves

Perhaps most critical to the smaller islands of the eastern Pacific, but also to coastal societies in the western Pacific, would be strategies to ensure sustained-yield use of reef, lagoon and other marine resources. As stressed by Klee (1980), "the types and importance of marine conservation in Oceania dwarf all other forms of traditional conservation practices". Systems of marine tenure and the existence of skilled traditional "conservation officers", local "fisheries ecologists", or "master fisherman" have played and continue to play prominent roles in ensuring that marine resources are not over-exploited and that appropriate areas are placed under at least temporary restrictions or prohibited use.

Putting limits on the seasons when and the size, number or species of fish that could be taken were components of many marine tenure systems. This is essentially exactly the same as the season opening and closing dates, fishing limits and size restrictions which are imposed today on fishing licence holders by "fish and game departments" in most metropolitan countries like the United States, New Zealand and Australia. In Ponape, for example, apprentice fishermen were "taught that it was bad to catch more fish than could be consumed". If more fish than were needed were caught they were commonly smoked and thereby preserved (Johannes, 1981).

The use of fish poisons and stupificants, which if used in excess, can and have devastated fishing stocks in lagoons and rivers throughout the Pacific, was also controlled more rigidly in the past. Both Gaigo (1982) and Johannes (1981) relate how in the Port Moresby and Palau areas, the use of *Derris* root ("tuha" and "dub" in the two areas respectively) was controlled so that the crushed root was not placed or left under the coral heads so as to avoid extensive small fish and coral kills after sufficient fish had been acquired.

Recently, on Ono-i-Lau in the south-east of Fiji, a chief has proclaimed an offshore island a sanctuary for the protection of giant clams (*Tridacna* spp), which have recently been over-exploited, both "legally" by local fishermen and illegally by Taiwanese and South Korean tuna boat crews, in the face of very low world tuna prices.

Another recent form of maricultural development, along similar lines, is the "vasuva (Tongan name for some forms of *Tridacna* spp.) ring" which has been proposed under the SPREP Action Plan. The "vasuva ring" is essentially a village *Tridacna* reproduction reserve. In such reserves, approximately 100 mature giant clams would be collected from distant sources and placed permanently in a circle in a protected sandy lagoon area some 3 to 6 metres deep near villages, where they could reproduce and "seed" surrounding exploitation areas. Whereas, 10 to 15 years ago most

Tongan villages still had nearby giant clam resources, they are now having to go out six to nine kilometres to procure this very important and highly desired source of protein. The projected high reproduction rates in these "vasuva rings" would hopefully improve the situation (Chesher R. 1984). Johannes (1982) reports that a similar, but less elaborate system operates in Manus in Papua New Guinea, where "giant clams are collected and held in walled enclosures on the reef until they are needed in rough weather when fishing is difficult".

Modern examples of what could be considered marine microparks are Hanauma Bay State Marine Park on Oahu in Hawaii and Ha'atafu Marine Park on the western tip of Tongatapu Island, Tonga. At Hanauma Bay, which was developed by the State of Hawaii, all exploitation of marine flora and fauna is restricted. This has turned the area into a major tourist attraction as well as a successful wildlife preservation reserve. Ha'atafu, likewise is a major recreation site for both tourists and local residents, but the area remains relatively "fished out" due to non-enforcement of legislation and limited advertisement of both its conservation function and the existing legislation. Tonga, which became the first Pacific country to establish such small-scale ('micro') marine sanctuaries, has, in addition to Ha'atafu Beach, established three other marine parks off Pangaimotu, Monuafe and Malinoa islands north of Tongatapu (Carter, 1984). Similar but less formal developments have been reported by Swadling (1982) of the East Sepik Province Papua New Guinea and in New Britain.

Finally, Johannes (1981) describes how such systems, although very protective of marine fisheries resources, were in fact also quite flexible. Owners commonly allowed neighbours to fish in their waters for subsistence purposes. Unfortunately, as has been the case in many other areas, increasing monetisation, the opening up of markets for fresh fish and improved fishing nets, boats and fishing tackle has led to over-fishing and the breakdown of traditional marine tenure systems and associated conservation practices.

2.2 Community Freshwater Reserves

There is also considerable scope for "micropark" freshwater development by giving sections or tributaries of rivers or streams or sections of lakes or ponds reserve status. Such fresh-water fishing reserves would of course be more important on the larger islands in the western Pacific, although freshwater finfish, prawns and eels are also traditionally important protein sources in some of the recent high volcanic islands groups to the east, such as the Samoas and French Polynesia.

As in the marine environment, traditional freshwater fisheries also operated under a limited entry rights system into what was often a fishery (e.g. a river system) which "was in reality a series of small sub-units subject to different pressures". The effectiveness of the conservation aspects of such an arrangement depended greatly on whether the species present were migratory or highly mobile or sedentary (Haines, 1982).

Haines (1982) stresses, however, that traditional freshwater fisheries conservation practices are slowly being eroded due to the growth of urban populations who disregard such tenure arrangements, changes in fisheries technology, increasing commercial exploitation of the resource by villagers themselves, and increasing population pressures, new technologies, industrial, agricultural, and mining pollution, indiscriminate use of *Derris* root (and sometimes pesticides), the introduction of the aggressive tilapia, (*Tilapia* spp.) and increasing sales of freshwater prawns and freshwater clams (*Batissa violacea* or "kai") on a commercial basis have severely reduced native freshwater prawns, clam, eel and fish populations.

This is a serious situation, considering the critical traditional importance of freshwater aquatic protein to non-coastal populations (Haines, 1982; Thaman, 1982), and is an area where local-level micropark reserves are vitally needed.

2.3 Community Aquaculture

There is also considerable scope for the development of both marine and freshwater aquaculture. Traditional fish pond culture, primarily of milkfish and mullet, is still practised on Molakai, Hawaii, and a very intensive system of milkfish culture has been practised in landlocked Buada Lagoon on Nauru since pre-European contact times. Cultured pearl, oyster, prawn, milkfish, and other maricultural activities are currently providing income and protein in Kiribati, French Polynesia, New Caledonia, Fiji, Hawaii and the Torres Strait Islands. Seaweed is being successfully raised for export in pond culture in Tonga, and milkfish exports to the United States and Nauru from ponds on Kiritimati (Christmas) and Tarawa in Kiribati were worth \$660,000 in 1981 (Carter, 1984).

In Papua New Guinea, once endangered freshwater and estuarine crocodiles are now raised on village crocodile farms, where they provide both valuable protein and cash earnings (Montague, 1981). Some doubt, however, has been expressed as to the future of crocodile farms as a conservation measure, because the need to stock farms has in some areas, only served to increase hunting pressure on declining wild populations (Burgin, 1982). Nevertheless, if sufficient breeding stock can be obtained to reproduce on a sustained-yield basis, it should be possible to maximise the conservation, food supply and commercial benefits of crocodile farming.

It has also been suggested that, where irrigated taro and rice cultivation are practised (without the use of pesticides and excessive inorganic fertilisers), combined agri- and aquacultural systems could yield surprising quantities of freshwater fish, eels, prawns or crayfish and shellfish (Spriggs, 1982). Traditional pond field rice framing, which is still practised by Indian farmers in Fiji and irrigated taro cultivation which is still practised in Vanuatu, New Caledonia and Fiji provides some scope for such hybrid aquacultural system development, especially based on the culture of exotic *Tilapia* spp., which are already widespread in wells and lowland agricultural and road drains throughout Fiji.

2.4 Future Management Potential

Marine and freshwater aquatic resources are, and will continue to be of critical value for both subsistence and commercial purposes in the Pacific. Given the wide range of traditional and recently introduced strategies that have been or are currently employed for their management, the role of a systematic "micropark" strategy to protect and encourage such development on the local level is indeed considerable.

3. Forest and Wildland Vegetation Reserves

There is a wide range of forest or wildland vegetation reserves that could classify as microparks. These include areas of tropical moist forest, mixed montane forest, secondary forests, mangrove, coastal strand and swamp forests, exotic forest stands and community wood lots, as well as a wide range of savannah and other wildland vegetation types.

3.1 Family or Community Forest Reserves

Clarke (1971), for example has described how marine communities of highland Papua New Guinea restrict use of sacred groves or "komung" which are thought to be inhabited by spirits, and which not only serve as sources of seed for the recolonisation of forest trees, but also as hunting reserves (Klee, 1980). Clarke (1977), in a later article on "The Structure of Permanence: The Relevance of Self-subsistence Communities for World Ecosystem Management", relates how the Maring consciously avoided clearing primary forest for gardening, and generally only cleared secondary forest areas which they regarded as productive capital to be preserved as a "garden mother" "out of which would issue later sustenance".

Mangroves are traditionally protected in many areas because of their value in retarding coastal erosion, as important sources of and breeding habitats for marine and estuarine food organisms, as well as major sources of firewood and other valuable products such as medicines, dyes and timber. They are reportedly protected in Truk and Ponape where they are still appreciated as "fasteners of the shore". (Fischer and Fischer, 1957).

In the modern context, governments, such as the Tongan and Fijian Governments, have officially prohibited the cutting or clearing of mangroves, but this as such, although very beneficial, would not constitute micropark development. Moreover, such laws are often not strictly enforced, and mangroves are still being cleared very rapidly in Fiji. Dahl (1980), similarly, reports of some existing and proposed, often small-scale reserves which would serve to protect mangrove resources, such as the Talele Islands Provincial Park in East Britain which protects eight islands ranging from 2 to 40 hectares, which have mangroves, beach forest, coral reefs and seabird and turtle nesting areas. If local communities were encouraged, through systematic conservation education programmes to enforce these laws on a village-level, a system of local mangrove ecosystems could be developed.

The practice of preserving areas of coastal strand forest also seems to be common. At the northern end of the island of Onotoa in southern Kiribati, there is reportedly a traditional forest reserve of *Pisonia grandis* trees ("te buka") which constitutes an important source of famine food and a favourite nesting area for sea birds of considerable dietary importance. Dahl (1980) also cites examples of existing strand vegetation protection legislation, and suggests the establishment of additional atoll forest reserves on islets of Butaritari and Nonouti Atolls in Kiribati.

One area where such coastal strand species micropark development is particularly critical is in Nauru where by the end of the century, all of the original "iyo" (*Calophyllum inophyllum*) forest will have been destroyed by open-caste phosphate mining. These forests, which often included groves of planted edible *Pandanus*, other culturally important plants, and nesting areas for the black nobby tern (*Anous tenuirostris*), a ceremonially important food (Thaman, 1982), were and are critically important cultural and ecological resources (Manner, Thaman and Hassall, 1984). Preservation of selected groves, especially those which still exist on currently unexploited rocky "islands" on the plateau ("topside"), should be encouraged either by the landholding groups themselves or by the government, possibly with appropriate compensation to landowners in an attempt to preserve what still remains of the Nauruans' natural heritage.

Perhaps, more widespread, however, is the practice of mixed secondary forest and tree cropping reserves. Clarke's "garden mother" areas would fall into this category. In Fiji's Ra Province in northern Viti Levu, for example, village secondary forest reserves surrounding villages, known as "drukudruku", are protected as accessible sources of a wide range of traditional tree-food products, medicines, dyes, fish stupificants, firewood (generally in the form of dry fallen wood), wild yams and ferns, etc. This practice is also common in Rewa and Tailevu Provinces and other areas throughout Fiji.

Limited entry also served a conservation function in relation to forest and wildland resources. "Control of forest resources was based on territoriality and it was in the interest of forest dwellers to act as caretakers for forest systems, if they did not, their means of survival would cease to exist" (De'Ath, 1982).

Allen (1976) stressed the role of traditional "forestry ecologists" who acted as conservation officers looking after trees, garden crops and making ecological decisions relating to the protection or exploitation of a given area. In the Lau Islands of Fiji, this took the form of the "Vaka Vanua", a custodian of forest produce and of crops, whose duties were to monitor the local food supply and to place restrictions (tabu) on its use accordingly. These traditional forestry ecologists reportedly had the power to control the cutting of particular trees or entire stands, the harvesting of fruits, leaves, bark or any other product of the tree, and the planting of trees as crops (Klee, 1980).

3.2 Exotic Forest Reserves or Woodlots

In heavily deforested areas, such as in the highlands of Papua New Guinea, the highly degraded niaouli (*Melaleuca leucodendron*) savannas of New Caledonia, and the "talasiyga" (sunburnt) grasslands of many of the islands in the Fiji group, the planting or preservation of village or community woodlots based on exotic species, such as Caribbean pine (*Pinus caribaea*) may serve a similar micropark or forest reserve purpose. Aside from improving the distribution of scarce forest resources, such forests seem to induce positive environmental changes that could allow for the subsequent planting of less hardy native and other culturally-valuable tree species as is done in less-degraded areas.

The establishment of such "microparks" has already been common throughout Viti Levu where Fijian villages, Indian cane farmers, and agricultural resettlement scheme members (e.g. in the Lomaivuna resettlement scheme in the 1960's) have been encouraged to plant woodlots of Caribbean pine, West Indian mahogany (*Swietenia macrophylla*), and to a lesser extent, various *Eucalyptus* and food tree species. Similarly, in New Caledonia in 1981, 554,054 trees were planted on over 504 hectares of niaouli and scrub land, a large percentage by Melanesians in village woodlots (Carter, 1984).

3.3 Fuelwood Plantations

The critical importance of fuelwood and its shortage in many areas of the Pacific has been stressed by Siwatibau (1981), Thaman and Ba (1979), and Thaman (1984a and 1985a). Although in a similar category with community woodlots, community, village or individual fuelwood plantations could also classify as an environmentally, culturally and economically beneficial type of micropark development.

Giant fast-growing varieties of *Leucaena* which have been developed in Hawaii, as well as other species, such as *Eucalyptus* and *Acacia* species, which have already been established in fuelwood plantations in Fiji's dry zone (Bell and Evo, 1982) and also offer great promise for fuelwood plantation micropark development.

4. Wildlife Reserves and Resource Islands

Pacific societies had and still do have a wide range of strategies for restoring, maintaining and increasing game populations. Klee (1980) stresses that habitat maintenance, game reserves, game laws and restrictions over the use of certain sacred plants and animals all played a role in conserving wildlife resources. Thus traditional areas and practices could successfully form the basis of wildlife microparks.

There are numerous examples of Pacific peoples who had systems of uninhabited resource islands which they periodically visited. Cook Islanders from the island of Atiu still claim rights to birds, bird eggs and copra on offshore islets. Tobin (1952) in Klee, (1980) relates how a number of northern atolls and specified individual islets of Erikub atoll in the Marshalls have served as game reserve

"from time immemorial". The island of Jemo, for example has been a source of turtles, birds and turtle and bird eggs for neighbouring atolls and are treated with utmost sacredness.

The protection of turtle nesting areas seems to have been particularly widespread throughout the Pacific. For example, Bipi islanders in Manus, traditionally owned the six nearby Sabben Islands which have significant nesting populations of marine turtles (Spring, 1982). Similarly, it is reported that in Yap, long voyages are made to uninhabited traditional "resource islands" where turtles are captured using elaborate methods. For example, Statawal islanders still sail 10 to 15 hours from their protein-scarce island to the uninhabited atoll of West Fayu 47 miles away. Turtle feasts are conducted there and live turtles transported back to Satawal where they are distributed by chiefs (McCoy, 1974).

Spring (1982) reports that there are already several wildlife management areas set up or proposed for the conservation of marine turtles in Papua New Guinea. Dahl (1980) similarly reports the existence of a greater number of established and proposed wildlife protection areas, turtle nesting sites and seabird rookeries throughout the Pacific, many of which would qualify as "microparks".

Other somewhat unique modern developments in the area of wildlife "micropark" development include the establishment of "butterfly farms" in Papua New Guinea and the first animal sanctuary in Fiji. Butterflies (including the economically-important giant bird-wing butterflies), once endangered due to habitat destruction and plundering by collectors (vying for part of the \$10 to \$20 million per year world-trade), are now being successfully reared on a commercial basis near Papua New Guinea villages, where important food plants have been planted (Pyle, 1981). In Fiji, the 79 hectare Yaduataba National Crested Iguana Preserve was established on village land off of Vanua Levu in 1980 as a sanctuary for the endangered endemic crested iguana (*Brachylophus vitiensis*) (Gibbons, 1984).

5. Water Quality Reserves

Given increasing population densities and widespread use of inorganic fertilisers, pesticides and other potentially toxic substances, water pollution will be an increasingly worrisome problem in the Pacific.

There is thus a need to establish water quality reserves or "water microparks" where activities, such as clothes washing, domestic and human waste disposal, use of agricultural chemicals, etc, are prohibited.

Although there is evidence of traditional water quality reserves, where selected sections or tributaries of streams were reserved for use as domestic water supplies, water quality control seems to be an area where management is more complex than for other resources. Ownership is often perceived in terms of first user. There are, however, examples of strong taboos against the pollution of drinking water supplies, with pigs and chickens being kept away from ponds and small streams by fences. Such barring of pigs, cattle and other animals is important because, as Feachem (1977a) in Spriggs, (1982) states, "a great majority of the faecal polluting material is of non-human origin".

Haiveta (1982) discusses the importance of pure water to village life, and describes how non-traditional communally-owned wells were looked after and maintained by the village women. Although there is only limited evidence of sophisticated systems for water quality protection, there is an increasing need to designate water quality reserves to ensure that rapidly increasing urban and rural populations are not faced with the considerable health hazards related to pollution of domestic water supplies by agricultural chemicals and industrial and human wastes. The establishment of such areas is particularly important on the low-lying atolls, especially in areas such as Betio islet of Tarawa atoll in Kiribati and Ebeye islet of Kwajalein atoll in the Marshall Islands, where population densities are among the highest in the world.

At the very least, concerted attempts must be made to establish water quality protection zones where possible, both on rivers and streams and near appropriate ground water sources, especially on atolls and in coastal areas. One such example, was the closure to tourists in the late 1960's of the track along the river to the beautiful Fataua Falls on Tahiti in order to protect what was Papeete's main freshwater source.

As Peachem (1977b) has stressed, even on the larger, wetter islands there is, throughout the Pacific, localised limited access to water. As of 1970, it was estimated by the World Health Organisation that, in the Western Pacific alone, 59 million people (79%) did not have reasonable access to safe water.

6. Agricultural Reserves

6.1 Critical Importance of Traditional Agriculture

Agriculture is still the life blood of most Pacific Island societies. As stressed by Clarke (1977), most traditional agricultural systems:

- 1) did not depend on imported inputs,
- 2) were not self-poisoning,
- 3) had highly positive net energy yields,
- 4) depended on renewable rather than non-renewable resources (e.g. fossil fuels and phosphate fertilisers were not used),
- 5) spread the energy yields and other products fairly evenly among the communities involved,
- 6) used environmental resources as if they were 'productive capital' to be preserved or only slightly modified for future generations, and
- 7) provided subsistence diversity through "polycultural" rather than monocultural practices.

In short, they were diverse tropical "agroecosystems" (Janzen, 1973), which evolved over thousands of years in response to both the local environmental conditions and the subsistence (and more recently cash) needs of a given society. As suggested before, Pacific agricultural systems were generally not seen as being separate from, but rather as integral parts of wild environments, thus incorporating montane, lowland, savanna, grassland, riparian, swamp, mangrove and strand vegetation and their wild products and ecologically regenerative attributes as integral parts of "natural" Pacific island "agroecosystems".

Bulmer (1982) stresses that although not all agricultural practices of pre-contact Pacific societies were ecologically conservative, many were. He points out that: "conservation of resources required to sustain the subsistence sector (in the broadest sense) of rural economies is a very urgent priority". As numerous other writers have also stressed, the destruction of time-tested traditional and modified agricultural and food systems may in fact be the most serious consequence of the over-emphasis by developing countries on capital-intensive development along Western lines. If this is true, then their preservation must be seen as at least of equal importance to the conservation of wildland areas. Because Pacific "agroecosystems" are generally community or household based, it should follow that systematic small-scale, local-level, "micropark" conservation of such systems, throughout all countries of the Pacific, would be the logical course to follow. Such micropark development could include subsistence agricultural reserves, urban garden reserves, community irrigation projects, school garden reserves and pesticide-free or fire-free agricultural zones (Table 1).

6.2 Subsistence Agricultural Reserves

Subsistence agricultural reserves where cash cropping, especially monocultural cash crop production, is prohibited or controlled is possibly the most direct means of ensuring that time-tested Pacific Island agroecosystems are not destroyed. By establishing such zones throughout Pacific countries, it should be possible to systematically encourage, with the support of legislation, education and extensive activities, the revival or at least maintenance of the polycultural diversity, inbuilt insurance and high degree of self-sufficiency that characterised such systems.

Such reserves could take the form of village or non-village rural lands where ploughing, tree-felling, the use of inorganic fertilisers, pesticides, fire and monocropping were prohibited. It could, for example, include coffee growing areas, where the use of chemicals was prohibited, and where intercropping with subsistence or local food crops for cash sale was required by agricultural officers.

The re-establishment and protection of traditional intensive systems of taro cultivation, which would also qualify as local-level micropark development, has been suggested by Spriggs (1980 and 1981) and Thaman (1984c) as possibly one of the most ecologically and appropriate means of increasing local agricultural production. Examples of such reserves would include:

- 1) community irrigated taro terrace reserves, similar to the irrigated terraces where mainly *Colocasia* taro was cultivated from New Guinea to Hawaii in the past and still cultivated in New Caledonia, Vanuatu and Fiji;
- 2) areas for drained swamp *Colocasia* taro cultivation, as is still practised in Solomon Islands, Fiji, Samoa, the Cook Islands, French Polynesia, and other areas of the Pacific;

- 3) areas for pit or excavation (down to the freshwater lens) cultivation of taro (mainly *Cyrtosperma*, but also *Colocasia* and *Alphoncia* taros) as practised primarily on the low-lying atolls of Micronesia and Polynesia (Thaman, 1984c).

Thus the conservation of or promotion of traditional intensive taro cultivation, which was very ecologically conservative in terms of water and soil conservation, may be seen as a priority in terms of its potential role in reversing dangerous trends of social, economic, nutritional and ecological deterioration and can be achieved in microparks.

6.3 Urban Garden Reserves

It is in urban areas where food dependency and ecological and social breakdown are most widespread. It has been suggested, therefore that the encouragement of urban gardening adjacent to homes, on undeveloped urban lands, and in urban garden reserves would be one of the most direct means of improving the situation (Thaman, 1977, 1982b, 1984d). Although Thaman stresses the economic, nutritional, technological, social and ecological appropriateness of urban gardening in Papua New Guinea and Fiji, it is probably no less important in most other Pacific Island urban areas. As the Solomon Islands Committee on Food Supplies (1974) has argued: "We believe that non-cash or so called 'subsistence incomes' are more important in towns, and cash incomes more important in rural areas than has been generally recognised".

There would seem to be great scope for further development of urban garden reserves or allotment systems throughout the Pacific. The "allotment system", found throughout urban and peri-urban areas in the British Isles, is possibly the most successful example of urban agricultural "micropark" development there is. An attempt was made in Fiji, under the auspices of the YMCA and the National Food and Nutrition Committee (NFNC), to set up a similar reserve with 68 plots for landless tenants of high-rise government housing areas in Suva. Although very successful at the onset, poor drainage and tidal incursion has limited its expansion.

The very fact that so much urban gardening already takes place underlines its considerable potential for systematic expansion and improvement. Given the right policies, possibly including appropriate education, the appointment of urban agricultural research and extension personnel (as has been done in Port Moresby), and the development of laws which encourage urban gardening, it should be possible to expand it as a form of "micropark" development throughout the Pacific.

6.4 School Garden Reserves

School garden reserves, in, adjacent to, or outside school compounds, like urban garden reserves, could be an excellent means of micropark development for furthering the preservation of both traditional and ecologically appropriate modern agricultural development. Such reserves, would optimally put stress polyculture, traditional crops and crop varieties, and tree cropping, in addition to the common practice of having

school children only plant imported seed crops, often for the expressed purpose of sale, rather than using school gardens to educate children as to the time-tested appropriateness of the traditional polycultural rural systems from which they have often been "kidnapped"! The ability of schools to establish highly polycultural gardens was demonstrated in 1979 in the Fiji National Food and Nutrition Committee (NFNC) and The Fiji Times National School gardening competition, during which many schools planted over 50 species of food plants.

6.5 Specialised Agricultural Zones

In addition to subsistence, urban and school agricultural reserves, there is also considerable scope for the establishment of specialised zones within both subsistence and commercial agricultural areas. In such zones practices not in the best long-term interests of the environments or the agricultural systems and peoples involved, could be prohibited. Examples, as suggested above, might include zones where the use of pesticides, fertilisers, ploughs and fire are prohibited, or zones where it is illegal for landholders or tenants to cut trees or reclaim marginal lands such as mangroves, coastal strand forest, etc. The long-term ecological benefits of establishing such areas are obvious. There is conversely, also the need for zones where appropriate new technologies, which might improve the environment, are encouraged or required.

7. Germ Plasm Collections, Botanical Gardens and Nurseries

The maintenance of "artificial" collections of native and exotic plant species is yet another means of preserving the natural and cultural heritages of the Pacific. Both Maenu'u (1977) and Powell (1977) have stressed the critical importance of plant resources (many of which are endemic and most of which have not been studied "scientifically") as a basis of life. Powell (1977) argues that even in New Guinea, where population densities are relatively low, "the modern developer has the chance to destroy not only one of the richest floras of the world but also one of the few remaining centres of diversity of many of the tropical crops". The possibilities for such "micropark" development could include community germ plasm (plant species and variety) collections, botanical gardens and nurseries of school nature reserves, plant collections and nurseries.

7.1 Community Germ Plasm Collections, Botanical Gardens and Nurseries

The establishment of community germ plasm or crop and plant variety collections must be seen as a conservation activity of the highest priority. Attempts to systematically establish germ plasm collections at the national level on agricultural experiment stations are common in the Pacific. These collections are, however, often neglected when civil servants or overseas experts leave or are transferred to other areas. Moreover, there has generally been only limited availability of the cultivars or species in these collections to the people throughout a country. In Tonga, for example, the Forestry Department's nursery at Tokomololo, Tongatapu, serves mainly urban dwellers in the capital city of Nuku'alofa and as a source of seedlings for government replanting schemes (Thaman, 1984c). The collection of

seed from sacred or endangered species and cultivars is also very ad hoc rather than systematic.

Community-based microparks in the form of germ plasm collections, botanical gardens or nurseries, would undoubtedly have a much greater spread effect, both educationally and in terms of serving peoples conservation and plant-material acquisition needs on the local level. As stressed by Pernetta, Morauta and Heaney (1980), such programmes could draw upon and reinforce traditional knowledge concerning crop plants and would be critically important in the conservation of genetic resources and of the maintenance of locally adapted varieties of important subsistence crops. This would also hold true for important wild plants.

Successful botanical gardens have been established in Lae and at the University of Papua New Guinea in Port Moresby. Somewhat more neglected ones have been established near Honiara and in Suva. Such gardens could be considered "micropark" development, and if designed appropriately could serve a very important conservation function, as well as serving as living science laboratories and educational reserves.

7.2 School Nature Reserves, Botanical Gardens and Nurseries

Possibly one of the most appropriate means of achieving the dual purposes of fully integrating both traditional and modern conservation knowledge into the formal educational process, while at the same time establishing a system of microparks would be, where possible, to encourage or require all schools to develop botanical reserves. These could include school nature reserves in wildland in areas nearby, school botanical gardens, in which both native and traditionally important cultivated and wild plants are planted and maintained, school nurseries, where children can raise plants, many of which they bring from relatives who still have or grow them, or, as suggested above, school garden areas, where children can establish traditional multistorey polycultural gardens based mainly on traditional crops and agricultural practices. Dwyer (1980) similarly, has suggested that a system of reserve areas associated with all community schools could play an important role, not only as foci for recording and teaching traditional knowledge and developing an appreciation of that knowledge, but also as a system of conservation areas (microparks) in their own right. Pernetta, Morauta and Heaney (1980) stressed that such an approach could go hand in hand with the careful planning of future reserves.

8. Sacred Reserves

One final type of conservation, which could classify as micropark development would be the protection or rehabilitation of ancient village sites, sacred groves, areas under periodic taboos, and a range of archaeologically or historically important sites. Such sites would be best protected at the local level, as they often have such great spiritual or religious significance, that outsiders may not be allowed to visit, let alone develop such areas. Where appropriate some could, of course, have economic value as tourist attractions.

The Fiji National Trust, for example, has recently declared a traditional ring ditch fortification ("bai ni valu") at Nasiny about 7 kilometres from Suva, a national historical reserve. This type of micropark development is an excellent start, and could possibly serve as an example and as an educational device to re-acquaint the younger generation with the traditional significance of the "bai ni valu", and perhaps encourage the rehabilitation of other "bai ni valu" throughout Fiji, as a system of historical and archaeological microparks. Other examples occur in Tonga where many extended families formerly reserved small sacred forest groves as family cemeteries or "mala'e" and in Vanuatu where an ancient irrigation system has been restored on the island of Anatom (Anneityum). There are perhaps many other similar projects which could qualify as micropark development.

THE ROLE OF MICROPARKS IN FURTHERING THE CONSERVATION MOVEMENT

As stressed by Dahl (1980), in examining why the conservation of nature is so important: "Man depends on nature for much of what he needs to live, and indeed lives within a natural ecosystem". To further paraphrase Dahl, he argues that although "many modern needs are met through manufacturing or agriculture, all of these activities ultimately depend and will in most cases continue to depend on natural ecosystems and their resources".

As non-renewable resources, such as phosphate, fossil fuel and other minerals run out, human societies will need to turn more and more to "natural systems to find alternative materials and processes on which to base civilisation". This would probably be even truer for the Pacific Islands because of fragmentation, isolation, small size and the relative absence of non-renewable resources.

Perhaps, most relevant, however, in terms of the conservation and national park movements, is that many of what Dahl calls "alternative materials and processes on which to base civilisation" already exist, or I should say still operate in the Pacific Islands. They are already there to be conserved, perhaps most appropriately in microparks on a local level, because of the very cultural and geographical fragmentation and isolation of individual islands, mountain valleys and discrete cultural groups from one another. What, in fact is needed, is the establishment of a system whereby governments encourage each community to conserve their own lands and the associated traditional marine, freshwater, forest, wildlife, agricultural, and social conservation strategies. Thus, it should be possible, not only to more widely and equitably conserve valuable natural resources, but to also protect human societies which are still integral and caring components working in harmony with once natural ecosystems.

The critical importance of land (and its resources) to Pacific societies is perhaps nowhere better summed up than by Ravuvu (1983) in his book, "Vaka i Taukei: The Fijian Way of Life" wherein he describes the significance of "The Vanua (Land)" to Fijian society:

The Fijian term, "vanua" has physical, social and cultural dimensions which are interrelated. It does not mean only the land area one is identified with, and the vegetation, animal life and other objects on it, but it also includes the social and cultural system--the people, their traditions and customs, beliefs and values, and the various other institutions established for the sake of achieving harmony, solidarity and prosperity within a particular social context.

Its social and cultural dimensions are a source of security and confidence. It provides a sense of identity and belonging. One feels good and comfortable when he feels that he belongs to a particular "vanua" or a social unit identified with a particular territorial area in which its roots are established. It is the place where he or his forbears were born and brought up, and where he prefers to die. In its spiritual dimension, it is a source of "mana" or power to effect things. It is the place where his ancestors preceded him and in which their spirits or souls linger and watch over the affairs of those who come after them. The "vanua" contains the actuality of one's past and the potentiality of one's future. It is an extension of the concept of the self. To most Fijians, the idea of parting with one's "vanua" or land is tantamount to parting with one's life.

He goes on to say that:

The land and water areas belonging to a "vanua" (tribe) or "yavusa" (clan) are generally of four main classes. They are the "quele ni teitei" (gardening land), the "veikau" (forest land), the "veikau" (founding ancestors' house sites) and the "qoliqoli" (fishing area).

These areas, of course, seem to match almost exactly the types of areas which have been suggested as appropriate for micropark development. In other words, these are the areas that, from the perspective of at least Fijians, would be priority conservation areas.

The situation is perhaps similar elsewhere. Although all villages would obviously not have all the same types of forest, reef, river, savanna, or agricultural systems and archeological sites that villagers and, hopefully, professional conservationists, geographers or anthropologists might identify for protection, it is conceivable that, if all villages in a country were encouraged through education, legislation and other means, to conserve representative sections of "areas" that they have, it might be possible, to preserve at least some examples of almost all representative ecosystems found in a country. This would be done, of course, at the local level, wherever these natural or cultural ecosystems happen to exist... in most cases on the land of Pacific peoples.

CONCLUSION

1. Potential for Micropark Development

Many examples of "micropark" development have been suggested. Some "microparks" have already been established by governments and other institutions. Countless areas that could qualify as microparks have already been established and maintained for thousands of years by Pacific Islanders at the community level, although many of these ecologically and socially appropriate models have been lost or adversely modified by modern equipment. The potential for micropark development is almost unlimited, in fact, for the conservation-minded, there is conceivably a nationwide system of microparks that could serve almost any long-term development objective.

2. Who should be involved

Almost any individual, group or agency could be made responsible for or become involved in micropark development. Table 2 lists some of these; there are undoubtedly many more.

The point is, that everyone must become involved, especially at the local level, with governments and other "supralocal" agencies, including external aid donors and consultants, providing the educational, extension, infrastructural and, where necessary, direct financial support to encourage local people, through self-help programmes, to develop their own lands for their own and the nation's long-term benefit. These agencies could, however, also be encouraged to become directly involved in micropark development, when appropriate. In the case of governments, they should keep on the alert for appropriate pieces of government and freehold land or islands, such as exist in Fiji, and consider using them or purchasing them (in the case of freehold land) for park development, rather than selling them to wealthy overseas buyers who have, in some cases, developed them as citadels of capitalistic affluence and materialism. This is not to rule out the possibility for allowing sale of such lands to buyers who are willing to develop such areas as ecologically appropriate "microparks" or even "macroparks".

3. Need for Education and Research

Any systematic micropark development must be supported by a comprehensive education and propaganda programme. There is, thus, a critical need for multi-media public (non-formal) and formal education programmes to provide the "re-indoctrination" of people at all levels of society as to the critical importance of their natural environment and their time-tested resource and land-use strategies: the real basis for sustainable long-term development. In short, environmental awareness is necessary among politicians and decision-makers, lawyers and professionals as well as the population at large (Pernetta, Morauta and Heaney, 1982). Such programmes must also be focussed on and include women as well as men, because women are increasingly taking on proportionately more responsibility for subsistence and conservation activities, as men become more involved in the cash economy (Rogers, 1980).

There is likewise a need for applied research which can improve existing understanding of traditional and modern environmental perception, possibly with an applied component, e.g., setting up of pilot microparks or using the research exercise itself to make people feel that existing micropark strategies are critically important to modern development. Particularly important, as stressed by Pernetta, Morauta and Heaney (1982) is the need for feedback from research in the vernacular to the societies under study, and the greater use of village collatorators in research to maximise the impact at the local level.

There is also a need for more appropriate formal environmental education, with particular emphasis on incorporating traditional environmental knowledge and resource-use strategies into the curricula. As Pernetta, Morauta and Heaney (1982) stress: "Western-style development models and administrative systems, the influence of international funding agencies on research priorities, the Western-style education system, and the lack of trained national manpower all conspire to under-value traditional knowledge and practice and render its application difficult".

4. Constraints to Micropark Development

Although the potential for micropark establishment and the practical application of traditional conservation practices is great there are

also a number of constraints, many of which have been identified by Baines (1982).

4.1 Colonial Administrative Models

As stressed by Baines, village based conservation development is often frustrated by "an administrative system inherited from colonial power, a system that evolved in social, political and environmental circumstances quite different from, that in which it is now being applied". For such bureaucracies to survive, they must, by necessity, generate revenue through the often short-term exploitation of rural, mineral, forestry, fisheries and agricultural resources. This in itself is one of the major contradictions of development...for the centre to develop the rural areas are often under-developed.

4.2 Economic Development Ideologies

As stressed before, the current focus on the macroeconomic benefits of large-scale resource development, on cash-cropping and cash-employment on one hand, and the widespread negligence of the subsistence sector and traditional conservation practices, on the other, have severe long-term cultural and ecological limitations. Hopefully such emphases will change, thus facilitating microdevelopment of rural areas.

4.3 Modern Technology

The impact of modern technology and the long-term impacts of large-scale development projects, which depend on such technology, is "beyond the perceptions of traditional communities and the capacities of their environments to adapt", and may in fact render traditional conservation practices ineffective in such severely modified environments.

4.4 Reduced Effectiveness of Land, Freshwater and Marine Tenure Systems

The fixing and recording of traditional tenure boundaries and land alienation have, on one hand, reduced the base for traditional micropark preservation, while, on the other, have aided economic development by allowing individuals, rather than the larger communal groups, to allow outsiders and possibly inappropriate development to proceed, free from the other divisive and costly disputes with right-holding groups.

4.5 National Pressures

There will always be pressure groups within a country, usually from the young "urban educated", in urban areas, who will favour modern large-scale export-oriented development over development models which stress self-reliance and ecological stability at the local level. These, as Baines (1982) argues, arise out of "differences in perception of resources and environment, and differences in attitudes towards development and traditional conservation practices.

4.6 International Pressures

Experience shows that international funding agencies, individual foreign aid donors and transnational corporations are often environmentally insensitive, are occupied with maximising economic, rather than social or environmental returns on their capital investments and have little knowledge of or pay little heed to traditional conservation practices. Consequently, most over-funded resource and infrastructural development projects and overseas-aided park development has usually been in the form of large-scale "macro" projects with their high visibility and "economies of scale".

5. Microparks and the Conservation Movement in Perspective

The success of the micropark and conservation movement could in fact ultimately depend on whether or not the Pacific Islands' managerial elite can capitalise on traditional systems of land and resource tenure and conservation at the local level through the widespread establishment of systems of microparks. This is not to suggest that there won't be a need for the establishment of some large-scale parks in areas of particular scenic or scientific importance or in areas which might be needed to provide wild land and cultural amenities to growing urban populations and tourists.

If, however, the majority of people in Pacific countries and territories are to benefit from the national parks and conservation movement, the bulk of thought, finance and effort should be put into micropark, rather than the more monumental macropark development. Although larger national parks, modelled along Western lines are definitely beneficial, they are not the only, and possibly not the best model for the Pacific Islands. It is perhaps time for the Pacific Island managerial elite and associated aid donors and technical bodies to see "Small As Beautiful" (Schumacher 1973). Dwyer (1982) argues, similarly, that legislation modelled to facilitate the establishment of large parks and reserves:

...seeks to conserve wildlife in an anonymous sense. It is distanced from the people whom hopefully it is intended to serve. Its compatibility with traditional practices may be largely beside the point once those practices are removed from their traditional setting. In a country that is consciously altering relationships between people and nature, the conservation of wildlife must ultimately be dependent upon public attitudes.

Micropark development at the local level would not be anonymous, it would serve those whom it was intended to serve, and its success would depend on the people themselves. It should follow, then, that if some of the effort and monies now funnelled into the conservation movement, were used to convince people at the local level that conservation is in their own best long-term interests, that the people themselves would develop and maintain their own systems of microparks. In short, given a change in emphasis, it should be possible to use microparks for macrodevelopment!

TABLE 1.

EXISTING AND POTENTIAL TYPES OF PARKS OR CONSERVATION AREAS
WHICH COULD BE CLASSIFIED AS "MICROPARKS"

Village or Community Reef and Lagoon Reserves

Stream, River, or Lake Sanctuaries

Village or Community Fish or Crocodile Ponds

Family or Community Forest Reserves

Exotic Forest Reserves or Wood Lots

Fuelwood Plantations

School Nature Reserves

Village or Community Wildlife Reserves

Uninhabited Resource Islands

Sea Bird Rookeries

Village Butterfly Reproduction Reserves

Water Quality Reserves

Subsistence Agricultural Reserves

Urban Garden Reserves

Community Irrigation and Erosion Control Projects

School Garden Reserves

Pesticide-free Agricultural Zones

Fire-free Agricultural Zones

Village or Community Germ Plasm Collections and Nurseries

Government or Municipal Botanical Gardens

School Botanical Gardens

Ancient Village Sites

Sacred Groves

Areas Under Periodic Taboo

TABLE 2

GROUPS OR AGENCIES THAT COULD BE MADE RESPONSIBLE FOR OR BE INVOLVED
IN "MICROPARK" DEVELOPMENT OR MAINTENANCE IN THE PACIFIC ISLANDS

Individual Citizens

Customary Landholders

Village Councils

Housing Estate Residents

Co-operative Societies

National Governments

International Aid Agencies

Appropriate Ministries and Departments

City Councils

Housing Authorities

Service Organisations

Schools and Education Departments

Museum and National Trust Bodies

Religious Organisations

Hospitals

Penal Institutions

Tourist Organisations

Private Corporations

Timber Companies

?

?

?

CASE STUDY: IRIAN JAYA, THE OTHER SIDE OF NEW GUINEA:
 BIOLOGICAL RESOURCES AND RATIONALE FOR A COMPREHENSIVE
 PROTECTED AREA DESIGN

Ronald Petocz
 WWF/IUCN Project Leader for Irian Jaya
 Jayapura,
 INDONESIA

INTRODUCTION

As part of the overall strategy to integrate conservation into developmental planning in Irian Jaya, the WWF/IUCN programme in the province, initiated in 1980, has been assisting the Government of Indonesia in identifying a comprehensive system of protected areas. Prior to the inception of this project, numerous reserve proposals were presented to government from different quarters. Many of these proposals contained constructive recommendations and contributed in stages of successive approximations to the comprehensive reserve design which we have produced in concert for our hosts (Schodde, 1973; FAO, 1978; 1981; Schultze-Westrum, 1980; Diamond, 1980, 1981; Lever, 1980). This comprehensive terrestrial reserve plan is now approved in principle by the government and will form the cornerstone of conservation policy in Irian Jaya. Many of the individual reserves still await formalisation through gazettal. However, the importance attached by government to these conservation areas has been reflected in recent proposals to nominate the two largest reserves in the province, the Lorentz (1.5 million hectares) and the Mamberamo-Foja (1.44 million hectares) as Asean Heritage Sites. Both areas have also been recommended as National Parks.

This paper presents the major considerations applied in identifying and defining the reserve components within the protected area design for Irian Jaya. A brief review of the physical and biological characteristics of the province is presented as a background to the discussion and to generate an appreciation of the richness and diversity for which New Guinea is renowned. The protected area system is reviewed illustrating how the various reserves fit the biological design criteria.

The system of provincial and national planning in Indonesia has allowed the formulation and approval of a reserve system based totally on biological principles and values. The next stage after gazettal will focus on developing management plans and reserve zoning for selected priority areas. For this we shall rely heavily on the knowledge and co-operation of local residents in each area whose participation in formulation and implementation of the plans is absolutely essential. If success at this stage can be achieved, our efforts in Irian Jaya will be justified as one of the most ambitious conservation initiatives in the Pacific Basin.

BACKGROUND

The Human Perspective

Irian Jaya is the largest and eastern-most province of Indonesia with an area of 410,660 km². It forms the western part of the island of New Guinea and shares a common border of 736km with Papua New Guinea. The province is sparsely populated with some 1.3 million people, about 800,000 of which are indigenous Melanesians. Concentrations of agricultural peoples occur

in the Central Highlands, particularly in the Baliem Valley, Paniai Lakes and Anggi Lakes area of the Bird's Head. The remaining majority are located in nine coastal towns (Figure 1).

At present, there are 254 airstrips in the province (Figure 2). These have acted as magnets drawing isolated peoples from the hinterland into a more integrated society. Here, education and health facilities have been made available to the people, and a government administrative infrastructure exists in various developmental stages at each post. But particularly in the highlands, the convergence of people into agricultural settlements near and around the airstrips has exacerbated problems of wood supply and land available for rotational agriculture.

In the next five years, the government plans to settle about 700,000 transmigrants, most in the agriculturally suitable areas on the southern coastal plains. This along with an ambitious road building programme, the rapid development of oil exploration and exploitation, together with logging and the construction of new sawmill facilities will permanently change the face of the province.

The Physical Perspective

The general physiography of the province is shown in Figure 3. The Central Dividing Range is the backbone of New Guinea and the most prominent physiographical feature of the island. It contains the highest mountain in Southeast Asia, Mt. Jaya (4,884m), and the only equatorial glaciers in this part of the world. The Cordillera effectively divides New Guinea into two major lowland areas: the hilly northern coastal plains and the flat-lying southern plains, while the constriction in the landmass at the western end of the Range separates the Bird's Head from the rest of the mainland. In Irian Jaya, eight outlying mountain blocks occur separate from the Central Range, and a structural low north of Cordillera, the Lakes-Plains, hold the province's rich inland swamps. Mainland Irian Jaya is fringed by two groups of offshore islands; those to the north in Cenderawasih Bay, and the Raja Ampat Islands to the West. Lying just south of the equator the province falls within the humid tropics, but the climate and weather patterns are largely influenced by topography. A distinctive monsoonal climate is present in the dry southeast which falls in the Australian rainshadow.

Regional Biogeographic Relationships

The geological events which led to the formation of the New Guinea landmass and its topographic features are complex and of great significance in determining its biogeographical relationships. In brief, part of New Guinea once formed the northern tip of Australia when both were a part of the ancient super-continent of Gondwanaland that began to break up and drift away from its position in the southern latitudes in mid-Cretaceous times, about 100 million years ago. A segment of this supercontinent, the Indian Australian Continental Plate, drifted north from its polar position and collided with the westward moving Pacific Oceanic Plate. Continental migration from the low latitudes, orogenic activity associated with the colliding crustal plates and the fluctuations in sea level with pulses of glaciation have been the major factors in determining biogeographical relationships in this region and on the island itself.

New Guinea's distinctive biota is a unique mixture of Asian and Australian forms. In its position on the northern part of the Sahul Shelf, (the Australian Continental Plate), New Guinea has had intermittent land

connections with the Australian sub-continent since the Cenozoic, but it has never been connected by land to the Indonesian islands to the west which lie on the Sunda Shelf (The Eurasian Continental Plate). It has thus been the meeting place and cross-roads of colonising and dispersing forms originating from both Southeast Asia (over sea) and Australia (over land and sea).

Floristic elements as far north as present day China migrated eastwards into the Pacific arena, whilst elements from Australia and through Australia from Antarctica dispersed overland through vast latitudinal changes. For here on New Guinea's mountain slopes just below the equator we find northern oaks and acorn bearing trees from south China alongside Antarctic beeches and southern gymnosperms. Although New Guinea forms the eastern-most part of the Malesian floral region, its inclusion is determined by the preponderance of western derived taxa which dominate the lowlands (van Balgooy, 1976); its montane flora is dominated by southern or Antarctic forms.

The fauna is equally complex and lies at the cross-roads of two of the six major zoogeographic regions of the world: the Oriental Region and the Australian Region (Figure 4). Research over the last decade has challenged the zoogeographic concept that New Guinea forms a part of the Australian Faunal Region (Walker, 1972; Tyler, 1972; Gressitt, 1982; Axelrod and Raven, 1982). Climate, it is argued, has played a more important role rather than land connections in determining overall immigration to New Guinea. Immigrants have been limited to certain of the birds, reptiles, amphibians and confined to monotremes and marsupials among the mammals (Gressitt, 1982). The insects however, are primarily Oriental, as are more than half of the mammals (rodents and bats) (Gressitt, 1982), and probably as many as 2/3 of the frogs may have their origin in the Oriental Region or Wallacea (Zweifel and Tyler, 1982).

Flora

Within the abundant assortment of habitats and landscapes spread over an altitudinal range of nearly 5,000m, Irian Jaya contains the richest concentration of plant life in all of Indonesia (Figure 5). With the exception of the monsoonal rainshadow in the southeast, the province's luxuriant forests lie entirely within the tropical rainforest belt and contain a floristic diversity of tremendous proportions. About 16,000 species of plants of which about 90% are endemic are found on New Guinea (Hope, pers comm.). Among the angiosperms, 1,465 genera have been recorded with at least 124 endemics. Also interesting is that about 1/3 of the angiosperms (2,770 species) are orchids (Millar, 1978). The lowlands contain the widest expanse of pristine tropical rainforest to be found in Southeast Asia, the largest mangrove formations in all of Indonesia, and the world's largest reserves of Sago (*Metroxylon sagu*). About 85% of the province's natural vegetation is still undisturbed and vast areas in the interior have yet to be explored.

Fauna

Of the 199 land mammals now known to occur in New Guinea Irian Jaya has 154 species, with 95 endemics, 51 indigenous, and 10 introduced elements (Ziegler, 1982; Petocz and de Pretes, 1983; Petocz, 1984). The following orders are represented: Monotremata (2); Marsupialia (52); Chiroptera (49); Carnivora (1); Rodentia (49) and Artiodactyla (2). The first two orders are largely affiliated to the Australian Zoogeographic Region, whilst the others are more closely allied to the Oriental Region, or have

been introduced by man (only 10 species). Of the 93 endemic species, 41 occur among the monotremes and marsupials, whilst there are 52 amongst the bats and rodents. Among the endemics are the Long-beaked Echidna (*Zaglossus bruijnii*), some of the phalangers, bandicoots, ring-tails, and of course the tree kangaroos and true giant rats.

The avifauna is even more diverse and is also the best known vertebrate group with at least 640 species occurring in Irian Jaya (Pechler and Finch, 1983; Petrocz et al., 1983; Petrocz, 1984). These include 270 endemic species among which are the very famous birds of paradise and bowerbirds, many of the honey-eaters and colourful parrots and pigeons, including the world's largest pigeons the Goura or Crowned pigeons. The island takes its name 'Pulau Cassowary' from this curious flightless bird, the largest naturally occurring animal in New Guinea. Although the avifauna is largely Australian, certain elements such as the Papuan Hornbill (*Mythicorpe plicatus*), tree swifts, shrikes and sandpipers are Oriental in origin and do not extend into Australia (Pratt, 1982).

New Guinea's herpetofauna includes 252 reptiles, with 89 species of snakes, 150 lizards, 2 crocodiles and 6 each of marine and freshwater turtles (Scott et al., 1982; Allison, 1982; McDowell, 1974, 1975, 1979; Whitaker et al., 1982). Irian Jaya's stocks of Estuarine Crocodile (*Crocodylus porosus*) and New Guinea Crocodile (*C. novaeguineae*) will form the basis of a skin industry based on principles of conservation and sustained utilisation of the resource to the benefit of local people. Important nesting beaches for marine turtles including Leatherback (*Dermochelys coriacea*), Green (*Chelonia mydas*), and Pacific Ridley (*Lepidochelys olivacea*), all listed in the IUCN Red Data Book (Groombridge and Wright, 1982), are also found in Irian Jaya. The amphibians are all frogs and the current number of species is listed at 174, but is probably more than 200 (Scott et al., 1977; Meozies, 1975, Zweifel and Tyler, 1982).

New Guinea lies in the centre of the Indo-Pacific Oceanic Region, which contains the richest and most diverse ichthyofauna of this basin, estimated at between 6,000 - 7,000 species (Munro, 1967). Besides the great diversity among the smaller coral reef fishes, Irian Jaya's marine waters hold an abundance of important commercial species such as skipjack tuna, bluefin trevally, mackerel, barracuda, snappers, groupers and emperors, many of which are no longer common or so completely represented in nursery schools of nearshore waters elsewhere in Indonesia. Large sawfish (*Pristiopsis* spp.) occur in the vast river systems of the lowlands of the north and south coastal plains. Allen (1982) has documented a further 158 species of the fish which only occur in New Guinea freshwater habitats.

Among the insects, there are probably in the order of 50,000 to 100,000 species but no one really knows for sure. Beetles are the largest group with over 30,000 species, and the butterfly and moth fauna boasts over 5,000 species. Other invertebrates will include countless thousands of species among their ranks. However, considerable research is necessary before we can even begin to guess at their diversity and richness. Among the most prominent are the corals, and here among the richest coral reefs of the Indo-Pacific (Ditlev, 1980), initial censuses in Cenderawashi Bay have proved the presence of at least 62 genera and 130 species (Salm et al., 1981). Endangered species such as Giant clam (*Tridacna gigas*) and a variety of other molluscs are still common in Irian Jaya's waters. The world's largest living terrestrial arthropod, the coconut or robber crab (*Birgus latro*) has also been reported on a number of offshore islands around the province (Holthius, 1959; 1963).

BIOLOGICAL AND PHYSICAL PRINCIPLES GOVERNING THE DESIGN OF THE PROTECTED AREA SYSTEM FOR IRIAN JAYA

Some of the biological considerations relevant to protected area design in New Guinea have been reviewed elsewhere [Diamond, 1982]. These have been expanded and modified for Irian Jaya. For the sake of brevity, the construction of actual physical boundaries is not considered in this discussion, nor are human or political factors. However, it should be mentioned that with few exceptions every effort has been made to exclude human settlements from reserves.

Habitat and Altitudinal Considerations

The very rich and diverse biota of Irian Jaya ranges over a vast continuum of habitats from the very lowest elevations at sea level upwards through the highest mountains in Southeast Asia [4,884m]. However, practically all of the thousands of wildlife species in the province are limited to a small part of this gradient. Many species have very restricted ranges that may fall within a few metres as is the case with certain coastal invertebrates. Others have broader vertical ranges such as the small mouse bandicoot [*Microperoryctes merinai*] [2,000 - 2,500m] which is, nevertheless, confined to only the moss forests of the highlands of the Arfak and Weyland mountains.

Other species, particularly among the birds, are more opportunistic and may be found in a wide range of habitats at many elevations. Many of the honey-eaters [*Meliphagidae*], one of the largest groups in New Guinea, span ranges of 1,000, 1,500 or even more than 2,000m taking advantage of flowering trees for nectar or insects, usually in the company of large flocks of lorikeets. Or, along with some of the pigeons and birds of paradise, they visit seasonally fruiting trees at lower elevations when the habitats of the mountains are less productive. However, even these species with very broad ranges require the entirety of their altitudinal ranges to survive. For example, there are a number of species which take advantage of more productive habitats at higher elevations to forage but return to the quiet shelter of coastal mangroves to breed and nest. It is therefore of primary importance that the entire altitudinal spectrum of the province be covered within the reserve design.

Of equal importance is the variation in habitat types that occurs within a very narrow altitude span. In the flat southeast coastal plain which does not vary more than 50m in elevation, one encounters a vast number of habitats, many of which are easily recognisable from the air. From the mangroves fringing the coast, one can view expansive *Melaleuca-Eucalypt* woodlands integrating with the open savannahs, swamps, lakes and river systems that eventually merge into the closed canopy of true lowland rainforest to the north. Likewise, although sometimes not as visible, the hill and montaine forests at higher elevations which stretch as far as the eye can see, exhibit differences in tree composition, structure, density and diversity due to differences in geological substrate, soil formation and rainfall regime. These changes in the vegetation and character of the forest can take place within a few kilometres or from one mountain block to another. The floristic factors in turn affect the overall distribution of animal species whether by type or quantity that can be supported in any one area. The distribution of habitats in the horizontal sense is therefore of equal importance as those changes that occur in altitude.

Likewise, habitats of a more limited distribution, particularly those which are critical as traditional resting or breeding places to substantial

numbers of migratory species indigenous to the province or seasonal visitors from Australia and other parts of Asia, must be identified and covered within the reserve design. Examples here will include tiny offshore islands which are important roosting and feeding areas for thousands of migratory waders from Australia, and the lakes and swamps that serve as winter feeding for waterfowl. Beaches that are used by large concentrations of marine turtles during the nesting season are also essential for inclusion within the reserve system, as are valuable segments of swamplands that are needed by crocodiles to nest and hatch their young.

Endemism and Species Diversity

Another key element in the initial selection of reserves is an understanding of species distribution, and in particular those species which are endemic or unique to the province. Considering the overwhelming richness of the biota and our relatively incomplete knowledge of the distribution of many of its elements, particularly among the plants and invertebrates, the task seems daunting at best. However, with sufficient information about the distribution of key elements, certain rules can be followed which will allow us to achieve a meaningful and comprehensive design.

Firstly, among the thousands of New Guinea's plants, it has been established that generic and family endemism is very low, whilst species endemism is higher than anywhere else in the world at about 90 percent (Hope, 1982, pers. comm.). In our richest and most diverse ecosystem, the lowland rainforest, species diversity is the highest of all, but the density of many tree species on a per hectare basis is quite low. It is therefore necessary that substantially large tracts of lowland forest be included within reserve proposals to secure self-sustaining species populations within the protected area system. With increasing altitude, floristic species diversity (but not endemism) declines, first gradually in the hill forest and lower montane zones, and then more dramatically as one approaches the simplest part of the ecosystem of the highest alpine zones. In these areas, where soil cover is thin, where the vegetation is scant and marked by an absence of trees, the flora is characterised by a few species adapted to the coolest parts of the environment, usually low growing.

On the other hand, with increasing elevation, the proportion of endemic bird species increases substantially while species diversity decreases. About 74% of Irian Jaya's endemic mainland birds are confined to the mountains; among the mammals (43) 50% of the endemic marsupials are montane species. As all major mountain ranges of Irian Jaya have endemic birds and mammals, it is therefore essential to consider these as an important part of the reserve design.

Biogeographical Considerations

The major biogeographic zones of Irian Jaya are presented in schematic form in Figure 6. The most prominent element is the central cordillera with no passes below 1,500m. It effectively stops genetic flow and isolates many hill and lowland species on either side of the range. It thus defines two of the major lowland biogeographic units, the northern plains and foothills and the southern lowlands. The range itself is a formidable barrier to genetic flow along its length. Less mobile montane elements have little genetic flow along the backbone of the cordillera so that many populations develop new characteristics and visible morphological changes from west to east. For example, among the birds of

paradise, two genera, *Astrapia* and *Ptilinopus* have five species each that range from the mountains of the Bird's Head to the Huon Peninsula. All 13 species of birds of paradise which occur in the central ranges have two or more sub-species which replace one another in the east-west direction. Furthermore, each of the major lowland areas north and south of the range contains many endemics. The third major lowland district includes the area west of the Weyland Mountains. These lowlands are sufficiently isolated from the northern and southern lowlands by the mountains of the central cordillera and a constriction in the New Guinea landmass.

Superimposed on these major distributional centres are other distinctive biogeographical units. The lakes-plains depression is sandwiched between the northern foothills and mountains and the central cordillera. The dry southeast lowlands in the monsoonal plains also have many unique elements south of the agroclimatic contact zone with the northerly lowland rainforest. Just as the central cordillera effectively separates the three major lowland districts into distinctive units, so do these lowlands isolate the montane elements which occur in these regions by forming a barrier to the dispersal of the montane fauna which are restricted to higher elevations. There are three montane units on the northeast plains and foothills; the Cyclops, Foja-Gauttier, and van Rees mountains of the Wandamen Peninsula; and two in the south: the Pakfak and Kumawa mountains. All of these have endemic species but the Tuarau and Arfak mountains are the highest and contain the largest number of endemics.

Irian Jaya's offshore islands fall into two distinctive biogeographical groups. The islands of the Sahul Shelf which include Waigeo, Batanta, Salawati and Misool to the west, and Japan to the north in Cenderawasih Bay (see Figure 6); all had recent intermittent land connections with mainland New Guinea. Those which lie off the Sahul shelf and had no connections with New Guinea in the recent past are Kofiau to the far west, Bisk-Suptori and Numfor to the north; all of these have distinctive endemic species, particularly Biak-Suptori.

Area Considerations and the Size of Reserves

The spatial requirements of the many different elements of Irian Jaya's fauna vary every bit as much as altitudinal range and habitat preference. The following examples are offered as illustrations: a tiny tree frog carrying out his entire life cycle within a small territory high in the canopy branches of a single tree in the forest; giant fruit bats roosting in colonies during the day on the branches of particular trees on a single offshore island and then flying tens of kilometres to feed on fruiting trees in mainland forests; the many species of flocking birds ... parrots, lorries and pigeons that travel considerable distances to feed on the seasonally flowering or fruiting trees; and finally the solitary eagles ranging over hundreds or even thousands of square kilometres over widely different habitats in search of prey, but breeding and nesting at a single traditional site. Clearly, the minimum area requirement of each species, their territorial behaviour or lack of it, together with their social or solitary habits will determine the numbers of breeding pairs that can co-exist within a specific area of their overall range.

To be meaningful, each reserve must be sufficiently large to protect self-sustaining viable populations of all elements of the biota within carefully selected biogeographical areas which cover the diversity and numbers in the province. An appreciation for the minimum area requirements of key species within each reserve locality is therefore essential before reasonable boundaries can be suggested. In this respect, attention must be

directed to those species with the widest area and habitat requirements and those with special requirements. Adequate coverage for these species will assure that most of the other elements of the fauna will also be automatically taken into consideration. Obviously, a larger reserve will contain more species, a greater variety of habitats, and can maintain species with large area requirements as well as species confined to specialised habitats.

THE PROTECTED AREAS SYSTEM FOR IRIAN JAYA

Figure 7 illustrates the overall reserve design proposed for the province. The areas selected provide a full representation of all the major biogeographic districts and recognised areas of endemism. This is apparent when comparing the reserve design (Figure 7) with the physiographic map (Figure 3) and the biogeographic sketch map (Figure 6).

The Central Dividing Range forms the major mountainous district. The high altitude section of three reserves - Jayawijaya, Lorentz and Weyland Mountains - adequately cover both known and expected species diversity in the cordillera from east to west. Included is Mount Jaya, New Guinea's highest mountain, capped with equatorial glaciers, as well as the highest peaks in both the eastern and western extremities of the range in Irian Jaya. Aside from their intrinsic biological value, the highest mountains and alpine areas of these reserves offer some of the most spectacular scenery on the whole island.

The major lowland districts on either side of the central ranges have been covered in the large Mamberamo-Foja, Jayawijaya and Lorentz reserves. Taken together they comprise a 3.9 million hectare (9.9 million acres) north-south cross-section completely across the country through the Central Dividing Range, and serve to maximise coverage for the widest ranging species. The Wasur-Rawa Biru complex in the southeast represents the climatically driest area, characterised by a mosaic savanna, *Melaleuca-Eucalypt* woodlands, and swamplands. The Kumbe-Merauke reserve contains an important agroclimatic transition zone where monsoonal forests integrate with lowland forest. And finally, the lowlands of the Bird's Head are represented by what will be Indonesia's largest mangrove reserve, located at the head of Bintuni Bay.

This sequence of protected areas give a good representation of all major terrestrial habitats in Irian Jaya, but much of the spectacular richness of the province's animal life is known to come from various exceptional areas of speciation: the outlying mountains isolated from the Central Range; and the offshore islands. Six additional reserves cover these 'isolated' mountain blocks and include the following order of faunal distinctiveness: the Tamrau, Ariak, Cyclops, Wondiwoi, Fakfak and Kumawa mountains. Only one of these distinctive mountain blocks, the van Rees Mountains, has not been included since its features are adequately covered in the higher and faunistically more diverse neighbouring Foja Mountains (the third most distinct mountain block) in the large Mamberamo-Foja reserve. All the major offshore islands, save Kofiau, have been included. Listed in order of their distinctiveness, they are: Biak-Supiori, Waigeo, Numfor, Batanta, Misool, Japen and Salawati. Kofiau island, whose two known endemic birds, the Kofiau Paradise Kingfisher (*Tanysiptera ellioti*) and a flycatcher, the Kofiau Monarch (*Monarcha julianae*), is undergoing large-scale logging and is not within a proposed reserve.

Having covered the major biogeographical districts, certain other special purpose reserves have been incorporated as refuges for migratory waterfowl, or to protect major population concentrations of estuarine and

freshwater crocodiles. These include Danau Bian, Pulau Kiwaam and the Rouffaer River reserves. Eight smaller areas have been proposed as recreational parks or centres or to safeguard unusual environments. Six different localities recognised as major nesting areas for Green, Leatherback, Pacific Ridley and Hawksbill turtles have been selected for protection, containing more than 100 km of beach. Among these is a newly discovered beach that has been shown to be the most important nesting site for the endangered Leatherback turtle in all Southeast Asia.

Representing the marine environment are three very large reserve proposals: Tulus Cenderawasih, Teluk Lelintah and Raja Ampat. In addition to open waters, these include adjacent coastlines, numerous small islands and submerged coral reefs. Their diversity includes endangered giant clams, dugongs, marine turtles and saltwater crocodiles. Of great economic consequence, they constitute an important reservoir of marine resources for the expanding fishing industry of eastern Indonesia. Coastal zone components of an additional five smaller island groups have also been included in order to protect marine turtles and nesting sea birds, pigeons and eagles. Additional marine reserves will most likely be identified along the south coast after further survey.

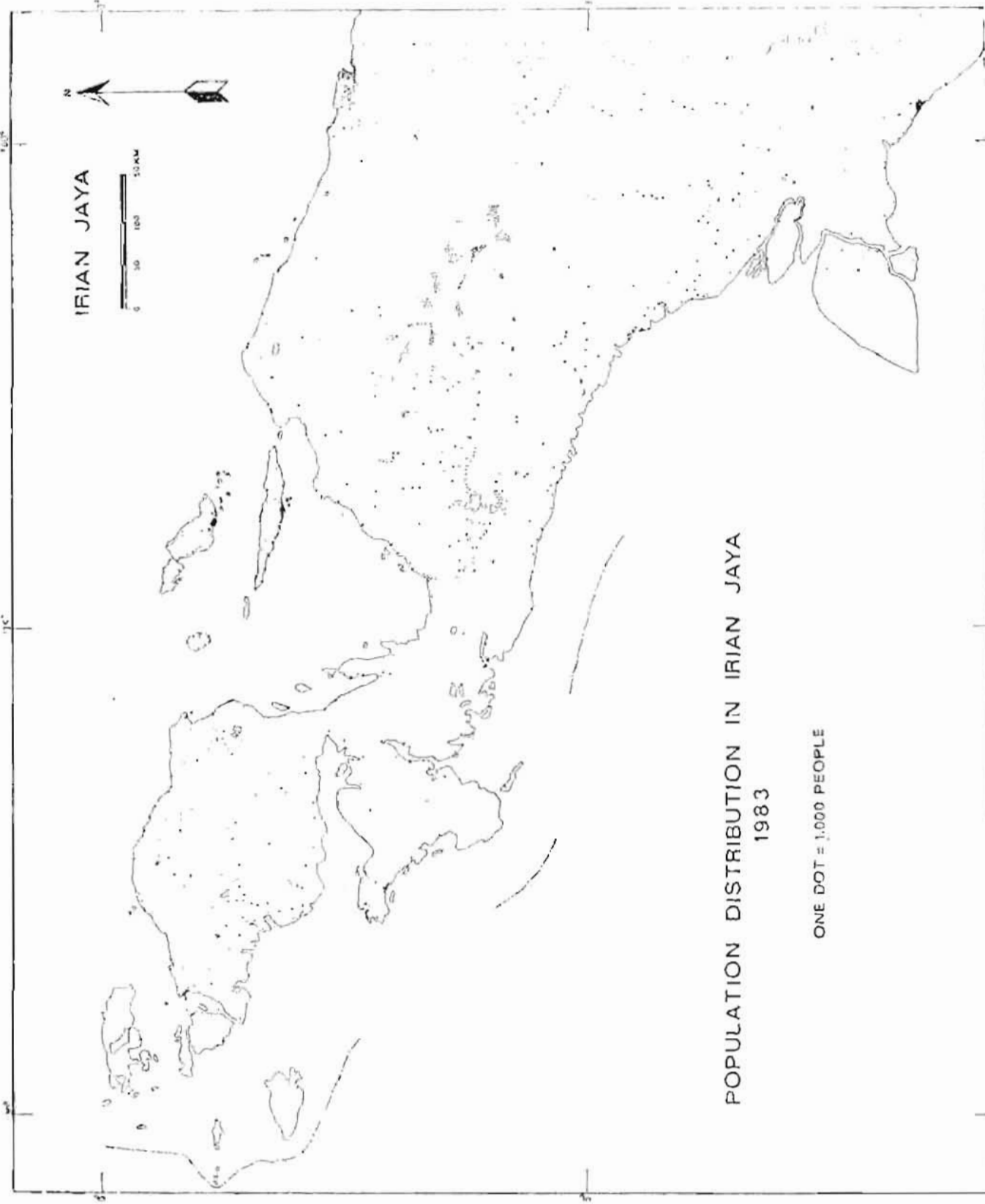
In total, the terrestrial reserves comprise approximately 7,771,340 hectares (19,202,981 acres), or about 18.9 percent of the province. This protected area system also represents nearly 40 percent of all the programmed conservation areas in the country. The challenge to the Government of Indonesia is to demonstrate a commitment to secure the rich biological diversity of Irian Jaya as we move away from the ground stage of developmental planning.



IRIAN JAYA



FIGURE 1



POPULATION DISTRIBUTION IN IRIAN JAYA
1983

ONE DOT = 1,000 PEOPLE



FIGURE 2



Figure 4



FIGURE 5

EXISTING AND REQUIRED PROTECTED AREAS IN IRIAN JAYA - 1983

0 50 100 150 200 250 KM



LEGEND

Classification of Regions

- 1. 20 Sorong 1,100,000 ha
- 2. 21 Mimika 1,100,000 ha
- 3. 22 Sorong 1,100,000 ha
- 4. 23 Sorong 1,100,000 ha
- 5. 24 Sorong 1,100,000 ha
- 6. 25 Sorong 1,100,000 ha
- 7. 26 Sorong 1,100,000 ha
- 8. 27 Sorong 1,100,000 ha
- 9. 28 Sorong 1,100,000 ha
- 10. 29 Sorong 1,100,000 ha
- 11. 30 Sorong 1,100,000 ha
- 12. 31 Sorong 1,100,000 ha
- 13. 32 Sorong 1,100,000 ha
- 14. 33 Sorong 1,100,000 ha
- 15. 34 Sorong 1,100,000 ha
- 16. 35 Sorong 1,100,000 ha
- 17. 36 Sorong 1,100,000 ha
- 18. 37 Sorong 1,100,000 ha
- 19. 38 Sorong 1,100,000 ha
- 20. 39 Sorong 1,100,000 ha
- 21. 40 Sorong 1,100,000 ha
- 22. 41 Sorong 1,100,000 ha
- 23. 42 Sorong 1,100,000 ha
- 24. 43 Sorong 1,100,000 ha
- 25. 44 Sorong 1,100,000 ha
- 26. 45 Sorong 1,100,000 ha
- 27. 46 Sorong 1,100,000 ha
- 28. 47 Sorong 1,100,000 ha
- 29. 48 Sorong 1,100,000 ha

Legend

- 1. 20 Sorong 1,100,000 ha
- 2. 21 Mimika 1,100,000 ha
- 3. 22 Sorong 1,100,000 ha
- 4. 23 Sorong 1,100,000 ha
- 5. 24 Sorong 1,100,000 ha
- 6. 25 Sorong 1,100,000 ha
- 7. 26 Sorong 1,100,000 ha
- 8. 27 Sorong 1,100,000 ha
- 9. 28 Sorong 1,100,000 ha
- 10. 29 Sorong 1,100,000 ha
- 11. 30 Sorong 1,100,000 ha
- 12. 31 Sorong 1,100,000 ha
- 13. 32 Sorong 1,100,000 ha
- 14. 33 Sorong 1,100,000 ha
- 15. 34 Sorong 1,100,000 ha
- 16. 35 Sorong 1,100,000 ha
- 17. 36 Sorong 1,100,000 ha
- 18. 37 Sorong 1,100,000 ha
- 19. 38 Sorong 1,100,000 ha
- 20. 39 Sorong 1,100,000 ha
- 21. 40 Sorong 1,100,000 ha
- 22. 41 Sorong 1,100,000 ha
- 23. 42 Sorong 1,100,000 ha
- 24. 43 Sorong 1,100,000 ha
- 25. 44 Sorong 1,100,000 ha
- 26. 45 Sorong 1,100,000 ha
- 27. 46 Sorong 1,100,000 ha
- 28. 47 Sorong 1,100,000 ha
- 29. 48 Sorong 1,100,000 ha

Legend

- 1. 20 Sorong 1,100,000 ha
- 2. 21 Mimika 1,100,000 ha
- 3. 22 Sorong 1,100,000 ha
- 4. 23 Sorong 1,100,000 ha
- 5. 24 Sorong 1,100,000 ha
- 6. 25 Sorong 1,100,000 ha
- 7. 26 Sorong 1,100,000 ha
- 8. 27 Sorong 1,100,000 ha
- 9. 28 Sorong 1,100,000 ha
- 10. 29 Sorong 1,100,000 ha
- 11. 30 Sorong 1,100,000 ha
- 12. 31 Sorong 1,100,000 ha
- 13. 32 Sorong 1,100,000 ha
- 14. 33 Sorong 1,100,000 ha
- 15. 34 Sorong 1,100,000 ha
- 16. 35 Sorong 1,100,000 ha
- 17. 36 Sorong 1,100,000 ha
- 18. 37 Sorong 1,100,000 ha
- 19. 38 Sorong 1,100,000 ha
- 20. 39 Sorong 1,100,000 ha
- 21. 40 Sorong 1,100,000 ha
- 22. 41 Sorong 1,100,000 ha
- 23. 42 Sorong 1,100,000 ha
- 24. 43 Sorong 1,100,000 ha
- 25. 44 Sorong 1,100,000 ha
- 26. 45 Sorong 1,100,000 ha
- 27. 46 Sorong 1,100,000 ha
- 28. 47 Sorong 1,100,000 ha
- 29. 48 Sorong 1,100,000 ha

Legend

- 1. 20 Sorong 1,100,000 ha
- 2. 21 Mimika 1,100,000 ha
- 3. 22 Sorong 1,100,000 ha
- 4. 23 Sorong 1,100,000 ha
- 5. 24 Sorong 1,100,000 ha
- 6. 25 Sorong 1,100,000 ha
- 7. 26 Sorong 1,100,000 ha
- 8. 27 Sorong 1,100,000 ha
- 9. 28 Sorong 1,100,000 ha
- 10. 29 Sorong 1,100,000 ha
- 11. 30 Sorong 1,100,000 ha
- 12. 31 Sorong 1,100,000 ha
- 13. 32 Sorong 1,100,000 ha
- 14. 33 Sorong 1,100,000 ha
- 15. 34 Sorong 1,100,000 ha
- 16. 35 Sorong 1,100,000 ha
- 17. 36 Sorong 1,100,000 ha
- 18. 37 Sorong 1,100,000 ha
- 19. 38 Sorong 1,100,000 ha
- 20. 39 Sorong 1,100,000 ha
- 21. 40 Sorong 1,100,000 ha
- 22. 41 Sorong 1,100,000 ha
- 23. 42 Sorong 1,100,000 ha
- 24. 43 Sorong 1,100,000 ha
- 25. 44 Sorong 1,100,000 ha
- 26. 45 Sorong 1,100,000 ha
- 27. 46 Sorong 1,100,000 ha
- 28. 47 Sorong 1,100,000 ha
- 29. 48 Sorong 1,100,000 ha

CASE STUDY: WILDLIFE MANAGEMENT AREAS IN PAPUA NEW GUINEA

Office of Environment and Conservation
PAPUA NEW GUINEA

INTRODUCTION

Wildlife Management Areas and in some special cases, Sanctuaries and Protected Areas, can be used to help village people conserve or protect the wildlife on their land (see Appendix 1). They can be declared only at the request of the landowners, but the declaration does not in any way affect the ownership of the land. However, land use can be affected should the landowners choose to establish rules governing human activities in the Area.

Because the Wildlife Division of the Department of Environment and Conservation received over 50 requests to investigate Wildlife Management Areas, it became necessary to set out clearly all the steps involved in the investigation and declaration of a Wildlife Management Area in order to assist field staff of the Division and the Department of Primary Industry to carry out this task in consultation with the landowners. The steps identified are outlined below and describe the general nature of the Wildlife Management Area:

1. Defining the Problem

There are two ways in which a potential Wildlife Management Area first comes to the notice of the government.

Firstly, field staff receive advice personally from village people or in writing from the Department or Minister that there are problems associated with the exploitation of wildlife on village land.

These often include:

- (a) people from other areas, and without traditional rights, coming to hunt wildlife or take eggs;
- (b) visitors from other countries hunting on village land (deer-hunters, crocodile hunters, etc);
- (c) the rapid decline in wildlife populations due to the use of shotguns by the landowners themselves;
- (d) large numbers of people from nearby towns and stations hunting in the weekends;
- (e) clearing of forest in special areas of habitat required by certain species of wildlife (e.g. wildfowl nesting grounds);
- (f) the need to protect some species of animals being over-utilised commercially by the landowners (e.g. crocodiles, cassowaries, etc);
- (g) the rapid decline of some species because traditional hunting rules are being ignored (e.g. rules governing the taking of eggs or young, or seasonal activities).

In many cases these problems can be reduced by carefully planning the establishment of a Wildlife Management Area in co-operation with the landowners.

Secondly, officers in the Wildlife Division who may be working with particular animals such as the Bird of Paradise, cassowaries, crocodiles, butterflies, dugong, turtles, etc. may discover habitat of great importance to an animal's survival. In such cases there is a need to approach the landowners and discuss the details of a possible Wildlife Management Area and ascertain whether they wish to co-operate with the government in the conservation of the animal.

2. Discussions with Landowners

Once a Wildlife Management Area is considered desirable field officers then explain to the landowners that there is a legal way by which the government can assist them to look after the wildlife on their land, without affecting the land ownership in any way, through the creation of a Wildlife Management Area.

The steps followed in discussion with the landowners are:-

- (a) discussion of the actual wildlife management problem so that the people have a clear understanding of its nature;
- (b) identification of the cause of the problem, e.g. too many guns, forest clearance, hunting by outsiders, etc;
- (c) investigation into the existence of traditional laws or practices which could help to solve the problem;
- (d) identification of a specific strategy to solve the problems;
- (e) identification of the area of land to be declared a Wildlife Management Area.
- (f) discussion on who is to be appointed to the Wildlife Management Committee which will represent the landowners at future discussions.

In undertaking these discussions, it is stressed to field staff that there are a number of very important points which must be remembered:

- i) It does not matter how long the discussions take, because it is necessary for all the landowners to agree on all the matters under discussion, particularly those relating to boundaries and rules where unanimous agreement is required. Without this there will be continuing problems or a lack of interest in enforcing the rules agreed upon. Discussions can take up to 5 or 6 years if necessary. Officers taking part in the discussions must also be conscious that they are representing the Minister and the government.
- ii) As stated above, there must be complete agreement among the landowners on all matters before declaration takes place or rules are developed. If agreement is not unanimous it is best to leave the matter for the landowners to discuss among themselves and arrange another meeting with them at a later date.

- iii) Meetings should be held with the landowners at least once every six months, but can be held more often at their request. Officers should not insist on frequent meetings in places where it is difficult for the people to meet due to distances, lack of transport, etc.
- iv) Sometimes officers may believe that it is easier and quicker to suggest an answer, but this does not always work. The problems affecting wildlife and habitat are often very complex and solutions are not always simple or easy to find. It should be remembered that the people of an area (particularly the old men and women) know a lot about their land the village wildlife. They often understand the cause of the problems affecting the wildlife and it is better to let them discuss these in detail and arrive at their own solutions.
- v) A brief report should be written after each meeting, setting out the matters discussed. The Provincial Wildlife Officer or Provincial Rural Development Officer keeps one copy of the report, and another is sent to the Assistant Secretary (Wildlife).
- vi) In most cases, local field staff should be able to undertake all discussions with the landowners with headquarters staff commenting in writing on reports of meetings when these are received. Should a particularly difficult problem arise, the Provincial Wildlife Officer can request that a headquarters officer attend a meeting.
- vii) A Wildlife Management Area can cover a piece of land owned by one man, one clan, a village or even a census division or Council area. The number of rules governing the Area is flexible. There may be only one (for example covering the use of guns or the hunting of one particular animal) or there may be a number depending on the wishes of the landowners.
- viii) Interested officers from other Departments or organisations should only be invited to attend meetings if the landowners agree.
- ix) The landowners should be reassured that the Wildlife Management Area and its associated rules will be declared in accordance with their wishes and that this will not in any way affect land ownership. Rules, boundaries and committee members can be changed as required by the landowners at any stage.
- x) Enforcement of the rules must be carried out by the people themselves so it is important that these are agreed to by all parties. It should be explained that Government officers will not be placed in each Wildlife Management Area to enforce the rules.

3. When the Area is Ready for Declaration

When there is full agreement amongst the landowners on a solution to the problem field officers should then call a final meeting to discuss the following matters:

- (a) the boundaries of the area to be declared;

- (b) the names of the Committee members who will represent the landowners in discussions about rules and problems;
- (c) the rules which the people want established.

Only when there is unanimous agreement on all these matters would the field officer recommend that the declaration go ahead.

4. Report Required for Declaration

The report on the final meeting should cover the following points:-

- (a) Boundaries: a copy of a map showing as accurately as possible the boundaries requested by the landowners should be included with the report. Comment should also be made on any particular matters such as the exclusion of special areas and the names of all streams, rivers or other natural landmarks used to define the boundaries. Maps often do not give the local names of these landmarks but they are very necessary in legal descriptions of the Area.
- (b) Committee Members: A list of the full name and village of each Committee Member appointed by the landowners. It is important to ensure that the names are spelt correctly.
- (c) Rules: these should be stated in simple English. Attempts to put the rules in legal language tend to lead to confusion.
- (d) Any other matters of particular importance raised by the landowners.
- (e) The name or names of the Local Government Council or Councils in whose area the Wildlife Management Area is located. It should be stated whether the Council was involved in discussions on the proposed Wildlife Management Area. If not, the Department would have to consult with the Council.
- (f) The name decided upon by the landowners for the Wildlife Management Area.

5. Steps in Declaration

When the final report is received at headquarters, the following procedural steps are taken:

- i) A brief report is presented to the Minister to inform him of the proposal and to obtain his approval to proceed with the declaration.
- ii) A legal boundary description is prepared.
- iii) A declaration is prepared which includes:
 - a description of the boundary including local names of key geographical features;
 - names of Committee members
 - name of the Area.
- iv) The declaration is then signed by the Minister for Environment and Conservation, and a press release is made.

- v) The declaration is gazetted by publication in the National Gazette.
- vi) Following gazettal, the Office of Legislative Counsel is advised of the rules requested by the landowners and these are discussed and amended if necessary.
- vii) The Office of Legislative Counsel prepares the final version of the rules.
- viii) The Statutory Instrument is then signed by the Minister for Environment and Conservation.
- ix) The Instrument is then submitted to the National Executive Council (NEC) for information.
- x) Finally the NEC Secretariat brings the Instrument into effect by obtaining the Governor-General's approval, and publishing a notice in the National Gazette.

It is because these detailed legal steps have to be completed at headquarters that it is very important that field officers send in full and accurate information after the final meeting with the landowners.

6. After Declaration of the Area

Once all these steps have been taken, field staff ensure there is abundant publicity about the Area and its rules. All interested Departments and bodies (e.g. Councils) are advised of the gazettal notices and patrols in the area discuss the Wildlife Management Area with local communities. Publicity in the form of news releases and interviews is arranged by the Provincial Wildlife Officer.

Meetings are held with the Committee members not less than once every six months, or more often if they desire. The success or failure of the rules is examined at each meeting as is the need for additions or amendments. Once any new rules or amendments are unanimously agreed to, headquarters is advised. Each of these meetings is reported on and details are sent to headquarters through the Provincial Wildlife Officer.

Again it is considered important to ensure that all Committee members and landowners unanimously agree on the details of any new rules required. If there is any disagreement it is considered best to allow landowners to discuss the matter further until they reach agreement.

7. The Wildlife Management Area Laws

In 1974 the Fauna (Protection and Control) Act was amended to allow for the establishment of Wildlife Management Areas.

Briefly, the relevant sections of the Act state:

Section 21A: The Minister may declare a Wildlife Management Area only after he has consulted with the landowners. He may also consult with the Local Government Council for the area.

- Section 21B: The Minister may appoint a Wildlife Management Committee.
- Section 21C: The Minister may make rules for Wildlife Management Areas only after consultation with the Committee. He may also consult with the Local Government Council for the area.
- Rules can effect the protection, propagation, encouragement, management, control, harvesting and destruction of fauna as well as licences to hunt, fees for licences, royalties and the use of fee and royalty funds.
- Section 21D: The Minister may appoint an Agent for the Committee to issue licences and collect fees.
- Sections 17 & 20:
The Minister may declare Sanctuaries and Protected Areas.
- Section 25B: The Minister may make rules for Sanctuaries and Protected Areas.

8. Enforcement of Laws

Essentially, Wildlife Management Areas are self-policing and the landowners are expected to enforce the rules in their Areas; the Government is not able to post officers to each Area to do this. In effect, this means that any village man or Committee member can take a man to Court if he has broken a rule in a Wildlife Management Area. In practice, it has been found that the Police are not aware of the relevant laws and are not sure about prosecuting offenders.

The procedure usually followed to bring about legal action where it is necessary is as follows:

- (a) A Committee member (or village leader) reports a person who has broken a rule to the Wildlife Officer.
- (b) The Wildlife Officer obtains copies of the notices in the National Gazette under which the Wildlife Management Area was declared and the rules given effect.
- (c) The complainant and Wildlife Officer then go to the nearest Police Station and discuss the offence with the Prosecuting Officer.
- (d) The following laws (and penalties) apply:

Fauna Protection Ordinance (No. 19 of 1966)

Fauna (Protection and Control) Act (No. 42 of 1974)

Copies of these statutes are kept in Police Stations and Courthouse libraries.

(e) Relevant Sections of these Acts are:

- 18 (1) Taking fauna in a Sanctuary. Penalty K20 each animal.
- 21 (1) Taking protected fauna in a Protected Area. Penalty K20 each animal.
- 21 (6) Contravening a rule in a Wildlife Management Area. Penalty K20
- 25 (2) Contravening a rule in a Sanctuary or Protected Area. Penalty K20

(f) With this information available, Police should be able to proceed with a prosecution and the Magistrate should be able to hear the case as a normal Court matter.

Where there are serious complications or problems, the Wildlife Officer usually contacts headquarters to seek clarification and guidance. If necessary a Wildlife Ranger will go to the area to carry out the investigation and prosecution. However, it is better to deal with the matter at the local level to assure the landowners that the law is effective and offences against the rules are treated just like any other case of law-breaking.

9. Sanctuaries and Protected Areas

In very special cases Sanctuaries and Protected Areas can be declared. However, in most cases it is considered better to establish a Wildlife Management Area which allows flexibility should the rules require amendment.

(i) Sanctuary: This is an area where all species of wildlife are usually fully protected. However, some species can be named as being exempted either in the original declaration of the Sanctuary or by a rule. For example people may not want wild dogs protected within the Sanctuary.

(ii) Protected Area: This is an area where only certain species of animals are named as being protected. For example, the grass wallaby is protected on Baniara Island, in Milne Bay Province.

CONCLUSION

With the assistance of these guidelines, field staff carrying out wildlife conservation work are able to discuss Wildlife Management Areas with concerned landowners in their Provinces. Once established the Wildlife Management Area offers a unique means of achieving wildlife conservation objectives with the all important support of the local community.

With the assistance of these guidelines field staff carrying out wildlife conservation work are able to discuss Wildlife Management Areas with concerned landowners and obtain the information and agreements necessary for their establishment by the government. Once established the Wildlife Management Area offers a unique and flexible means for achieving wildlife conservation objectives with the all-important support of local landowners and communities. It is a model which is particularly well suited for application in the Pacific region where communal land tenure systems dominate and where it is desirable to retain and utilise traditional resource management techniques.

PURPOSE	STATEMENT OF THE PROBLEM	SETTING/ BACKGROUND	CONSTRAINTS	INTERVENTIONS	RESULTS	CONCLUSION
The declaration of an area as the LOU WILDLIFE MANAGEMENT AREA for the protection of dugongs and turtles and their surrounding environment.	<p>A. Problem from other areas, and without traditional rights hunting dugongs and turtles</p> <p>2. Over-exploitation through efficient harvesting techniques and the break-down of traditional hunting rules.</p> <p>3. Traditional activities affected include initiation customs, bride price and festivities. Laws have prohibited the use of modern techniques for harvesting these species and only allow the use of traditional methods</p> <p>4. Both turtles and dugongs are protected fauna under PNG laws. However, provisions are made within the law to recognise the traditional values of such resources and allowances are being made for traditional methods to continue.</p> <p>6. The Declaration of the WMA provides for more conclusive management than the traditional management rules people have used in the past.</p>	<p>A. Study Area</p> <p>1. Marine coastal ecosystem</p> <p>2. Turtles and dugongs feed around the sandflats on sea grasses.</p> <p>3. Reefs extend 200 metres from the shoreline.</p> <p>4. Seagrasses are extensive at certain points around the island.</p> <p>B. Human Use</p> <p>Fishing and harvesting of fish, oysters, turtles, dugongs, sea cucumbers, shells, etc.</p> <p>C. Values</p> <p>Traditional and world concern both for dugong and turtle.</p> <p>D. Objectives</p> <p>Maintain traditional values</p>	<p>A. Conflicts</p> <p>Use of the resource (turtles and dugongs) by outsiders</p> <p>B. Political & Govt.</p> <p>Government has declared turtles and dugongs to be protected fauna. This is generally in line with the International ban by member States to CITES.</p> <p>C. Values</p> <p>Traditional values are bride price, festivities initiation, etc.</p> <p>D. Religion</p> <p>Hosi Lou Islanders do not eat turtle and Dugong meat. They are S.O.A.</p> <p>E. Limitations</p> <p>1. Basically cost and qualified manpower.</p> <p>2. Only 0.09% of national budget goes to environmental protection and conservation.</p>	<p>A. Public Consultation</p> <p>1. Original enquiry</p> <p>2. Discussions with owners of the area. - definition of the problem causes and action strategy.</p> <p>3. Establishment of Committees</p> <p>4. Agreement on: - boundaries - rules - name</p> <p>D. Govt. Procedures</p> <p>1. Report to seek approval DEC-M</p> <p>2. Legal description of boundaries</p> <p>3. Gazetted procedures</p>	<p>A. Evaluation</p> <p>No criteria established for evaluating such projects. There is a need for monitoring and evaluation of the current established WMA.</p> <p>Landowners will be the best people to conduct the evaluation of the W.M.A. projects.</p> <p>B. Conflicts</p> <p>There are "big-man" conflicts internally within the social groups highlighted by the project.</p>	<p>A. Development of WMA concept has provided an opportunity for landowners to become involved in the management and conservation of wildlife in their areas.</p> <p>B. There is no guarantee that this is a long term solution but the interim solution will give breathing space.</p> <p>C. Public awareness and land use planning are needed to promote and further develop the WMA concepts.</p> <p>D. There is a need for conservation education at all levels, particularly amongst the coming generations.</p>

Abbreviations

CITES	Convention on International Trade in Endangered Species
DEC	Department of Environment and Conservation
M	Minister of Environment and Conservation
WMA	Wildlife Management Area
PNG	Papua New Guinea
SDA	Seventh Day Adventists

CASE STUDY: NEW ZEALAND FOREST PARKS : A MULTIPLE USE MANAGEMENT MODEL
FOR THE SOUTH PACIFIC

John Holloway
N.Z. Forest Service
Wellington, New Zealand

Forest parks in New Zealand are managed according to a multiple, or balanced, use philosophy under a single management and administrative structure. Formal provision is made for local community involvement in planning and administration. Most parks provide for a range of land use across the entire conservation (wise use) spectrum, from strict protection to intensive production.

This pattern of management has an inherent flexibility and offers a potential model which might promote the achievement of nature conservation goals in the South Pacific where conflicting pressures on resources are often intense.

The multiple use concept as practised in forest parks enables the interaction between alternative uses to be clearly understood, and makes the interdependence of nature conservation and development explicit.

INTRODUCTION

The South Pacific Regional Environment Programme's (SPREP) Action Plan and its associated convention "have the principal objective of assisting the countries of the South Pacific to maintain and improve their shared environment and to enhance the capacity to provide a present and future resource base to support the needs and maintain the quality of life of the people". (Carew-Reid, 1984).

The Third South Pacific National Parks and Reserves Conference has a number of objectives relating particularly to the establishment and management of protected areas; through them runs a theme of recognition that the absolute protection of natural values is dependent upon the maintenance of the quality of life through the use of an alternate resource, and that some natural values can be maintained only within the context of an appropriate continued human use of the ecosystem in which they occur.

The management of State forest in New Zealand is in accord with a balanced, or multiple use management philosophy which recognises the spectrum of forest values from preservation to intensive production management. Within State forest the system of parks endeavours to practise practical conservation, or wise land use, achieving an integration of conservation and development activity under a single administration, and with a formal provision for public involvement in the determination of both the appropriate balance of land use, and its day-to-day implementation.

This form of management appears to be very relevant to many of the countries of the South Pacific, which do not have the luxury of being able to set aside, for single purpose use, large areas of land for management under the more restrictive IUCN categories of Protected Area.

BACKGROUND

New Zealand, prior to European settlement, was a largely forested land. These natural forests, for most of the period since, have been regarded as a source of timber for national requirements and of land for agriculture. This period is now past and there is no longer any absolute need, in economic terms, to harvest timber from these forests or to clear land for agriculture, although very limited areas have the potential to continue providing special purpose timbers on a sustained yield basis. Most of the remaining natural (or native) forest remains in State ownership (Table 1). The national demand for building timber is now satisfied from extensive plantation forests of introduced species owned both privately and by the State and timber harvest from natural forests has been reduced to very low levels.

Very little of the remaining native forest estate is suitable for timber harvest (in physical land use and biological terms), nor is it now acceptable to the public generally that it be managed for timber production, or converted to other uses. The bulk of the forest is therefore either dedicated to nature conservation, or available for a narrow range of productive use options, excluding timber harvest. These options include the harvest of small forest produce, and of animals for meat, farm stock and fur. All forests both native and plantation, except for a small area whose nature conservation management requirements preclude it, are available for public use and recreation, and all perform a valuable role in maintaining soil and water values, and preventing accelerated erosion in mountain and hill lands.

The principal characteristics of the forest estates of New Zealand now are:

- the predominance of ownership by the Crown (or State) (Table 1)
- the distribution of administration among tenures which within New Zealand, require preservation-oriented management (National Parks & Reserves) and tenures which admit multiple use management (State Forest)
- the satisfaction of demand for timber from plantation forests.

THE EVOLUTION OF FOREST PARKS

The State forest estate since 1925 has been managed under a philosophy of multiple use; all uses have been permitted provided they were "not prejudicial to forestry". While this rather negative approach did permit evolutionary change, it did not actively encourage it. In 1976, therefore, the Act was amended to require balanced use, according equal emphasis to protection, production and recreation (Appendix 1). Forest parks were first formally recognised in 1965, to provide for public input into the planning process for public recreation, and its subsequent implementation for each park. This public input is effected through an Advisory Committee, usually of 10 citizens, appointed after public advertisement for nomination, by the Minister of Forests. The committees are chaired by the regional Conservator of Forests, and are responsible to the Minister. In 1976, the role of the committees was expanded to allow them to participate in all aspects of park management.

Forest parks were originally conceived to be distinctive areas of State forest in which there was a major and particular public interest. This

distinction has now practically disappeared as the concept of balanced or multiple use has been made more explicit by Parliament, and as public awareness and use of forests has increased rapidly. There are now 21 forest parks comprising 1.9 million ha, or 53% of the State forest area, and the distinction between forest park and State forest is becoming blurred.

Most forest parks are dominated by native forest in a mountain landscape, where timber production is a relatively minor, and recreation and forest protection are the major components of management; however, there are two parks which are dominated by intensively managed plantation forest where wood production is a major feature.

FEATURES OF THE FOREST PARK SYSTEM POTENTIALLY RELEVANT TO THE SOUTH PACIFIC

New Zealand has traditionally placed much emphasis on the development and management of land. Its economy has been, and is still largely dependent on land based production from farming and forestry. This process has involved a change in the developed lands from an exclusively natural landscape to one predominantly cultural, dominated by introduced flora and fauna. Productive use of natural ecosystems is only regionally significant. Those ecosystems not exploited in the past for productive use comprise an extremely large land resource owned by the State, whose use for production purposes is very largely a discretionary one, not required for providing the necessities of life, or maintaining living standards. Much of the land has already been legally set aside for strict nature conservation under several different Acts of Parliament. Because of these resource characteristics, no New Zealand management or administrative system is likely to be transferable, unmodified, to a South Pacific situation. The forest park system, nevertheless, has some characteristics which are pertinent to the resolution of the problems of achieving the goals of nature conservation in the Pacific.

1. Land ownership. The forest parks comprise a single tenure, which greatly simplifies problems of administration and management. The land is, however, owned in common by all the citizens, and there are parallels with the customary ownership characteristics of the Pacific. The multiple-use pattern of management is probably the only means of accommodating preservation and production in the context of customary ownership of land.
2. Conservation land-use. The forest parks are managed to accommodate both use and non-use values; they include the entire spectrum of land use within one overall tenure, from legally protected areas set aside for nature preservation and science (ecological areas) at one extreme, to land managed intensively for production (usually of wood) at the other. This land may also be set aside legally, and yet remain a part of the park. The bulk of the forest land lies between these two extremes and is managed according to the requirements of the land and society, determined by a regular management planning process. The underlying ethic of a conservation oriented land management lies comfortably within a Pacific situation which requires both the better use of natural resources to maintain living standards and traditional life style, as well as an increased focus on nature conservation for its own sake.
3. Complementarity with National Parks and other protected areas. Forest parks were originally conceived in New Zealand to provide a "relief

- valve" for national parks. They were to be areas within which activities which were incompatible with national parks values could occur. This complementary management between forest parks and more strictly protected areas has not been of major significance while levels of use of natural land for recreation were low, but it is becoming more important as visitor use pressures increase.
4. Flexibility of management. The forest park provides mechanisms for the accommodation of both the natural values and productive uses of land, and more importantly, implicitly recognises that neither the ecosystems themselves, nor the demands of society for the products of the ecosystems remain constant over time.
 5. Management skills. The forest park concept requires the determination of appropriate land use over an area on which the demands are many and often conflicting, and the subsequent management of the land for some or all of those uses under some cohesive administration. As a result it develops and maintains valuable integrative management skills. The practice of multiple land use requires the good husbandry of all the resources, and the capacity to clearly identify land for different mixes of use. It requires the acquisition, use and maintenance of a data base pertinent to subsequent consideration of changes in the pattern of land use. Such changes may flow from shifts in the nature of society's requirements, or from natural or induced changes in ecosystem condition. The skills and management ability necessary to understand all demands on land, including nature conservation, and to be able to respond to changing resource demands, are more appropriate than more narrowly defined skills and management structures, especially where resources of both land and trained managers are short.
 6. Provision for community input. The process of public consultation during the planning phase, and of advisory committee involvement in both planning and subsequent management is probably more suited to a developed "western" society than to that of the Pacific generally. However, the model may be appropriate in some situations, and may be modified to accommodate the needs of customary landowners and governments in order to facilitate effective management for nature conservation objectives.
 7. A zoning system for separation of incompatible land uses. The forest park system commonly uses a well developed zoning system for defining predominant and compatible secondary uses of land. These permissible uses can be further defined and protected by legislation; forest parks may include areas set aside for nature or science, for wilderness, for timber production, for education, history, archaeological or any other reason. Generally, their permanent setting aside has been done only in accord with carefully predetermined criteria, as the general objective has been to retain flexibility of management. The zoning system affords protection from indiscriminate development (1).
-
- (1) The New Zealand Government has recently adopted a proposal to legally protect the existing condition of the native forest estate. This proposal will require that the approval of Government be given before native forest may be used for timber management or harvest, as it is now required before its setting aside for nature conservation.

8. Capacity to contribute to funding. A major constraint in the setting aside of land for nature conservation is the question of cost. The forest park system permits the deliberate intensification of use on some land to generate a compensatory income for that lost as a consequence of meeting nature conservation needs elsewhere.
9. Capacity to satisfy traditional needs. The park concept is fully compatible with the continued satisfaction of traditional demands, and the limitation of these to those people entitled to them. In a New Zealand context these needs are relatively minor; they include some food resources, and timber for carving, but they are a much more important aspect of Pacific Island culture.

THE APPLICATION OF THE FOREST PARK CONCEPT IN THE PACIFIC

Dahl (1984) has made an analysis of the environmental problems of the Pacific. He lists as widespread problems the loss of forest cover, (with consequent problems of water loss, soil erosion and habitat destruction) land use, and tenure. Dahl notes that "on small islands with limited resources efficient use must be made of all available land to meet the needs of the people for water, food, building materials and reasonable quantity of life and to maintain the functioning of the natural systems on which those depend. This requires comprehensive planning and careful allocation of land for the most appropriate use or combination of uses." He goes on to say "Land is a limited and precious commodity on an island. The Pacific Islander's attachment to his land goes beyond western concepts of ownership" and "restoring or building on customary systems of management may be the most acceptable and effective approach where it is still possible."

Dealing with endangered species, Dahl notes that "small islands can seldom afford to create parks and reserves for the sole purpose of nature conservation. Solutions need to be more flexible and adapted to island circumstances."

The resolution of these problems will require a broad spectrum of conservation oriented action in which 'protected area' establishment and management will play an important, but not dominating role. The "law of the commons" applies; if the natural resources which have traditionally met the needs of the communities are to continue to meet those needs, and provide for a standard of living comparable with that of the world at large, then some changes will be required. They cannot satisfy an ever increasing level of demand. These changes must be addressed in the context of the most critical environmental issue of the South Pacific: "the sustainable use and management of limited island resources" (Dahl, op. cit.)

The New Zealand experience of multiple use management in forest parks, which is an example of an endeavour to marry conservation and development, emphasising the balance between appropriate uses of resources and their sustained yield management, (living on the interest rather than the capital) provides an established and proven regional model.

Within the forest park model, the needs of preservation (nature conservation in the strictest sense) can be seen as a component in a spectrum of land management, all components of which are interdependent and interactive. If the needs of preservation are presented in this way, they are likely to be more widely acceptable to the community, and therefore more carefully managed. Moreover, preservation and development are less likely to be seen as incompatible alternatives, and a contribution toward

nature conservation goals (which while best served by preservation management, can be partially met in a management system allowing human use) is made more probable.

The forest park model minimises the number of outside agencies which may be perceived to be attempting to inflict a foreign set of values on the community concerned. It may also, by facilitating community involvement in and identification with the land use decision, bring to bear a degree of community policing of self determined management. The model is potentially capable of making explicit the link between intensified management at one point, and a withdrawal from, or prohibition of use of a resource elsewhere.

The Ministerial Meeting following the Conference is invited to redraft the 1976 Convention on the Conservation of Nature in the South Pacific as a protocol to the South Pacific Regional Environment Convention, since this would "place the issue of protected areas within a broader environmental context, rather than creating it in isolation."

Although the New Zealand forest park system has evolved in a country with a western tradition, and moreover one in which, by comparison, few problems exist, it does provide a creative framework for addressing the very real conservation needs of the region. This framework will allow the requirement for protected area/nature conservation to be addressed in a "broader environmental context"; this context has, if success is to be achieved, to recognise that the human species is now an unalterable component of those environments where the immediate needs of nature conservation are most pressing.

The reality of sensible land management is that it must intelligently marry human development with resource conservation and renewal; this reality the forest park model may promote.

TABLE I

FORESTED LAND IN NEW ZEALAND

	Natural Forests (thousand hectares)	Plantation Forests (thousand hectares)	All Forests	% of New Zealand's Land Area
State forest	2,993	526	3,519	13.1
National Parks and Reserves	1,500	-	1,550	5.8
Unalienated Crown Land	361	-	361	1.3
Other tenures	1,342	467	1,809	6.7
TOTAL	6,246	992	7,239	26.9

(From 1984 NZ Official Year Book)

APPENDIX I

EXTRACT FROM THE FORESTS ACT (1949)

14. Functions of the Forest Service - The Forest Service, under the direction of the Minister and subject to the provisions of this Act, shall have exclusive responsibility for carrying out all matters of forest policy affecting State forest land and land which, by this or any other Act (including any subsequent Act), is required to be administered by the Minister; and shall have exclusive control and management of:
- (a) All State forest land to ensure the balanced use of such land, having regard to the production of timber or other forest produce, the protection of the land and vegetation, water and soil management, the protection of indigenous flora and fauna, and recreational, educational, historical, cultural, scenic, aesthetic, amenity, and scientific purposes;

CASE STUDY: OWNER INVOLVEMENT IN THE ESTABLISHMENT OF PARKS

Birandra Singh
Conservation Officer
National Trust for Fiji

INTRODUCTION

This paper is intended to show a method of establishing a park or reserve utilising traditional negotiation and agreement processes without waiting for formal legislative lease procedures, which at times are a prolonged and expensive affair.

The object of the project described in this case study was to make the landowners an essential part of the management team. Their involvement in the protection of the area gave them a social status, a sense of honour to preserve something of Fiji's heritage and a supplement to their incomes.

PROBLEM

A unique iguana species (*Brachyocopus vitiensis*) was identified by Dr John Gibbons to exist on the island of Yadua Tabu. The iguana population on the island was threatened with habitat destruction through goat grazing, slash and burn and potential poaching. The National Trust for Fiji proposed the establishment of a sanctuary on the island to be maintained by the native landowners living on the nearby island of Yadua. The goats were to be removed to Yadua and the landowners would be supplied with goat fencing to protect their food gardens.

This was to be an important pilot project for Fiji, being the first serious attempt at saving an endangered species and establishing a nature reserve. It was particularly important as it explored the process whereby nature reserves could be established in Fiji without the initial need to enter into long, drawn out, and impossibly expensive native land lease negotiations. 83% of the land in Fiji is communally owned by native Fijians, and can only be leased by extremely complex procedures. This remains one of the stumbling blocks to the establishment of an effective system of parks and reserves in Fiji, and the National Trust was anxious to find a way around this problem.

YADUA TABU

Yadua Tabu is situated about 25 kms west of Vanua Levu. It is 1.5 km long and about 173 acres in area. It is uninhabited and reaches a height of a little over 100 metres. The island was used as a goat farm and coconut plantation. The goats were introduced with Government help to supplement the native landowners income in the late 1950's. Since their introduction there has been no proper culling and as a result the vegetation is devastated, so much so that severe erosion can be seen in places. Small pockets of forests remain in the valleys on the island.

CONSTRAINTS

Even though an urgent need was established for the protection of the crested iguana habitat, no known mechanism for this existed. The iguana had not been scientifically described and the few wildlife protection laws that existed did not cater for this situation. The Forestry legislation could not offer any protection to the island as only scattered remnants of

forest were present. The National Parks and Reserves Bill was still incomplete and in draft form. Further delays could have spelt disaster for the crested iguana.

INTERVENTION

Initially a series of public relations exercises about the discovery of the new crested iguana were carried out utilising radio, the press and photographic displays. These were all aimed at informing the people of both the discovery of the creature and the urgent need to protect its habitat. As a precautionary measure the island was not publicly identified.

The National Trust for Fiji then submitted a project proposal to the International Union for Conservation of Nature and Natural Resources (IUCN) for funding. In May 1980, approximately five months after the application confirmation of funding was received from World Wildlife Fund (WWF).

RESULTS

To conclude the final negotiations for the reserve, a Ministerial delegation was dispatched which included the Minister for Communications and Works, and responsible for the National Trust for Fiji; the Minister for Urban Development, Housing and Social Welfare; the District Officer for Nabouwalu, the Chairman of the National Trust and the author, the Conservation Officer of the National Trust.

The member of the matagali (landowning unit) and elders of the village gathered in Yadua village, on the island of Yadus, to hear an explanation of the agreement and to ask questions. This was a crucial meeting as any major disagreement could have resulted in prolonged renegotiation and a possible redraft of the contract. The two ministers outlined the agreement and the yaqona made its traditional rounds. The negotiations were completed quickly, and agreement was reached that the final papers would be signed the following day.

The following day after the presentation by the National Trust of a tabua (whales tooth), to the head of the landowning mataqali and its acceptance by him, the agreement documents were signed. Under the terms of the agreement, the members of the mataqali will ensure that the iguana habitat is free from any outside interference including visiting yachts and tourists. In return, the National Trust will compensate the landowners \$1,500 annually to act as honorary wardens of the island. This arrangement has worked very well to date and the animal sanctuary (nature reserve) is a reality, to the benefit of all parties involved - the mataqali, the Government and the people of Fiji - and of course the Crested Iguana (*Brachyocopus vitiensis*).

CASE STUDY: ENDANGERED SPECIES MANAGEMENT NEEDS IN THE COOK ISLANDS

The Conservation Service
 Department of Internal Affairs
 Cook Islands

INTRODUCTION

This paper describes a proposal by the Cook Islands Government to establish an IUCN Category I (Scientific Reserve/Strict Nature Park) reserve over approximately 10 square kilometres of Native Customary and Native Freehold land in inland Rarotonga. The primary purpose of the reserve is the protection of the Rarotongian Flycatcher [*Pomarea dimidiata*, (*Kakerori*)] one of the world's rarest birds. Protection will also be afforded the native flora and animals abundant in this mountainous inland area.

LOCATION AND PHYSICAL FEATURES

The proposed reserve (to be named the Kakerori Reserve) covers an inland area on the southern side of Rarotonga extending from Te Kou in the west to Toroume in the east and reaching Te Manga in the north (see Map 1). About 90% of the area is over 90m and includes Rarotonga's highest and second highest mountains, Te Manga (653m) and Te Atukura (638m). The area is one of the wettest in Rarotonga with about 4,000mm a year. Although the mean daily temperature is 24°C which is similar to the north side of Rarotonga, the range is reduced by the more common cloud cover. It contains the headwaters of four streams: Taipata, Totokoitu, Turoa and Avana and can be described as an area of steep-sided valleys and razor-backed ridges.

VEGETATION

The area is covered by a montane tropical forest and has not faced major disturbance, although areas of it were once grazed by cattle. There are a few areas of fernland [*Dicranopteris linearis*, (*Tu'anus*)]. Over 90% of the vegetation is native, overlooking the fact that the Beach hibiscus [*Hibiscus tiliaceus*, (*pu'rau*)] in the valleys may be an aboriginal introduction. Some introduced trees including the Guava [*Psidium guajava*, (*Tuava*)], the Strawberry guava [*Psidium cattleianum*, (*Tuava*)] and Lantana [*Lantana camara*, (*Tataranoa*)] are moving into the lower areas.

The native bush consists mainly of *Homalium* [*Homalium acuminatum*, (*Matu*)]. Other species present are: *Waimania* [*W. rarotongensis*, (*Kaiatea*)], *Elaeocarpus* [*E. rarotongensis*, (*Karaka*)], *Vagraea* [*V. berteriania*, (*Pua*)], *Fitchia* [*F. speciosa*, (*Neinei*)], *Metrosideros* [*M. collina*, (*Rata*)], *Canthium* [*C. barbatum*, (*matira*)], *Pittosporum* [*P. rarotongensis*, (*Kavakava*)], *Coprosma* [*C. laevigata*, (*Angi*)], *Ixora* [*I. bracteata*, (*Itoa*)], *Meryta* [*M. pauciflora*, (*Kak-vatua*)] and *Xylosma* [*X. gracile*, (*Ake ake*)]. The ground-cover shrubs consist of the Kingfern [*Angiopteris longifolia*, (*Anae*)], *Alyxia* [*A. elliptica*, (*Maire rakau*)], *Macropiper* [*M. latifolia*, (*Kavakava atua*)]. A common sprawling vine on ridges is *Freycinetia* [*F. Wilderi*, (*Kiekie*)].

Ed. Note: Names in () are local names.

The flora requiring special protection includes three species in particular:

- (a) *Cyrtandra rarotongensis*: the only recorded specimen of this species is in the western section of the reserve.
- (b) *Scleroteca viridiflora*: the only recorded specimen of this species is in the western section of the reserve. It is thought that some also occur near Te Kou.
- (c) *Evodia* sp.: a few plants are found in the western section of the Reserve.

NOTEWORTHY FAUNA

The main reason for the reserve is to attempt to prevent the extinction of one of the world's rarest birds, the Rarotonga Flycatcher [*Pomarea dimidiata*, (*Kakavori*)]. Although this bird was quite common during the 1850's its population declined drastically during the next fifty years. Today the total population probably consists of less than 50 birds. These live in the upper parts of the valleys on the south side of the reserve: Taipara, Totokoitu, Turoa, some unnamed streams west of the Turoa and in some eastern valleys of the Avana.

The Reserve should protect the natural environment of the Flycatcher and allow control over the number and type of people visiting the reserve. This is considered important because the presence of people may encourage more rats into the area which in turn may destroy nestlings. Evidence indicates that each pair of birds raise only one nestling and it is essential for the survival of the species that the young are given every possible chance to survive.

One reason for including the whole of the upper Avana in the Reserve is to protect the ridge behind the main Flycatcher populations and make it possible for the birds to move over into the western valleys. The other reason for including the Avana is to protect the nesting site of another very rare bird: the Herald Petrel [*Pterodroma harvaldia*, (*Koputu*)]. This large seabird was common in the early 1800's and was thought to be extinct by the turn of the century as a result of excessive hunting. However, either some survived and have continued in low numbers to the present day, or Rarotonga has been re-colonised by a few birds from overseas. At present there are five pairs nesting on the western face of the Te Manga-Te Atukura divide and five pairs on the eastern side of Maungatea.

Other land birds seen in the area include the Rarotonga Starling [*Aplonis cinerascens*, (*Toi*)], Rarotonga fruit dove [*Ptilinopus rarotongensis*, (*Kikaipa*)] and the Pacific pigeon [*Ducula pacifica*, (*Kupe*)]. The nesting, migrant from New Zealand, the Long-tailed Cuckoo [*Eudynamis taitensis*, (*Karavia*)] is also present during the winter months.

There are a number of feral fowl [*Gallus gallus*, (*Moa*)] in the Reserve but these do not constitute a danger to either of the two birds threatened with extinction.

Seabirds nesting in the Reserve are the Brown Noddy [*Anous stolidus*, (*Ngolo*)] and the White tern [*Gygis alba*, (*Kakaia*)]. A few White-tailed tropic birds [*Phaethon lepturus*, (*Rakoa*)] also nest on some of the cliffs on the Te Manga-Te Atukura divide.

There are at least three colonies of Flying foxes in the Reserve and these may require periodic control. There are no cattle, sheep, goats, horses or pigs in the Reserve and this situation should be maintained.

Black rats [*Rattus rattus*, (*Kiore toka*)] in the area could be a problem to the Flycatcher and some control measures may be required. As far as is known feral cats [*Felix domesticus*, (*Kore ngi'ao*)] are uncommon or absent from the area.

CULTURAL FEATURES

The reserve is uninhabited, the nearest dwellings being about a kilometre from the southern edge. No areas of cultural significance have been identified in the Reserve, however, there is a "Marae" (historic site) close by.

MANAGEMENT AND SCIENTIFIC RESEARCH

The Reserve is under the joint control of the Conservation Service of Internal Affairs and the Totokoitu Research Station and is administered by the Conservation Service Director and the Manager of the Totokoitu Research Station. There are no full-time staff, nor is there an annual budget for the Reserve. Day-to-day management is undertaken by staff from both the Conservation Service and the Research Station. The zoning of the Reserve is limited to Scientific Research however, none is being undertaken at present. The Totokoitu Research Station has basic laboratory facilities and accommodation for two scientists.

DISTURBANCES AND DEFICIENCIES

At present visitors to the areas of the Reserve containing Flycatchers are scientists, flying fox hunters and a few hikers. Their numbers will be monitored and they will be reminded of the dangers of leaving anything which would encourage rats to live in the area. It is fundamental that trees containing flycatcher nests should not be climbed at any time as human footprints will attract rats.

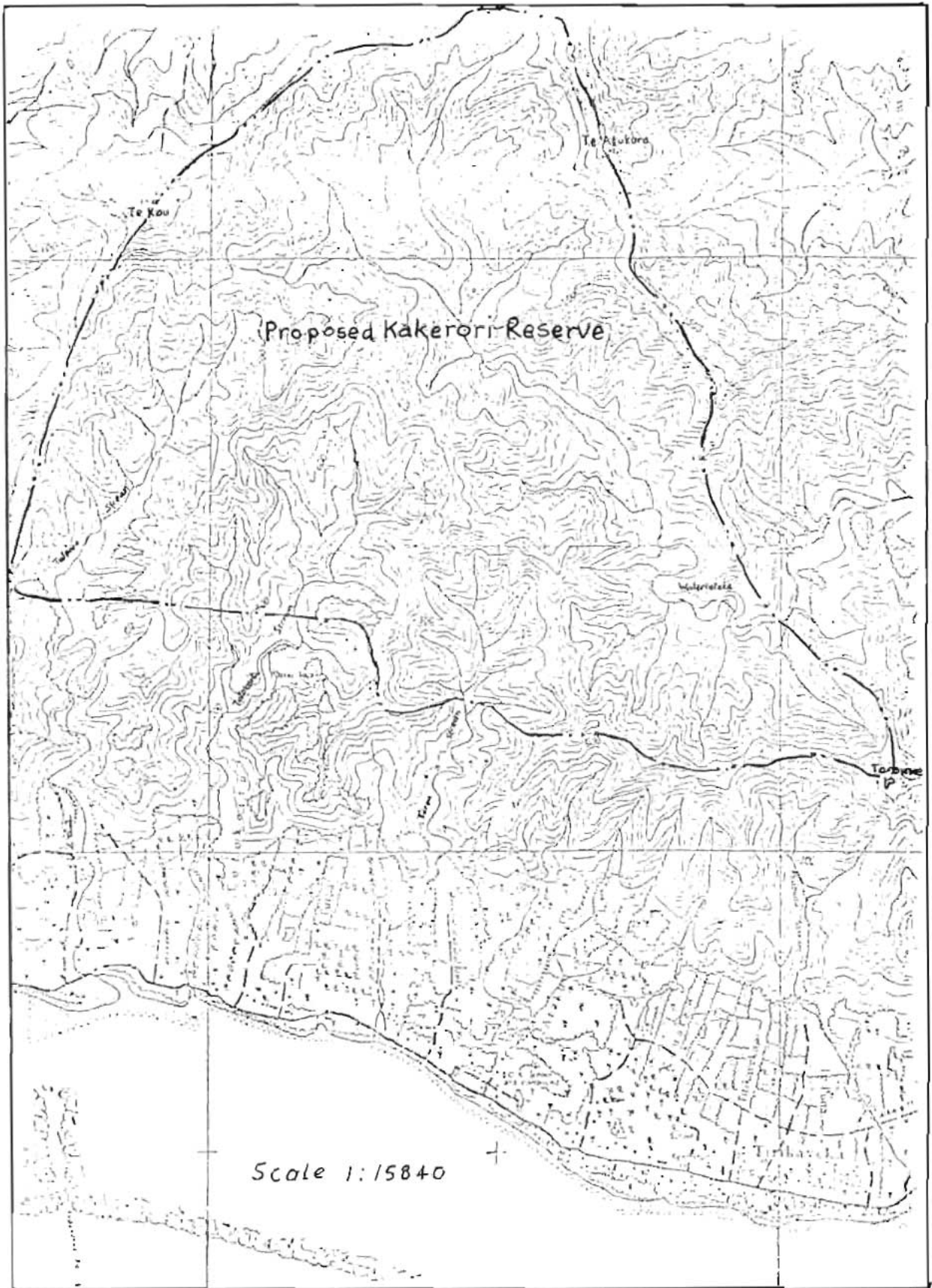
No scientist will be allowed to take samples of the rare plants without prior permission from the Management Committee.

Because the main valleys are water-catchment areas they should remain undisturbed. However, this situation needs to be monitored and a watch maintained on the extent of agricultural intrusions along the southern edge of the Reserve. Any extension of the present access roads within the Reserve will require the prior approval of the Management Committee.

All present water-intake dams are excluded from the Reserve.

MAP 1





CASE STUDY: FERAL ANIMAL ERADICATION PROGRAMME
KIRITIMATI, KIRIBATI

Wildlife Conservation Unit
KIRIBATI

INTRODUCTION

Proposals for a cat eradication programme in Kiritimati were prepared by the Wildlife Conservation Unit in 1983 in conjunction with the New Zealand Wildlife Service who sent an expert in this field to study the problem and the potential benefit of a successful programme. The proposal has been put to Government for overseas funding. The objective of the programme is to remove feral cats from Kiritimati but it will also be applied to the removal of feral pigs. It is important to note that the programme has been designed with consideration for the present and future economic situation in Kiribati.

STATEMENT OF PROBLEM

Feral cats are known to pose the most serious threat to the birdlife of Kiritimati. They are present in large numbers over the entire island and live almost entirely on birds. Despite the establishment of the Wildlife Conservation Unit on Kiritimati in 1977, attempts to control their numbers have been without much success. The proposed programme will therefore ensure survival of the birds which are of economic benefit to Kiribati as an added attraction for tourists. Efforts to solve the feral animal problem have not been attempted on any major scale apart from intensive and laborious hunting and live trapping which has been maintained as a routine task. The 321 square kilometres of Kiritimati renders present control methods worthless. The island is recognised internationally as having considerable scientific and conservation importance for wildlife in the central Pacific. Therefore, the success of the programme is important to help ensure that this situation is maintained or enhanced in the future.

SETTING AND BACKGROUND

Kiritimati is the world's largest coral atoll with a total land area of 321 square kilometres and an approximately equal area of lagoons. With its multi-complex system of subsidiary land-locked lagoons, the island and its several hundred islets harbour some of the world's largest concentrations of seabirds and are of world significance both in terms of species diversity and abundance. Human activity over past years has not changed much of the island's appearance, although there is some modification in the form of coconut plantations which presently cover a third of the total land area. With unfavourable weather conditions discouraging further planting, other forms of development are being undertaken, e.g. tourism based on sport fishing and bird-watching. Another recent example of the development is a solar salt project.

CONSTRAINTS

The major constraint for the feral animal eradication programme is the lack of financial provision or support for its implementation. The Government alone cannot back such an extensive programme and it is hoped that overseas financial assistance will be forthcoming for this purpose.

CONCLUSION

Apart from the routine control work undertaken by the Wildlife Conservation Unit since 1977, no major programme has been undertaken to achieve total feral animal eradication. The proposed 5 year project is therefore one of the biggest conservation measures to be undertaken to preserve wildlife on Kiritimati.

BIBLIOGRAPHY

- ALLEN, G.A., and N.J. Cross, 1982. *Rainbow fishes of Australia and Papua New Guinea*. T.H.F. Publications, New Jersey, 1982. 141pp.
- ALLEN, J., J. Golson and R. Jones, 1977. *Funda and Sahul: Prehistoric Studies in Southeast Asia, Melanesia and Australia*. Academic Press, 647pp.
- ALLEN, R. 1976. *Reodevelopment and Traditional Natural Resource Management in the South Pacific*. Paper presented at the Second Regional Symposium of Conservation of Nature, Apia, Western Samoa, June.
- ALLTON, A. 1982. Distribution and Ecology of New Guinea Lizards. In: Cressitt, J.L. (ed.). *Biogeography and Ecology of New Guinea*, Vol.2. pt.5, Dr W. Junk Publishers, The Hague: 803-814.
- AMERSON, A.B. Jr., W.A. Whistler, and T.D. Schwaner, 1982. *Wildlife and Wildlife Habitat of American Samoa. I. Environment and Ecology*. U.S. Department of the Interior. Contract No. 11-16-001-5782FA to Environmental Consultants Inc, Dallas, Texas. 151pp.
- AMERSON, A.B. Jr., W.A. Whistler and T.D. Schwaner. *Wildlife and Wildlife Habitat of American Samoa. II. Accounts of Flora and Fauna*. U.S. Department of the Interior. Contract No. 11-16-001-5782FA to Environmental Consultants, Inc. Dallas, Texas. 151pp.
- ANON. 1985. Indonesia's Irian Jaya. Part II. *Parks* 10 (1) : 17
- AQUATIC Farms and AECOS (AF & AECOS). 1980. *American Samoa Coral Reef Inventory*. U.S. Army Corps of Engineers, Honolulu District. Prepared for Development Planning Office, American Samoa Government. Part A: Text. Part B: Atlas. 314pp.
- AXELROD, D.I. and P.H. Raven. 1976. Paleobiogeography and Origin of the New Guinea Flora. In: Cressitt, J.L. (ed.) *Biogeography and Ecology of New Guinea*. Vol. 2., pt. 6, Dr W. Junk Publishers, The Hague: 919-941.
- AYLING, A.M. and AYLING, A.L. 1984. *Hydrographers Passage Navigational Aids - A Preliminary Investigation of the Effect of Large Structures on Reef Communities and Topography*. Unpublished report to the Great Barrier Reef Marine Park Authority, Townsville.
- BAINES, G.B.K. 1980. Pacific Islands: Development of Marine Resources of Selected Islands. In: *Man, Land and Sea*. (ed.) Soysa O., Bangkok: Agricultural Development Council.
- BAINES, G.B.K. 1981. *Environmental Management for Development in the Pacific*. UNDAT report. Suva.

- BAINES, Graham. 1982. Traditional Conservation Practices and Environmental Management: The International Scene In: (see Bulmer 1982). pp.45-47.
- BALASINGHAM, E. and Pong, T.Y. 1972. Preliminary Observation on Nesting Returns of the Leathery Turtle (*Dermonohelyx coriacea* Linn.) in Central Trengganu, Malaysia. *Malay Nat. J.* 25:6-9.
- BEANLANDS, G.E. and Duinker, P.N. 1984. Lessons from a Decade of Offshore Environmental Impact Assessment. *Ocean Management* 9: 157-175.
- BEEHLER, B. and B.W. Finch, 1983. A species checklist of New Guinea birds. [First draft]. 112pp.
- BELL, L.A.J. and E.J. Albert, 1983. Progress Report on the Green Mussel Culture Project in Western Samoa. *South Pacific Commission Fisheries Newsletter* 25: p.12-16.
- BELL, L.A.J. and E.J. Albert, 1984a. Update Report on the Green Mussel Culture Project in Western Samoa. *South Pacific Commission Fisheries Newsletter* 26: p.24-28.
- 1984b. First Harvest Results from the Green Mussel Culture Project in Western Samoa. *South Pacific Commission Fisheries Newsletter* 29: p.24-26.
- BELL, L.A.J. 1984. Mussel Spatfall Survey in Asau Bay. Fisheries Division, Department of Agriculture, Forests and Fisheries, Apia, Western Samoa.
- BELL, T.I.W. and Tevita Evo. 1982. Energy Plantations in the Fiji Dry Zone. *Fiji Pine Research Paper No. 10*. Fiji Pine Commission, Lautoka and Fiji Forestry Department, Suva.
- BIRKELAND, C. and R.H. Randall. 1979. *Report of the Acanthaster planci (Alamea) studies on Tutuila, American Samoa*. Prepared by University of Guam Marine Laboratory for the Director, Office of Marine Resources, American Samoa Government.
- BONNEMAISON, J., 1984. Social and Cultural Aspects of Land Tenure. In: *Land Tenure in Vanuatu*, (ed.) Larmour, P., University of the South Pacific.
- BROWNLIE, G. and Philipson, W.R. 1971. Pteridophyta of the Southern Cook Group. *Pacific Science* 25: p.502-11.
- BRYANT, J.J. 1984. Environmental Education and Training in the South Pacific. *INR Environmental Studies Report*, No. 22. A report to the United Nations Environmental Programme. Bangkok.
- BUCK, P.H. 1930. Samoan Material Culture. *Bernice P. Bishop Museum Bulletin* 75. Honolulu, Hawaii.
- BULMER, R.N.R. 1982. Traditional Conservation Practices in Papua New Guinea. In: *Traditional Conservation in Papua New Guinea: Implications for Today* (L. Morauta, J. Pernetta and W. Heaney eds). Monograph 16. Institute of Applied Social and Economic Research, Boroko, P.N.G. pp.59-77.

- BURGIN, Shelly. 1982. Crocodiles and Crocodile Conservation in Papua New Guinea. In: (see Bulmer, 1982). pp.295-300.
- CAREW-REID, J. 1984. South Pacific Regional Environment Programme: A United Approach by Pacific Islands. *Ambio*. Vol. XIII, No. 5-6.
- CAMERON, McNamara. 1985. Guidelines and Methodologies for Environmental Assessment of Offshore Developments (in prep.).
- CARR, A.F. 1952. *Handbook of Turtles*. Comstock Assoc., Cornell Univ. Press.
- CARR, A. and Ogren, L. 1959. The ecology and migrations of sea turtles, 3. *Dermochelys* in Costa Rica. *Amer. Mus. Novitates* 1958: 1-29.
- CARR, A. 1982. Notes on the behavioural ecology of sea turtles. In: Bjørndal, K. (ed.) *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington D.C.
- CARTER, John. 1984. *Pacific Island Yearbook* (15th edition). Pacific Publications, Sydney.
- CHAMBERS, R. 1976. Two Frontiers in Rural Management : Agricultural Extension and Managing the Exploitation of Communal Natural Resources. In: Hunter, G. et. al., (ed.) *Policy and Practices in Rural Development*. Overseas Development Institute : London. pp. 429-450.
- CHEESMAN, T.F. 1903. *The Flora of Barotonga, the Chief Island of the Cook Group*. Trans. Linn. Soc. Lond. 2nd Ser. Bot VI pt: 261-313 with 5 plates.
- CHESHER, R.H. 1984. Black coral of Tonga - Resource Assessment Report. SPREP, South Pacific Commission, Noumea.
- CHESHER, R.H. 1984. Pollution sources of survey of the Kingdom of Tonga. SPREP, South Pacific Commission, Noumea.
- CHESHER, Rick. 1984. Research Scientist. ex South Pacific Regional Environmental Programme (SPREP) Noumea. Personal Communication.
- CLARKE, W.C. 1971. *Place and People*. University of California Press, Berkeley.
- CLARKE, W.C. 1977. The Structure of Permanence : The Relevance of Self-subsistence Communities for World Ecosystem Management. In: *Subsistence and Survival: Rural Ecology in the Pacific* (T. Bayliss-Smith and R. Faachem eds.), Academic Press, New York, pp.363-384.
- CODE of Federal Regulations. 1980. 50 Wildlife and Fisheries. Parts 1-99. Revised.
- COMMITTEE on Food Supplies (B.S.I.P.). 1974. *Food and Self-Reliance: Report of the Committee on Food Supplies*. Government House, Honiara, Solomon Islands.

- CORNELIUS, S.E. 1976. Marine turtle nesting activity at Playa Naranjo, Costa Rica. *Brenesia* 8:1-27.
- CROCOMBE, R.G. 1964. *Land Tenure in the Cook Islands*, Oxford University Press, Melbourne.
- DAHL, A.L., and Antonias, A. 1974. American Samoa field survey (September 7-12, 1971). In: Dahl, A.L., MacIntyre, I.G., and Antonius, A. (eds.). A comparative survey of coral reef research sites. pp.72-74. *Atoll Research Bulletin* 172 : 37-120.
- DAHL, A.L., and Baumgart, I.L. 1982. The State of the Environment in the South Pacific. In: *Report on the Conference on the Human Environment in the South Pacific*. South Pacific Commission, Noumea, New Caledonia. pp.47-71.
- DAHL, A.L. 1971. Ecological report on Tutuila, American Samoa. Smithsonian Institution, Washington, D.C. 13pp. Unpublished.
- DAHL, A.L. 1972. Ecology and community structure of some tropical reef algae in Samoa. *Proceedings of the International Seaweed Symposium* 7:36-39. John Wiley and Sons, New York.
- DAHL, A.L. 1978. Report on Assistance to Western Samoa with National Parks and Conservation. South Pacific Commission, Noumea, New Caledonia, mimeo.
- DAHL, Arthur L. 1980. Regional ecosystems survey of the South Pacific area. *South Pacific Commission, Technical Paper No. 179*. Noumea, New Caledonia.
- DAHL, Arthur L. 1981. Regional ecosystems survey of the South Pacific area. *South Pacific Commission, Technical Paper No. 179*. Noumea, New Caledonia.
- DAHL, Arthur L. 1984. Biogeographical aspects of isolation in the Pacific. *Ambio* 13(5-6):302-305.
- DAHL, A.L. 1984. Oceania's most pressing environmental concerns. *Ambio*. 13(5-6).
- DASMANN, R.F. 1975. *The Conservation Alternative*. John Wiley and Sons, New York.
- DE'ATH, Colin. 1982. Forest Conservation Practices in Papua New Guinea In: (see Bulmer, 1982). pp.203-215.
- DERANIYAGALA, P.E.P. 1939. The tetrapod reptiles of Ceylon. Vol. 1, *Turtles and crocodilians*. Colombo Mus., Ceylon.
- DIAMOND, J.M. 1980. Proposal for a reserve in the Mamberamo region, Irian Jaya; WWF Indonesia Programme, Special Report No. 3, Mimeo. 24p.
- DIAMOND, J.M. 1981. Surveys of proposed reserves in the Poja Mountains and Fakfak Mountains, Irian Jaya, Indonesia; Mimeo. 18p.
- DIAMOND, J.M. 1982. Biological principles relevant to protected area design in the New Guinea region; World National Parks Congress, Managing Protected Areas Workshop; 3p.

- DITTLE, H. 1980. *A Field Guide to the Reef-Building Corals of the Indo-Pacific*; Dr W. Backhuys, Rotterdam; 291p.
- DRIML, S.H. and Kermond, J.L. 1984. Tourism in the Great Barrier Reef Region. *Proceedings of the 19th Conference IAG*. Sydney. (in press).
- DUTTON, I.M. and Woodley, S.J. 1984. Offshore Tourist Developments : A Case Study of an Emergent Management Issue Within the Great Barrier Reef Region. *Proc. 57th Nat. Conf. Royal Aust. Inst. Parks and Recreation*. pp.139-149.
- DWYER, P.D. 1982. Wildlife Conservation and Tradition in the Highlands of Papua New Guinea. *ibid.* (see Bulmer, 1982). pp.173-189.
- EATON, P. 1985. Land Tenure and Conservation : Protected Areas in the South Pacific. South Pacific Commission, Noumea.
- EHRENPELD, D. 1982. Options and limitations in the conservation of sea turtles. In Bjorndal, K. (ed.), *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- FAO/UNDP. 1978. Nature conservation in Irian Jaya: general information and proposals for establishment of new conservation areas; FO/INS/73/013, Bogor, 52p.
- FAO/UNDP. 1981. National conservation plan for Indonesia, vol. VII, Maluku and Irian Jaya; FO/INS/78/061 Field Report 18, Bogor.
- FEACHEM, R.C.A. 1977a. Environmental Health Engineering as Human Ecology: An Example from New Guinea. In: *Subsistence and Survival: Rural Ecology in the Pacific*. Academic Press, London. pp.129-182.
- 1977b. Water Supplies for Low-Income Communities: Resource Allocation, Planning and Design for a Crisis situation. In: *Water, Wastes and Health in Hot Climates* (R. Feachem, M. McGarry and D. Mara eds.). John Wiley & Sons, New York, pp. 75-95.
- FIJI Central Planning Office. 1980. *Fiji's Eighth Development Plan: 1981-1985*. Government Printer, Suva, Fiji.
- FISCHER, J.L. and A.M. Fischer. 1957. The Eastern Carolines. Pacific Science Board and Human Relations Area Files, New Haven.
- FITTER, R.S.R. 1961. The leathery turtle or luth. *Oryz* 6:116-125.
- FRETEY, J. and J. Lescure. 1979. Rapport sur l'étude de la protection des tortues marines en Guyane française. Notes sur le projet de réserve naturelle de Rasse Mana. Ministère de la Culture et la Nature. Paris.
- GALGO, Bobby, 1982. Past and Present Fishing Practices Among the People of Tana Village, Port Moresby. In: (see Bulmer, 1982). pp.301-302.

- CARLOWSKY, D., and A. Bergquist. 1970. Crown-of-Thorns Starfish in Western Samoa. *South Pacific Bull.* Vol. 20, No. 3 pp.47-49.
- GAUSS, C.A. 1981. Apia Harbour Survey, Samoa. Cruise Report No. 55. UNDP Economic and Social Commission for Asia and the Pacific. 10pp.
- GIBBONS, J.R.H. 1984. Iguanas of the South Pacific. *Oryz*: 18(2):82-91.
- GILSON, R.P. 1970. *Samoa 1830 - 1900; The Politics of a Multicultural Community*. Oxford University Press, Melbourne.
- GOVERNMENT of Western Samoa. 1980. *Fourth Five Year Development Plan 1980-1984. Volume I Development Objectives, Strategies and Sectoral Programmes*. Economic Development Department.
- GOVERNMENT of Western Samoa. 1984. *Fifth Development Plan 1985-1987*. Department of Economic Development.
- GRATTAN, F.J.H. 1948. *An Introduction to Samoa Custom*. Samoan Printing and Pub. Co., Apia.
- GREGG, William, P. Jr. 1983. Multiple-site Biosphere Reserves for Better Management of Regional Resources. Jim Wood (ed.), *Proceedings of the Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands*. U.S. National Park Service Southeast Regional Office, Atlanta. pp.12-19.
- GRIGG, R.W. 1977. *Hawaii's Precious Corals*. Island Heritage Ltd., Honolulu.
- GRESSITT, J.L. 1982 Ecology and biogeography of New Guinea Coleoptera [beetles]. In: Gressitt, J.L. (ed.) *Biogeography and Ecology of New Guinea*, Vol. 2 pt. 4, Dr W. Junk Publishers, The Hague, 709-734.
- GRESSITT, J.L. 1982. Zoogeographical summary. In: Gressitt, J.L. (ed.) *Biogeography and Ecology of New Guinea*, Vol. 2, pt. 6, Dr W. Junk Publishers, The Hague, 897-918.
- GROOMBRIDGE, B. and L. Wright. 1982. *The IUCN Amphibia-Reptilia Red Data Book Pt. 1, Testudines, Crocodylia, Rhynchocephalia*. IUCN, Gland, Switzerland and IUCN Conservation Monitoring Centre, Cambridge, 462p.
- HAINES, A.K. 1982. Traditional Concepts and Practices and Inland Fisheries Management. In: (see Bulmer, 1982). pp. 279-291.
- HAIVETA, Chris. 1982. Freshwater Supplies, Past and Present, in Lese Oalis, a Gulf Province Village. In: (see Bulmer, 1982). pp. 273-277.
- HALFFTER, G. 1981. The Mapimi Biosphere Reserve : Local Participation in Conservation and Development. *Ambio* 10 (2-3) : 93-96.
- HIRTH, H.F. 1980. Some aspects of the nesting behaviour and reproductive biology of sea turtles. *Amer. Zool.* 20:507-523.

- HOLLOWAY, C.W., 1975. *A National Parks System for Western Samoa*. UNDP.
- HOLTHUIS, L.B. 1959. The occurrence of *Birgus latro* in Netherlands New Guinea [Crustacea Decapoda Paguridea]; *Contr. New Guinea Carcinology III, Nova Guinea, New Ser.* 10:303-310.
- HOLTHUIS, L.B. 1963. Further data on the occurrence of *Birgus latro* in West New Guinea [Crustacea Decapoda Paguridea]; *Contr. New Guinea Carcinology IV, Nova Guinea, Zool.* 18:355-359.
- HOLYOAK. 1980 *Birds of the Cook Islands*.
- HUGHES, G.R. 1982. Nesting cycles in Sea Turtles - typical or atypical? In: Bjorndal, K. (ed.). *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- INSTITUTE of Marine Resources. 1984. *Annual Report to Council*. USP, Suva, Fiji.
- INSTITUTE of Natural Resources. 1984. *Annual Report*. USP, Suva, Fiji.
- INSTITUTE of Rural Development. 1984. *Report to Council 1984*. Nukua'lofa, Tonga.
- IUCN, 1975 *South Pacific Conference on National Parks and Reserves*. IUCN, Morges, Switzerland.
- IUCN, 1979 *The Biosphere Reserve and its Relationship to Other Protected Areas*. IUCN, Morges, Switzerland.
- IUCN, 1980 *World Conservation Strategy: Living Resource Conservation for Sustainable Development*. IUCN/UNEP/WWF, Gland, Switzerland.
- IUCN, 1982 *United Nations List of National Parks and protected areas*. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.
- JANZEN, D.H. 1983. Tropical Agroecosystems, *Science* 82(4118): 212-219.
- JOHANNES, R.E. 1978. Traditional Marine Conservation Methods in Oceania and Their Demise. *Annual Review of Ecology and Systematics*, 9:349-364.
- JOHANNES, R.E. 1981. *Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia*. University of California Press, Berkeley.
- JOHANNES, R.E. 1982. *Reef and Lagoon Resource Management in Western Samoa*. South Pacific Regional Environment Programme, South Pacific Commission, Noumea, New Caledonia.
- JOHANNES, R.E. 1982. Implications of Traditional Marine Resource Use for Coastal Fisheries Development in Papua New Guinea. In: (see Bulmer, 1982). pp.239-249.
- JOHANNES, R.E. 1984. Marine Conservation in Relation to Traditional Life Styles of Tropical Artisanal Fishermen. In: J. Hanks (ed.), *Traditional Life Styles, Conservation and Rural Development, Commission of Ecology Paper* 7:31-35.

- JORDAN, D.S. and A. Seals. 1906. The fishes of Samoa. pp.173-455. In: *Bulletin of the Bureau of Fisheries XXV*. Department of Commerce and Labor, Government Printing Office, Washington, D.C.
- KAWAPINA, N. 1982. Wildlife conservation, past and present in the lowlands of Papua New Guinea. In: Morauta, L., Pernetta, J. and Heaney, W. (ed.). *Traditional Conservation in Papua New Guinea: Implications for Today*. I.A.S.E.R. Boroko.
- KLEE, G.A. 1980. Oceania In: *World Systems of Traditional Resource Management* (G.A. Klee ed.). Edward Arnold, London, pp.245-281.
- KRAMER, A.F. 1888. *The Samoan Islands*. A translation of Die Samoa - Inseln. Translated from German by D.H. and M. de Beer 1902.
- KUNATABU, P. 1983. *Traditional Knowledge of the Marine Environment in Fiji*. University of the South Pacific, Suva, Fiji.
- LAMBERTS, A.E. 1978. Field studies of corals, Tutuila, American Samoa (November - December 1978). 77pp. Unpublished notes.
- LAMBERTS, A.E. 1979. Field book of American Samoa reef studies (October 7 - October 27, 1979). 32pp. Unpublished notes.
- LANE, R. 1971. The New Hebrides: Land Tenure without Land Policy. In: Crocombe, R.G., (Ed.) *Land Tenure in the Pacific*, Oxford University Press, Melbourne.
- LEONARD, G., 1977. Acquiring Land for National Parks. In: S. Kalauni et al., *Land Tenure in Niue*. University of the South Pacific, Suva. pp.40-47.
- LESLIE, D.M. 1980. Soils of Rarotonga, Cook Islands. *N.Z. Soil Survey Report*, 49: D.S.I.R. New Zealand. 68pp.
- LEVER, J.C. 1980. *Crocodile Conservation and Industry Development in Irian Jaya*, FAO, Bogor. 53p.
- LIMPUS, C.J. 1982. The status of Australian Sea Turtle populations. In: Bjornadal, K. (ed.). *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- LIMPUS, C.J. and N.C. McLachlan. 1979. Observations on the leatherback turtle, *Dermochelys coriacea* (L.), in Australia. *Aust. Wildl. Res.* 6:105-16.
- LUCAS, P.H.C., Gorio, S. and Poai, K. 1981. Parks and Reserves in the South Pacific. Topic Review Paper presented to the South Pacific Regional Environment Programme Technical Meeting, Noumea, New Caledonia.
- MAENU'U, L.P. 1977. Traditional Farming in the Solomon Islands. In: Winslow J.H. (ed). *The Melanesian Environment* Chapter 14. Australian National University Press, Canberra. pp.139-145.
- MANNER, B.I., and Thaman, R.R. 1983. Environmental Studies Degree at USP. *Review* 3(8):21.

- HANNER, H.F., R.R. Thuman and D.C. Bassall. 1984. Phosphate Mining Induced Vegetation Changes on Nauru Island. *Ecology* 65(5): 1454-1465.
- MCCOY, M.A. 1974. Man and Turtle in the Central Carolines. *Micronesica* 10(2):207-221.
- MCDOWELL, S.B. 1975. A catalogue of the snakes of New Guinea and the Solomons, with special reference to those in the Bernice P. Bishop Museum; Part 1; Scolecophida; *Jour. Herpetology* 8[1]:1-57.
- MCDOWELL, S.B. 1975. A catalogue of the snakes of New Guinea and the Solomons with special reference to those in the Bernice P. Bishop Museum; pt. II; Aniliodea and Pythoninae; *Jour. Herpetology* 9[1]:1-79.
- MCDOWELL, S.B. 1979. A catalogue of the snakes of New Guinea and the Solomons, with special reference to those in the Bernice P. Bishop Museum; pt. III, Boinae and Acrochordoidea (Reptilia, Serpentes); *Jour. Herpetology* 13[1]:1-92.
- MCLEAN, D. 1983. Black coral and Tonga. Report submitted to the Hon. Dr M'afu Tupou, Governor of Vva'u by Sea Jewellery from Tonga Ltd.
- MENZIES, J.L. 1975. *Handbook of northern New Guinea frogs*; Wau Ecology Institute Handbook No.1, 75p.
- MILLAR, A. 1978. Orchids of Papua New Guinea; ANU Press, Canberra, 101p.
- MILLER, K.R. 1974. Development and Training of Personnel - The Foundation of National Parks in the Future. Second World Conference on National Parks, IUCN.
- MOKOROA, P. 1984. Te Vai E Te Tai: Customary Rights to Water and the Sea. In: Kautai, N. et al., (eds.) *Atiu: An Island Community*. University of the South Pacific, Suva. pp.102-104.
- MONTAGUE, J.J. 1981. His 'crop' is crocodiles. *International Wildlife* 11(2):21-28.
- MUNRO, I.S.R. 1967. *The Fishes of New Guinea*. Dept. Agric., Stock and Fisheries, Port Moresby, 651p.
- O'CONNOR, D.C. 1983. New approach to environmental assessment. Paper presented at a Conf. on Environmental Impact Assessment, Perth. Western Australia.
- OFFICE of Coastal Zone Management and the Development Planning Office, American Samoa Government. 1980. *Final Environmental Impact Statement and the Proposed Coastal Management Program for the Territory of American Samoa*. 197pp + Attachments.
- OFFICE of Ocean and Coastal Resource Management. 1984. *Final Environmental Impact Statement and Management Plan for the Proposed Fagatele Bay National Marine Sanctuary*. 107pp. + Attachments.

- OFFICE of Samoan Information. 1980. American Samoa's annual report, fiscal year 1981. Pago Pago, American Samoa. 73p.
- OWEN, R.P. 1969. The Status of conservation in the Trust Territory of the Pacific Islands, *Micronesia*, 5.
- PERCIVAL, M. and I.S. Womersley. 1975. Floristics and ecology of the mangrove vegetation of Papua New Guinea, *Botany Bull. No. 8*, PNG Dept. of Forests, Div. Botany, Lae, Papua New Guinea, 96p.
- PERNETTA, John, Louise Morauta and William Heany. 1982. Overview. In: *Traditional Conservation in Papua New Guinea: Implications for Today* L. Morauta, J. Pernetta and W. Heany eds.). Monography 16. Institute of Applied Social and Economic Research, Boroko, Papua New Guinea. pp.1-15.
- PETOCZ, R.G. 1983. Recommended reserves for Irian Jaya province: statements prepared for the formal gazettelement of thirty-one conservation areas; WWF/IUCN Project 1528 Special Report in two parts; Pt.I - Text, Pt. II - Map Folio. WWF/IUCN Conservation for Development Programme in Indonesia, Jayapura, 44p. [Indonesian version - Bogor, 61p.] + map folio.
- PETOCZ, R.G., M. Kirenius and Y. de Prates. 1983. Avifauna of the reserves of Irian Jaya; WWF/IUCN Project 1528 Special Report. WWF/IUCN Conservation for Development Programme in Indonesia, Bogor, 226p.
- PETOCZ, R.G. and Y. de Prates. 1983. Mammals of the reserves in Irian Jaya; WWF/IUCN Project 1528 Special Report, Jayapura, 104p.
- PETOCZ, R.G. and G. Raspado. 1984. Conservation and development in Irian Jaya: a strategy for rational resource utilisation; WWF/IUCN Project 1528 Report, PT Sinar Agape Press, Jakarta, 279p.
- POWELL, J.M. 1977. Plants, Man and Environment in the Island of New Guinea. In: Winslow J.M. (ed). *The Melanesian Environment*. Chapter 2. Australian National University Press, Canberra. pp.11-20.
- PRATT, T.K. 1982. Biogeography of birds in New Guinea. In: Gressitt, J.L. (ed.) *Biogeography and Ecology of New Guinea*, vol. 2, pt.5; Dr W. Junk Publishers, The Hague, 815-836.
- PRITCHARD, P.C.H. 1971. The leatherback or leathery turtle *Dermochelys coriacea*. *IUCN Monograph No. 1* International Union for Conservation of Nature and Natural Resources. pp.39.
- PRITCHARD, P.C.H. 1979. *Encyclopedia of Turtles*. T.F.H. Publications, Hong Kong.
- PRITCHARD, P.C.H. and Clifton, K. 1981. Final Report. Research and Conservation of Sea Turtles in Pacific Mexico, 1980-1981. WWF Project No. 1812.

- PRITCHARD, P.C.H. 1982. Nesting of the leatherback turtle, *Dermochelys coriacea* in Pacific Mexico, with a new estimate of the world population status. *Copeia* 1982: 741-747.
- PUTNEY, Allen D. 1983. Basis for the Selection of a System of Protected Areas in the Lesser Antilles. Jim Wood (ed.), *Proceedings of the Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands*. U.S. National Park Service Southeast Regional Office, Atlanta, pp.1-11.
- PYLE, R.M. 1981. Butterflies : Now You See Them ... *International Wildlife* 11(1): 4-11.
- QUINN, N.J., B.L. Kojis and P. Warepha (eds.). 1984. *Subsistence Fishing Practices in Papua New Guinea*. Lik Lik Buk Information Centre, Lae, pp.135.
- RANDALL, J.E. and D.M. Devaney. 1974. Final report, marine biological survey and resource inventory of selected coastal sites at American Samoa. B.P. Bishop Museum, Department of Zoology. Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division, 100pp.
- RAVUVU, Asesela. 1983. *Yaka i Taukei : The Fijian Way of Life*. Institute of Pacific Studies, University of the South Pacific, Suva.
- ROGERS, Barbara. 1980. *The Domestication of Women: Discrimination in Developing Countries*. Tavistock Publications, London.
- ROSS, J.P. 1982. Historical decline of loggerhead, ridley and leatherback sea turtles. In: Bjorndal, K. (ed.). *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- RUDDLE, K. and R.E. Jonannes (eds.) 1984. *The Traditional Knowledge and Management of Coastal Systems in Asia and Pacific*. Unesco Regional Office for Science and Technology for Southeast Asia, Jakarta. 311pp. (See especially section on Oceania).
- SALM, R.V., R.G. Petocz and T. Soehartono. 1982. Survey of coastal areas in Irian Jaya; UNDP/FAO and WWF, FO/INS/78/061 Special Report Bogor; 19p. + appendices (also in Indonesian).
- SALM, R.V. 1981. Trengganu meets competition: does Irian Jaya harbour southeast Asia's densest leatherback nesting beaches? *Conservation Indonesia* 5(3):18-19.
- SAUSSOL, A. 1971. New Caledonia: Colonisation and Reaction. In: Crocombe, R.G. (ed.), *Land Tenure in the Pacific*, Oxford University Press, Melbourne.
- SCHODDE, R. 1973. General problems of fauna conservation in relation to the conservation of vegetation in New Guinea. In: Costin, A.B. and R.H. Groves, *Nature Conservation in the Pacific; Proc. Symposium XII Pacific Science Congress*, IUCN N.S. No. 25, ANU Press: 123-144.
- SCHOOL of Social and Economic Development. 1984. *Report to Council, 1984*. USP, Suva.

- SCHOOL of Natural Resources. 1984. *Report to Council*. USP. Suva, Fiji.
- SCHULZ, J.P. 1975. Sea turtles nesting in Surinam, Neder. Comm. Int. Naturt. Med. 23, Stichting Natuur. Suriname (Stinasu). Verhandeling No. 3.
- SCHULTER-WESTRIM T. 1978. Conservation in Iraw Jaya; WWF Field Report, Bogor, 42p.
- SCHUMACHER, E.P. 1973. *Small is Beautiful : Study of Economics As If People Mattered*. Abacus (Sphere Books), London.
- SCOTT, F.F. Parker and J.I. Menzies. 1977. A check list of the amphibians and reptiles of Papua New Guinea. *Wildlife in Papua New Guinea*, PNG Wildlife Publications, 77/3.
- SLOW, K.T. 1978. Leathery Turtle (*Dermochelya coriacea*) conservation programme on Rantou Abang, the State of Trengganu, Malaysia. First Marine Science Conference 'Our Seas in Perspective; 5-6 August.
- SINBA, K. 1981. Report on Long Island marine turtle tagging programme, July 1980 - August 1981. Papua New Guinea Office of Wildlife and Conservation. pp.48.
- SIWATIBAU, Suliana. 1976. Traditional Conservation Practices for Modern Pacific Societies. Paper presented at the Second Regional Symposium on Conservation of Nature, Apia, Western Samoa.
- SIWATIBAU, Suliana. 1981. *Rural Energy in Fiji : A Survey of Domestic Rural Energy Use and Potential*. IDRC - 157e. International Development Research Centre, Ottawa.
- SOUTH PACIFIC Commission / SPREP. 1982. *Report of the Conference on the Human Environment in the South Pacific, Rarotonga, Cook Islands, 8-11 March, 1982*. South Pacific Commission. Noumea, New Caledonia.
- SPRIGGS, M.J.T. 1980. Taro Irrigation in Oceania : A Call for More Research. *South Pacific Bulletin* 30(1): 15-18.
- SPRIGGS, M.J.T. 1981. Bombs and Butter : The Revival of Ancient Irrigation Techniques for a Market Economy, a Pacific example. Department of Pre-History, ANU. *Papers in Pre-History*, No. 2, Canberra.
- SPRIGGS, M.J.T. 1982. Traditional Uses of Fresh Water in Papua New Guinea: Past Neglect and Future Possibilities. In: (see Bulmer, 1982). pp.257-271.
- SPRING, S. 1980. *Turtles, Men and Magic*. Division of Wildlife, Port Moresby.
- SPRING, S. 1981. Marine turtles in the Manus Province. *Wildlife in Papua New Guinea* 13:1-15.
- SPRING, S.C. 1982. Marine Turtle Conservation in Papua New Guinea. In: (see Bulmer, 1982). pp.303-306.

- SWADLING, Pamela. 1982. Shellfishing in Papua New Guinea, with Special Reference to the Papuan Coast. *In:* (see Hulmer, 1982). pp.307-310.
- TURAKOTO, P. 1984. Customary Rights to Reefs and Landings. *In:* Lamour, P. (ed.) *Land Tenure in Vanuatu*, University of the South Pacific, Suva. pp.14-16.
- THAMAN, R.R. 1975. Tongan Agricultural Land Use : A Study of Plant Resources. *Proceedings of the International Geographical Union Regional Conference and Eighth New Zealand Geography Conference, Palmerston North, December 1974.* (E. Stokes ed). Geographical Society (Inc.), Wellington, pp.153-160.
- THAMAN, R.R. 1977. Urban Gardening in Papua New Guinea and Fiji. Chapter 15 *In:* *The Melanesian Environment*. J.H. Winslow (ed.) Australian National University Press, Canberra, pp.146-168.
- THAMAN, R.R. 1981. Environmental Education and Research, Human Ecology and Ecosystem Management in the Pacific Islands: The University of the South Pacific and the South Pacific Regional Environmental Programme. Paper presented at the 1981 SPREP Technical Meeting in Noumea, New Caledonia.
- THAMAN, R.R. 1982a. The Foods that Came First. *Alafua Agricultural Bulletin*. 7(3): 105-116.
- THAMAN, R.R. 1982b. Urban Taro Cultivation in the South Pacific. *In:* *Taro Cultivation in the South Pacific*. M. Lambert (ed.). Handbook No.22 (1982), South Pacific Commission, Noumea. pp.103-122.
- THAMAN, R.R., and Morrison, R.J. 1983. The University of the South Pacific: Institutional Facilities and Capabilities Relevant to the SPREP Action Plan. Paper presented at the SPREP Consultative Meeting of Research and Training Institutions in the South Pacific, Suva, Fiji.
- THAMAN, R.R. 1984a. *The Firewood Crisis and Smallholder Fuelwood Systems on Tongatapu Island, Tonga: Present Systems and Development Potential*. PEDP Report: Tonga 85-1. United Nations Pacific Energy Development Programme (ONPEDP), Suva.
- THAMAN, R.R. 1984b. The Poisoning of Paradise: Pesticides, People, Environmental Pollution, and Increasing Dependency in the Pacific Islands. *South Pacific Forum U.S.P. Sociological Society* 1(2): 165-200.
- THAMAN, R.R. 1984c. Intensification of Edible Aroid Cultivation in the Pacific Islands. Chapter 14 *In:* S. Chandra (ed.). *Edible Aroids*. Clarendon Press, Oxford. pp.102-122.
- THAMAN, R.R. 1984d. Urban Agriculture and Home Gardening in Fiji: A Direct Road to Development and Independence. *Transactions and Proceedings of the Fiji Society for the Years 1978 to 1980*. vol. 14:1-28.
- THAMAN, R.R. 1984e. *Trees, Tongans, and Reafforestation in Tonga 1965 to 1984*. Occasional Paper No. 4. The University of the South Pacific, Institute of Rural Development (IRD), Atele, Tonga.

- THAMAN, R.R. 1985a. Fuel Famine Dilemma. *Islands Business* 11(2) (February): 49-51.
- THAMAN, R.R. 1985b. Family Food Production and Nutrition in Kiribati: Problems, Prospects and Potential. Report prepared for the UNICEF Pacific Island Regional Family Food Production and Nutrition Project (RAS/83/008), UNICEF, Suva (In Press).
- THAMAN, R.R. and Tevita Ba. 1979. Energy Needs and Forest Resources of Small Islands. In: *Proceedings of the Tenth and 49th ANZAS Congress*. W. Moran, P. Hosking and G. Aitken (eds.), N.Z. Geographical Society Conference Series No. 10. pp.198-204.
- THORSELL, J.W. 1982. Guidelines for Training Resource Managers. Paper prepared for the Training Protected Areas Personnel Workshop at the Third World National Parks Conference, Bali.
- TOBIN, J.E. 1952. Land Tenure in the Marshall Islands. *Atoll Research Bulletin* 11:1-36.
- TYLER, M.J. 1972. An analysis of the lower vertebrate faunal relationships of Australia and New Guinea. In: Walker, D. (ed.) *Bridge and Barrier: The Natural and Cultural History of Torres Strait*. Res. School Pacific Studies, Publ. BC/3, ANU, Canberra, 231-256.
- UDVARDY, M.D.F. 1975. A Classification of the Biogeographical Provinces of the World. *IUCN Occasional Paper* No. 18:1-45.
- UNESCO. 1974. Task Force on: Criteria and Guidelines for the Choice and Establishment of Biosphere Reserves. *MAB Series Report* 22:1-61. UNESCO, Paris.
- UNIVERSITY of the South Pacific. 1985. *Calendar*. Vol.2. USP. Suva, Fiji.
- U.S. Army Engineer Division, Honolulu. 1979. Baseline water quality survey, American Samoa. *American Samoa Water Resources Study*. Fort Shafter, Hawaii.
- VAAJ, S. 1984. Water Rights in Western Samoa. Paper presented at DSP/FAO Workshop in Land Tenure and Rural Productivity, held in Tonga 10-14 April 1984.
- VAN BALGOOY, M.M.J. 1976. Phytogeography, Part I. In: Paijans, K. (ed.) *New Guinea Vegetation*, ANU Press, Canberra, 1-22.
- VAN PEL, H. 1960. Report on the Sea Fisheries of Western Samoa. South Pacific Commission, Noumea New Caledonia.
- VAUGHAN, P.W. 1981. Marine turtles: a review of their status and management in the Solomon Islands. Ministry of Natural Resources, Honiara, Solomons.
- VON BULOW, W. 1902. Fishing Rights of the Natives of German Samoa. In: *Globus LXX XII*, p.40-42. Translated from German by Christa Johannes.

- VON DROSIE, B. 1983. UNESCO'S Protected Areas Programme. *Proceedings of the Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands*. U.S. National Park Service Southeast Regional Office, Atlanta. pp.20-30.
- WALKER, D. 1972. Bridge and barrier. In: Walker, D. (ed.). *Bridge and Barrier; the Natural and Cultural History of Torres Strait*; Res. School Pacific Studies. Publ. BG/3. ANU. Canberra, 399-405.
- WASS, R.C. 1978a. Fagatele Bay reef front and flat: list of species recorded along reef front on September 25, 1978, and along reef flat on February 15, 1978. Office of Marine Resources, American Samoa Government. Unpublished data.
- WASS, R.C. 1978b. Current status of the crown-of-thorns starfish [*Acanthaster planci* - (Alamsa)] around Tutuila Island. Report to Governor P.T. Coleman. Prepared by Office of Marine Resources, Government of American Samoa. 7pp. + figures.
- WELLS, S.M. 1984. What's Happening to Coral Reefs? Part 1. In: *ICLARM Newsletter* Vol. 7. No. 4 (October 1984) pp.5-7.
- WHITAKER, R., Z. Whitaker and D. Mills. 1982. Reptiles in Papua New Guinea. *Wildlife in Papua New Guinea* No. 82/2, Div. Wildlife, Dept. Lands and Environment, P.N.G. 53p.
- WILDER, G.P. 1931. Flora of Rarotonga. *Bernice P. Bishop Museum Bull.* 66. 113pp. with 3 plates. (Kraus Reprint, 1971).
- WOOD, B.L. and Hay, R.F. 1970. Geology of the Cook Islands. *N.Z. Geological Survey Bull.* 82. D.S.I.R. New Zealand. 103pp.
- ZANN, L.P. 1983. Man and Atolls: Traditional Patterns of Utilisation and Conservation in Kiribati and Tuvalu. XV Pacific Science Congress, Dunedin.
- ZANN, L.P. 1983. Traditional Management of Fisheries in Fiji Institute of Marine Resources. The University of the South Pacific, Fiji.
- ZANN, L.P., L.A.J. Bell and T. Sus. (in prep.) A Preliminary Survey of the Inshore Fisheries of Upolu Island, Western Samoa.
- ZIEGLER, A.C. 1982. An ecological check list of New Guinea recent mammals. In: Gressitt, J.L. (ed.) *Biogeography and Ecology of New Guinea*, vol. 2, pt.5, Dr W. Junk Publishers, The Hague, 868-894.
- ZWEIFEL, R.G. and M.J. Tyler. 1982. Amphibia of New Guinea. In: Gressitt, J.L. (ed.) *Biogeography and Ecology of New Guinea*, vol. 2, pt. 5, Dr W. Junk Publishers, The Hague, 759-802.

LIST OF CONTRIBUTORS

Baines, Dr Graham,
Commonwealth Science Council,
P.O. Box 36,
Gizo,
SOLOMON ISLANDS

Bell, Lui, A.J.,
Marine Biologist,
Fisheries Division,
Department of Agriculture,
Forests and Fisheries,
P.O. Box 206,
Apia,
WESTERN SAMOA

Carew-Reid, Dr Jeremy,
C/- Australian National Parks &
Wildlife Service,
G.P.O. Box 636,
Canberra, ACT 2601
AUSTRALIA

DAHL, Dr Arthur L.,
Environmental Consultant,
Gorre Rible,
29127 Plomodiern,
FRANCE

Department of Environment
and Conservation,
(The Secretary),
P.O. Box 6601,
Boroko,
PAPUA NEW GUINEA

Department of Internal Affairs,
(The Director of Conservation),
P.O. Box 98,
Rarotonga,
COOK ISLANDS

Department of Lands & Survey
(The Director General),
Private Bag,
Wellington,
NEW ZEALAND

Dutton, I.M.
Great Barrier Reef Marine Park
Authority,
Townsville,
Queensland 4810,
AUSTRALIA

Eaton, Dr Peter,
Director of Land Studies Centre,
University of Papua New Guinea,
P.O. Box 402,
PAPUA NEW GUINEA

Holloway, Mr John
Assistant Director of Environmental
Forestry,
N.Z. Forest Service,
Private Bag,
Wellington
NEW ZEALAND

Jourde, M. Jean-Louis,
Chef du Service de la Marine,
Marchand et des Peches Maritimes,
Noumea,
NEW CALEDONIA

Kartawinata, Dr Kuswata,
Programme Specialist in Ecological
Sciences
UNESCO Regional Office for Science and
Technology for Southeast Asia (ROSTSEA),
Jl. Thamrin 14,
P.O. Box 273/JKT,
Jakarta 10001,
INDONESIA

Kelleher, G.G.,
Great Barrier Reef Marine Park Authority
P.O. Box 1379, Townsville,
Queensland 4810,
AUSTRALIA

Kusser, M. Jaques,
Secretarire due Comite pour la
Protection de l' Environnement,
Ministere de l' Environnement,
BP 285, Noumea,
NEW CALEDONIA

Macdonald, Dr C.M.
P.O. Box 41,
East Melbourne, Victoria,
AUSTRALIA

Manner, Dr Harley, I.,
Senior Lecturer in Geography,
University of the South Pacific,
P.O. Box 1168, Suva,
FIJI

Ministry of Lands, Survey and
Natural Resources,
(The Permanent Secretary),
P.O. Box 5,
Nuku-alofo,
TONGA

Ministry of National Resources,
Marine Resources Division,
Katori,
PALAU 96940

Mossman, Mr Rex,
Chief Ranger,
Hauraki Gulf Maritime Park,
Department of Lands & Survey,
P.O. Box 5249,
Auckland,
NEW ZEALAND

New South Wales National Parks
and Wildlife Service,
(The Director),
P.O. Box N189,
Grosvenor St., Sydney, NSW 2000,
AUSTRALIA

Ohta, Mr Masahiro,
Deputy Regional Representative,
UNEP,
Regional Office for Asia and the
Pacific,
United Nations Building,
Rajadamnern Avenue, Bangkok 10200
THAILAND

Petocz, Dr Ronald,
WWF/OCIM Project Leader,
P.O. Box 525,
Jayapura, Irian Jaya 99001,
INDONESIA

Quinn, Dr Norman,
Fisheries Department,
Papua New Guinea University of
Technology,
Lae,
PAPUA NEW GUINEA

Riley, Mr William K.,
President,
Conservation Foundation,
1717 Massachusetts Avenue - NW,
Washington, D.C. 20036,
U.S.A.

Reti, Mr Iosefatu,
Co-ordinator,
South Pacific Regional Environment
Programme,
South Pacific Commission,
E.P. D5, Noumea
NEW CALEDONIA

Sheppard, David,
N.S.W. National Parks & Wildlife
Service,
P.O. Box N189,
Grosvenor Street Post Office,
Sydney, N.S.W. 2000
AUSTRALIA

Singh, Mr Birandra,
Conservation Officer,
National Trust for Fiji,
P.O. Box 2089,
Government Buildings,
Suva,
FIJI

South Pacific Regional Environment
Programme,
(The Co-ordinator)
South Pacific Commission,
E.P. D5, Noumea,
NEW CALEDONIA

Taylor, Mr Peter,
Australian National Parks and Wildlife
Service,
Box 636,
Canberra City ACT 2601
AUSTRALIA

Thaman, Dr R.R.,
School of Social & Economic Development,
The University of the South Pacific,
P.O. Box 1168, Suva,
FIJI

Thomas, Mr William J.,
Sanctuary Programs Division,
OCIM/NOAA,
3300 Whitehaven St., N.W.,
Washington, D.C. 20235
U.S.A.

Thorsell, Dr James,
Executive Officer,
Commission on National Parks and
Protected Areas,
IUCN.,
Avenue du Mt. Blanc,
1196 Gland,
SWITZERLAND

Wildlife Conservation Unit,
Ministry of Line and Phoenix Islands,
Kirimati (Christmas Island),
Line Islands,
REPUBLIC OF KIRIBATI

