

STATUS OF SEA TURTLE CONSERVATION IN FIJI:

AN ASSESSMENT OF THE INTERNATIONAL,

REGIONAL AND NATIONAL FOCUS

By

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requirements for the Degree of Masters in Arts (Marine Studies)**

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Declaration of Originality

I, Joytishna Navnita Jit, declare that this thesis is the result of my own work and that, to the best of my knowledge, it contains no material previously published, or substantially overlapping with material submitted for the award of any other degree at any institution, except where due acknowledgement is made in the text.

I, Dr Joeli Veitayaki, declare that this thesis is the result of Joytishna Jit's own work and that, to the best of my knowledge, it contains no material previously published, or substantially overlapping with material submitted for the award of any other degree at any institution, except where due acknowledgement is made in the text. I am satisfied with the state of the thesis for submission.

Table of Contents

Declaration of Originality	ii
Table of Contents	iii
Acknowledgements	vi
Abstract.....	viii
List of Acronyms	x
Chapter One: Introduction and Methodology	1
1.1. Background of Fiji Islands.....	2
1.2. Marine Conservation in Fiji Islands	4
1.3. Implications of Tradition in Sea Turtle Conservation	7
1.4. Recent Developments in Sea Turtle Conservation Worldwide	8
1.5. A Sea Turtle Conservation Framework.....	12
1.6. Rationale for this Study.....	13
1.7. Approach and Methodology.....	16
1.8. Expected Results	17
1.9. Organisation of Thesis.....	18
Chapter Two: What Makes the Sea Turtles Endangered?	20
2.1. Introduction.....	20
2.2. Characteristics of Sea Turtles (Order: Testudines).....	21
2.2.1. Green turtles (<i>Chelonia mydas</i>).....	22
2.2.2. Hawksbill turtles (<i>Eretmochelys imbricata</i>).....	23
2.2.3. Loggerhead turtles (<i>Caretta caretta</i>).....	24
2.2.4. Leatherback turtles (<i>Dermochelys coriacea</i>).....	25
2.3. Life History	27
2.4. Range and Distribution	31
2.5. Sea Turtles Ecology	34
2.6. Overview of Natural Causes for Sea Turtles Decline.....	36
2.6.1. Evolutionary Trend.....	36
2.6.2. Environmental Factors.....	37
2.7. Overview of Anthropogenic Factors in Sea Turtle Conservation.....	39
2.7.1. Coastal Threats	39
2.7.2. Offshore Threats.....	42

2.8. Management Units for Sea Turtle Populations in the Pacific Ocean	47
2.9. Summary	49

Chapter Three: Overview of International and Regional Sea Turtle

Conservation Regimes	52
3.1. Introduction	52
3.2. The International Regime	53
3.2.1. Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973 (CITES).....	54
3.2.2. United Nations Convention on the Law of the Sea, Montego Bay, 1982 (UNCLOS)	55
3.2.3. United Nations Food and Agriculture Organization Code of Conduct for Responsible Fisheries	57
3.2.4. Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCP Convention).....	58
3.2.5. Convention on Migratory Species of Wild Animals (CMS) or Bonn Convention	60
3.2.6. Convention on Biological Diversity Conservation, Rio de Janeiro, 1992 (CBD)	62
3.2.7. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971 (Ramsar Convention)	64
3.2.8. Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972 (World Heritage Convention, WHC)	65
3.2.9. IUCN Resolution on incidental capture of marine turtles in pelagic longline fisheries, 1998	66
3.3. Regional Network on Sea Turtle Conservation	67
3.3.1. Role of SPREP in Sea Turtle Conservation.....	68
3.3.2. Role of SPC in Sea Turtle Conservation	77
3.3.3. Role of WWF Asia Pacific Programme in Sea Turtle Conservation.....	78
3.4. Summary	83

Chapter Four: National Mechanisms and Instruments for Sea Turtle

Conservation.....	87
4.1. Introduction	87
4.2. Social and Cultural History of Sea Turtle Conservation in Fiji.....	89
4.3. Current Legislation and Policy Protecting Sea Turtles.....	91
4.3.1. Fisheries Legislations	92
4.3.2. Sustainable Development Act 2005	95
4.3.3. Endangered and Protected Species Act 2002	96
4.3.4. Fiji’s Tuna Development and Management Plan	97

4.3.5. Fiji Sea Turtle Conservation Strategy.....	98
4.4. Compliance and Enforcement	102
4.5. Community-Based Management: Fiji’s Locally Managed Marine Areas Network (FLMMA).....	105
4.6. Case Study: A Perspective from Qoma Village	106
4.6.1. Overview of the Case Study	106
4.6.2. Brief Overview of Qoma Island	108
4.6.3. Significance of Sea Turtles.....	111
4.6.4. Traditional Knowledge on Sea Turtles	114
4.6.5. Conservation and Management	117
4.7. Summary	123
Chapter Five: Conclusions	127
6.0 References	136
7.0 Appendices.....	147
Appendix 1: People Consulted in this study:.....	147
Appendix 2: Guidelines to Reduce Sea Turtle Mortality in Fishing Operations	149
Appendix 3: Activity Matrix for SPREP YOST Campaign for 2006.....	156
Appendix 4 : Participants from the Sea Turtle Conservation Strategy Workshop, 31 May to 1 June, 2006.....	159

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May the lord give you all twice as much as you have given me.

Abstract

Sea turtles will become extinct unless appropriate action is taken to reverse the decline. This study assesses the existing framework and mechanisms for sea turtle conservation at the international, regional and national levels. The study is a combination of literature and legislative review, a case study of a traditional sea turtle fishing community, and interviews with key contacts. Local perspective on sea turtle conservation in regard to culture, traditional knowledge, and socio-economic considerations is addressed to provide insight into the status of turtle conservation in the country.

Sea turtles are a shared resource therefore the international community is driving regions and nations to take measures to minimise threats to sea turtles, especially bycatch. Fiji cannot afford to be left out of this action. The Western and Central Pacific Fisheries Commission (WCPFC) drafted a Resolution to mitigate the impact of fishing for highly migratory fish species on sea turtles. Existing sea turtle bycatch data and information in Fiji's tuna industry is limited, and measures to better monitor bycatch through greater observer coverage, improved fishing techniques and proper turtle handling onboard is needed. Although Fiji is not a party to the Convention on Migratory Species of Wild Animals (CMS), it is obliged under several other Conventions to conserve sea turtles domestically. The Secretariat of the Pacific Regional Environment Programme (SPREP) is the leading the regional sea turtle conservation agenda. Worldwide Fund for Nature (WWF) has been working closely within the context of international environmental Conventions to conserve sea turtles under its Asia-Pacific Programme. The regional initiative has been important in raising awareness and education among stakeholders and conducting research, regionally. However, there are many gaps in scientific, ethnobiological and socio-economic research, legislation and policy, enforcement and compliance for sea turtle conservation in Fiji, limiting the effectiveness of sea turtle conservation

initiatives. In the case study of the coastal community, which relied on sea turtles for livelihood, the ban on domestic sea turtles was ineffective. The case study and other findings indicated that there were no mechanisms in place in the duration of the study to induce positive incentives for sea turtle conservation in Fiji's communities. It is recommended that inclusion of carefully planned sea turtle conservation strategies into the existing and otherwise highly successful locally managed marine areas network is the ideal way forward.

List of Acronyms

CBD	Convention on Biological Diversity Conservation
CIEL	Centre for International Environmental Law
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COFI	Committee on Fisheries
CMS	Convention on the Conservation of Migratory Species of Wild Animals
DWFN	Distant Water Fishing Nations
EEZ	Exclusive Economic Zone
ESCAP	Economic and Social Cooperation Between Asia and Pacific
FAO	Food and Agriculture Organization of the United Nations
FFA	Pacific Islands Forum Fisheries Agency
FLMMA	Fiji's Locally Managed Marine Areas
FSPI	Foundation for the Peoples of the South Pacific International
GEF	Global Environment Fund
GCC	Great Council of Chiefs
GDP	Gross Domestic Product
IAS	Institute of Applied Sciences of the University of the South Pacific
IOSEA	Indian Ocean and South East Asia Memorandum of Understanding on Marine Turtle Conservation and their Habitats
IUCN	International Union for the Conservation of Nature
MCEDAP	Ministerial Conference on Environment and Development in Asia and the Pacific
MPA	Marine Protected Area
NBSAP	National Biodiversity Strategy and Action Plan
NMFS	National Marine Fisheries Service
Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
RMTCP	Regional Marine Turtle Conservation Programme

SIDS	Small Island Developing States
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
STSL	Sea Turtle Survival League (under the Caribbean Conservation Center)
TDMP	Tuna Development and Management Plan
TEDs	Turtle Excluder Devices
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
USD	United States Dollar
USFWS	United States Fish and Wildlife Service
USP	University of the South Pacific
WCH	Convention Concerning the Protection of the World Cultural and Natural Heritage
WCPFC	Western Central Pacific Fisheries Council
WCPO	Western and Central Pacific Ocean
WCS	Wildlife Conservation Society
WCU	World Conservation Union
WIDECAST	Wider Caribbean Sea Turtle Conservation Network
WPRFMC	Western Pacific Regional Fisheries Management Council of the United States of America
WSP	Western Sub-tropical Pacific
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization
WTP	Western Tropical Pacific
WWF	Worldwide Fund for Nature
YOST	Year of the Sea Turtles

Chapter One

*“The women of Namuana are all dressed in mourning
Each carries a sacred club each tattooed in a strange pattern
Do rise to the surface Raudalice so we may look at you
Do rise to the surface Tinaicoboga so we may look at you”¹
(The turtle calling song of the maidens from Namuana, Kadavu – in WWF, 2005)*

1.0 Introduction and Methodology

Sea turtles are on the verge of extinction, and extinction is an irreversible process (WCU, 2006). Conservation measures have to be applied to stabilise endangered populations of sea turtles or reverse their decline *before* extinction occurs (Dyke, 2003). Conservation can be defined as the care and protection of the environment to allow people to enjoy the benefits they offer while maintaining the capacity of the resource to provide those (Green, 1995). Sea turtles requires care and protection of the species to maintain the long term sustainability of their populations. They have immense cultural, and often spiritual significance, throughout the Pacific Islands that people do not want to lose (SPREP, 2006; Luna, 2003).

This chapter includes a brief background of Fiji, leading to an overview of Fiji’s marine conservation efforts in order to provide the broader perspective and linkages to sea turtle conservation efforts. Two critical dimensions for effective sea turtle conservation are reviewed: the implications of local traditions and, worldwide developments in sea turtle conservation. A framework for sea turtle conservation is provided, which forms the underlying basis for the assessment of international, regional, national and local conservation of turtles in this thesis. Then, the rationale of

¹ In the turtle call, *Raudalice* and *Tinaicoboga* are two sisters who went fishing from the village, but had turned into turtles in order to escape being caught by enemies.

the study, methodology, expected results and the framework of the study are discussed.

1.1. Background of Fiji Islands

Fiji is a tropical archipelagic state comprising of 332 islands located between latitude 15° and 22° South and longitude 177° West and 175° East (Figure 1). It has a land area of 18, 333 square kilometers, and an oceanic vastness that is slightly more than 70 times the land area. This includes a large Exclusive Economic Zone (EEZ) of 1.3 million square kilometers (SPC, 2006). Fiji has an oceanic climate. The cool season is from April to October. The hot season, from November to March, is also the hurricane season and the period of heaviest rainfall. Rainfall generally ranges from 1500 to 2500 millimetres. South east trades are the prevailing winds in Fiji (Ryan, 2000).

Approximately one third of the islands in the Fiji are inhabited. The archipelago consists of two large high volcanic islands, several medium sized high islands and numerous small islands and atolls (Figure 1). Fiji lies in the Western Pacific region, which is known to have the highest marine diversity in the world (Ryan, 2000). Some of the other countries in the Western Pacific region are Australia, Papua New Guinea, Solomon Islands, Philippines, Indonesia, Malaysia and Vanuatu. Fiji's extensive network of coral reefs, seagrass beds, mangroves and other marine areas are economically important for the tourism industry and local people's livelihoods (WWF Annual Report, 2005).

About 80 percent of Fiji's population of 826,281 dwell along the 5,010 kilometres of coastline, and deal with marine resources on a daily basis (Fiji Bureau of Statistics, 2005). In 1996², an estimated 30,000 people were engaged in the subsistence fisheries

² The last population census in Fiji Islands occurred in 1996.

sector, which is approximately three times greater than numbers employed by the primary and secondary fisheries sectors combined (Fiji Bureau of Statistics, 2006).

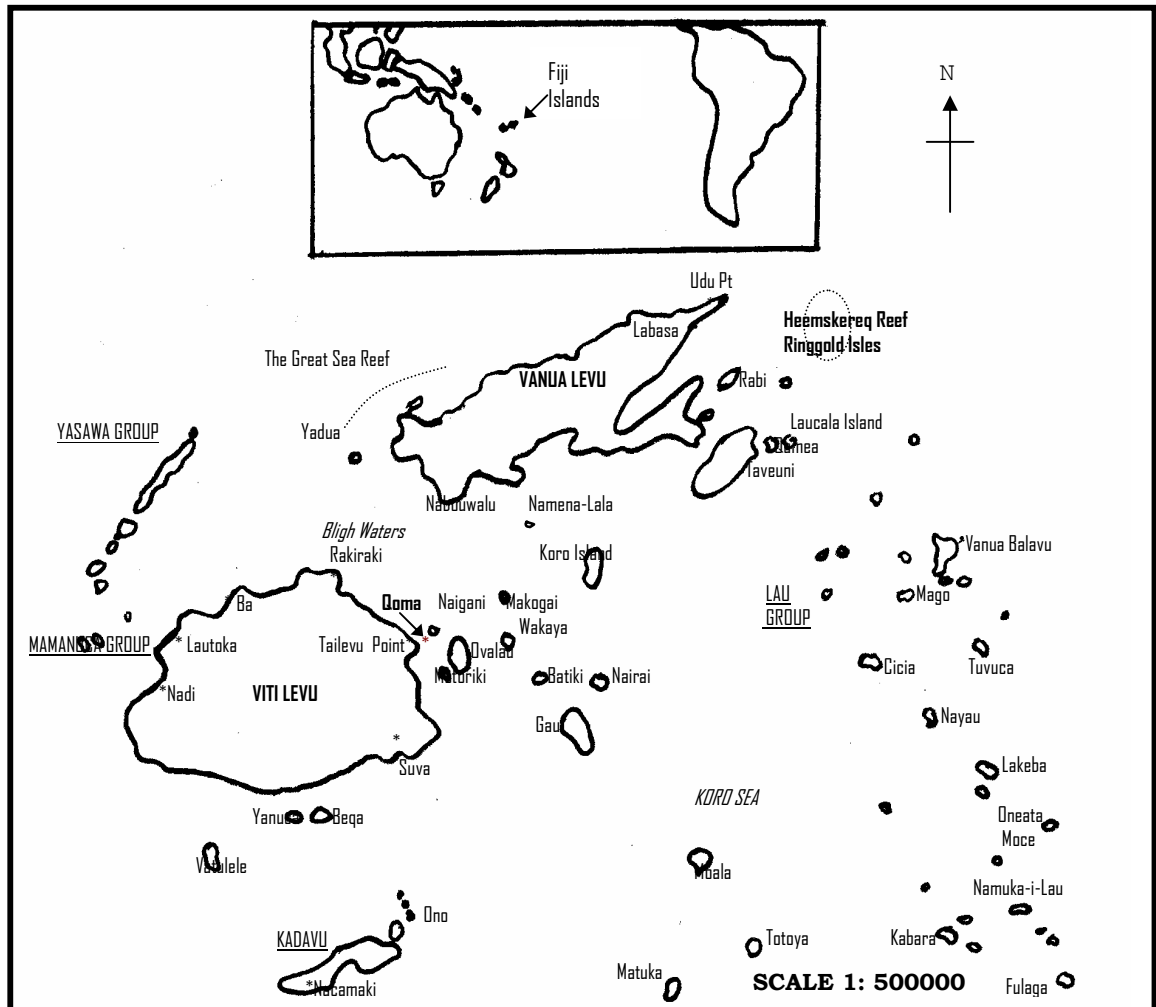


Figure 1. Map of the Fiji Islands (Source: Sketched from Ryan, 2000).

About 53 percent of the population are indigenous Fijians, 40 percent are Indians and seven percent are of other ethnic origins, mainly Chinese. Fiji is a multiracial State, with more than half of the population being Christians (58 percent), and the remaining being Hindus (34 percent), Muslims (7 percent), Sikhs (0.70 percent) and

other races (Fiji Bureau of Statistics, 2006). More than 90 percent of adults in Fiji are literate.

The current gross domestic product (GDP) per capita is around USD1200 per annum, about 30 percent of which can be attributed to natural resource activities such as agriculture, forestry, fisheries and mining. In 1995 the contribution of fisheries to the GDP was 2.8 percent (Fiji Bureau of Statistics, 2006). Nonetheless, the impact of fisheries on local livelihoods is noteworthy. It is estimated that 50 percent of all rural households in Fiji are involved in some form of subsistence fishing and that more than half of all domestic production is actually from subsistence fisheries (Fiji Bureau of Statistics, 2006; Anon., 1999). The Asian Development Bank (ADB) estimated that catches from this sector were worth USD24 million (FAO, 2006). Tourism is also one of the largest industries in Fiji. Coastal tourism is important, and has implications for fisheries development and management.

One of the best developed coral reef systems of the Pacific region occurs in Fiji (WWF, 2006). Ryan (2000) and Allen & Steene (1999) give a good account of Fiji's biodiversity. There are about 1,200 species of reef fishes in the Fiji group. Most of the islands are surrounded by fringing and barrier reefs. There are different interconnected zones, such as lagoons, sea grass beds, mangroves and woodlands. These zones include species from the marine and terrestrial environment and are an important habitat for a variety of organisms. Coastal waters contain a complex array of food webs and ecological functions that provide the biological basis for the life support system on islands (Allen & Steene, 1999).

1.2. Marine Conservation in Fiji Islands

Sustainable development has become essential for Fiji, especially after the 2002 World Summit on Sustainable Development, with concepts such as conservation and

management of resources becoming increasingly prominent at the political level (ESCAP, 2006). Tamata & Lovell (1993) made reference to the destruction of seagrass habitats in Nadi Bay from reclamation activities to build a marine complex. The impact of such activities on sea turtles in Fiji is difficult to quantify because of the lack of a fundamental scientific inventory on all turtle nesting and foraging areas in Fiji. Some of the studies that have been conducted include Guinea (1993), Rupeni *et al.* (2002) and Batibasaga (2002).

Lack of national legislation for resource management is another major drawback for sustainable development in the marine sector (Veitayaki, 2001). The law governing the use of marine resources in Fiji recognises the customary right of indigenous Fijians to fish in traditional fishing grounds (*i qoliqoli*) and to control most types of fishing effort in those areas; the control extends over the immediate waters enclosed by a fringing or barrier reef system. Traditional fishing rights areas cover the entire extent of the Internal Waters of Fiji.

According to Veitayaki (2001), the indigenous Fijian communities and their conservation partners (government, intergovernmental and non governmental bodies, including non-profit organisations) have used these comprehensive provisions over time to push for the protection of their marine resources under a Locally Managed Marine Areas network. This has been significant for the conservation and management of the network of Marine Protected Areas (MPAs) in the Fiji Islands. The Government of Fiji in early 2005 declared its commitment to establish a network of MPAs in 30 percent of Fiji's inshore and offshore marine areas (*i qoliqoli's*) by 2020. These MPAs are forecasted to contribute to the global target of 10 percent of world seas to be MPAs (Government Press Release: June 8, 2006; Tavola: speech, 2005). The 10 percent target has been established by the World Summit for Sustainable Development Johannesburg Plan of Action (WSSD) and the Convention

on Biological Diversity (CBD). Fiji took part in agreeing to the wording of WSSD, and is also a signatory to CBD.

As a developing state, which is comprised of many small and isolated islands, Fiji is faced with numerous challenges in terms of conservation and management of natural resources: limited government fund allocation for environmental issues; a relatively small accessible natural resource base that serves to provide primary production for income generation, subsistence needs and other uses; overexploitation of natural resources; frequent occurrence of tropical cyclones and floods; inadequate regulation and enforcement; need for widespread community awareness and/or participation in conservation and management strategies; and population growth (Ryan, 2000; Weaver, 1996; Watling & Chape, 1993).

The Sustainable Development Act 2005 and the Endangered and Protected Species Act 2002 are positive steps towards making Fiji environmentally friendly. The Government of Fiji, and several regional and international organisations are aware of the problems Fiji faces in this regard, and are attempting to restore and conserve Fiji's natural resources (Government Press Release: February 17, 2006; June 8, 2006; & November, 18, 2005). The effectiveness of their engagement with local, national and regional stakeholders will be a critical element of this study.

Troëng & Drews (2004) established that coastal communities harvest a significant number turtles for socio-economic reasons in developing countries of the world: Developing countries contain a significant proportion of the world's sea turtles. This means that conservation measures must consider funding limitations and resource implications for sea turtle conservation carefully, addressing most of the funding for the minimisation of threats in developing countries. In addition, non-consumptive uses of turtles which promote sea turtle conservation are suggested. In an economic study of sea turtles in developing countries, Troëng & Drews (2004) found that non-

consumptive uses of sea turtles, such as ecotourism, generated greater revenue, had greater economic multiplying effects, greater potential for economic growth, created more support for management, and generated proportionately more jobs, social development, and employment than consumptive uses of sea turtles. The relevance of introducing such an opportunity in the existing conservation efforts in Fiji will be highlighted.

1.3. Implications of Tradition in Sea Turtle Conservation

Turtles are a chiefly food used in ceremonies in most of the villages in Fiji Islands, and therefore perhaps the most important consideration for implementing effective sea turtle conservation strategies in Fiji. It is important to understand existing measures for sea turtle conservation within the context of traditions. Traditionally turtle hunting is one of the duties of selected members of a clan, who have been well educated in the natural history and traditional taxonomy of turtles, and are responsible for supplying animals at the chief's request for consumption on special occasions (WWF, 2005).

There are villages that traditionally neither catch nor eat sea turtles: for example, the two turtle-calling villages, Namuana in Kadavu Island, and Nacamaki in Koro Island. Both villages have the belief that sea turtles are descendents of their ancestors. When the villagers chant the turtles song, turtles are lured to the surface of the waters.

There are very limited studies on the ethnobiology of sea turtles in Fiji Islands. Veitayaki (1990) conducted a case study of fishing practices on Qoma Islands, the inhabitants of which are traditional sea turtle fishers. He described the sea turtle harvest as follows:

“A kava (*yaqona*) ceremony of *vakasobu ni lawa* is presented by the head of the turtle-net-owning-unit, normally the extended family, every time the net is to be used. The first bowl of *yaqona* is always for the head of that family....This ceremony ... will publicise the objective of the intended trip, such as for money, graveyard clearing or a wedding feast. Only one objective can be satisfied or fished for at a time and according to the islanders, the righteous fishermen will always successfully return with a catch to suit the purpose for which the fishing was requested.” (Veitayaki, 1990:167)

The end of the turtle fishing trip was also steeped in traditional rules. If a turtle was observed to swim past the turtle net deployed in the water without getting entangled, the trip was deemed complete. Each fishing trip which resulted in the capture of a turtle was concluded with an honorable kava ceremony laced with gratitude for the turtle fishers (Veitayaki, 1990). This was the tradition in Qoma Island documented 16 years ago. It would be beneficial to know the nature and the underlying reasons for any changes in such practices to date.

Culture is dynamic. According to the Western Pacific Regional Management Council (WPRMC), although cultures have been managed through sustainable use and have also promoted ecological balance for centuries, there has been continual degradation of cultural conservation of sea turtles (Kinan, 2002). There is a need to understand the processes of this cultural degradation so that it can be moulded to effectively allow sea turtle conservation.

1.4. Recent Developments in Sea Turtle Conservation Worldwide

Widespread concern at the alarming declines in sea turtles numbers in recent years is reflected in their high conservation status. The worldwide decline has been attributed to unregulated adult and egg harvest, habitat degradation, commercial trade and mortalities through incidental capture in fishing activities (SPC, 2003; Kinan, 2002). Various countries, including Australia and the United States, have drafted and

implemented recovery plans that attempt to address the issue of declining sea turtle populations. Within the Pacific region, there are now major nesting rookeries that have been reserved for nesters in nearby countries such as Malaysia, Indonesia, Papua New Guinea and Western Samoa (Dernawan 2002; Utzurum 2002; Liew, 2002; Chaloupka & Limpus, 2001; Halim, 1998). For example, there has been increased leatherback nesting females from 1999 to 2004 in the Kamiali Wildlife Management Area in Papua New Guinea, which is established and managed by trained Kamiali community members with donor funding and resource scientists from the Western Pacific Regional Fisheries Management Council (WPRFMC) (Kisokau & Ambio, 2005).

The 2000 International Union for Conservation of Nature (IUCN) Red List of threatened species characterises sea turtles species as either “Critically Endangered”, “Endangered”, “Threatened” or “Vulnerable” (WCU, 2006; USFWS, 2006). Among those species found in the Pacific region, most fall in the former two categories (Table 1).

Table 1. Classification of sea turtles in the Pacific region under 2000 IUCN Red List (WCU, 2006).

Species	Common Name	Status
<i>Eretmochelys imbricata</i>	Hawksbill	Critically Endangered
<i>Dermochelys coriacea</i>	Leatherback	Critically Endangered
<i>Caretta caretta</i>	Loggerhead	Endangered
<i>Lepidochelys olivacea</i>	Olive ridley	Endangered
<i>Chelonia mydas</i>	Green turtle	Endangered
<i>Chelonia agassizi</i>	Eastern Pacific black turtle	Threatened

The global strategy for sea turtle conservation recognises the need for improvements in research and monitoring, integrated management for sustainable sea turtle populations, building local capacity for conservation, research and management, and public awareness, information and education (WCU, 2006). The main international

Conventions that specifically address sea turtle conservation are the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Sea turtle conservation is part of the global biodiversity and as such included in several other international instruments. Oldfield (2003) stated that international regimes are the guidelines to integrate the interests of few and the interests of many in a way that serves the best possible interests for all.

Major nations of the world have integrated sea turtle conservation regimes into national or regional instruments. The United States is continually focusing significant amounts of resources to conserve endangered species within the Pacific border. However, the importance of focusing on strategies beyond domestic programs in the conservation and management of sea turtle stocks cannot be ignored due to the migratory behaviour of sea turtles. This especially applies in the United States where domestic law has been extended to foreign fishing states through the use of trade embargoes. For example, there was a drastic U.S. imposed shrimp embargo to protect turtles in 1996, which alarmed several countries which did not use the Turtles Excluder Devices (TEDs) to significantly reduce sea turtle bycatch in trawling gear (WTO, 2001). All the countries affected were developing countries like India, Malaysia, Thailand and Pakistan. The proceedings that followed have impacted on world trade rules, and the World Trade Organisation decisions had to balance environmental concerns together with trade (WTO, 2001).

The United States is taking actions to protect leatherbacks and loggerheads by banning pelagic longlining in fisheries grounds. A shallow set swordfish longline fishery based in Hawaii was closed to longliners in 2006, About 2.6 million nautical square miles off the coast of England covering the Grand Banks was also been closed to pelagic long liners in 2002 (USFWS, 2006). The United States is trying to persuade other countries to do the same through diplomatic initiatives and intergovernmental

agencies, such as the United Nations, as well as the Western Central Pacific Fisheries Council.

There is also active participation in the Caribbean under the Cartagena Convention³ and its Protocol forming an important framework for sea turtles management throughout the Caribbean region. The Wider Caribbean Sea Turtle Conservation Network (WIDECAST) is based on the belief that conservation must be nurtured from within, it cannot be commanded from outside. Further there are beliefs that conservation can only be effective if actions that are implemented have strong scientific basis for management, and that the measures are tailored to local circumstances (WIDECAST, 2006). For instance, the traditional usage of sea turtles versus the possibility of a domestic black market within sectors in a country needs to be considered in national legislation.

Multilateral marine management frameworks and agreements are an essential means of protecting migratory species such as marine turtles (WWF, 2005). For example, regional marine turtle conservation agreements now cover many areas of the globe, including the Americas, the West Coast of Africa, the Indian Ocean and South East Asia. The Indian Ocean and South East Asia Memorandum of Understanding on Marine Turtle Conservation and their Habitats (IOSEA) is a voluntary agreement between countries within the region, to protect and manage their turtle populations under the CMS. This coordinated management across migratory pathways is critical for providing adequate protection to turtles, and the communities that depend upon them throughout their life-cycles. The IOSEA encourages and supports cooperative, broader marine management at the regional scale among all parties to the agreement (IOSEA, 2006).

³ United Nation's Environmental Programme's 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (WIDECAST, 2006).

1.5. A Sea Turtle Conservation Framework

Effective sea turtle conservation requires strategic planning and implementation, and there are two main considerations for this to occur; the scientific basis and the interests of all stakeholders – the human element (Oldfield, 2003). Conservation plans need to be created in a way that truly benefits sea turtles and their ecosystems, and for this to occur the best available scientific information needs to become a foundation for decision-making (Oldfield, 2003). Over time, the best available scientific information can improve, and this must also be reviewed and incorporated in conservation management. Marine turtles travel freely across the maritime borders of many nations, and are susceptible to a wide range of threats at various stages of their lifecycle. Climate change and its likely consequences is also a growing concern because warmer temperatures shift the gender ratio of hatchlings towards significantly fewer females than males, and rising sea levels will inundate nesting beaches increasing hatchling mortality (Bjorndal, 1995).

According to Carr (1968), the main threat to sea turtle populations have been dynamic over the large geological timescale (where continental drift and extreme conditions may have played a role), earlier civilisation (where the relatively conservative subsistence and barter systems occurred when vast sea turtle populations had established themselves quite aptly), and during discovery and exploitation period (technology became gradually more advanced and people began claiming greater possession over land).

Humans appear to impose on the natural behaviour and ecology of sea turtles. They have done so in the past, and continue in new and more alarming ways with time. In the past few decades, human population has increased rapidly and so has the fishing pressure to meet the proportionate increase in demand for sea turtles (Craig, 2002). Craig (2002) highlighted that it was significant for sea turtle conservation to note that

the Pacific Islands population of 7.1 million in 1998 was expected to double over the next 50 years. There have been dramatic overall declines in marine turtle populations (particularly leatherbacks) over the last 20 years across much of South East Asia and the Pacific (WCU, 2006). For example, nesting populations of Eastern Pacific leatherback turtles have dropped by 90 percent in the last two decades. In 2002, there were an estimated 2,300 adult nesting leatherback females across the entire Pacific Ocean, which was rapidly declining (WCU, 2006). Close to 2,000 nesting leatherback females were tagged in Terengganu, Malaysia in 1970, but only nine returned to nest in 1999, and then numbers dwindled to only one or two a year (Liew, 2002).

There has been a trend of over-consumption of turtles meat and eggs, trade in turtles and turtle products, destruction of nesting beaches and nearshore habitats through inappropriate coastal development practices, and high levels of capture in modern industrial fishing gears worldwide (SPREP, 2006; WWF, 2005; Kinan, 2002). Human-induced negative pressures on sea turtle populations accelerate the decline in sea turtles at national, regional and global scales. Mortality from these persistent and ever increasing threats at all stages of marine turtles' life-cycles means that many populations cannot recover from the sustained pressure on their numbers.

Once the scientific basis is incorporated into a conservation plan, the implementation of the plan plays an equally important part. Oldfield (2003) indicates that the best designed scientific conservation plan is of little worth unless it is implemented as intended. For this, it is important that the people of diverse interests are involved in planning sea turtle conservation strategies.

1.6. Rationale for this Study

The ocean, which appeared massive in the past and with resources inexhaustible, has now become a conservation concern in many ways. Dying resources such as sea

turtles will need to be managed carefully so that the resources do not run out completely and forever. It would be a shame to lose this evolutionary relic which has stood the test of times as one of the oldest of mythical heroes. There is a need to consider all conservation aspects of sea turtles and integrate them into wise and effective sea turtle conservation strategies promptly, in order to continue having these unique reptiles.

Sea turtle conservation is essential in the Pacific region for ethical and other reasons; including not jeopardising international trade relations. Its importance needs to be effectively reflected in national, regional and international legal instruments. The importance of achieving sea turtle conservation is shared worldwide, as described in this abstract:

"We must now learn to use our living resources without exceeding their capacity to remain renewable. To do this, nations must be willing to cooperate in conserving and managing the ocean's living wealth. Sea turtles can serve as a case study for the development of methods to ensure international cooperation in preventing the further decline of depleted living resources, in restoring them to former levels of abundance, and in maintaining them for sustained use. The potential benefits of such a methodology are immense." (Frazer, 1992: 101)

International legal instruments put a lot of impetus for enforcement measures on developing countries such as Fiji Islands. According to Oldfield (2003), international regulations indicate standard measures for enforcement assuming that all countries are able to meet the minimum standards. In developing countries, the resources for effective conservation and regulation are limited. According to Watling and Chape (1992), most of the conservation and natural resources management laws in Fiji suffer from lack of enforcement through inadequate staffing, lack of technical resources, expertise and funding, or through administrative failures. Although more concerned about wildlife trade regulations, Oldfield (2003) did generalise that international

regulations have all too often been set by policy-makers that are distanced from the realities of enforcement.

Developed and developing countries have different resources and national goals compared to the developed countries. Since international conventions apply uniformly to all countries concerned, the onus is on Small Island Developing States (SIDS) which have ratified to international conventions to make resource allocations to meet their obligations under international law. Developing nations like Fiji tend to prioritise their limited resources with more central matters such as health, employment, security and infrastructure taking precedence over conservation at political levels. There is a need for conservation agencies to raise the profile of sea turtle conservation at political and donor levels.

There are several direct and indirect outcomes of this study. There is a very limited amount of published information relating to the legal conservation status of sea turtles in the Pacific Islands, which is not surprising as there is very little scientific information available on the actual population size of sea turtles. Much of the literature available and accessible covers developed countries including in some cases the territories of these countries. This study will primarily assess the existing framework and mechanisms for sea turtle conservation at the international, regional and national levels in Fiji. Secondly, it will highlight the local perspectives on sea turtle conservation in regard to culture, small island state economy, ecological importance, social and socio-economic implications. These features are crucial since conservation will only be effective if implementation reflects local circumstances. This study consists of a combination of literature and legislative review, a case study of a traditional sea turtle fishing community, and interviews with key contacts.

1.7. Approach and Methodology

A mixture of primary and secondary information forms the basis of this project. Any information retrieved had to be constantly cross-checked with other sources to ensure they were accurate. For example, until 2006 olive ridley sightings have been reported in Fisheries Annual Reports until mid-1990s, but interviews with Fiji's Fisheries Department staff it was confirmed that olive ridleys did not occur in Fiji waters at all. Previously reported sightings were clarified to be misidentification.

This study is a comprehensive review of relevant sea turtle literature, particularly those that were available for Fiji. Materials were accessed through various libraries belonging to the University of the South Pacific, Fiji's Department of Fisheries, and Secretariat of the Pacific Community. Internet based research proved invaluable for obtaining background, technical and scientific papers and reports of meetings from forums organised to address issues in sea turtle conservation.

The analysis of relevant international, regional and national legal instruments and mechanisms for sea turtles formed a considerable part of the project. There was significant primary information collected from various international conventions in terms of their relevance to sea turtle conservation: the relevance of these conventions and the status of Fiji in meeting obligations under the conventions were described.

Personal communication and interviews with key personnel from government, educational institutions, non government and non-profit organisations, inter-governmental bodies (regional and international), local offshore fisheries operators and the local community members was useful for obtaining information on current trends and issues (Refer to Appendix 1 for a list of key contacts).

Due to time and money limitations it was beyond the scope of this research to quantify sea turtles caught for domestic sales (black market). Sellers were interviewed and those who revealed relevant information did it through investigative questioning, and much coaxing. Some translators were used to deliver questions asked in the appropriate manner to some of the turtle fishers and witnesses of turtle fishing events. The informants delivered slowly and cautiously, but far too little information was revealed for any valid generalisations on a broad scale or extrapolation.

A survey of the handicraft sellers along Queens Highway between Suva and Lautoka, in the southern and southern west coast of Viti Levu, was undertaken to identify the extent of the sales of turtle shells, and to investigate the status of the turtle shell trade.

Last but not the least, were interviews with the people living in Qoma Island (the traditional turtle fishers) on the significance, apparent trends and nature of sea turtle catches, traditional knowledge on sea turtles, and conservation and management options for a brief case study. The objective was to obtain the community's perspectives on conservation of turtles and assess the effectiveness of current conservation measures at village-level. Information from sea turtle tags obtained in the village was sent for verification to appropriate authorities in Hawaii and Australia.

1.8. Expected Results

Traditionally, sea turtles were revered for their endurance. As Fiji's population continues to grow at a rate of up to two percent per annum, pressure on the environment is bound to increase (Ryan, 2000). With increased consideration of environmental concerns in the new millennium, Fiji cannot afford to be left out of the international drive to conserve environmental resources such as sea turtles. Countries have a strong will to protect sea turtles and are pressuring the smaller countries with

high biodiversity to protect their resource pool. Any negative image in terms of conservation can be disastrous for the tourism industry and also affect trade.

Eventually Fiji will have to genuinely commit to protecting sea turtles at all levels. It was expected that the mechanism for achieving this was within the existing network of Department of Fisheries, Environment Department, Non government organisations, regional bodies like WCFPC, SPREP and SPC, educational institutions, and local communities. Fiji has been an excellent model for community-based management worldwide, and any success in conserving sea turtles can be achieved in the medium to long term after stakeholders', including villagers', support for sea turtle conservation.

1.9. Organisation of Thesis

There are four additional chapters in this thesis apart from this introduction. These other chapters are outlined below:

Chapter Two: Why Are Sea Turtles Endangered includes background information on Fiji Islands, and leads on to a description of the biology and ecology of sea turtles as an integral part of sea turtle conservation planning in Fiji.

Chapter Three: Overview of International and Regional Sea Turtle Conservation Regimes identifies and analyses some key international instruments for sea turtle conservation, and describes the regional regimes that are relevant for sea turtle conservation, in Fiji's context.

Chapter Four: The National Mechanisms and Instruments for Sea Turtle Conservation analyses Fiji's status in sea turtle conservation. It will provide an examination of the legal and policy framework and mechanisms relevant to sea turtle

conservation in Fiji, including the social-economic and cultural setting. There will be a case study of the traditional sea turtle fishers of Qoma Island to assess the key considerations for sea turtle conservation from a community perspective.

Chapter Five: Conclusions is a summary of the key findings in the study, integrated with recommendations for future sea turtle conservation activities in Fiji Islands.

Chapter Two

“In considering biodiversity from the perspective of species richness...many inconsequential species may not be as valuable as fewer important ones”

(Salm et al., 2000:19)

2.0 What Makes the Sea Turtles Endangered?

2.1. Introduction

Sea turtles are reptiles belonging to the Order Testudines (Carr, 1968).⁴ This is an ancient Order, with members that have undergone little morphological changes from its ancestral form since the late Triassic period, 200 million years ago. This implies that sea turtles are extremely successfully adapted to their environment. Sea turtles have occurred since the upper Cretaceous period about 90 million years ago, and evolved very slowly since then (Pritchard, 1967). They belong to two families, the hard-shelled Cheloniidae, with six representatives, and the Dermochelyidae, with only one extant member, the leatherback sea turtles. There are different kinds of species that occur in the Pacific Ocean from the five genera *Chelonia*, *Caretta*, *Eretmochelys*, *Dermochelys* and *Lepidochelys*. These refer to green turtles, loggerheads, hawksbills, leatherbacks and ridleys, respectively (Carr, 1968).⁵

There is very limited information available on the population of sea turtles in Fiji Islands. Most of the information that is available is restricted to green turtles, because these are the most commonly encountered. According to Craig (2002), about half of the migrating sea turtle populations in the Pacific Islands are headed specifically for

⁴Kingdom is Animalia, Phylum is Chordata and Class is Reptilia.

⁵ The only species of sea turtle that does not occur in this region is the Kemp Ridley, *Lepidochelys kempii*, which occurs only in the Gulf of Mexico and northwest Atlantic (Limpus, 1998).

Fiji, and seagrass and algal beds associated with Fiji are a significant food resource for green turtles in the region.

Fiji's Department of Fisheries Annual Report 1994 states that there was a decline in sea turtle populations in Fiji waters from 1984 to 1994, although there is no evidence of any baseline data to support this (Anon. 1994). Mr Aisake Batibasaga (pers. comm., 2006) maintains that the sea turtle populations are still declining based on tagging studies conducted by the department and analysed by SPREP; the decline mainly attributed to over-harvesting of turtles for consumption or sale, destruction of nesting and foraging habitats, and bycatch in offshore tuna fisheries. There are both natural and anthropogenic activities that threaten the abundance and survivorship rates of each lifestage of turtles, and will have to be minimised in order to protect turtles. It is also important to understand the biology and ecology of sea turtles in order to devise long-term policies to effectively conserve this long-lived and highly vulnerable species (Oldfield, 2003).

2.2. Characteristics of Sea Turtles (Order: Testudines)

Sea turtles are saltwater reptiles with backbones, lungs, tough scaly skin and are cold-blooded. Sea turtles are different from other turtles because they cannot pull their heads into their shells (Hickman *et al.*, 2001; Carr, 1968). Their vision, although quite good in water, is poor on land. Their colour perception in water is equal to that of humans (Hickman *et al.*, 2001). Thick tears constantly wash across their eyes, cleaning them and to get rid of body salt. Basking occurs in some populations (Coste, 1993). Compensating for poor hearing is a good sense of smell. They are mute (Hickman *et al.*, 2001). There are ongoing speculations on the ability of sea turtles to navigate across vast ocean space, and many attribute this to their sense of smell (Carr, 1968). Their shells consist of an upper part (carapace) and a lower section (plastron).

Hard scales (or scutes) cover all but the leatherback, and the number and arrangement of these scutes can be used to determine the species (STSL, 2006).

There are seven species of sea turtles that occur in the Pacific Ocean: the loggerhead sea turtle *Caretta caretta*, green turtle *Chelonia mydas*, which also includes a distinct subpopulation of Eastern Pacific ‘black’ turtle, *Chelonia agassizi*, hawksbill turtle *Eretmochelys imbricata*, olive ridley turtle *Lepidochelys olivacea*, flatback turtle *Natator depressus* (native to Australia) and leatherback turtle *Dermochelys coriacea* (Robins *et al.*, 2002). According to Mr Aisake Batibasaga (pers comm., 2006), there are only four species of sea turtles in Fiji.⁶ In order of abundance there are green turtles, hawksbills, loggerheads, and leatherbacks.

Below is a species by species description of the four kinds of sea turtles known to occur in Fiji.

2.2.1. Green turtles (*Chelonia mydas*)

Green turtles are the largest of the hard-shelled species, with adults often measuring over one meter in length and may exceed 300 kilograms (Hickman *et al.*, 2001) (Figure 2). They have four pairs of costal scales with a high domed and mottled light to dark olive-brown shell, although colour can vary greatly (Limpus, 2002; Queensland Department of the Environment and Heritage, 1994). The green turtle is the only genuinely herbivorous sea turtle, dining almost exclusively on seaweeds. Immature green turtles can be carnivorous (Hickman *et al.*, 2001; Anon., 1999). Green turtles are found in tropical and subtropical waters worldwide and are known to undertake complex migrations (Limpus, 2002).

⁶ At the recent Sea Turtle Strategy Workshop in 2006, Mr Aisake Batibasaga clarified that Olive Ridleys did not exist in Fiji waters, despite some his previous publication quoting five species existing in Fiji islands (Batibasaga, 2002).

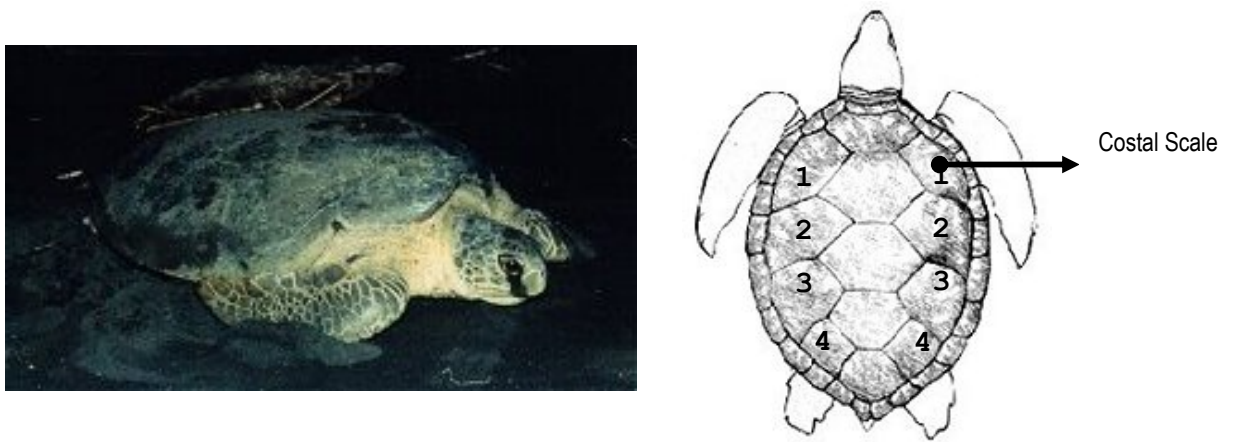


Figure 2. Green turtle (Source: Reproduced with kind permission from the Caribbean Conservation Centre [online] www.seaturtle.org/species_class.htm).

Green turtles are exploited for the meat and eggs. They are often considered to have the best meat for consumption among sea turtles. The name ‘green turtle’ is derived from the green colour of their subdermal fat. Along with providing food, green turtle shells are also used for ornaments and tourist items (Bjorndal, 1995). As a result of exploitation, the species is already extirpated in Bermuda and the Cayman Islands. Alternatively, there have been promising signs of green turtle recovery in Hawaiian waters (Balazs, 1996).

2.2.2. Hawksbill turtles (*Eretmochelys imbricata*)

The most distinctive feature of the hawksbill turtle is its patterned shell, ranging from light amber to brown-black (Figure 3). Other features include a distinctive parrot-like beak, four pairs of costal scales and two pairs of prefrontal scales (Queensland Department of Environmental and Heritage, 1994; Limpus, 1998; Ruckdeschel *et al.*, 2000; Environmental Protection Agency, 2002). Hawksbills live in tropical tidal and sub-tidal coral and rocky reef areas but have been seen in more temperate regions

down to northern New South Wales in Australia. Their diet is primarily sponges, and they will also feed on seagrass, soft corals and shellfish (Limpus, 1998).

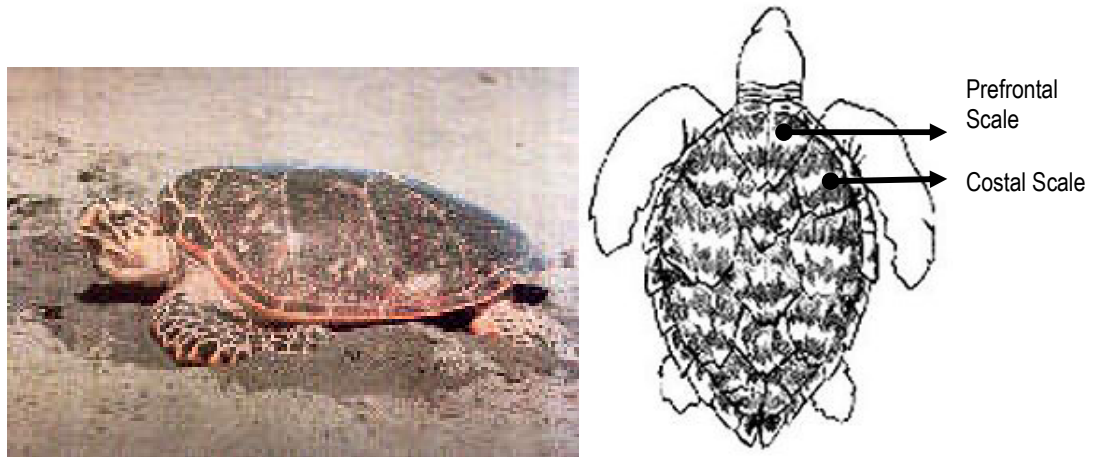


Figure 3. The adult Hawksbill in the oceanic life stage (Source: Reproduced with kind permission from the Caribbean Conservation Centre [online] www.seaturtle.org/species_class.htm).

The hawksbill sea turtle has undergone severe reductions in abundance in many areas with some significant nesting populations disappearing (Limpus, 1998). The most significant threat is harvesting for turtle shell, used in the manufacture of various items including hair-combs, eyeglass frames, pieces of jewellery and souvenirs, even stuffed specimens (Limpus, 1998). There are also considerable numbers of eggs harvested on beaches, killing for meat, and mortality from drowning in commercial fishing nets, boat strike and ingestion of marine debris such as plastic (Ruckdeschel *et al.*, 2000).

2.2.3. Loggerhead turtles (*Caretta caretta*)

Loggerheads have a distinctive large head relative to body size compared to the other sea turtles and they have five pairs of costal scales with reddish-brown shell (Wetherall *et al.*, 1993; Environment Australia, 1998) (Figure 4).

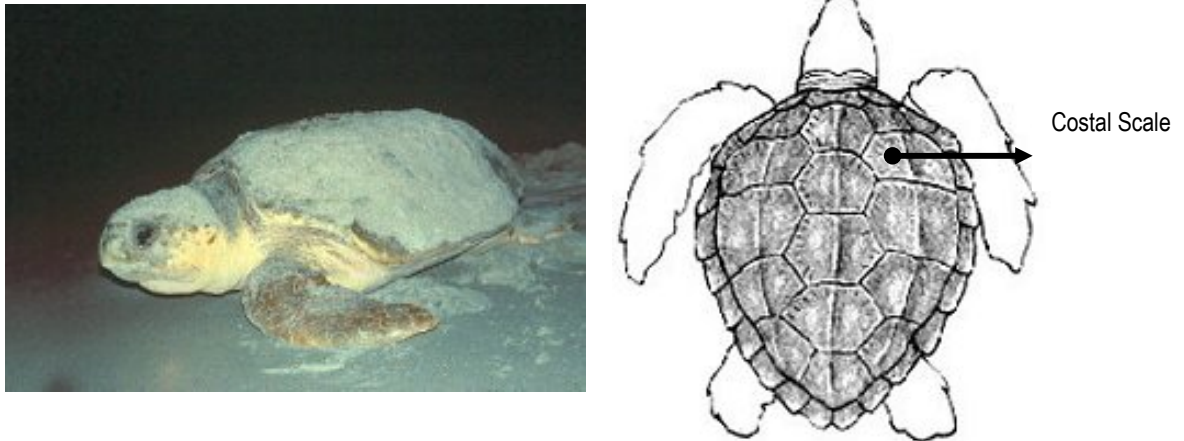


Figure 4. An adult loggerhead (Source: Reproduced with kind permission from the Caribbean Conservation Centre [online] www.seaturtle.org/species_class.htm).

They are found in tropical to temperate waters. Generally, they live around coral cays, bays and estuaries, and primarily feed on invertebrates, including jellyfish, crabs, shellfish and sea urchins. They will scavenge fish but are not considered to be fish eaters (Queensland Department of the Environment and Heritage, 1994).

Loggerheads can be divided into five nesting aggregations worldwide, and those for the Pacific Ocean stocks are mostly from Japan. The 2002 estimate of the total number of nesters in Japan was 2,000 to 3,000. These occur mostly in the north Western Pacific. There is another, south western Pacific aggregation which occurs in the south Western Pacific (Hatase *et al.*, 2002).

2.2.4. Leatherback turtles (*Dermochelys coriacea*)

Leatherbacks are the largest living species of sea turtles, sometimes weighing more than 500 kg and having carapaces spanning almost two meters (Figure 5). One specimen had a reported body mass of 916 kg (Eckert & Luginbuhl, 1988). Unlike all of the other sea turtles that are hard bony-shelled, leatherbacks have a distinctly

ridged and rubbery carapace. Their colour ranges from black to bluish-black and greyish-black, with the flippers and head sometimes mottled or spotted. They have seven ridges, including those along the side of the body, that run lengthways and end in a pointed terminal extension (Limpus, 1998).

These jellyfish-eating oceanic travellers have a global distribution and migrate vast distances from temperate feeding grounds to tropical breeding grounds. They also spend considerable amounts of time basking on the surface of the water (Wetherall *et al.*, 1993).

Leatherbacks are able to live in colder waters and dive to greater depths than most other reptiles in search of prey items. They have specific adaptations to handle high pressure and to keep their core body temperature higher than the surrounding water temperature (Queensland Department of the Environment and Heritage, 1994; Ruckdeschel *et al.*, 2000).



Figure 5. Adult leatherback (Source: Reproduced with kind permission from the Caribbean Conservation Centre [online] www.seaturtle.org/species_class.htm).

Globally, leatherback numbers are dwindling throughout their range. Although the population estimate in 1980 was determined to be around 115,000 leatherbacks, Spotila *et al.* (1996) later estimated the global population of female leatherback turtles to be only 34,500 nesting females. The eastern Pacific population has continued to decline since that estimate, leading to conclusions that the leatherbacks are now on the verge of extinction in the Pacific Ocean (Spotila, *et al.*, 2000). Leatherbacks face many challenges throughout their life, ranging from egg theft to death of adults in fishing gear. The killing of gravid females while nesting was a historical practice that decreased through protection of nesting beaches (Eckert, 1997). Anthropogenic factors have been the main cause of mortality responsible for the depressing plight of these populations. The death of adults as a result of fishing operations is very difficult to address but has been a particularly large threat (Spotila *et al.*, 2000).

2.3. Life History

The life history of sea turtles is important in identifying biological, behavioural and environmental factors that determine their survival. Different stages of the life cycle are subjected to different types and levels of threats.

The age at reproductive maturity of most species of turtles is lengthy exposing immature turtles to threats for a prolonged period of time. Mortality of large numbers of immature turtles prevents the populations to replenish sufficiently to replace mortality: Green turtles may take as long as 30 to 60 years, while loggerheads reach reproductive maturity between 12 to 35 years. Reproductive maturity in hawksbills may be reached as early as three years (STSL, 2006; Crouse, 1987). Sexual maturity may also be related to carapace size, where it has been found that green sea turtles reached maturity at a carapace size of 69 to 79 cm; loggerheads reached maturity at 79 cm; and hawksbills reached sexual maturity at 60 to 95 cm (STSL, 2006).

Once reproductive maturity is reached, males and females both travel from foraging grounds to nesting areas (these are usually quite precisely linked to their original nesting beaches) to mate (Coste, 1993). For Fiji, the nesting months are between November and March (Guinea, 1993), coinciding with the hot, hurricane season (Ryan, 2000). Mating occurs in the water, and the males do not come ashore onto the beach with females during nesting. Sea turtles are oviparous, and bury their shelled amniotic eggs in the ground. Usually considerable care is exercised in constructing the nest, but once eggs are deposited and covered the female deserts those (Hickman *et al.*, 2001). Turtle harvesters can find it relatively convenient to harvest females as they climb ashore to nest (often before eggs are laid), to collect eggs by digging burrows, or trapping or catching females as they return to the sea after laying eggs. The timing for hatchlings (that are not harvested, predated upon or damaged) to emerge from the eggs and dash to the surf are synchronised: This is an adaptation that may increase the chance of many hatchlings making it safely to the surf despite active threats on the beach.

All species of sea turtles exhibit a life cycle of hatchlings moving offshore from nesting beaches to live in the open ocean feeding zone, referred to as the pelagic phase, and then after a number of years, migrating to coastal shallow benthic foraging zones (seagrass nurseries) (Figure 6). These life cycle characteristics make sea turtles particularly vulnerable to habitat degradation and overexploitation (WWF, 2005). In water, the direct threats are harvest of turtles, fisheries bycatch, diseases and ghostfishing, and indirect threats include the degradation of foraging habitats and pollution. On beaches direct threats are egg collection, turtles collection, egg predation by native and introduced species (including mongooses), and indirect threats are destruction of nesting habitat and coastal development (WWF, 2006; SPREP, 2006).

The female turtles usually come ashore at night on high tide to nest (STSL, 2006). Nesting occurs from one to eight times every nesting season (specific for each country), but once every two to three years only. The nester first digs a 'body pit' with her front flippers before she makes the actual nest. Between 50 and 150 eggs are laid in a burrow shaped like a bottleneck (wide at the bottom and small on top) using the specialised hind flippers within the body pit (STSL, 2006; Coste, 1993). The turtle covers up the burrow before making its journey back to the surf. The leatherbacks are known to dishevel sand at other locations on the beach to confuse predators concerning the exact location of the hatchlings (Carr, 1968). The beach burrow serves to cover the eggs from predators, prevent eggs from dehydrating and helps maintain proper temperature. A lower nest temperature (the optimum temperature is not known) will offset sex ratio favouring more males during embryonic development, while a higher temperature is in favour of females (STSL, 2006).

The eggs are white and leathery, and appear like dimpled ping pong balls. The eggs incubate for up to two months before the hatchlings emerge at night reducing the exposure to predators. Since the burrows are about two feet deep, hatchlings need to stamp and move sand under them in order to climb out of the burrows and make a rush for the surf in a large group, which optimises survival chances (STSL, 2006; Coste, 1993). According to Carr (1968), the leatherbacks are an exception. The hatchlings climb over each other as they all try to scramble out of the burrows. Ultimately, some hatchlings that remain in the burrow in the end cannot make it out of the burrows at all (STSL, 2006).

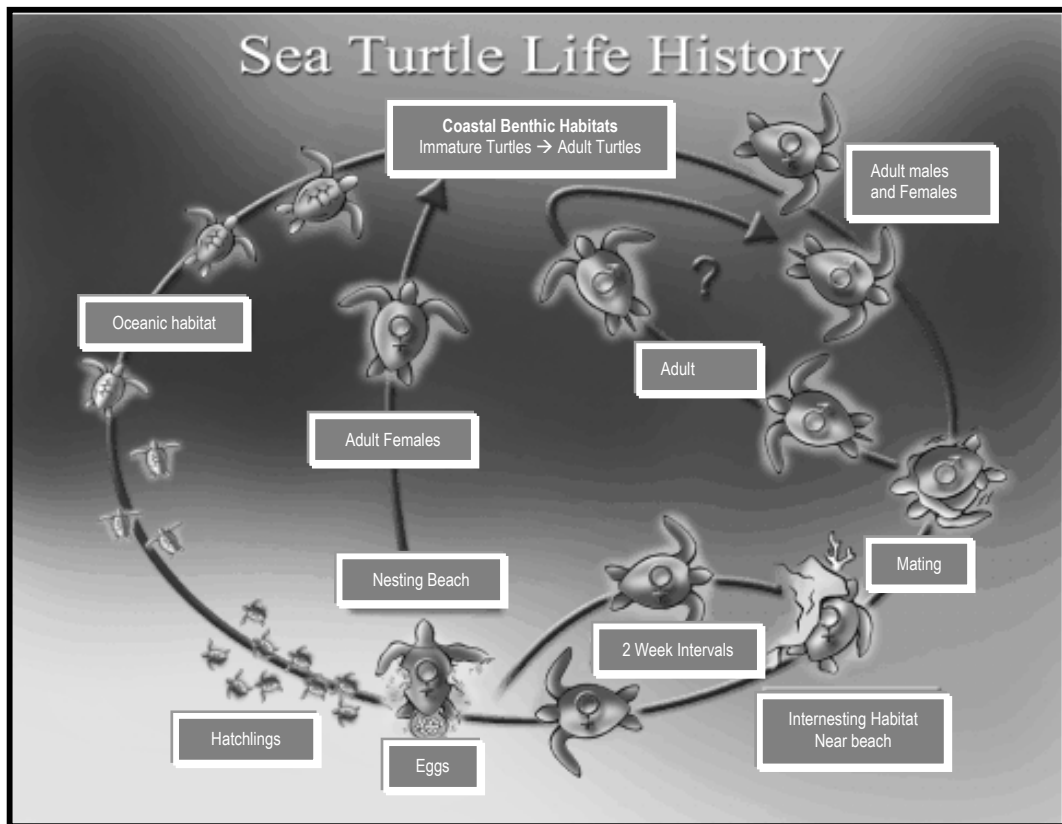


Figure 6. The life history of a typical sea turtles (Source: “Sea Turtles life History” [online], <http://northflorida.fws.gov/SeaTurtles>).

Not much is known about how the first year of the hatchling is spent (STSL, 2006; Bjorndal, 1995; Coste, 1993; Crouse, 1987). Researchers generally agree that most hatchlings spend their first few years living an oceanic existence before appearing in coastal areas among seagrass beds and reefs (STSL, 2006).



Figure 7. Sea turtles hatchlings in the fight for survival (Source: Reproduced with kind permission from the Caribbean Conservation Centre [online] www.seaturtle.org/species_class.htm).

2.4. Range and Distribution

Two of the four species, the green turtles and hawksbills, occur throughout Fiji Islands in varying abundances. Loggerheads and leatherbacks are more biogeographically restricted (Guinea, 1993). All, except for the loggerheads have been known to nest in Fiji. Over time there has been a general reduction in the number of breeding sites for turtles (Batibasaga, 2002).

Rupeni *et al.* (2002) estimated that there were approximately 3000 to 4000 sea turtles in Fiji waters, with relatively few nesters. According to Guinea (1993) and Batibasaga (2002), the only nesting sites for green turtles are now located in isolated islands and sand isles north of Taveuni, in an area known as the Heemskereq Reefs and Ringgold Isles (Figure 1). This uninhabited region consisting of reefs, sand cays and white sandy islets is located within longitudes 179° 20'E and 179° 33'E and latitudes 16°

11°S and 16° 40'S, with a total area of about 1,150 square kilometers (Fiji Marine Spaces Chart 81/2, 1970). Because they are uninhabited, the nesting beaches on these islets are vulnerable to illegal harvest by fishing vessels. The total number of green turtles nesters is estimated to be 30 to 40 nests (Rupeni *et al*, 2002). Hawksbills nest more widely in small populations particularly in the Eastern and Southern parts of Fiji. The only major nesting site known is Namena Lala Island at 179° 10'E and 17° 11'S, which contained 40 nests in total between 1995 and 1999 (Guinea, 2003; Batibasaga, 2002). Leatherbacks are rarely sighted in Fiji, with only four documented nest attempts. Sightings have occurred around Savusavu, Qoma Island, Yaro Passage, Vatulele and Tailevu (Guinea, 2003; Rupeni *et al*, 2002).

There is interconnectedness between islands or countries in terms of turtles' foraging and nesting preferences. This is one of the reasons why recovery efforts for turtles are often complicated. Moreover, there are thousands of islands in the Pacific Ocean which are scattered over a large geographical range. For example, SPREP (1993) reported extensive green turtles migrations across the South Pacific from central South Pacific westwards after nesting. According to Limpus (2002), satellite telemetry and tagging studies have assisted in identifying migratory pathways. Tagging results combine to increase comprehensive understanding of relationships between feeding and nesting sites. Satellite telemetry is restricted to the use of small samples because it is an expensive operation. The limitation of tagging studies is that only adult nesting females are tagged because males do not come ashore during nesting (Limpus, 2002).

Craig (2002) suggested (from tagging results) that islands to the east of Fiji lack significant quantities of seagrass for green turtles to feed on, and therefore the turtles returned to areas like Fiji to utilise the large seagrass beds. As a result of such connectivity, it is essential to bridge gaps for same stocks between islands, and extend the limited knowledge about migratory routes of green turtles and the other species

within the Pacific region (Craig, 2002). Hawaii is a special case that has to deal less with interconnectivity of nations for sharing the green turtles resource because of isolation. Due to the behavioral change of fearlessness in green turtles, ecotourism has become prominent (Balasz, 2002). This gives a positive contribution to the Hawaiian economy without killing the species or its habitats.

After nesting, the sea turtles migrate. According to Limpus (2002), female green turtles range up to a 2,500 kilometres radius of their nesting site, in places with suitable foraging areas. This range spans several different nations. The females of a nesting population may migrate to foraging areas of any country within this span. Females from a different population will also enter foraging areas within this boundary (Limpus, 2002). There is evidence of breeding migration links between feeding and nesting sites in the Western Pacific and Southeast Asia. Without a tag, it will not be possible to identify whether or not turtles that are caught in a particular area belong to the same stock. For example, the Sulu Sea is a common nesting ground for several stocks of sea turtles. Cummings (2002) reported that a green turtle migrated from Guam to the Sulu Archipelago in the Philippines. This shows evidence of habitat linkage and shared resource between the Central and Western Pacific.

Suitable foraging for green turtles requires an area with substantial turtle grass beds. Balazs (2002) reported that tracking data had shown that 89 percent of tagged nesting green turtles migrated from Rose Atoll (American Samoa) to Fiji to forage on extensive turtles grass beds. He also suggested that Fiji was a main foraging destination for many turtles throughout the Pacific; particularly green turtles from French Polynesian nesting populations, which fan out across the Pacific. Craig (2002) also indicated that long range migration of green turtles originating from Rose Atoll reveal a general westward pattern, with many heading towards Fiji. Skelton & South (2006) indicate that *Syringodium isoetifolium*, the common seagrass eaten by green turtles, is widespread from Fiji to Samoa, and possibly also to American Samoa. They

also indicated that the seagrass occurred from 1 to 15 meters depth in shallow subtidal regions. The prevalence of fishing in this range and depth makes sea turtles highly vulnerable to capture in coastal fisheries.

Loggerheads do not have overlapping foraging areas. Instead, each stock radiates out into a quite large feeding area. Hawksbills are distributed from single nesting grounds to feeding areas spanning numerous countries. Leatherbacks span large distances to feeding areas throughout eastern Asia and the central North Pacific (Environment Australia, 1998). In Australia, loggerheads migrate from feeding areas around the north of Australia to nest sites along the eastern and western coastlines (Department of the Environment and Heritage, 1994; Environment Australia, 1998). They also travel further afield to and from islands in the Pacific Ocean and have occasionally been seen as far south as Tasmania (Environment Australia, 1998).

Fiji can be considered an important foraging site for green turtles and hawksbills in the Pacific Islands region, but the extent of its significance cannot be quantified and compared in the regional or global scene without sufficient localised scientific evidence.

2.5. Sea Turtles Ecology

Sea turtles live in coastal waters and the open ocean. Some migrate vast distances from their foraging grounds to their breeding grounds. They are slow-growing, often taking decades to mature, and breed for many years. All species are well adapted to marine life, with strong flippers; light, streamlined shells; and glands to excrete excess salt (Limpus, 1998).

Turtles have important ecological roles in the environment. They assist in maintaining the balance of the ecosystem (Abas, 2000). Green turtles are among very few living

creatures that eat seagrasses, thus regularly nipping them at the tips. This keeps the seagrass beds healthy, and makes the seagrass garden expand laterally on the ocean floor rather than vertically (STSL, 2006). Seagrass beds are critical breeding and nursery grounds for a diverse range of marine life, many of which contribute to the livelihoods of coastal communities (Castro and Huber, 1997). A decline in seagrass beds—which is already occurring and could be linked to the decline in sea turtles—will cause a decline in all other species that are dependent on it for survival (STSL, 2006).

Sea turtles are unique in cycling nutrients by transporting the substances from rich feeding grounds to nutrient poor nesting sites (Abas, 2000). Sand beaches and dunes, where turtles lay eggs, are known to be poor in nutrients. Unhatched eggs, trapped hatchlings and egg shells contribute significantly to nourishing beaches with nutrients, aiding growth of vegetation on sandy substrate (STSL, 2006). Sea turtles have an important role in the beach ecosystem.

Turtles have symbiotic relationships with colonial barnacles, algal growth and leeches attached on the shells, although different turtle populations may vary in the types and extent of growth on the shell (Carr, 1968) (Figure 8).

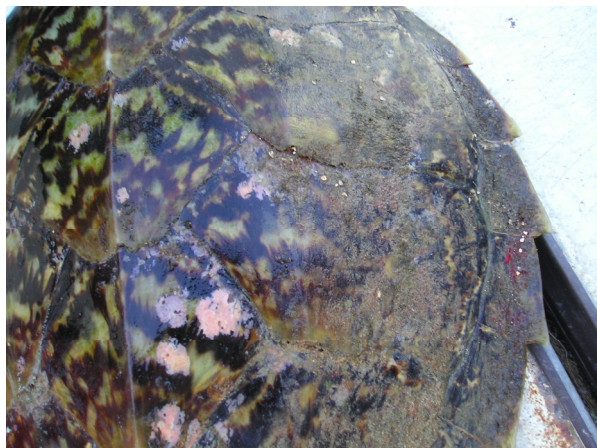


Figure 8. Algal growth on the shell of a hawkbill turtle
(Source: Photo taken by Joytishna Jit, 2006).

Sea turtles face many threats throughout their lifetime. These include mortality through commercial and recreational fishing, boat strike and ingestion of discarded fishing line and rubbish, predation at rookeries by feral animals, indigenous harvesting, and coastal development negatively affecting hatchlings and nesting females (Limpus, 1998).

2.6. Overview of Natural Causes for Sea Turtles Decline

This section describes three known causes of sea turtle declines: evolutionary trend due to natural selection, environmental factors and anthropogenic causes. Sea turtle conservation efforts need to strategise on the different causes of decline and address them all.

2.6.1. Evolutionary Trend

Carr (1968) indicated that one cause of decline in sea turtles may be related to the long evolutionary history of sea turtles in the face of natural selection. According to Carr (1968), natural selection has over time favoured turtles survivors with destination-seeking genes and destination-finding genes that relate to the current migrations of sea turtles to ancient nesting and foraging grounds. The older configurations of land and sea were vastly different with large masses of land and without islands and cays. With the emergence of the various continental and oceanic islands, gyres and currents have systematically allowed turtles to radiate to different habitats for foraging and nesting. The natural selection processes changed to favour islands and sand cays, which have low predation, occur at relatively short distances and have better sand for incubation (Coste, 1993; Carr, 1968).

Despite these relatively short-term advantages, rather severe long-term disadvantages may have disfavoured the once vast populations of sea turtles. Carr (1968) suggested that since islands are dynamic, they may sink or shrink over time, making them harder to find. In the case of the former, adults need to continue the journey further until they find a suitable nesting beach (if they make it). As such, the distances that hatchlings need to travel to resident grounds also increases, adding to the strain of the population. Overall, the sea turtles appear to be in decline unless efforts are made to sustain populations, and minimise other threats.

2.6.2. Environmental Factors

Scientists are still unable to fully describe the reasons behind the nesting and migratory behaviours of sea turtles; only that sea turtles have continued to nest in the breeding grounds of their parents, and that migrations occur over vast distances to feeding grounds. Even less is understood about their breeding and courtship behaviour (Bjorndal, 1995; Carr, 1968; Pritchard, 1967). Effective conservation will only be achieved if the environmental factors causing sea turtle decline are addressed together with reducing the impact of human induced influences. The major environmental factor for declines in sea turtle numbers is change in climate due to sea level rise, which negatively affects of biotic and abiotic factors.

One of the main biotic factors affecting survivorship is food availability. Sea level rise is changing the distribution and abundance of seagrass beds, therefore reducing the chance of sea turtles returning, or juveniles finding the same foraging habitats (IUCN, 1995). The green turtles depend on seagrass beds for nutrition, and the other species feed on invertebrates. Much of the literature is unclear on the feeding of juveniles of all species, and it is widely believed that juveniles are omnivorous (Bjorndal, 1995; Carr, 1968; Pritchard, 1967).

Breeding males and females move to habitats near nesting beaches for mating. The males return to their feeding zones, while the females nest, possibly a number of times, before returning to their benthic-feeding zone. Mature females will nest in the locations that they hatch in years ago (Ruckdeschel *et al.*, 2000). Their linkage to fixed feeding grounds indicates similar vulnerability in searching for mates should the food distributions changes as a result of climate change.

Predation and disease also contribute to the decline in sea turtles. Exotic pests like pigs, cats and rats may also prey on the eggs and hatchlings (Hickman, 2001). Hatchlings are also predated by ghost crabs. Predation on adult sea turtles occurs by large tiger sharks (STSL, 2006). The life threatening disease known to affect sea turtles is fibropapilloma. This disease was first recorded as early as the 1970s, but the cause remains a mystery. It has only been known to occur intensively in some populations of green turtles in specific localities, which have so far been outside the Western and Central Pacific Islands (NFMS, 2006).

The main abiotic factors known to affect sea turtles are water temperature, water depth, water currents, nesting beach substrate, nest beach temperature, sand depth on nest beach, and presence of light onshore during nesting. These factors will be subject to changes as climate change progresses, but its effects of sea turtles are largely uncertain at this stage (Kinan, 2002; IUCN, 1995). The explanations below reflect the importance of the above factors for sea turtle survivorship.

All four sea turtle species occurring in Fiji prefer tropical to sub-tropical waters. The hatchlings will not climb out of the burrows until the temperature is cool as at night time (Carr, 1968). Some researchers suggest that the one year old juveniles feed from, and take refuge in, massive bed of *Sargassum* seaweed floating in prevailing currents within tropical gyres (STSL, 2006).

Nesting needs to occur at night (in total darkness) on sandy beaches that are quiet, undisturbed and isolated. Often if disturbed, the female returns to the water without laying the eggs. It is known that sand depths must be greater than one meter for turtles to make nests (STSL, 2006). Therefore, erosion of beaches is a cause of decline in sea turtle numbers.

Reclamation of coastal areas for development projects and lighting and noise on former turtle nesting beaches, prevent turtles from nesting in those areas. Climate change is predicted to reduce sea turtle nesting sites and increase hatchling mortality due to sea water inundation and sea level rise (Limpus, 2002).

When the turtles are in the ocean, they need to surface often because they have lung structures and therefore breathe in atmospheric oxygen (Pritchard, 1967). This limits the depths to which they occur in the water column. Many of the sea turtles migrations between foraging and nesting areas follow currents, often the warmer currents (STSL, 2006).

2.7. Overview of Anthropogenic Factors in Sea Turtle Conservation

The human-induced threats are inherent in coastal and offshore areas. Fishing and pollution (including debris) are the primary causes for sea turtles decline worldwide (IUCN, 1995).

2.7.1. Coastal Threats

There are several direct and indirect causes for sea turtle decline for which conservation need to be addressed in the coastal region.

Direct exploitation of turtles takes place for commercial markets (black market), local utilisation or subsistence consumption, and harvest for traditional ceremonies. Direct intake for sea turtles consumption in Fiji is one of the main threats to sea turtles (Rupeni *et al.*, 2002; Batibasaga, 2002; Boyle, 1997). According to Rupeni *et al.* (2002), traditional harvest was limited to the turtles, and not its eggs. Rather eggs are consumed as a delicacy. He further explains that as traditions weakened over time, sea turtles in Fiji have been considered common property with widespread general consumption and domestic sale. Rupeni *et al.* (2002) indicated that hunting for sea turtles in Fiji was relatively easy because management was generally unregulated and uncoordinated. Batibasaga (2002) also admitted that enforcement of existing legislation needed improvement.

There are other important aspects to consider in turtle capture. Constant pressure and decline of females due to high vulnerability to capture (during nesting) over time may upset sex ratios, further decreasing rate of recovery of the population (Bjorndal, 1995). Fishing can contribute to sea turtles decline if incidental capture of sea turtles occurs regularly in small scale coastal fisheries (Bjorndal, 1995). Hawksbill fishing for the purposes of international trade in turtle products from Fiji was significant until 1990. Daly (1991) reported that 30,000 hawksbill shells were exported to Japan from Fiji during the 1980s. Canin (1991) quoted that Fiji last exported approximately 1,438 kilograms of shells to Japan in 1990. Fiji banned international trade in turtle shells through legislation in 1991 (Anon., 1996).

Nesting beach degradation is a form of indirect threat. It has occurred due to coastal development, dredging, vessel traffic, erosion control, sand mining, vehicular traffic on beaches, and artificial lighting, which repels the adults and disorients the hatchlings. Development of piggeries and farms near the coast, if not managed adequately, can cause excessive nutrients to enter the coastal ecosystem that smother corals, and cause excessive growth in brown algae which can out-compete seagrass

beds (Castro and Huber, 1997). Human alteration of terrestrial habitats can also change the feeding patterns of natural predators, thereby increasing predation on marine turtles nests and eggs (NOAA Fisheries, 1998). The eastern coast of Viti Levu, the largest island in Fiji is developing fast to cater for large tourist resorts on the coast, with several established resort beaches (including reclaimed beaches) already. This is a cause for concern for potential turtle nesting and foraging sites, which are not yet thoroughly documented and mapped for Fiji. There is some available nesting information in Guinea (1993) and Batibasaga (2002). However, it is apparent that there are more nesting sites in Fiji than those published (Mr Aisake Batibasaga, pers. comm., 2006; Solomona, pers. comm., 2006).

There is only one legislated marine sanctuary in Fiji called Makogai Island (See Figure 1) in which turtles and hatchlings are preserved. The sanctuary is managed by Fiji's Department of Fisheries, but there is some evidence of poaching by nearby fishers (Batibasaga, 2002). Although Ringgold and Heemskereq is recognised as the most significant green turtle nesting region for Fiji, no special measures have been taken to conserve this site. Coincidentally, this area is barely a scattering of islets and sand keys, which are uninhabited. Sea turtle fishing probably occurs by fishers from the second largest island in the Fiji Group, Vanua Levu, or from nearby islands like Taveuni, Vanua Balavu and Qamea.

Damage to benthic feeding habitats by destructive fishing such as dynamite fishing or dredging may displace foraging sea turtle populations. The displacement may cause residual loss of sea turtles due to the need to extend migration or remain with greater competition for available food (Lawson, 1997). Destruction of reefs from vessels anchoring, striking or grounding is also an issue. Hawksbills are dependent on coral reefs for shelter and food, and their wellbeing is intrinsically linked to healthy reefs (NFMS, 2006).

There is no specific study on the nature of pollution in Fiji waters in relation to its effect on sea turtles. Ruckdeschel, *et al.* (2000), USFWS (2006), Limpus (1998) and Wetherall *et al.* (1993), indicated that pollution is an important contributor to sea turtles decline; negative effects of pollution (pesticides, heavy metals, organochloride compounds, sewage effluent) sourced from the land and from boats affected feeding grounds and contributed to increases in disease. The authors also explained that ingestion of, and possibly entanglement in, plastic and other debris, including plastic bait bands, possibly causes injury, internal blockages, drowning, ulcers and toxic effects in turtles. Sea turtles that actively feed on jellyfish can eat plastic bags floating in the water as plastics resemble jellyfish in form and colour. Finally, the ingestion of, and coating in, oil droplets and tar in the water and on beaches, cause choking, inhibition of movement and sub lethal effects in turtles.

Poaching for black market sales has also been a major concern in sea turtle conservation throughout the late 1990s in coastal waters (Dernawan, 2002). Oldfield (2003) and Dernawan (2002) suggested that much of the illegal trade in sea turtles and its products also originated from local villagers catching the specimens for the middlemen. No study has been conducted so far to investigate this for Fiji.

Since sea turtles spend more than 90 percent of their time offshore, it is apparent that preserving coastal sea turtles habitats alone is insufficient for protecting sea turtles.

2.7.2. Offshore Threats

The main offshore impact on sea turtles worldwide is fisheries bycatch. FitzSimmons *et al.* (2002) indicated that sea turtles are ocean travellers that use the whole Pacific Ocean; foraging on one side and migrating through the middle to nesting grounds on the other side. As a result, the locations of destructive (in terms of high sea turtle fishing mortalities) pelagic fishing fleets in the Pacific Ocean are likely to impinge on

the migratory paths of several stocks and species of sea turtles. The pelagic fishing fleet in the Pacific Ocean use longlines and purse seines, which can catch turtles. Fishing may easily eliminate vulnerable populations by large killings (SPREP, 2001). According to Brogan (2002), the Western and Central Pacific Ocean (WCPO) supports the largest commercial tuna fishery in the world. She estimated that there were 2,182 turtle encounters in the WTP, based on from figures held in SPC database. Interaction is expected to occur during the period when turtles are in the open ocean prior to association with inshore forage habitats. Certain species, particularly leatherbacks and olive ridleys (FitzSimmons *et al.*, 2002) are much more prevalent in oceanic waters than others.

There is a general shortage of information on sea turtle bycatch worldwide. A detailed review of sea turtle bycatch in the Australian pelagic longline fishery in 2002 suggested that sea turtle bycatch was as high as 400 turtles per year (Robins *et al.*, 2002).

Liew (2002) provided some information from interviews and surveys of fishers on the incidental capture of sea turtles in coastal and offshore fishing gear in Malaysia (Table 2). Turtles could be caught in driftnets with large meshes to target rays and sharks, trawl nets and purse seines. The turtles caught in fish traps were essentially entangled in buoylines of traps. Those caught in the drift nets, lift nets, purse seines and beach seine are essentially released alive and unharmed. Trawlers and ray nets were the main threat to sea turtles, and those ray nets that were very efficient in capturing turtles have been banned, although an enforcement problem cannot be ignored. Longlines and hook and line were not contributing threats to sea turtle capture (Liew, 2002).

Table 2. Incidental catch of sea turtles across various fishing methods used in Malaysia in 1994/1995 (Liew, 2002).

Gear Type	Number of fishers interviewed	Number (percent) of Fishers with past experience incidentally capturing sea turtles
HOOK & LINE	77	0
FISH TRAPS	35	4 (11percent)
PURSE SEINE	27	6 (22percent)
DRIFT NET/TRAMEL NET	23	3 (13percent)
LONG LINE	20	0
TRAWL	20	11 (55percent)
RAY NET	9	6 (67percent)
LIFT NET	7	2 (27percent)
BEACH SEINE	4	4 (100percent)

According to Kelleher (2004), reliable information on bycatch is generally only available through observers. He also indicated that low observer coverage gave relatively low and unpredictable sea turtle bycatch rates, which made it difficult to analyse. In attempts by the Food and Agriculture Organisation (FAO) to assess the extent of sea turtle bycatch, Asian shipping representatives revealed that sea turtle bycatch was rare, and the survival of sea turtles caught in longlines was also high as most turtles were released alive (Kelleher, 2004).

A study by SPC, commissioned by SPREP, revealed that between 1990 and 2000, the chances of encounter for a turtle per 1000 hooks in longline operations in the WCPO was 0.029⁷ and, most of those that were caught were released alive (SPREP, 2001). A significantly lower chance of encountering turtles per set of 1000 hooks, that is 0.002, was observed in the western sub-tropical Pacific (includes Fiji), which is a sub region within the WCPO (SPREP, 2001). The national observer coverage in this time was less than one percent, and all the distant water fishing nations are covered except

⁷ The bulk of this is from bycatch in the sub region, western tropical Pacific (excludes Fiji), which accounts for 2138 turtle encounters (21 dead turtles) in one year attributed mainly to the deep set fishing lines in that subregion. That is, a probability of encountering turtles per set of 1000 hooks of 0.026. (SPREP, 2001). This data was not extrapolated to give a yearly estimate for the western sub-tropical Pacific because data on total fishing effort is not available, but is expected to be fewer than 21 dead turtles a year.

Japanese and Korean fleets that operated in eastern areas of the WCPO and an Australian swordfish fishery off the east coast of Australia (SPREP, 2001).

A detailed quantification of bycatch in Fiji's tuna fisheries has not occurred (Prof Kenneth McKay, pers. comm. 2006). Interviews with members from Fiji's tuna industry on bycatch issues revealed that turtles were only rarely caught (from none to four turtles a year) in the local tuna industry, and those that were caught were usually turtles that were entangled in the fishing lines and buoys, rather than hooked. The finding on numbers caught was verified with observer information kept with the Secretariat of the Pacific Community (SPC). Through consultation with SPC's Coastal Fisheries Programme, it was confirmed that the information was most probably reliable (Lindsay Chapman, pers. comm. 2005). The observer coverage on fishing boats in Fiji waters, however, is below five percent of the fishing effort (Amoe, 2006), and may not be representative for the remaining fleet. Nonetheless, it was reasoned that the targeted pelagic species caught in Fiji were different from the variety of targeted species in most other tuna fisheries where sea turtle bycatch was high, and as such longlines were set deeper in the water column where they were less likely to encounter turtles. Also, only United States purse seiners are licensed to fish in Fiji's EEZ, although they rarely operate in Fiji's waters (Amoe, 2006; WCPFC, 2002). This is a major advantage as purse seiners have relatively high sea turtle bycatch (SPREP, 2001).

It may well be the depth of setting that largely determines the incidence of sea turtle capture, where fishing gear set low in the water column may reduce sea turtle bycatch (Brogan, 2002). Turtles surface at regular intervals to breathe, and so there are high chances of the interaction of the sea turtles with surface set fishing gear (Brogan, 2002). Similarly, if surface inhabiting species of tuna or billfish are targeted, there will likely be a higher incidence of sea turtle bycatch compared with demersal sets.

In addition, NMFS (2006) reported that leatherbacks are particularly susceptible to longlines. They become entangled in longlines, fish traps, buoy anchor lines and other ropes and cables. Successful migrations to nesting or foraging grounds may be inhibited by prolonged fishing in fishing hotspots along the route (SPREP, 2001).

Brogan (2002) reported the preference of sea turtles for distinct thermal regimes, which is also a factor in tuna migration patterns, and means that certain populations of sea turtles and tuna stocks may be attracted along similar paths. As a result, fishing for tuna in the mixed stocks can lead to sea turtle bycatch.

Using irresponsible fishing methods and procedures (such as prolonged soak time for fishing nets) or ignoring safe release guidelines for turtles will all contribute to rapid extirpation in the areas where these are used. If this occurs in multiple sites and regions over the entire range the species occupies, over time extinction can result (SPREP, 2001). Species-specific decline may occur if certain areas or species specific methods are used. For example, leatherbacks appear more vulnerable to longline operations, which constitutes up to 60 percent of total leatherback bycatch (SPREP, 2001).

It was also indicated from the interviews of tuna fisheries operators that there was a general awareness of existing guidelines for ensuring safe release of turtles caught in longlines. Turtles that were caught dead were kept by crew and taken onshore for household consumption. On query about the possibility of poaching for sea turtles by distant water fishing fleets, Mr Lindsay Chapman (pers. comm. 2006) suggested that this was unlikely for two key reasons. The value of catching tuna was far more than the value of turtles, and therefore the space for storing tuna was precious. Also, the distance that distant water fishers need cover to catch turtles in Fiji was probably not a cost effective option.

Offshore fishing in Fiji's EEZ is limited to longline fishing and pole and line (TDMP, 2001). The main catch for offshore operators is tuna, and the bycatch of commercial value in this fishery include snapper and billfish, particularly marlin, wahoo and swordfish (TDMP, 2001). Incidental sea turtles catches in longlines are a result of opportunistic turtles encountering baited hooks or entangling themselves with the longline gear. Both types of interactions result in drowning, unless the gear is hauled in before drowning occurs (Brogan 2002; Robins *et al.*, 2002). Although there are guidelines to follow in order to revive the turtles and ensure safe release, the subsequent fate of the turtles also depends on its life stage at the time of capture. Young turtles are less likely to survive (Robins *et al.*, 2002).

2.8. Management Units for Sea Turtle Populations in the Pacific Ocean

Once threats to sea turtles are identified, the allocation of scientifically-sound management units can assist in recovery efforts that can target the threats in separate sea turtle populations. This section attempts to review findings about separate management units for populations of sea turtles that are shared by Fiji with other Pacific countries.

Combining tagging, satellite telemetry and genetic analyses allows considerations of juveniles and male specimens as well as females in sea turtle population studies, and also helps identify the foraging areas of separate populations that nest in the region (FitzSimmons *et al.*, 2002). The findings of this recent analysis are of conservation use in defining management units for sea turtle populations, and will be elaborated here.

With the advent of the use of molecular genetics on pelagic specimens caught in definite areas of the ocean, defining turtle stock boundaries has become more feasible (FitzSimmons *et al.*, 2002). With the use of such techniques on the different species

of sea turtles provided by fisheries located at various sites within the region, some interesting relationships were discovered by FitzSimmons *et. al.* (2002). They considered using sea turtle bycatch specimens from a Hawaii-based Longline Fishery that operates in the North Pacific. This location provided a mixed stock that utilises the same foraging areas. The results from FitzSimmons *et. al.* (2002) are interesting and are described hereon.

The Western Pacific and Indian Ocean contains one metapopulation of olive ridleys and leatherbacks, and the Eastern Pacific, the other. These two populations occur on opposite sides of the Pacific plate. In the study, 15 out of 16 leatherbacks originated from the Western Pacific stocks, and one from the Eastern Pacific; the sample size in this case was considered too small to be generalised.

Loggerheads originate from two distinct areas: the North Pacific stock (Japan nesters) and the South Pacific stock (Australia nesters). It is the North Pacific stock that is affected by the fishing operations in the North Pacific while moving with the Kuroshio Current to feed in the respective area. Together with the results from a United States west coast driftnet fishery, it was discovered that the nesters from the South Pacific stock possibly use the Southern gyre to migrate to forage habitats on the Peruvian coast. The conservational significance of these results is the need for integrated management efforts among nations of the Pacific islands and Pacific Rim.

For the green turtles and hawksbills, Fitzsimmons *et al.* (2002) discovered that the genetic makeup is distinct for turtles that occur in rookeries that are separated by a few kilometres. The implication of this is that restoration of recently depleted stocks via natural colonisation by females from another genetic stock may be unlikely, except over more than 100 or so generations. The better alternative suggested is to use local efforts to increase survivorship and reduce mortality, especially in and around feeding and nesting habitats.

The heavily exploited turtles in Papua New Guinea and Solomon Islands are foragers in Australia that breed in Papua New Guinea and Solomon Islands. There are genetically similar populations that also breed within areas in Australia. This means that exploitation in one region will flow to another region with the shared resource of similar genetic populations. It also means that natural re-colonisation may tend to occur in this case.

These results were useful in allocating management units (logical areas for recovery efforts) for these species since general population dynamics became somewhat defined. It follows then that Fiji is a logical area for recovery efforts, for green turtles in particular (Figure 9).

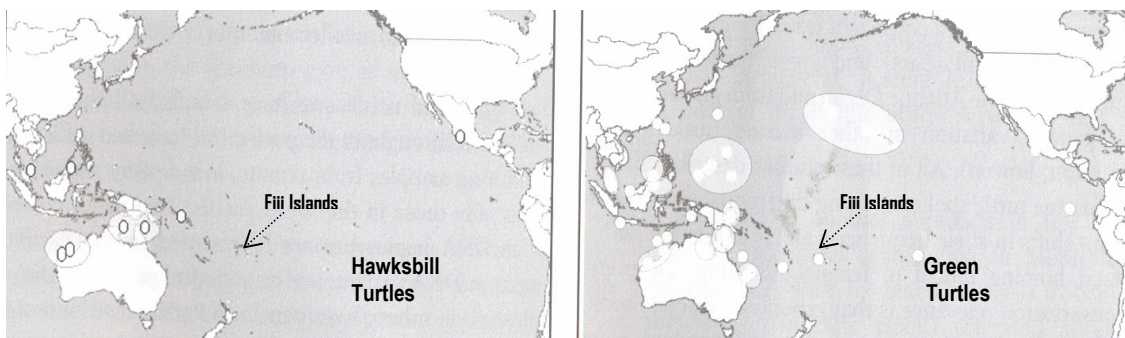


Figure 9. The two maps show the management units (shaded regions) for hawksbill and green turtles in the Pacific Ocean (Source: Kinan, 2002:96).

2.9. Summary

Despite the numerous changes that have occurred in that their ocean environment over the past 200 million years, the survival of sea turtles over this time shows that they are extremely successfully adapted to their environment. It is even more significant therefore that they are in such drastic decline through the 20th century.

They are now facing one environmental change that they cannot adapt to – humankind.

Sea turtles are long-lived and require several decades to mature sexually, which means that conservation efforts have to be sustained over decades to observe a reversal in sea turtles declines. Sea turtle conservation activities will benefit not only turtles, but will also help to make fisheries sustainable, ensure good management of marine resources, and secure access to and benefits from marine resources for local communities.

A single sea turtle will make seasonal migrations over vast areas through the waters of several countries and the open ocean making conservation and management a shared responsibility among many countries. Turtles need a wide range of habitats to complete different life-cycle stages, including beaches, tropical and subtropical coastal waters, seagrass meadows, coral reefs, and open ocean pelagic waters. This requires coordinated management actions between land and sea.

The threats to sea turtles considered in sea turtle conservation strategies worldwide are similar. Increased mortality from threats at the egg and early life history stages impacts the species' abilities to maintain or increase their numbers by limiting the number of individuals that survive to sexual maturity. In addition, the mortality of adult females results in the loss of potential juveniles. Adults, juveniles and the eggs, all have to be considered in conservation planning. This information also needs to be packaged adequately for local communities so that they are equipped with the knowledge as a tool in considering the consequences of their action on the harvest of turtles and eggs.

The four species of turtles in Fiji waters are loggerhead sea turtles *Caretta caretta*, green turtles *Chelonia mydas*, hawksbill sea turtles *Eretmochelys imbricata*, and

leatherback sea turtles *Dermochelys coriacea*. All these turtles are affected by natural and anthropogenic threats. Some human-induced threats—which need to be minimised to help revive declining populations in Fiji—include direct harvest of turtles and eggs, beach disturbances, degradation of reefs, seagrass beds and beaches, bycatch and pollution. Actions need to be taken to ensure that the natural balance for sea turtles is maintained, even in the face of climate change, increasing human populations, impact of tuna fisheries and coastal development.

While there are large gaps in the knowledge of local sea turtle population status, range and distribution, the poor conservation status of the turtles themselves present the best evidence that sea turtle populations cannot withstand current mortality rates and a reversal of the process is needed to ensure that sea turtles do not go extinct. There is a need for research into the critical habitat areas for sea turtles in Fiji, and subsequent validation by experts.

Chapter Three

“We are part of the global economy for better or worse. Education is... the means by which we equip ourselves with knowledge in order to better relate to our environment. The problem with merely accepting strategies and programmes from elsewhere, is that it often devalues, and diminishes that which allowed us to survive in this milieu for thousands of years. I am not advocating a return to the past. That would be lunacy. What I am saying is that due acknowledgement be given to what is our Pacific heritage. A place must be found for it so that we do not lose touch with our roots, with what makes us what and who we are.”

- H.E. the Vice President of Fiji, Ratu Joni Madraiwiwi (Madraiwiwi: Speech, 2006)

3.0 Overview of International and Regional Sea Turtle Conservation Regimes

3.1. Introduction

Marine ecosystems have hazy boundaries and exhibit a wider geographical and spatial scale than land ecosystems (Agardy, 1997). The vast habitat range of sea turtles makes it important to consider international and regional regimes for effective conservation over the entire habitat range, considering all environmental and anthropogenic factors that affect sea turtles. The migratory nature of sea turtles is at the heart of the failure of customary international law in reversing sea turtles decline, because the international law does not adopt strong measures for sea turtle conservation (Wold, 2002). Coastal States have sovereignty over resources on the beach, internal waters and territorial sea, where it can use natural resources under Permanent Sovereignty over Natural Resources as long as it does not harm another State (UN, 1997). Resources in the EEZ and high seas must be conserved, and any utilisation must be consistent with the interests of other States (UN, 1997). There are several international environmental instruments described in this chapter that may assist in sea turtle conservation; implementation is the responsibility of States that adopt and ratify them.

Salm *et al.* (2000) explains that extinction can be avoided if turtle populations or stocks maintain adequate rates of survival at all stages of the life cycle, and for this regional cooperation is essential. While the current IUCN Assessment for sea turtle populations is carried out on the global scale, green turtle population status varies for different regions due to different turtle stocks (Seminoff, 2001). Therefore, it may be appropriate to apply the IUCN Red List Criteria at regional levels during future assessments. For example, green turtle populations in Australia, the western Atlantic and central Pacific (Hawaii) show encouraging trends, whereas populations in Southeast Asia, the northern Indian Ocean, eastern Pacific and western Pacific (includes the Fiji Islands) and Mediterranean are doing relatively poorly (Seminoff, 2001). In successful regions, once particular turtle stocks can be declared stable, there is no reason why the resource may not be subject to sustainable harvesting, or even sustainable commercial exploitation.

Regional cooperation for sea turtle conservation may most likely be effective if it includes protection of sea turtles in foraging, nesting and breeding sites, and in fishing grounds (Salm *et al.*, 2000). This is based on some fair examples of improvements in sea turtle populations with the protection of nesting and foraging grounds (Mortimer, 1995) and the closure of fishing grounds such as the north Pacific Ocean longline fishery to protect leatherbacks (USFWS, 2006). However, some other national turtles sanctuaries have proceeded to show declining trends (Mr Aisake Batibasaga, pers. comm. 2006; Thebu & Hitipeuw, 2004; Suganuma, 2002; Broderick & Pita, 2004; Chan & Liew, 1996).

3.2. The International Regime

International conservation law has grown rapidly in the past three decades. One of the most challenging problems that has faced natural resource preservation in all times is achieving international cooperation in managing and protecting species that cross

national boundaries in the natural cause of their life history (Dyke, 2002). Several international instruments address the issue of the management and protection of sea turtles, directly or indirectly. Some are binding, 'hard law' and others are non binding, 'soft' law. Some are aimed at protecting the habitat of ecosystems in a broad sense, while others are targeted at specific species or impacts (Salm *et al.*, 2000). It is now recognised that obligations under the international regime broadly contribute to an ecosystem approach to sustainable development, and as such new and additional resources for developing countries (like Fiji Islands) to meet such obligations related to biodiversity and climate change are being made available, for example through the Global Environment Facility (GEF) (Salm *et al.*, 2000).

3.2.1. Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973 (CITES)

CITES is intended to prohibit or regulate commercial trade in globally endangered species or their products, and in accordance with the appendix under which they are listed (CITES, 2006). CITES came into force in 1973. All species of sea turtles are listed in Appendix I of CITES, indicating that they are provided complete protection, and permits from importing and exporting countries are required even if transfer is for non commercial purposes.

According to Robins *et al.* (2002), a significant issue in recent years in regards to CITES and sea turtles is that of trade in hawksbill turtle shells - especially in Japan; hawksbills shells, called *bekko*, are popularly used in jewellery and hair accessories. It was also explained that Cuba had requested the downlisting (assigning of a lower level of restriction on the trade) of its population of hawksbill turtles. The two thirds majority needed to reopen the *bekko* trade was not mustered in subsequent meetings (Robins *et al.*, 2002).

Fiji acceded to this binding Convention on 30 September 1997. However, Fiji had effectively banned all export in sea turtle shell and products before this (CITES, 2006; Anon, 1996). Globally, CITES has been crucial for sea turtle conservation, in particular hawksbills, but it alone is insufficient for sea turtle conservation because it does not cover domestic consumption, bycatch and other threats.

3.2.2. United Nations Convention on the Law of the Sea, Montego Bay, 1982 (UNCLOS)

UNCLOS is a legally binding instrument that includes provisions relating to the conservation and management of living marine resources in the State's EEZ and on the high seas. Fiji was among the first countries to ratify UNCLOS in 1982. It entered into force in 1994 (UN, 1997).

UNCLOS strongly urges international and regional cooperation in the conservation and management of living resources in the high seas. UNCLOS Part VII, Section 2 requires cooperation of all States for conservation of living resources on the high seas, and as such Coastal States must take national measures for sea turtle conservation (UN, 1997). The Agreement on the Implementation of the Provisions of the UNCLOS Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, also known as United Nations Fish Stocks Agreement is an implementing agreement which establishes principles for the conservation and management of straddling and highly migratory fish stocks, and establishes (such as under UNCLOS Part V Article 61) the duties of fishery management organisations to conserve all non-target, associated and dependent species that are affected by the fisheries (UN, 2006). It requires parties to ensure that vessels flying their flags comply with subregional and regional conservation and management measures and do not engage in any activity that undermines the effectiveness of such measures. The Agreement entered into force in November 2001

and is legally binding to all signatories. Fiji has been a party to this Agreement since 12 December 1996 (UN, 2006).

UNCLOS states that the Coastal State is responsible for establishing laws and regulations for the requirements for and the use of observers or trainees on board fishing vessels (UN, 1997). As discussed earlier, the observer coverage in Fiji is almost a quarter of its intended target of 20 percent indicated in Fiji's Tuna Development and Management Plan (TDMP, 2001). Observer coverage in 2004 and 2005 were 2.3 and 4.2 percent respectively (Amoe, 2006). The Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (described later) gives expression to UNCLOS provisions for turtle bycatch in the Western and Central Pacific (WCPFC, 2006a; UN, 1997)

There are other important provisions from UNCLOS that may assist in sea turtle conservation. Part III includes the right of Coastal States to designate shipping lanes within the territorial sea and contiguous zone (UN, 1997). This can provide the means to protect sea turtles from threats such as noise pollution and boat strikes in areas close to nesting or foraging sites.

In terms of compliance and enforcement in the EEZs, UNCLOS also allows boarding and searching of vessels on the high seas if perceived to be in violation of some of its provisions, and for other reasons (UN, 1997). This allows enforcement of CITES in terms of smuggling of turtles across borders, and also for sea turtle bycatch on the high seas.

UNCLOS Part IX requires States to protect and preserve the marine environment and this has a significant role to play in minimising the pollution-related threats for sea turtles. It clearly states that measures are necessary to “protect and preserve rare and

fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life” (UN, 1997).

An important aspect of UNCLOS is that it encourages international collaboration in conducting marine scientific research. States and relevant international organisations are responsible for promoting and facilitating the development and conduct of scientific research. Coastal States have the sovereign right to regulate, authorise and conduct such research.

3.2.3. United Nations Food and Agriculture Organization Code of Conduct for Responsible Fisheries

The FAO Code of Conduct for Responsible Fisheries is important for sea turtle conservation. Its first principle is to designate the duty of the State *and* the users of the living aquatic resources to conserve aquatic ecosystems. The FAO Code of Conduct was adopted in September 1995 and is non-binding (FAO, 2006). It has strict bi-annual reporting mechanisms and, therefore considerable moral suasion is applied to States to comply (Robins *et al.*, 2002). The FAO Code of Conduct presents best practice guidelines for States to sustainably manage their fisheries. An important consideration also is the precautionary principle in conserving, managing and exploiting fisheries resources (FAO, 2006). This is important for sea turtle conservation where data is limited in detail and scope, especially on catch and effort, complete life history, migratory behaviour, and entire nesting and foraging range of different stocks or populations.

The FAO Code of Conduct notes that fishing carries with it “the obligation to do so in a responsible manner so as to ensure effective conservation...of living resources” (FAO, 2006). It is the primary international document linking conservation and high seas fishing gear (CITES, 2002). Salm *et al.* (2000) suggests that the FAO Code of

Conduct places significant emphasis on linking fisheries management and coastal zone management. As such, it is a framework within which regional fisheries management can occur, as several habitats can be protected throughout their biological range. It considers bycatch issues by indicating that States should ensure the use of selective fishing gear, minimise wastage and discards, and minimise the capture of non-target species during fishing.

The twenty-fifth Session of the FAO Committee on Fisheries (COFI) in 2003 raised the question of sea turtle conservation and interaction with fishing operations. A Technical Consultation was subsequently held to consider the preparation of Guidelines to Reduce Sea Turtles Mortality in Fishing Operations. These guidelines, voluntary in nature and non-binding are intended to serve as input to the preparation of FAO Technical Guidelines as well as to offer guidance to the preparation of national or multilateral fisheries management activities and other measures allowing for the conservation and management of sea turtles (FAO, 2005). Implementation needs to consider national, subregional and regional diversity, including cultural and socio-economic differences, with the participation and, where possible, cooperation and engagement of fishing industries, fishing communities and other affected stakeholders (FAO, 2005). The Guidelines offer a clear (Appendix 2). The areas covered are: fishing operations; research, monitoring and sharing of information; ensuring policy consistency; education and training; capacity building, socio-economic and cultural considerations; reporting; and consideration of other aspects of sea turtle conservation (FAO, 2005).

3.2.4. Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCP Convention).

The objective of the WCP Convention is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the

Western and Central Pacific Ocean (WCPFC, 2006a). This Convention gives expression to UNCLOS within the Western and Central Pacific region in terms of bycatch issues (WCPFC, 2006a). Article 5 of the Convention resolves that Commission members implement the United Nations Food and Agriculture Organization (FAO) Guidelines to Reduce Sea Turtles Mortality in Fishing Operations (WCPFC, 2005). The Western and Central Pacific Fisheries Commission (WCPFC) was set up under the Convention in 2004 in Pohnpei, Federated States of Micronesia; most of the UNCLOS fisheries provisions are implemented through regional fisheries management bodies (WCPFC, 2006a; UN, 1997). The Contracting Parties to the Convention are members of the Commission. Fiji became a signatory in 2000, and ratification occurred in 2001. The Convention entered into force on 19 June 2004 (WCPFC, 2006a).

A Resolution to Mitigate the Impact of Fishing for Highly Migratory Fish Species on Sea Turtles was put forward to the Commission in December 2005 and was to be discussed in December 2006 (WCPFC, 2006a). The Commission can decide that resources in a Special Requirements Fund (USD158,000 in proposed budget for 2007) may be used to assist developing State members in implementing the Guidelines (WCPFC, 2006a). A total of about USD3.5 million was proposed for WCPFC's work programme for 2007 (WCPFC, 2006b). The source of the funds was stated as being from Commission members and cooperating non-members; the largest assessed contributions (based on catch and national wealth) projected for 2007 were from Japan (26 percent), China (14 percent), Korea (12 percent) and the United States of America (10 percent). The contribution from Fiji was projected to be about one percent (WCPFC, 2006b).

In the Resolution, the Commission urges further research and trials of appropriate-sized circle hooks in artisanal, subsistence and commercial fisheries. It also requires longline vessels to carry onboard and use appropriate equipment to promptly release turtles when turtles interactions occur (WCPFC, 2005). In promoting the development

and use of selective, environmentally safe and cost-effective fishing gear and techniques to minimise bycatch, it may become necessary to adjust target species management measures (WCPFC, 2002). The Resolution also highlights the need for reviewing existing observer programs in the region to ensure appropriate sea turtles interaction information is collected, such as species identification, fate and condition at release, relevant biological information and gear configuration. In the Forum Fisheries Agency's (FFA) submission at the Third Session of the WCPFC in December 2006, it stated that the Commission shall set minimum levels of observer coverage and protocols for observers, and establish standards and procedures that will be subject to review and audits (WCPFC, 2006).

3.2.5. Convention on Migratory Species of Wild Animals (CMS) or Bonn Convention

The Convention on Migratory Species (CMS), also known as the Bonn Convention, is a global intergovernmental treaty that is specifically concerned with the conservation of migratory species *and* the habitats on which they depend. Fiji has not ratified this Convention, which came into force in 1973.⁸ The Convention allows member government deliberations, and communication with each other on issues concerning migratory species (CMS, 2006). The Secretariat of the CMS is provided and administered by the United Nations Environment Programme (UNEP).

The CMS is a group of several Conventions concerned with the conservation and management of diversity, including CITES (CMS, 2006). While CITES deals with conservation threats arising from international trade, CMS is intended to address problems of domestic consumption of endangered wildlife, like turtles, and to promote international cooperation in achieving conservation objectives.

⁸ Although Fiji has yet to ratify to CMS, it has signed a MoU for the Conservation of Cetaceans in the Pacific Islands Region.

The Convention places species for which States need to endeavour to conserve and restore essential habitat in Appendix 1, and species for which to develop Agreements for conservation in Appendix II. Agreements have to be based on population segments rather than the species as a whole, allowing for population-based conservation status to be determined. It aims to restore the migratory species concerned to a favourable conservation status or to maintain it in such status. Designated national authorities are needed for implementing Agreements, monitoring effectiveness and establishing procedures for dispute settlement (CMS, 2006).

From personal interviews, it appears that Fiji is aware of the Convention but is slow to accede. However, the member countries of the regional lead agency in environmental protection in the Pacific Islands, SPREP, have agreed to place accession to CMS as a priority item for Pacific Islands in its 2006 Year of the Sea Turtles campaign (discussed later)(SPREP, 2006). Samoa is already a member. CMS appears sound in that it will cover most of the threats for sea turtle populations through their entire range, but the incentives or drivers for countries to sign up are limited. There are resource, time, effort and funding implications for setting up a national authority dedicated to any Agreement.

Some additional features of CMS are that it allows for periodic review of conservation status, coordinated management plans, information exchange, and recognition of the network of habitats in relation to migration routes (Wold, 2002). The latter supports regionally or internationally coordinated turtle sanctuaries. The IOSEA is a working example established under this Convention, involving a memorandum of understanding among states that share turtle populations in the Indian Ocean and South East Asia.

Another reason why accession to CMS may be beneficial for Fiji is that CMS is concerned with the protection of a wide variety of migratory species other than turtles. Therefore, common habitat areas can be targeted worldwide to protect multiple endangered species such as seabirds and cetaceans, which Fiji is also obligated to do under CBD. Seabirds nest on isolated islands, many of which are common to sea turtles. This is already recognised by the European Union-funded Darwin Initiative Project, which is involved in preserving some common habitats areas on the outer islands (Gardingen, 2005).

3.2.6. Convention on Biological Diversity Conservation, Rio de Janeiro, 1992 (CBD)

The Convention on Biological Diversity Conservation (CBD) is derived from the 1992 United Nations Conference on Environment and Development (UNCED), also known as the Rio Summit, and entered into force in 1993. The CBD comprehensively addresses conservation and sustainable use of biodiversity combined with fair sharing of resources (CBD, 2006). This Convention is generalist in terms of biodiversity conservation, and this is the main reason for its inclusion in this chapter. Biodiversity is the current buzz word among many scientists and natural resource managers worldwide, and the preservation of biodiversity is one of the primary justifications for sea turtle conservation at the international level.

Fiji has been a signatory to this Convention since it entered into force. The Convention parties have committed themselves to “achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth” (CBD, 2006). In the second CBD National Report (2002) for Fiji, it was reported that the Government of Fiji prioritises conservation of species that are determined to be economically beneficial to the nation, especially to agricultural activities. Does this mean that Fiji governance justifies potential forfeiture of species and populations

unless they have economic value? The CBD National Report (2002) indicated that there was no complete inventory of biodiversity in Fiji, and therefore prioritisation of endangered and endemic species had not occurred. Regardless of prioritisation, assessing the local vulnerability status of populations (Dr Tim Adams pers. comm., 2006) and geographic demarcation of critical habitat sites for sea turtle conservation would assist in local sea turtle recovery efforts.

The report stated that there were existing programmes to help restore wild population of threatened species such as sea turtles which had been “temporarily removed” as a result of resource limitation (CBD National Report, 2002). For example, *ex situ* conservation (Article 9 *ex situ* conservation) of sea turtles was indicated. The report stated that non government organisations and private organisations were working on *ex situ* conservation. Overall, *ex situ* conservation was considered to be of medium priority, considering the limited resources. Fiji’s Department of Fisheries has a programme of saving sea turtles by protection and monitoring of nesting and feeding turtles on Makogai Island, a marine sanctuary that has been gazetted, and at least four other sites in outer islands close to the two large mainland islands. Some tourist operators in the Yasawa Group and Namena Lala (which has a resort) have resolved to ensure minimum disturbance to nesting sites on their properties. Tourism is an economic activity that will promote non-consumptive uses of turtles (Troëng & Drews, 2004). The successful Namena Lala resort is a long standing example of the benefits that can be obtained from tourism taking advantage of the presence of turtles (Dr Tim Adams pers. comm., 2006).

The CBD National Report (2002) explains that an important task of Fiji’s Department of Fisheries is to establish appropriate regimes for the proper conservation and management of fisheries resources, including sea turtles. Several Non government organisations, government agencies and the University of the South Pacific are currently working together to establish locally managed marine protected areas

(LMMAs) (discussed later). Holistic conservation strategies that consider elements of sustainable livelihoods have proven to be highly successful in improving conditions in communities themselves. This outcome increases the morale of communities and results in the desired, long term and self-sustaining conservation (Oldfield, 2003; Johannes, 1978).

Currently, a National Biodiversity Strategy and Action Plan (NBSAP) is being drafted with special attention to conserving Fiji's biodiversity. The leading agency in drafting the NBSAP is the Ministry for Environment. Some of the marine priority areas defined by Nair (2003) for the NBSAP included Kadavu, Nadi Bay, Yadua Taba, Lau group, Ba, Rewa and Labasa. These are important marine areas. However, Heemskereq and Ringgold, which is the most significant nesting site for green turtles in Fiji as well as Namena Lala for hawksbills, should be included among priority areas in the final plan.

The CBD National Report (2002) acknowledged the migratory nature of turtles and, in doing so, stated the need for joint initiatives with other parties in their management, where Fiji could work closely with neighbouring countries in the Pacific region.

3.2.7. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971 (Ramsar Convention)

The Ramsar Convention is considered one of the major, legally binding conservation Conventions as it promotes conservation of all types of wetlands as habitats through national action and international cooperation in order to achieve sustainable development worldwide. It came into force in 1971. Fiji ratified to Ramsar relatively recently in August 2006 (Ramsar, 2007). CITES (2002) considers the Ramsar Convention as having the strongest protections with respect to wetlands of

international importance, including nesting and foraging areas of sea turtles, and the Convention considers sea turtles as an international species. It recognises overall values of wetlands including basic ecological, economic, cultural, scientific and recreational functions (Salm *et al.*, 2000). Apart from acceding to Ramsar, parties have to designate at least one wetland of international importance in the country. The Convention allows funding under a Small Grants Fund supporting education and protection of MPAs in Fiji, Marshall Islands and Tonga (Ramsar Media Release, 2006). This is a good avenue for funding for sea turtle initiatives. Fiji is in the process of assessing its marine biodiversity (Ramsar Media Release, 2006; Nair, 2003). The only site nominated by Fiji as a Ramsar site so far is a 615 ha river ecosystem in the central highlands of Viti Levu, called Upper Navua Conservation Area (Ramsar, 2007). An important consideration for further sites should be to include, as a priority, some key sea turtle nesting and foraging areas for the more common green turtles and hawksbills that occur in Fiji.

CITES (2002) states that the assistance provided through the Ramsar Secretariat is unparalleled in its approach for coordination with other Conventions and international organisations as a mechanism for maximising its parties' ability to achieve objectives under the Convention.

3.2.8. Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972 (World Heritage Convention, WHC)

The WHC entered into force in 1972, with Fiji becoming a signatory in 1990. This is a Treaty for the protection of internationally important natural sites. CITES (2002) suggests that sites important in the life cycle of sea turtles may meet the Convention requirements for listing, pending approval from the World Heritage Committee established under the Convention. Furthermore, the Convention is proactive in

oversight of the listed sites that are threatened or degraded under a list of “World Heritage in Danger”.

Guinea (1993) in his geographic study of sea turtle nesting sites in Fiji, strongly indicated that Heemskereq reefs and Ringgold islets, and Namena Lala were the most significant nesting areas for green turtles in Fiji. Craig (2002) raised the importance of Fiji as a central foraging destination of many Pacific Island sea turtles. It seems imperative that these are raised in the international forum by Fiji so that turtles sanctuaries can be declared and the assistance provided to maintain them. Another important reason for declaring turtle sanctuaries is because sea turtles are a culturally revered species in Fiji (and the rest of the Pacific). The extirpation of sea turtles from Fiji will eventually lead to a gradual extinction of the culture surrounding sea turtles among indigenous Fijians.

3.2.9. IUCN Resolution on incidental capture of marine turtles in pelagic longline fisheries, 1998

This IUCN Resolution considers the long time threats to sea turtle conservation by longline fisheries worldwide, and the obligations derived from instruments such as the CBD, UNCLOS and CMS, specifically to address the incidental capture of marine turtles in pelagic longline fishery operations (Robins *et al.*, 2002).

The IUCN Resolution urges all countries to assess the magnitude of the incidental capture of marine turtles in pelagic longline fisheries and to reduce the incidental capture of marine turtles to the lowest levels possible. Technical consultations were conducted by FAO to assess the magnitude of the incidental catch and mortality of marine turtles in pelagic longline fisheries worldwide (FAO, 2006; Kellehar, 2004). Several of these recommendations are consistently followed by major non-governmental organisations in the United States (Robins *et al.*, 2002). In the Pacific

Ocean, incidental capture of sea turtles has been recognised as a threat in the North Pacific Ocean (USFWS, 2006).

In the Pacific Islands region, SPC has assessed the magnitude of the incidental catch and mortality of marine turtles in pelagic longline fisheries. They have been implementing a training and awareness programme for longline fishermen and observers in the Pacific Islands for the past three or four years, with apparently positive results (Dr Tim Adams pers. comm., 2006). An SPC staff member won a prize from WWF in 2005 for designing a modification of tuna longline fishing gear, which keeps baited hooks well below the surface – away from the layer of maximum turtle vulnerability – and, at the same time, increases the catch rate of tuna (Dr Tim Adams pers. comm., 2006).

3.3. Regional Network on Sea Turtle Conservation

The origin of regional programmes for sea turtle conservation was linked to fisheries concerns, until the SPC joint Fisheries Programme/Environment Programme Turtles Workshop in 1989 (Adams, 2003). Various aspects of the attempts to quantify and boost turtle populations were discussed by Pacific Island nations prior to this workshop, which then laid the foundation that eventually led to the Environment Programme (which later became SPREP) becoming the lead regional agency for sea turtle conservation activities. This workshop was significant in that it marked the changeover, at the regional level, of turtles being a mainly fisheries issue to becoming a species conservation issue (Adams, 2003). At the national level, most of the sustainable management measures relating to turtles are still under fisheries legislation and the responsibility of fisheries departments.

The bilateral and multilateral EEZ fishing agreements between Pacific Island countries and territories, and distant water fishing nations (DWFNs) include specific

measures to quantify and minimise bycatch; WCPFC has already been elaborated. Fisheries Forum Agency plays an advisory role with respect to legislation and monitoring, control and surveillance. The SPC Fisheries Information, Training, Development and Maritime units are dedicated to awareness raising and training of commercial fishers in bycatch avoidance and in techniques for releasing turtles alive if caught (Adams, 2003).

3.3.1. Role of SPREP in Sea Turtle Conservation

Since 1989, SPREP has been the lead agency for regional sea turtle conservation. Its initial focus has been increasing the knowledge of marine turtles in the region in terms of rookeries, international migration, sharing of turtle stocks, and genetic uniqueness of large to small turtle stocks. It was really in the mid-1990s that the labour of regional initiatives bore fruits in terms of conservation. The year 1995 was declared by SPREP as the Year of the Sea Turtles (YOST), and in Fiji this was immediately followed by an effective ban on sea turtles export, the development of a three year sea turtle conservation strategy for Fiji, and a five year moratorium on sea turtles harvest, with some provision for traditional harvest. Many of SPREP campaigns were to actively raise awareness of sea turtle conservation through the use of brochures, booklets, stickers, posters, educational videos, tee-shirts, post cards, workshops and through Fiji's secondary school curriculum (SPREP, 2006).

With the availability of sufficient Canadian funding, a Regional Marine Turtle Conservation Programme (RMTCP) was established by 2003, together with an associated network of governments and non government organisations (SPREP, 2003). This led to the formulation of a Marine Turtle Action Plan 2003 to 2007, with SPREP as the lead organisation, supported by a steering group of community leaders, scientists, government and non-governmental focal groups in-country and at the regional level. Also aligned with the Marine Turtles Action Plan 2003 to 2007 was a

plan for the year 2006 to be declared another YOST; this is currently in place (SPREP, 2006). These are discussed below.

3.3.1.1. Marine Turtle Action Plan 2003 to 2007

The vision for SPREP's Marine Turtle Action Plan 2003 to 2007 is a future where generations of Pacific Island people will have choices about how they use and interact with sea turtles. SPREP (2006) indicates that for this to be achieved, Pacific Islanders will have to be empowered to ensure that sea turtle populations recover to become healthy, robust and stable. The SPREP's RMTCP envisions that sea turtles will fulfil their ecological role, and that turtle harvests by Pacific Island people will be on a sustainable basis, strictly to meet cultural and nutritional needs. The determination of sustainable levels of sea turtle harvests⁹ is a challenge in itself, but would need to be established in order to assess (as well as benefit from) the success of this plan.

The principle elements of the RMTCP are listed (SPREP, 2006):

- Identify turtle nesting and foraging areas
- Improve information base to be used by communities and schools
- Strengthen community and industry involvement to reduce threats from over-harvesting, habitat destruction and marine debris and pollution
- Improve national management framework for turtle conservation
- Increase scientific knowledge
- Foster regional coordination and collaborative mechanisms
- Promote regional and international arrangements for conservation of turtles

⁹ SPC is the regional agency normally responsible for assessing stocks and providing scientific information to enable countries to agree on target and limit indicators of sustainable catch of highly migratory marine species, but no member country has ever actually requested SPC to do an assessment of turtle, except to quantify bycatch, in which case the request came from SPREP (Dr Tim Adams pers comm., 2006).

These elements appear to cover sea turtle conservation quite comprehensively from a regional perspective, except for the assessment of the status of sea turtle populations. The challenge is groundwork at the national level, where the plan is not detailed enough in demonstrating how the elements can be turned into strategies given limited staffing and funds.

In terms of progress on the action plan in June 2006, SPREP launched a meta-database for consolidating monitoring and research information on sea turtle species. The data covers the Asia-Pacific region and reaches back to 1989 (at a meeting in Vanuatu). The database, called Turtle Research and Monitoring Database System (TREDS), is housed in SPREP. Data collection is also assisted by other regional bodies and donors. TREDS is intended to assist in understanding population trends for Pacific marine turtles by coordinating the collection and analysis of data tag deployment, nesting beach and foraging ground monitoring data, clutch and hatchling information, and biological samples for genetic data. Tagging data is supplied by Fiji's Department of Fisheries for the tagging and monitoring of sea turtles in Fiji. SPREP is also working on a report on sea turtle nesting and foraging areas. The WCPFC is funding the salary and costs of the SPREP turtle database person.

In addition, SPREP has signed a Memorandum of Cooperation with the Ramsar Secretariat covering a three year period from 2006 to 2008. Under the memorandum of Cooperation, the two intergovernmental organisations have agreed to several joint collaborative activities that aims to promote and strengthen the conservation and wise use of wetlands and their resources in the Pacific Islands region (Ramsar Media Release, 2006). This is an important step forward for the region, in terms of international partnership in critical coastal habitat protection.

2006 YOST Campaign

The Year of the Sea Turtles (YOST) campaign aimed to achieve a broad range of conservation activities in a single year, including the promotion of community conservation of turtle foraging and nesting sites, strengthening of national legislation and policies to encourage sustainable management, and the facilitation long-term partnerships for turtle conservation. This regional campaign was coordinated by SPREP with its key partners that included national governments, intergovernmental organisations including the University of the South Pacific, local communities, the fishing industry, fisheries and tourism authorities, donors and non governmental organisations.

There were some key messages put forward by SPREP through the campaign, such as the need for active support by all stakeholders concerned. Turtle conservation needs community and commercial fishers support (Chaloupka *et al.*, 2004; Hogan, 2004). Turtle nesting areas are usually either on land that is traditionally owned by communities or certain individuals within the community, or in areas near and easily accessible by communities. Likewise, turtle foraging and feeding areas are also usually easily accessed by communities. Traditional ceremonies or feasts targeting the taking of turtles exist in some communities in the Pacific. Thus, communities play an important role in the effort to conserve turtles. Inclusion of turtles and turtle conservation issues in school curriculum is also necessary since youths will become future decision-makers.

The YOST campaign also considered that turtle mortalities from bycatch, boat strikes and pollution from commercial operations were significant worldwide and should be taken seriously in the region (SPREP, 2006). There is a need for more data on bycatch in Fiji, owing to limited observer coverage and under-reporting in logsheets (Amoe, 2006). The importance of continued awareness-raising activities promoting

best practices for releasing turtles is also significant (SPREP, 2001). In addition, Fiji has low density of motorised boats compared to many other nations where boat strikes are significant (SPREP, 2006). Unfortunately, the same cannot be said about pollution because pollution from plastic on the beaches, rivers and seaside is a common sight in Fiji, particularly in the more populated areas (MCEDAP, 2000).

Government action is needed for turtle conservation (Salm *et al.*, 2000). Although SPREP envisions that this will be by means of national laws, policies and enforcement on the part of the government, the role could perhaps also be expanded to reflect the strengths and constraints at the national level. The Department of Fisheries has existing networks among communities and human resources that are relatively widespread. For example, fish wardens are village representatives tasked by the Department of Fisheries to monitor fisheries resources and participate in tag and release studies of sea turtles. SPREP identified that the utilisation of effective and practical national legislation and policies was the key, and legislators and policy makers were considered as an important target audience for the campaign (SPREP, 2006).

All nations sharing the migratory resource need to take responsibility for sea turtles. Mindful of their current low population levels, conservation of sea turtles requires a long-term concerted regional and international effort and partnership in order for the efforts to be effective. These are being initiated under the YOST campaign but, as a largely grant-funded organisation, there has been no guarantee of the continuity of SPREP's capabilities in sea turtle-specific conservation after the 2006 YOST.

Key partners were expected to play a major role in the implementation of the campaign. The targeted partners were those that had existing programmes involving marine sea turtles in the Pacific region. These include national governments and administrations, local communities, the fishing industry, fisheries and tourism

authorities, donors and the non-government organisations, academics, institutes and other organisations, many of which are listed in Appendix 3. This is the basis for sea turtle conservation in small developing countries, since national governments tend not to allocate the much needed priority to resources like sea turtles, which are deemed to have non-commercial value (CBD National Report, 2002).

The campaign recognised that national actions should include accession to relevant international Conventions, and the one highlighted in the YOST campaign activities is CMS (Appendix 3). There was an arrangement also to link the Pacific YOST campaign to IOSEA once countries acceded to CMS but this has not materialised for Fiji and several other Pacific Island countries (SPREP, 2006) This would have been an excellent avenue for sharing of resources and expertise in a joint and coordinated effort to solve the issue of declining sea turtle populations from coastal users. WPRFC provided strong sufficiently arrangements for offshore bycatch measures that were endorsed by the Commission members.

The YOST campaign advocated that improving the capacity of Pacific Island countries and territories in communications and environmental education was critical to improving the ability of Pacific Islanders to actively promote sustainable use of their marine resources and the protection of sea turtles (SPREP, 2006). As such, SPREP sought and secured funding assistance from the Pacific Development and Conservation Trust (New Zealand) to recruit a YOST intern who was trained and also assisted in the regional facilitation of the campaign. The area of training included campaign framework development (national and regionally), preparation and distribution of campaign material, coordination and organisation of events and activities, liaison with countries and key partners within the Pacific and within the international context. The intern, a Pacific Islander, was recruited for a period of 6 to 9 months (SPREP, 2006).

Campaign materials are continually produced for distribution throughout the region (SPREP, 2006). These products include posters, tee-shirts, information or campaign booklets, postcards, fact sheets, video/DVD, stickers, and even guidelines (such as for turtle tourism). A YOST web page has been developed on the SPREP web site and is a key web point of contact for the Pacific YOST. This page is linked to partner organisations, organisations of the Steering Committee members, as well as other key stakeholders (SPREP, 2006).

A key component of the YOST was a school programme including an information pack and other materials on the SPREP website for schools to aid understanding of sea turtle conservation. This information is downloadable from the site, but CD-ROM and hard-copy material are available for distribution to those schools that have no access to the internet (SPREP, 2006). The latter is an important consideration for education and awareness-raising in small island communities distanced from the conveniences of modern technology. SPREP (2006) indicates that key school programme initiatives could include the “Adopt-a-turtle” initiative in which schools can track turtles online, but some reservations were prevalent depending on funding limitations. The idea was to tag and release turtles. Similar initiatives in the Caribbean region have proven very successful in generating concern for sea turtles among coastal communities through youth (STSL, 2006). The impetus on using web based tools prevents such initiatives from reaching most local communities.

The YOST campaign is also involved in promotion of sea turtle conservation initiatives using a range of media outlets including press, radio, television and airline magazines; this has been observed to be in full force in Fiji, with talk shows featuring representatives from Non-government organisations (WWF, 2006). However, the rural coastal communities are not reached by these initiatives either.

It is envisioned that limitations on funding will be an immense issue that will prevent some of the goals of the YOST campaign being met in the long term, unless a sustainable donor is identified. The CMS and other international Conventions like Ramsar are suitable avenues for this to occur but SPREP will be limited in implementing capacity unless Pacific Island countries, including Fiji, accede to such Conventions.

Additional activities of SPREP that have considerable potential to raise awareness about sea turtles have been planned, such as participation in World Environment Day with activities coordinated worldwide, such as a poster competition, community workshops on turtle conservation, and a regional turtle conservation pledge. Some industry supported activities are also planned, with the intention of introducing best practice management, and guidelines for tourist operators to reduce impacts on turtle behaviour (SPREP, 2006).

The 2006 YOST campaign started out to be the most concerted effort yet for sea turtle conservation in the region, but to achieve all this in a campaign that was limited to one year made it ambitious. According to Hudson (1988), changes in basic attitudes of people are difficult to attain and are not usually affected by short-term awareness campaigns. However, he emphasises that the establishment of good relationships with the stakeholders, presentation of facts and shared experience of all people involved will reinforce campaigns.

SPREP identified some indicators for estimating success, some of which include documentation of important turtles areas in the region; an improved regional turtles database; initiation of community programmes; formation of Agreements between government and traditional owners of nesting beaches for the conservation of these areas; review of turtles legislation; improved policies and development of legislation; national reports; greater accession to CMS by Pacific Island countries; and a regional arrangement for sea turtle conservation (Appendix 3). There was limited success to

no success in 2006. Changes in practices require convincing arguments and engagement, which is not possible over a year. It is only practical to expect that the goals and campaign activities must be ongoing in order to accomplish positive outcomes in terms of steady or increasing sea turtle numbers.

The YOST 2006 campaign built on the foundation of the 1995 YOST campaign, but with more targeted actions and audiences. The campaign slogan and logo depicted the fact that sea turtles are a part of the Pacific people's heritage, and conserving them is ensuring the survival of that Pacific Heritage; "Turtles: Protect Them, Protect our Heritage" (SPREP, 2006). It is a big forward step in terms of recognising the need to engage the interests and concerns of the local community, but as yet, just the tip of the iceberg. There has been no report or assessment carried out to determine the success of the YOST campaign, which is an important point of departure for future campaigns. The village case study presented in this research will venture into the practical dimension of such sea turtle conservation measures within the local community's perspective.

Overall, the YOST campaign entailed a comprehensive effort to save sea turtles, although the sustainability of the activities started by the programme is unclear. In order for positive outcomes to be observed in Fiji a longer period of sustained campaigning will be needed to make a significant difference to sea turtle populations, with options made available in practical ways to local fishers. The impact of SPREP at the national level appears to be through Fiji's Department of Fisheries, non-government organisations (especially the Worldwide Fund for Nature), and other interested bodies, like the National Trust of Fiji.

3.3.2. Role of SPC in Sea Turtle Conservation

SPC is the lead regional agency for fishery stock assessment, but has always been required to concentrate its oceanic fishery assessment resources on tuna, whilst SPREP has taken the lead on endangered species, including turtles (Adams, 2003). These issues are now starting to come together with concern about turtles as a bycatch in commercial tuna fisheries. Although other sources of turtle mortalities are probably more significant, this intersection provides a new focal point for collaboration between the regional fisheries and environment agencies (Adams, 2003).

SPC's Oceanic Fisheries Programme began a scientific observer programme in 1990s in several Pacific Island Countries, including the Fiji Islands. Under this programme, sea turtle bycatch data is recorded by trained scientific observers placed on offshore tuna fleets¹⁰ operating in the Pacific Islands (SPREP, 2001). The observer coverage, estimated to be below one percent, is poor compared to certain developed-country fisheries. But, it is at least a start, and is improving rapidly as the regional programme develops capacity at the national level (Dr Tim Adams pers. comm., 2006). However, data have been useful for comparing trends in the Western and Central Pacific subregions, as explained under the section on "Anthropogenic Impacts on Sea Turtle Conservation" in Chapter Two. Results in the review of bycatch in the western subtropical region have estimated sea turtles mortality at 18 percent of fishing effort, despite 92 percent of turtles caught in longlines being released (SPREP, 2001). SPC is currently actively involved in finding ways of reducing sea turtle mortalities in tuna operations, including scientific research on fishing gear and techniques, and educating the fishermen on the safe handling and release of sea turtles when they are caught (SPC, 2006). Fiji's Department of Fisheries is working closely with SPC on bycatch.

¹⁰ The tuna fishery in the Western and Central Pacific is very large on the global scale; it alone accounts for two thirds of the global tuna catch, and is valued at USD 1.5 to 2 billion per year (TDMP, 2001).

3.3.3. Role of WWF Asia Pacific Programme in Sea Turtle Conservation

According to WWF's Asia-Pacific Marine Turtle Programme, the immediate goal of WWF is to reduce the threats that are currently decimating populations of marine turtles, and to help communities, governments and industries to address the underlying causes of these threats. The intent is that creating sustainable opportunities and solutions in collaboration with communities and governments will eventually lead to the stabilisation of sea turtle populations and allow for their recovery. WWF is conducting or supporting turtle conservation work in 45 countries across the world, including many countries within the Asia Pacific region (WWF, 2005). It appears to be engaged in most of the current major international turtle conservation policy discussions and linking countries on the basis of marine turtles' migratory routes.

With an extensive network of offices, staff and projects throughout the Pacific, and over 40 years of regional existence in conservation and community-based conservation, WWF intends to reverse sea turtles decline by: linking field conservation to national and international policy and legislation; developing new partnerships; and involving communities in the management, decision-making and livelihood opportunities from turtle conservation. There are four regional, marine turtle conservation programmes around the world, which are collectively designed to deliver the goal of restoring turtle populations globally to ecologically healthy levels: Asia Pacific; Latin America and the Caribbean, Africa and Madagascar, and Europe and the Middle East (WWF, 2005).

On a global scale, WWF aims to save turtles by:

- Furthering relevant policy and legislation in all sectors and at all levels;
- Ensuring the necessary extent, integrity and functioning of critical habitats for turtles;

- Ensuring adequate protection and biological management of marine turtle populations;
- Creating mutually beneficial incentives for the co-existence of people and turtles; and
- Mitigating threats to turtles by creating awareness and influencing human attitudes and behaviour (WWF, 2005 & 2006).

WWF's Asia Pacific Marine Turtle Programme is working in three key ways to address these challenges. One way is by connecting individual conservation projects into interrelated units that effectively address threats to turtle migrations and life-cycles. Secondly, the programme works through "innovative projects and alliances, bringing non-traditional partners together to find mutually beneficial solutions". Thirdly, through collaboration and partnerships at all levels, including local communities, government agencies, scientists, industry, religious leaders, Non government organisations and other regional and international organisations (WWF, 2005).

WWF (2005) recognises that through turtle conservation work, issues of broader global resonance can be addressed. These include fisheries management, a global network of adequate and representative MPAs, illegal wildlife trade management, and enforcement capacity in many of the range state countries, and economically successful ecotourism. WWF participation in sea turtle conservation with direct relevance to Fiji is described under five projects in the medium to long term (WWF, 2005). Without going into too much detail on each, the scope, relevance, underlying principals and practicality of each project will be discussed.

There is a Pan Pacific Initiative that recognises that Pacific leatherback and loggerhead turtles need urgent conservation and management help at every stage of their life-cycles and in every critical habitat across the Pacific Ocean, and covering

both national and international waters. The initiative will scale-up its existing work, forge new partnerships and build comprehensive conservation solutions to protect these species across the Pacific by promoting and assisting implementation of bycatch reduction mechanisms across the Pacific, protecting nesting beaches and critical nearshore marine habitats, implementing community-based, conservation and monitoring programmes, including alternatives to over-harvesting of eggs, using science to develop better management models, and enhancing the effectiveness of regional and global conservation and fisheries policy (WWF, 2005 & 2006).

The other project involves the Western Pacific Marine Protected Area Network. It recognises that networks of protected habitats linking one site to another are needed, and without these networks spanning migratory routes, the marine turtle conservation efforts of one country may be in vain, since the turtles are unprotected in other countries during different stages of their lifecycles (WWF, 2005). It is intended that the protected area network establishment and management will go beyond national boundaries to the regional boundaries. A network of sites that protects marine turtles is expected to automatically protect a suite of ecosystems and a vast array of other marine species, and coastal people depend on many of the species for subsistence or local fisheries (WWF, 2006; WWF, 2005). Salm *et al.*, (2000) in particular supports the notion of networked MPAs at regional or international scales as long as the ecological boundaries are well-defined and fully addressed in their designs.

It is also useful to note here that WWF provided regional assessments in the determination of ecoregions on a global scale for Global 200. According to Olsen & Dinerstein (2002), Global 200 is an attempt to identify a set of ecoregions whose conservation would achieve the goal of saving a broad range of the diversity of the earth's ecosystem. In an article called "WWF Applauds Tri-National Leatherback Turtle Conservation", WWF (2006) described that the governments of Indonesia, Papua New Guinea and Solomon Islands had committed to a tri-national partnership

focused on conserving the western Pacific leatherback turtles within the Bismarck-Solomon Seas ecoregion, where the beaches hold the last remaining leatherback nesting sites in the Pacific Ocean. The WWF, by concentrating its activities in priority ecoregions of the world, considers sea turtles migrations as they are deemed to be “large-scale ecological phenomena” (Olsen & Dinerstein 2002).

Fiji’s Great Sea Reef, the world’s third largest barrier reef, is one of the 238 ecoregions of the world, and one of the 43 marine ecoregions (Olsen & Dinerstein, 2002). This is the only ecoregion declared by Global 200 in the Fiji Islands and constitutes 200,000 square kilometres (Figure 1). The reef is approximately 100 kilometres long and stretches between 16° 26’24”S; 178° 05’48”E and 16° 19’24”S; 178° 27’12”E (Fiji Marine Spaces Chart 81/2, 1970). A 12 day survey of the reef by non government organisations, international experts, local community members and the University of the South Pacific documented 12 endangered species on the reef. Of these one species of turtles was sighted, the green turtle (WWF, 2005).

Another project focus, which is very special for Fiji because of the large tourism industry, looks at promoting the fact that the value of living sea turtles in their natural habitat is greater than that of dead turtles and turtle products. WWF found that in some countries, industries based on live turtles, such as properly and planned tourism activities involving beaches or diving, generated upto three times more income for local communities than using slaughtered turtles for their shells and meat (Troëng & Drews, 2004). Many of the world’s most important turtle habitats are in developing countries with marginal economies, where local economies and livelihoods are dependent on unsustainable levels of local resource use (Troëng & Drews, 2004); Fiji is no exception. Sustainable practices should occur to conserve and manage marine resources, but with consideration of the economic needs of the coastal communities that depend on it (UN, 1997). This type of initiative provides a golden opportunity to help local communities and marine turtles at the same time. Unsustainable levels of

use have caused worldwide declines in the numbers of marine turtles. High levels of turtle mortalities jeopardize potential future income for these communities. WWF is working with coastal communities across the region to conserve turtles in a manner which benefits both turtles and people.

This work includes bolstering local economies and investigating new livelihood opportunities for local people through a suite of options including sustainable ecotourism operations. Recently, there has been an indication that there may be one other turtle calling village called Solodamu in Kadavu, Fiji Islands. At the Sea Turtle Strategy Workshop organised by the World Wildlife Fund in May 2006, a representative from the village indicated that turtle calling was being revived in Solodamu Village along with other alternatives to promote ecotourism in the village. Unfortunately, the village is unable to claim at present that turtles are not killed by villagers, although it was indicated that this was something that they hoped to achieve. This confirms that ecotourism has the potential for acceptance by local communities, and hence can support conservation efforts.

One of the most essential elements for successful campaigning is governmental cooperation. WWF (2005) indicates that Regional Marine Turtle Agreements and Marine Management Frameworks need to be developed and implemented for conservation to occur. This initiative is supported by SPREP, but WWF will also need to have the support and cooperation of national Fisheries administrations to proceed. WWF also advocates cooperative, multilateral arrangements under IOSEA and accession to relevant Conventions such as CMS and Ramsar.

An important aspect of WWF's work in the region is the promotion of marine conservation for sustainable development of coastal communities, through a biodiversity management agenda within the context of the relevant international regimes.

3.4. Summary

The international and regional mechanisms discussed in this chapter indicate that the way forward is to adopt multiple strategies that include all relevant stakeholders to build comprehensive conservation solutions for the protection of sea turtles. Coordinated turtle conservation strategies are necessary to conserve the entire habitat range of the sea turtles by engaging at international, regional, national and even local levels. Fiji has sufficient international obligations to implement relevant measures to assist in the reversal of sea turtles decline (Table 3).

Table 3. A matrix of the relevance of international standards for sea turtle conservation in Fiji.

Convention/ Code/Guidelines	Obligation to Fiji	Primary implications to sea turtle conservation
CITES	Binding international law. Fiji is a signatory	Conservation of wild species eliminating unsustainable harvesting of turtles, its eggs or shell, or turtle products for international trade. There has not been any reported trade in turtles or turtle products since mid-1990s.
UNCLOS	Binding international law. Fiji is a signatory	The delineation jurisdictions and attached responsibilities of States to conserve and manage living resources, also ensuring that utilisation of resources will not harm another State. Sea turtles are migratory and therefore pertinent and localised threats to turtles in one State will affect another States sharing the same resource, particularly in the offshore tuna fisheries. For national actions, see WCP Convention.
FAO Code of Conduct for Responsible Fisheries, including the Guidelines to Reduce Sea Turtles Mortality in Fishing Operations	Voluntary	Designation of the duty of the State <i>and the users</i> of the living aquatic resources to conserve aquatic ecosystems. The guideline covers turtle mortality reduction in the offshore fisheries. For national actions, see WCP Convention.
WCP Convention	Binding multilateral law for the WCP region and DWFNs.	Gives expression to UNCLOS within the WCP region in terms of bycatch issues, and allocates resources to assist States in implementing the FAO guidelines. There is an observer programme in Fiji. Fiji is also projected to contribute USD35,000 annually to the WCPFC.
CMS	Not a signatory	Specifically concerned with the conservation of wild, migratory species <i>and</i> the habitats on which they depend.
CBD	Binding international law	Comprehensively addresses conservation and sustainable use of biodiversity combined with fair sharing of resources
Ramsar Convention	Binding international law	Promotes conservation of all types of wetlands as habitats through national action and international cooperation
WHC	Binding international law	Protection of internationally important natural sites.

In Fiji, the national management concerns have focussed heavily on the tuna fishery and, as such, the respective international treaties have received much consideration in national and regional planning and policy in offshore fisheries. Impetus from the international conservation community is for a holistic approach to sea turtle conservation to include coastal threats to sea turtles as well as bycatch issues.

Fiji is not a party to CMS, an agreement which obliges States, and offers mechanisms, to regulate and monitor domestic populations of sea turtles. Targeted conservation efforts at the local community level (coastal) are relatively slow to develop for Fiji. Sea turtle conservation is evolving to include sensitivity to livelihoods in coastal communities that utilise sea turtles for food, cash incomes and traditional feasts and rituals. There is little advantage to a nation in not acceding to CMS because the Convention facilitates information exchange, and provides resources to fulfil obligations under the Convention. Domestic sea turtle conservation can also be addressed in conventions broadly seeking to establish biodiversity conservation such as CBD and WCH, or those such as Ramsar which recognises turtles as populations of international extent (highly migratory) needing international measures for the protection of nesting beaches, foraging areas and significant migratory routes.

Some key challenges for Fiji in meeting its obligations to international conventions were also identified in this chapter. These include the lack of a complete inventory of biodiversity in Fiji, lack of local vulnerability status of populations, and the inadequate demarcation of critical habitat sites for turtles. These present fundamental gaps in the national prioritisation of endangered species, as required by CBD. Prioritisation has been conducted easily for species of commercial value. A valuable approach may be to view turtle conservation as a commercial activity specifically through ecotourism activities.

Collaboration of sea turtle conservationists in projects with common ecological principles is another way forward. Cetaceans such as dolphins also have some commonalities with sea turtles; they enjoy similar feeding grounds and food. Ramsar and WHC offer avenues for creating sanctuaries in which the inclusion of sea turtle nesting and foraging areas can occur. Such sanctuaries (better if interconnected for wide ranging populations) could become part of a regional and international network of sanctuaries to conserve the entire habitat range of sea turtles. In Fiji, the success of sanctuaries will depend on the incentives provided to communities that rely on marine resources for sustenance.

The international regime is useful in providing the tools for regional organisations to carry out relevant activities. Apart from WCPFC, it appears that there have been two direction settings in terms of regional collaboration; one from SPREP and one from WWF, although SPREP achieved some of its mandate through WWF and government agencies located in-country. SPREP has strong linkages with government officials in terms of research on nesting and foraging sites of sea turtles through adequately coordinated regional tag and release programme. Awareness raising and education are focal points of both organisations, and these are much needed activities in the Fiji. WWF engages very successfully at the national level (possibly because of the location one of their offices in Suva, and access funding). There were significant strengths in the activities of both organisations, but there was a risk of duplication and lack of coordinated activities, leading to a waste of resources. Funding specific to sea turtle conservation needs to be coordinated through centrally focussed initiatives for optimum effect.

Targeted funding for conservation is of paramount importance for Fiji since the national budget is often devoted primarily to fulfilling what are considered higher priority needs, such as health, utilities and infrastructure. Resources and funding may be achieved by identifying available donors in other regional forums and

internationally. There is scope for increasing the efficacy of sea turtle conservation through existing biodiversity programmes.

Overall, the key lessons learnt from regional strategies is the importance of improving communications and environmental education to coastal communities; inclusion of turtle conservation issues in school curriculum since youth will become future decision-makers; campaigning to legislators and policy-makers as important target audience; and establishment of good relationships with stakeholders, presentation of facts and shared experience. It was highlighted that ecotourism has the potential for acceptance by local communities, hence supporting conservation efforts. Recognising that countries are linked in terms of critical sea turtle habitats, there is also a need for further localised research translating into regional networks of protected habitats spanning migratory routes in the near future. An important challenge in implementing action plans is groundwork at the national level, where the plan will need to be detailed enough to demonstrate how lessons learnt can be turned into strategies given limited staffing and funds.

Chapter Four

4.0 National Mechanisms and Instruments for Sea Turtle Conservation

4.1. Introduction

The relevance of international and regional regimes in driving sea turtle conservation in Fiji, where applicable, will be discussed in this chapter. The extent to which national legislation incorporates sea turtle conservation and the national mechanisms that exist to implement relevant principles will also be reviewed.

The drivers for national legislation have been local and national concerns about the status of turtle populations, particularly hawksbills, in Fiji, and a realisation that existing regulations did not address the large volumes of hawksbill shells exported to Japan by Fiji (Dr Tim Adams, pers. comm. 2006). Although Fiji was not a signatory to CITES in 1991, it legislated a ban on the export of turtles. International forums had also recognised the transboundary nature of sea turtles and advocated the need for global cooperation in turtle conservation. Japan, which was by far the largest importer of turtle shell and its products, ratified CITES in 1991 with reservations on turtle product exports because of traditional uses of the shell. Fiji was among the largest exporters of turtle products until the ban, exporting on average 1,500 kilograms constituting seven percent of the total turtle products imported by Japan (Canin, 1998). Fiji allowed the export of hawksbill shells until 1996 to clear existing stockpiles, and this was legal as there was a Ministerial exemption clause in Fiji's Fisheries Act, which allowed the Minister to permit this (Dr Tim Adams pers. comm.,

2006; Canin, 1998). At this time Japan was still importing large quantities under its export permit.

A Fiji Sea Turtle Working Group was formed in 1995 with substantial support from SPREP (and its international partners) which, with government agencies and non government organisations lobbied for compliance with the legislations on the ban of sea turtle shell exports under the Fiji Sea Turtle Conservation Strategy (1995). This was a lobby for the Minister to comply with the spirit of the national law, not international law. In another context, trade sanctions and embargoes have been known to place pressure on countries to comply with international conventions (WTO, 2001).

The national capacity for conserving sea turtles, especially the regulatory responsibility, is vested with the Department of Fisheries under the Ministry of Fisheries and Forests. The governing legislation for the Department of Fisheries is the Fisheries Act 1978. The Ministry of Local Government, Urban Development and Environment is responsible for implementation of CITES, and the NBSAP. The governing legislation relating to sea turtles comes under the Endangered and Protected Species Act 2002 and Sustainable Development Act 2005. For enforcement duties, the responsible government agencies, such as Fiji Inland Revenue and Customs Authority, the Fiji Navy and Fiji Police, are combined.

Weaver (1996) suggested that a social dimension was inadequately addressed in environmental planning and management programmes in the Pacific, but was important for implementation because conservation needed to occur within the context of Fiji's social and cultural environment. He also indicated that many environmental management failures were due to social problems. Iliapi (2000) indicated that the current legislation that manages Fiji's coastal water is outdated, and

he has challenged authorities to review, discuss and formulate policies to address the unique *i qoliqoli* system.

The Great Council of Chiefs (GCC) is the highest governing body in Fijian administration, and is highly respected. Its decisions are sought by parliamentary members in government decisions. In 2005, the GCC called on fishermen to exercise wisdom when catching turtles for traditional occasions (Fiji Times: 28 October, 2005). The Council indicated that they supported the capture of turtles as long as it was done in compliance with the guidelines set by the Ministry of Fisheries and nature conservation groups.

4.2. Social and Cultural History of Sea Turtle Conservation in Fiji

The international regime protecting sea turtles (Chapter Three) lays the foundation for national sea turtle conservation, and acts to facilitate national implementation by providing assistance in terms of expert advice, resource materials, or funding. However, the onus is on individual countries to tailor these to national circumstances. After the ban in international trade of sea turtles and turtle products, the challenge lay in regulating domestic catch related to the cultural and social values attributed to sea turtles.

Gadgil (1998) demonstrated that several traditional societies view the physical and biological parts of their environment and the human populations as an interrelated whole. The *vanua* is a Fijian term that refers to the land and water area, and its water, soil, plants, animals and human occupants are an interrelated whole (Baines, 1984). Catibog-Sinha (2000) explained that through the *vanua*, the villagers are connected to land through their ancestors and guardian spirits. She also contributed that the *vanua* can serve as a 'control mechanism' that minimises biodiversity loss despite economic activities like tourism.

Luna (2003) suggested that, like the current laws protecting marine turtles, Pacific islanders acted to protect this species by restricting both their take and consumption. Johannes (1978) conducted a study of traditional marine conservation in the Oceania region and documented several ways in which sea turtles have been protected. These included protection of eggs and hatchlings via fencing or by placing *tapus*¹¹ on the taking of turtle eggs, and on specific locations that were frequented by nesting turtles. There are some documented records of traditional sea turtles practices in Fiji, as are described below.

Turtles were a very important feast food for the people of the Lau group of islands (Figure 1). In particular, sea turtles were considered the most chiefly of all foods and therefore protected by special *tapu*. Thompson (1940) in a study in Lau, found that permission to fish for turtles could only be granted by the chiefs' fisherman who decided the day and place of the hunt.

In a later study, Veitayaki's (1990) analysis of resource utilisation on Qoma Island revealed interesting insights into traditional turtle fishing, and the modernisation of fishing patterns as a consequence of the Western influence. The inhabitants of Qoma Island were traditionally turtle fishermen, who were guided by the belief that ancestral spirits assisted them in the capture of turtles, particularly if they were moral and ethical prior to the fishing event. Ancestral spirits also determined when to end a fishing trip.

Siwatibau (1984) elaborated on changing patterns in the Fijian community indicating that the increase in monetization had been a main factor in depleting natural resources, and had driven people to fish longer and more regularly. Reports of declining, small-scale, near-shore artisanal fisheries throughout the Pacific are on the

¹¹ *Tapus* are traditional forms of prohibitions.

rise. A number of small Pacific island nations, including Fiji, Kiribati and Samoa, have reported that subsistence catches are on the decline (Gonzales, 2004). Veitayaki (1990) also indicated this trend in his study on Qoma Island, explaining how quick cash schemes and advance in technology had increased catch and effort. Now, the traditional importance and significance of turtle fishing has been lost to some extent in possibly all local communities that have been influenced by modernisation, and turtle capture has been tarnished by feasting and luxurious exchanges with relatives in urban centres (SPREP, 2006; Boyle, 1998).

Siwatibau (1984) and Kunatuba (1983) found that traditional prohibitions on sea turtles meat and turtle egg consumption occurred in some areas of Fiji and turtle fishers were specialized fishers. They also indicated that the traditional society frequently used simple fishing methods, ensuring small catches. Veitayaki (1990) added that fishing areas were previously located closer to shore than at present. Commercialisation was found to be prominent, and fishing with modern technologies was less obstructed by vagaries such as weather. In addition, elders indicated that traditional methods for sea turtle capture had become unattractive due to alternate methods that require less effort and yield more, such as gleaning, handline fishing and diving.

4.3. Current Legislation and Policy Protecting Sea Turtles

According to Watling and Chape (1992), most of the laws in Fiji are ineffective in a modern management context. They considered Fiji's environmental laws to be "many and varied, a relic of the colonial period when environmental problems were limited and clearly sectoral". Most laws concerning the environment were found to have administration failures, mostly by lack of funding (Weaver, 1996; Watling & Chape, 1992).

4.3.1. Fisheries Legislations

Sea turtles related legislation in Fiji is almost totally captured by the Fisheries Regulation 1978 Cap. 158 and the Fisheries (Protection of Turtles) Amendment 2002. The provisions in the legislation relating to sea turtles are limited to: maximum size of sea turtles at capture; taking of turtle eggs; a ban on the taking of turtles during the nesting months from the beginning of November to the end of February; limitation on the type of spear for catching turtles; and a ban on shell exports. The legislated maximum size at first capture is 455 millimeters. Set in the 1970s, this limit has not been updated to incorporate new scientific evidence, which shows that the sexual maturity of sea turtles differs between species, and occur at much larger sizes than 455 millimeters as described in Chapter Two. The regulations state that no person shall harpoon any turtles unless the harpoon is armed with at least one barb of which the point projects not less than 9.5 millimeters from the surface of the shaft, measured at right angles to the long axis of the shaft.

A five year moratorium that addressed killing of turtles, the taking or destroying of eggs, and the trade of turtle meat and eggs was imposed from 1995 to 2000 (WWF, 2006). According to a report submitted to CITES (2002), the Department of Fisheries has extended this moratorium twice for five years at a time. The Fisheries (Protection of Turtles) Amendment 2004 states that the current moratorium is in effect as of 1 March 2004 and will end on 31 December 2008. The penalties for breaching this are three months imprisonment or a \$500 fine, or both. This moratorium was brought into effect after public concern was raised about rapidly declining number of turtles, which used to frequent Fiji waters and beaches. Oldfield (2003) warns that if enforcement is not credible, then simply banning the harvest can promote a decline in sea turtles through black market capture and sales.

The Acting Director for Fisheries indicated in 2005 that the department's five-year ban on the catching of turtles was still in place but there were provisions for

traditional gatherings if the villagers applied for a permit from the Ministry of Fisheries and Forestry (Fiji Times, 28 October 2005). A formal request has to be made in writing through the Department of Fisheries, which if approved by the Permanent Secretary for Fisheries, will only permit a maximum catch of three turtles. It is common knowledge that in practice more than three turtles are sometimes harvested despite the issued permission. In recent State funeral ceremonies of high chiefs and their families, more than three turtles have been slaughtered for the tradition occasions. In September 2005, nine turtles were caught for the installation ceremony of a chief in a province in the Western Division in Fiji. The fishermen needed to liaise with their respective Divisional fisheries officers in applying for the permits. People requested to catch ten or more turtles for their functions but the Department of Fisheries only allowed a maximum of three turtles (Mr Aisake Batibasaga, pers. comm. 2006).

A total of twelve permits to harvest sea turtles were requested in 2005. Although there were no guidelines in place for issuing of permits at the time of this study, the Department of Fisheries indicated that a guideline was being developed to help guide decisions on the conditions of the permit. It is recommended that such a guideline be made available in the local language to make the application process user friendly. Standardised forms will also allow electronic storage and analysis of additional information from the potential fishers.

Traditional intake of sea turtles is largely acceptable, but controls are needed to prevent abuse of the freedom of harvesting. In addition, traditional harvest techniques involve turtle traps, iron hooks or simply manually flipping over of the turtles and towing them home (Liew 2002; Limpus 1998), and this should be considered in national legislation allowing traditional harvest. Oldfield (2003) described that perceiving regulations as an effective tool has the risk of encouraging a “do-nothing” approach, or biasing regulations towards measures with low costs to the regulatory body. The costs are real and it is important to know where they are transferred or

absorbed. Commercial and subsistence sea turtle harvests or consumption are not permitted under any national or international regimes at present but should be carefully considered at the national level where it does occur, so that numbers of sea turtles harvested for such purposes are minimised at least for the short to medium term until alternative food or income sources are found or in the event that sea turtles reach sustainable levels in the future. A reasonable quota system for sea turtles harvest may be the way forward at national and community levels, but adequate consultation and participation of all stakeholders is necessary to make it effective. Such a system has been effective in several regions in Vanuatu (one of the leading Pacific nations to take local measures to conserve turtles), where there are also turtle monitors trained in villages to assist in sea turtle conservation activities. It must be ensured that the turtle monitors remain focussed on the need to conserve sea turtles. In these parts of Vanuatu, sea turtle conservation has become a community effort with everyone from Police to children involved in protecting and tagging turtles.

The Department of Fisheries is currently working closely with the WWF Fiji to restore and manage the turtles. WWF expressed that the turtle ban should apply to everyone who does not have a permit and that the government needs to develop a strategic turtle conservation plan so that the ban could be effective (Fiji Times, 2005). The WWF Fiji programme is using available funding to educate and spread awareness by targeting identified stakeholders, including village representatives. Currently, the role of the Department of Fisheries is probably most effectively focused on enforcing the ban on external trade, and minimising the incidental capture of turtles in the offshore fishery. Dr Tim Adams (pers. comm., 2006) suggests that another important role of the Department of Fisheries would be monitoring and quantifying any local or national turtle use (presuming the moratorium will eventually be lifted), and using scientific information to determine the status and limits of sustainable catch for turtle populations, as it does for other critical fish populations. Catch and effort statistics are difficult to collect data on domestic sea turtles

consumption, most of which occurs in geographically isolated areas, among close knit community members isolated from sea turtle conservation initiatives, and in the black market.

Key seagrass beds and reefs need to be identified so that the threats are minimised. Currently, research in Fiji is limited to having identified only a few of the optimum nesting and breeding sites for sea turtles, whereas those identified have not yet been validated (Prof. Robin Meakins, pers. comm. 2004). Legislation and policies are restricted by insufficient research on threats to sea turtles, including their niches and habitats.

There are only two gazetted MPAs in Fiji Islands, Makogai Island and on Waisomo in Ono Island, Kadavu. Salm *et al.* (2000) suggested that there be some legal basis for enforcement in MPAs, because otherwise MPAs set up without legislation being passed would be unsustainable. This was justifiable as MPAs tend to restrict activities. In practice, there are several community-based MPAs in Fiji Islands. However, they are not legally recognised by government (although they are not in any way illegal). The government should have criteria for establishing and maintaining MPAs. Importantly, the government cannot work in isolation to draft legislation. Community members and supporting non governmental agencies should also be consulted in the process (Salm *et al.*, 2000). Salm *et al.* (2000:132) indicated that the authority in charge of establishing and maintaining an MPA needs to ensure that it has the capacity and authority to conserve threatened, rare and endemic marine species and threatened, unique, representative, and valuable habitats.

4.3.2. Sustainable Development Act 2005

The Sustainable Development Act 2005 was developed over a decade, with implications to a broad range of stakeholders, from investors to conservationists. The

recognition of sustainable development is perhaps one of the major breakthroughs for sea turtle nesting and breeding worldwide. Inadequate environmental impact assessments (or lack of them), and inadequate assessments by tribunals and by the Department of Fisheries to determine loss or disturbance of fishing rights (including effects on turtles) can easily lead to the wiping out of turtle nesting regions. Factors in this process may include noise and marine pollution, lighting on a beach or physical loss of a nesting beach or foraging area through building or reclamation. Pollution, noise and increased water activity can also chase away turtles from foraging areas.

Expanded roles for national planning, Lands Department, Native Land and Fisheries Commission (NLFC) and tourism offices in protecting nesting beaches are likely to be crucial, and the zoning of development areas needs to take turtle nesting into account. Hotel operators and dive operators have often proven considerable allies in protecting and monitoring nearby islands nesting beaches, but well-meaning efforts need to be carefully informed in case they do more harm than good. For example, caging turtles as a tourist attraction can prevent them from breeding and nesting, and using money as an incentive for locals bringing turtles to show tourists can easily turn into a turtle fishing venture.

4.3.3. Endangered and Protected Species Act 2002

The Endangered and Protected Species Act 2002 was drafted to enable Fiji to accede to CITES. It also contains provisions to prohibit international trade in sea turtle shell and other products, although this was already established in Fiji's fisheries regulations in 1991. The new Act has established a Fiji Islands CITES Management Authority consisting of senior members from the Department of Environment, National Trust of Fiji and three public officers (including someone from Department of Fisheries), non government organisations and the fishing industry. There is also allocation for a CITES Scientific Council, to support the management authority.

Under the Act, anyone caught exporting or importing sea turtles or their products without an export or import permit is liable to a fine of \$20,000 for the first offence, and in the case of a second offence, a fine of \$100,000 or imprisonment for five years. The provision of import or export permits depends on decisions made by the Management Authority, guided by feedback from the Council.

A survey of all 20 handicraft sellers (targeted at tourists) along the busy Queens Highway along Eastern Viti Levu in the Coral Coast revealed only two specimens of sea turtle shells. The shells looked quite old and it was obvious that the shells had been in stock for a few years. On enquiring with the two sellers, this was confirmed and the sellers expressed disdain that tourists were no longer interested in buying sea turtle shells or products because they were stopped by customs on arrival in their home countries. They also revealed that the Ministry of Environment in Fiji was also proactive in ensuring that there was no sale of products from endangered and threatened species under CITES. It appeared that on the shelf trade in turtle shell was rare and restricted to the domestic market. This was strictly enforced by local authorities, including customs departments overseas.

4.3.4. Fiji's Tuna Development and Management Plan

Fiji's Tuna Development and Management Plan was developed to strengthen measures for sustainable management of tuna fisheries that were established under the Fisheries Licensing Regulations 1989 (TDMP, 2001). It has undergone one review since its inception to improve the plan. The Plan incorporates incidental catch under Section 6.6 and the observer program under Section 6.9. The TDMP provides for the observer programme to monitor and collect information on bycatch for the first time commencing from 2002, and is coordinated between the Department of Fisheries and SPC (TDMP, 2001). The TDMP specifies that it will work with the environmental community in sharing bycatch data and the development of measures

to reduce bycatch interactions and maximise survival chances for the bycatch species (TDMP, 2001). Mostly, SPC is relied upon to analyse the observer data, and to carry out research on bycatch, and this is recognised in the Plan where it specifies the facilitation of research by interested environmental agencies (especially SPC).

Currently, less than five percent of the fishing effort in Fiji's EEZ is being monitored. The incidence of sea turtle bycatch of the fleet is presently assumed to be low, but there is apparent under-reporting in logsheets; the Plan acknowledges the need for greater observer coverage (up to 20 percent) to get a more accurate representation of fisheries bycatch by species, including discards.

4.3.5. Fiji Sea Turtle Conservation Strategy

Regional forums have tried to address threats to sea turtles by campaigning and lobbying in Fiji. In 1995 a sea turtles working group comprising a good mixture of representatives from government agencies, non government organisations, regional organisations, including the University of the South Pacific, Peace Corps, resort owners and the Fiji Visitors Bureau, formulated the first Fiji Sea Turtle Conservation Strategy with a key objective of banning international trade in sea turtles and its products. This proved very successful. The strategy was coordinated by WWF and SPREP.

Other initiatives under the strategy included reduction in subsistence and commercial harvest and increased compliance with locally initiated prohibitions. There is no established indicator to measure if any reduction in subsistence harvest occurred, but since 1995 there have been continual moratoriums on sea turtle harvests, which indicate the unchanged threat of depletion. These moratoriums permit traditional harvests, not subsistence or commercial harvests.

In terms of compliance, Boyle (1998) found that even after the three year ban on sea turtle harvests in 1997, turtle shell handicrafts were still being commercially sold, and she had heard people witnessing turtles being killed and eaten in outer islands. Boyle (1998) studied the biology of sea turtle captured for domestic consumption in Fiji and found that large juveniles and sub-adults were the most common constituent of sea turtle catches for domestic consumption. She indicated these had not had any chance to contribute to the turtle population by breeding, and under these circumstances Fiji's sea turtle populations were most likely headed for a severe decline. At the time, sea turtles meat was sold commonly in the local market for prices of as little as \$4 to \$5 per kilogram (Boyle, 1998).

Although traditional harvest implies harvest for usage in ceremonial purposes, it is actually common knowledge that non-traditional consumption of sea turtle meat also occurs in the villages, towns and cities in Fiji (WWF, 2006). Consumers in towns and cities either buy the meat or receive it as gifts from relatives in the village, who provide these would be their most likely access to sea turtle meat.

Since the three year sea turtle conservation strategy was implemented a decade ago, there has been a second sea turtle conservation strategy developed coinciding with the 2006 YOST. The second strategy is being drafted from feedback gathered from consultations made in a two day Sea Turtle Strategy Workshop held at the end of May, in which I participated. The Sea Turtle Strategy Workshop was organised by WWF with keen interest by the Department of Fisheries. Other participants were the University of the South Pacific, Laje Rotuma Initiative, National Trust of Fiji, Partners in Community Development, Wildlife Conservation Society, Live&Learn Education Programme, SeaWeb, Department of Culture & Heritage, Mamanuca Environment Society, and a few community representatives (Appendix 4).¹² In

¹² Although the Police and Department of Environment were invited, they were not present.

discussions of the new strategy, important sea turtle conservation issues were identified to be local traditional, subsistence and commercial (black market) harvesting of sea turtles, bycatch, degradation of nesting beaches, and in the longer term - sea level rise. Local sea turtle research and enforcement of sea turtles management methods were also considered as key elements. The new strategy also identified the need to reach local communities through churches and the involvement of children (such as through schools). There was an indication by the group that more offenders (that is, sea turtle fishers without permits) should be penalised, although there was recognition of the need to review the permit system and to consider setting up a quota system for sea turtles in consultation with the local communities.

The three year Fiji Sea Turtle Conservation Strategy (1995) also notes that research on sea turtles must occur, and that the research must translate into management if it is to serve a conservation purpose. The year 1995 had marked the beginning of formal documentation of turtle sightings and nesting behaviour in Fiji Islands for discussions in international forums that were keen to reverse the alarming decline in sea turtle numbers (Guinea, 1993; Batibasaga, 2002; Rupeni *et al.*, 2002). However, Fiji since then has neither updated nor expanded research to gather information on sea turtle nesting and foraging areas in its elaborate coastal areas (Guinea, 1993).

Guinea (1993) studied the biology, exploitation and management of sea turtles of Fiji as a Masters project at the University of the South Pacific. However, his project had to be abandoned because of the high costs involved in travelling to outer island nesting areas and conducting aerial surveys, the lack of information about feeding populations in Suva and the difficulty of carrying out research in the summer months, which coincided with the cyclone season. This is the reality of scientific sea turtle research in Fiji Islands. A different approach to collecting nesting and foraging information is by tapping into traditional knowledge held by the coastal communities. This can have the dual effect of instigating conservation concerns in the communities

and therefore increasing compliance (Becker & Ghimere, 2003; Salm *et al.*, 2000; Gadgil, 1998).

The Department of Fisheries encouraged participants at the Sea Turtle Strategy Workshop to contribute to the knowledge of nesting and foraging areas, of which it had begun to keep a log. The only substantial research recently involving Fiji has been tagging studies to investigate regional scale turtle movements. Therefore, it cannot be expected that much new scientific input based on local research has gone into national legislation during the last few decades.

Although the Fiji Sea Turtle Conservation Strategy (1995) was designed as a three year plan, and even though it has not been formally adopted by the rest of the government, it has been used quite effectively for sea turtle conservation by the Department of Fisheries (Batibasaga, 2002). The strategy listed a number of factors that were deemed to support the need for of sea turtle conservation: outer island villagers observations of declining turtle numbers, below the levels needed to maintain traditional obligations; the need to cooperate internationally for turtle conservation; growing public interest in turtle conservation; and, turtles being regarded as a tourist attraction, particularly for resorts. All of these factors still prevail in the current scheme of things in Fiji, but the focus needs to be redefined: *all* villagers observe declining turtle numbers; and, there is willingness among some tourist operators to genuinely assist with sea turtle conservation measures. The new strategy needs to look at finding alternative food sources for socio-economic (where the purpose is not traditional) turtles harvesters, and review traditional catch quotas in consultation with villages. An attempt to gather the perspective of the traditional turtle fishers is presented in the case study of Qoma.

Some constraints for sea turtle conservation highlighted in the conservation plan were: lack of staff and resources at the Department of Fisheries for sea turtle

conservation; strong commercial lobby resisting ban in turtle shells; and traditional fishing rights obstructing the establishment of protected areas. These observations can be used to assess Fiji's progress in the previous ten years. Despite persistent staffing problems, the Department of Fisheries has a designated Sea Turtle Project Officer. The export bans and compliance in international trade can be concluded as attained (but should continue to be monitored), and there has been continued campaigning and public awareness of sea turtle conservation even though a black market for sea turtles remains and there are concerns regarding unsustainable socio-economic and traditional turtle harvests. This calls for a significant reduction in coastal sea turtles harvest and consumption. Traditional fishing rights or *i qoliqolis* are probably the only practical means to address the issue of coastal harvest of sea turtles through community-based management (Adams, 2003; Ghimere & Becker, 2003; Salm *et al.*, 2000).

4.4. Compliance and Enforcement

Salm *et al.* (2000) found that lack of enforcement is an important factor that may erode a community's confidence in the management process. In addition, they indicated that lack of enforcement can cause frustration and undermine the self esteem of the stakeholders involved in the management or conservation process. Compliance may result from providing positive inducements to improve stakeholders' commitment to conservation (Oldfield, 2003). This can be more effective than the sole use of enforcement in establishing sustainable use (Oldfield, 2003).

The compliance and enforcement of existing Fisheries legislation and regulations is a major challenge for Fiji, one that may not be feasible to undertake in the immediate future. Socio-economic incentives and the traditional implications of sea turtle consumption make enforcement of legislation only partially effective, and probably

not effective at all in ‘isolated’ communities within Fiji, given the limited resources of the Department of Fisheries. Commenting on wildlife trade enforcement, Oldfield (2003) pointed out that there were substantial global disparities in capacity for enforcement. There is significant effectiveness of some aspects of enforcement in Fiji, in that sea turtles are rarely brought out into the open to sell in the local markets and roadside stalls, although turtle shell artifacts are occasionally seen with usual or *ad hoc* handicraft sellers. Compared to Boyle’s (1997) observations, sale of turtles are now less obvious in Fiji. According to Guinea (1993) and WWF (2005), the extent and intensity of sea turtle harvesting (and incidental captures) is unknown because of a lack of local capacity and financial resources to assess them on the national scale.

Sea turtles are caught by some regular fishermen without permits in Fiji waters for sale in the black market. These incidents are scattered over the two main islands and outer islands. According to anonymous informants residing in Suva, all types of sea turtles encountered are caught as there is no preferential species in illegal fishing for turtles for domestic consumption. Any size that is caught is sold, including undersized turtles. Although not many leatherbacks were sighted, they indicated that leatherbacks had sometimes also been caught. Overall, the catches were either of a random nature reliant on turtles sightings, or targeted by the use of sea turtle nets or night diving using spearguns. This confirms that deliberate sea turtles catches are occurring, although the fishers are aware of the existence of restrictions placed on the catches. The cost of a sea turtle weighing 60 kilograms regardless of species could be between \$300 to \$600. Renowned and educated people have admitted to consuming sea turtles either bought, or offered to them by regular and irregular fishers of turtles. To know that a black market exists, and to lay out some parameters within which these offences exist, may be important for understanding the nature of offenders (the catchers and the consumers) and how to encourage compliance .

Fisheries wardens and officers are also involved in enforcement, but the difficulty lies in locating the incident. This is the reason that the sale of illegal turtles, not only their capture, is an offence (Dr Tim Adams, pers. comm., 2006). Some enforcement occurs through patrol boat programmes. The Department of Fisheries indicates that there have been 12 to 15 sea turtle related offences in the past five years. In 2005, an offender from Bua became the first person to be imprisoned for three months. This is significant because there were no offenders imprisoned in the past (fines were derisory amounts) (Dr Tim Adams, pers. comm., 2006). The Department also indicated that there was a high probability that many sea turtles harvested were not detected due to limited capacity and resources to monitor harvests made Fiji-wide. They also indicated that it was usually the local communities that were the offenders that were caught. The main problem admitted by the Department was that of effective surveillance. It was felt by the Department that community policing was possibly the best solution for ensuring compliance, but there was a risk that the traditional system might override such efforts, unless administered with precaution.

Another important consideration, and perhaps the best example of the problems with current policing, is the respect for Fijian traditional protocols for visiting villages. Visitors—who sometimes include fisheries officers or political members that understand the legal status of sea turtle conservation—are presented with cooked sea turtle meat by the host village to welcome them. It would be a sad moment if the visitor turned around and arrested the hosts (villagers).

In terms of enforcement for permit holders, the fisheries officer in charge of the area in which the permit is given should be informed and required to be present at the time of the killing or harvest. In circumstances where the fisheries officer is unavailable, there is a provision for another government official, such as agricultural officer, to be present.

4.5. Community-Based Management: Fiji's Locally Managed Marine Areas Network (FLMMA)

The role of community in turtle conservation lies in their customs and traditional fishing practices (Adams, 2003). The high status given to turtles should provide strong incentives for conservation actions, especially the restriction of external trade or the restriction of non-traditional methods of capture. There is no reason why cultural strengthening cannot go together with conservative resource management. Marine protected areas provide a natural bridge between customary practices and marine conservation science (Seaweb, 2006).

The FLMMA Network comprises government ministries such as Fisheries, Environment, Tourism, and Fijian Affairs and non governmental organisations such as WWF, Foundation of the People of the South Pacific International (FSPI), Institute of Applied Sciences (IAS/USP) and National Trust of Fiji. The collaboration among representatives from these agencies has been tremendously successful. Each of the organisations once having selected a site, work with their site communities to develop a community-based marine resource management plan and come to a consensus to declare and enforce a *tabu* or no take zone within their fishing grounds. Some of its highlights are the sharing of human resources and information among representatives and interested parties, and the care taken to deliver, translate and inform in the Fijian language. By having the FLMMA network, these organisations are able to come together to discuss their sites and their problems, solutions and achievements. The collaboration not only helps them to improve their management strategies but also to encourage one another, clarify goals and strengthens their will to succeed.

The Deputy Director of Fisheries of the Ministry of Fisheries and Forests openly welcomed the FLMMA initiative, and indicated that the community support for this initiative was overwhelming. The Department works closely with the FLMMA

Network in their initiative to survey all 410 *i qoliqoli* in the country. The Department of Fisheries has offered its research vessel for use by FLMMA free of charge (Yabaki, 2005: Speech). Additionally it has promised to offer a fibreglass boat for each of the sites with which FLMMA is working to assist in combating illegal fishing. FLMMA has decided to set up a trust fund for the USD30,000 Equator Initiative prize it won in 2005 to be used for FLMMA activities and to meet community project needs (FLMMA, 2005).

A demonstration of the value of FLMMA to conservation as well as to the community is given below. At the first-ever National Community Leaders' Workshop in Lomawai, Nadroga in 2003, community leaders signed a Lomawai Charter, which stipulated conditions of trust and cooperation among project members in their resolve to continue to improve conservation practices (FLMMA, 2005).

Gadgil (1998) indicated that indigenous communities routinely make common property decisions, which work because of the presence of a common property foundational ethic that balances benefits to individuals with benefits to their communities. This means that empowering communities to conserve sea turtles may well prove successful in achieving the goal of effective conservation. In addition, it has been recently recognised that traditional knowledge, apart from scientific knowledge, is also important in conservation and needs to be documented and included for insight in conservation planning (Becker & Ghimire, 2003; Ravuvu, 1995).

4.6. Case Study: A Perspective from Qoma Village

4.6.1. Overview of the Case Study

The study of Qoma is a comprehensive example of a local perspective on the feasibility and success of conservation of sea turtles. Qoma is one of many indigenous

coastal societies, where the peasant societies are victims of foreign strategies and policies of conservation and development. According to Miller (2002), socio-political, economic and industrial developments put increased pressure on everyday-living in the traditional societies.

Traditional societies have depended on the Mother Nature for their food, medicine and shelter. They have been living in harmony with their resources, which they have nurtured for generations (Gadgil, 1998; Miller, 2002). Qoma fisherfolk have utilised the coastal and marine resources and have developed time tested traditional practices, methods and beliefs for managing and utilising their natural resources. They are not unaware of the decline in sea turtle populations, and are very much conscious of the ban on sea turtle capture. They have also applied for permits to traditionally harvest sea turtles as required by Fiji's Department of Fisheries. However, the villagers have also caught turtles without permits at times for traditional functions, and for subsistence and commercial uses. They present a good case study on the needs of a village community dependent on the sea, and the strengths and weakness in the existing regimes for sea turtle conservation.

There have been significant changes in the resource availability for traditional fishing societies (Miller, 2002). The people of Qoma have also felt the pressure to cope with everyday living to access the basic needs for survival. Heavy competition from commercial harvesters and reduced populations of target species has spurred the replacement of canoes, traditional nets and spears of the traditional fisherman and handed them spear guns and powerboats (Veitayaki, 1990), resulting in a partial loss of their ancient culture and identity. The harvesting time and distance travelled to fish are increasing exponentially with depleted resources and the indigenous people have to bear all the costs involved with this, such as the extra fuel. Above all, they also have been pushed into illegally harvesting nationally banned species which have been part of their own culture and sustenance for generations, long before the legislation

came into being, when the village community itself determined the right and wrong, and enforced it.

4.6.2. Brief Overview of Qoma Island

Qoma is a small island group just off the northeastern coast of Viti Levu in Fiji, about 80 kilometers from Suva by road and 350 meters away from the mainland. It is comprised of a group of three islands Nabulebulewa, Qoma Levu and Qoma Lailai. The land area is about 23 hectares, and falls in the province of Tailevu. It is located between 17°38'22"S and 178°35'19"E (Marine Spaces Chart 81/2, 1970) (Figure 1).

The population of Qoma in the last population census in 1996 was 250, and there had been an average rate of population increase of six percent since 1976 (Fiji Bureau of Statistics, 2006). This is above Fiji's average population increase of two percent for that period (Ryan, 2000). The total number of houses has increased from 32 in 1976, to 43 in 1986, and to 46 in 2006 (Fiji Bureau of Statistics, 2006).

Nabulebulewa is very small with an area of only 0.09 ha, but contains the majority of the Qoma population. The geology is Korovou sandstone, which is a grey, calcareous and marly sandstone with shelly beds (Geology of Londoni Area, 1966). The northwestern point of Qoma Levu, which has a similar geology to Nabulebulewa, is a settlement site for the remaining Qoma villagers. There is a wooden bridge for people to conveniently walk between the two islands. The geology of the rest of the uninhabited parts of the islands is of volcanic origin, leading to mineral rich soil types (Geology of Londoni Area, 1966). The villagers maximise its use for small scale subsistence agricultural practice growing mostly cassava and breadfruit. Pandanus has also been planted for making mats. There are freshwater wells located on its northwestern part, indicating a reasonable size of water lens. Qoma Lailai is also of volcanic origin, similar to Qoma Levu. However it is utilised as a firewood source

and also as a traditional burial ground for the Qoma villagers. The water barrier from the mainland and settlement make it less disturbed compared to the former two, Nabulebulewa and Qoma Lailai.

The major ecosystem of Qoma village is the sea and its resources, given the smallness of the area. Qoma is surrounded by a fringing reef. The fishing area of Qoma stretches from Verata Point and Moon Reef on Viti Levu, to Cakau Davui Reef to the northwest and Ovalau and Moturiki to the east (Veitayaki, 1990). Veitayaki (1990) noted that Qoma villages were mainly coastal fishers as they were restricted by technology and finance from fishing further from their village.

Another critical ecosystem on Qoma is the mangrove forest. There is a reasonable patch of mangroves around all three islands of Qoma. However they are more abundant on the lagoon side of the islands. The dominant mangrove is from the genus *Rhizophora*. Mangrove was the main source of firewood for the villagers in the past, but observed beach erosion made the people of Qoma realize the importance of mangrove vegetation in stabilising sea shore and protection against wave and wind damage. The only mangrove usage now for the Qoma people is very traditional such as extraction for dyes and medicine which may rarely produce long-term damage. This is a classic example of the people in Qoma practicing community-based management or conservation. The alternative to wood from mangroves is wood from trees on the mainland.

Qoma is surrounded by patches of white sandy beaches. The view from Qoma is of long, white, sandy beaches in the Dawasamu area; black sandy beaches near the Queen Victoria School; and sandy beaches in Nukulevu (Figure 10).

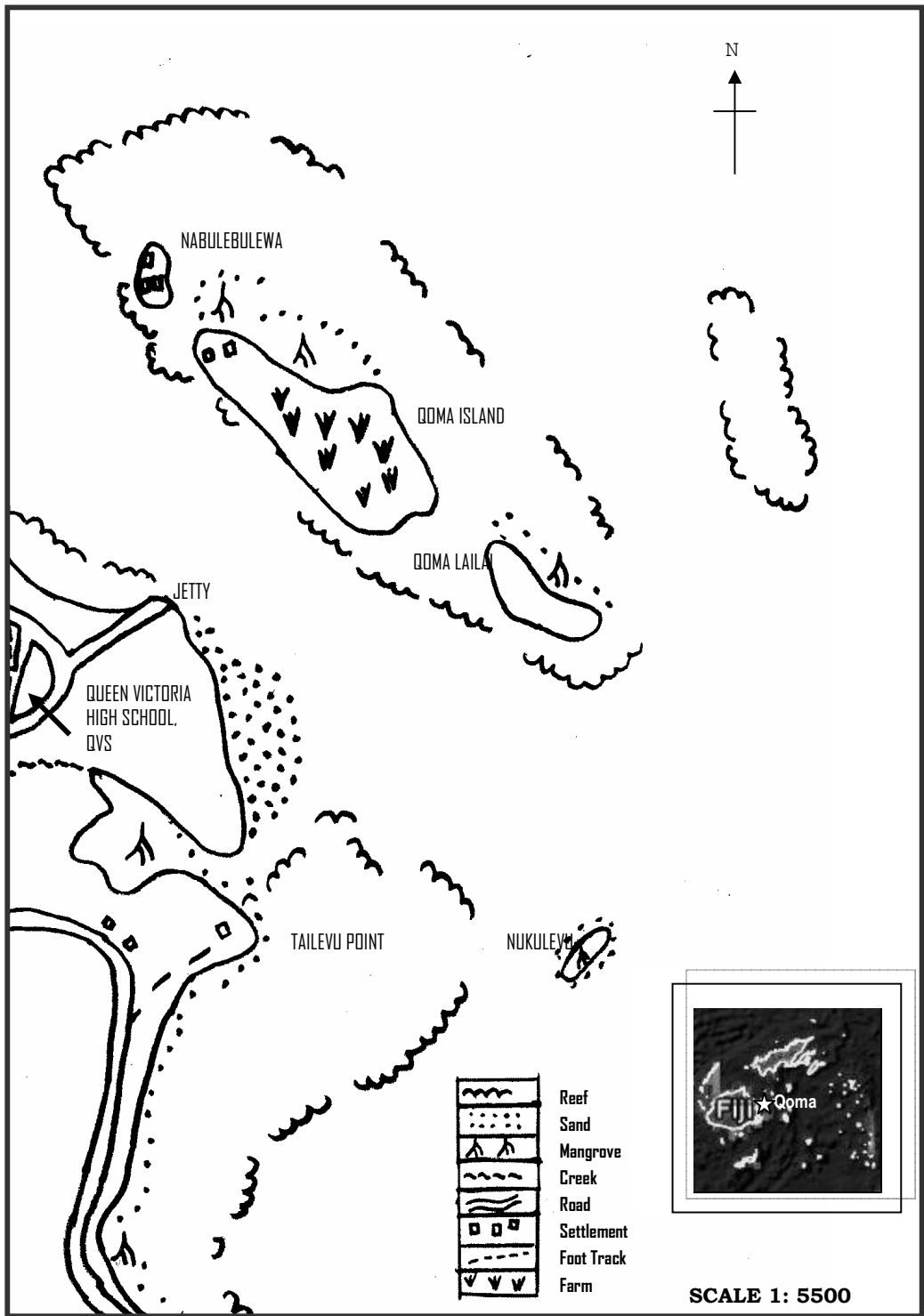


Figure 10. A sketch map showing Qoma Island and surrounding areas (Insert: Location of Qoma on the map of Fiji; See also Figure 1).

4.6.3. Significance of Sea Turtles

The sea turtles have a spiritual connection to people in Qoma. The villagers in Qoma call themselves the “true turtle fishers”. They believe that they can catch sea turtles better than any other villagers in Fiji, to the extent that sea turtles will ‘pass through’ a net deployed by a fisher from another village and get caught in their net. They never directly point at turtles as that would be a form of disrespect for the turtles.

When it is decided to catch turtles, a *yaqona* ceremony is held by the household and every member of the *tokatoka*¹³ must be present. Each of the seven *tokatoka* in the village owns one turtle fishing net. The head of the *tokatoka* is understood to take hierarchy over the Chief of the village for the duration of the ceremony. In Qoma, there is a belief that when a sufficient number of sea turtles are caught for the purpose it is meant to serve, the fishing gear will no longer catch more turtles, and they would seem to ‘pass through’ the nets. The number of turtles that are caught will be the amount needed for the purpose. In addition, if a person is “unclean”, that is, has committed an offence like stealing or lying, he should not go out turtle fishing. If he does, no turtles will be caught until he confesses to the *tokatoka* and performs a *yaqona* ceremony. Similarly, a man whose wife is pregnant cannot go turtle fishing either.

Chiefs from Verata could approach Qoma villagers to request for turtles and this was considered of high importance. The chiefs know they have to bring *yaqona*, and in some cases *tabua* (whales tooth) as well. A *yaqona* ceremony would take place before the fishers from Qoma set out to catch the turtles. All the traditional beliefs mentioned previously would apply.

¹³ *Tokatoka* refers to all those who are related in the same bond of kinship, like grandparents, parents, brothers and sisters, and the children of the family.

Only men and boys are involved in catching turtles. The turtle net is the most common fishing gear used for traditional turtle fishing. Until the 1950s the nets used to be made of coconut husk reaching lengths between 30 to 60 meters and 1.8 meters wide. The nets used now are synthetic, and 60 meters long.

Sea turtles are caught for traditional village functions such as marriage, funeral and the annual graveyard cleaning ceremony. Sea turtles were also caught using traditional methods and beliefs by *tokatoka* when money was required for other important non-traditional purposes, like building a house or collecting school fees. Sea turtles are the main source of livelihood in Qoma. The fishery has helped feed the people and build their homes. Turtles are a means of exchange for food crops from the mainland when their own small subsistence gardens are ruined, especially after cyclones. Without turtles, the villagers would have difficulty in building their houses, because for many a large proportion of the money required for the construction materials is from selling sea turtles in the black market. If any captured turtle bit the fisher, the villagers believed that the turtles should not be sold, but slaughtered for the family to consume. If they sold it, a bad omen like death would befall someone in the family.

Another major source of income for the few who are lucky enough, is remittances, constituting up to half the price for building a house. There are only few other sources of income such as selling fish to the nearby school and other buyers, some sale of traditionally woven mats using the leaves of Pandanus, and sale of sea shells and beche-de-mer to a Chinese owned company, Yon Tong. Sale of fish is not common in the closest town market (Tailevu) because of the distance, means of transport (usually bus or other random transport), cost of travelling to the market and lack of storage facilities for fish. Instead, fish is sold to middlemen, with the profits from fish thus compromised.

Selling sea turtles is far more lucrative. The sellers first go and offer sea turtle meat verbally (whisper) to people walking by. Only when the price is negotiated and a customer is fixed, they return to the village to pack and deliver the meat. The price can be negotiated between \$5 per kilogram to \$10 per kilogram. However, a price close to the lower margin is usually negotiated for quick sale because both the sellers and buyers are aware of the legal implications of the sale. This is to the advantage of the buyer. The high returns and quick sale are probably other reasons why villagers continue to have a dependence on the turtle trade for building houses. Queried about the cost of building a house in the village, a figure of \$7,000 was stated. All the houses visited in the village were designed as on open plan, approximately 12 to 15 meters wide and 20 to 30 meters long concrete, wooden and thatched houses. It is the person who wants to build a house that takes the risk of selling the turtles. The number of turtles killed to build a house will depend on the size of the turtles.

On rare occasions individuals approach the villagers with money to buy live sea turtles for their traditional or social purposes and the villagers usually accept it. The price of a live turtle with a carapace width¹⁴ of 60 centimetres at the widest point is \$300, and bigger ones are sold for prices reaching \$600 each. There was no evidence of turtles kept in captivity in the village, so the turtles must be caught when an order is given. From the sale price of live turtles and the cost of building a house, the number of turtles killed to build a house can range from 12 to 23 turtles.

Turtles are also food for the villagers, and can be caught when sighted during any fishing trip. This is not considered traditional, and therefore the animal can be caught without any rituals or traditional fishing methods. The speargun is the most efficient form of catching turtles on such trips. During my stay in the village, a hawksbill with a carapace length of 300 millimetres was caught by a fisher during his daily fishing

¹⁴ Carapace is usually measured as length (head to tail), however, the villagers used width of carapace to measure turtle size.

trip using a speargun (Figure 11). Speargun fishing at night is more efficient than catching turtles in the day time.



Figure 11. An undersized hawksbill turtle killed for food using a speargun at night.

4.6.4. Traditional Knowledge on Sea Turtles

All four kinds of sea turtles known to exist in Fiji Islands were sighted in Qoma. A picture of six different sea turtles was shown to the villages. They claimed to have sighted five of those types, including a fifth kind of sea turtles known as olive ridley because of its small head, distinct taste and shell shape. They sketched an outline of the shell (before sighting the picture of an olive ridley), which appeared accurate, although that is not sufficient to confirm the species' presence in Fiji. Since there were previous records for olive ridley in Fiji, perhaps this indicates that olive ridleys have been extirpated from some of the previously cited coastal areas (Guinea, 1993; Batibasaga, 2002).

The most common kind of sea turtles in Qoma were said to be the hawksbills, and the least common was thought to be leatherback. The last leatherback that was sighted

and caught by the villages was on the 16th of February, 1986; the exact date was known because they named a boy born on that day “*Vukitabaiwalu*”, their traditional name for leatherbacks. During nesting, this leatherback was trapped in a hole dug on the beach in Dawasamu because it was too big to catch any other way. The shell was described to be six feet long.

The fishers knew that turtles are more abundant in the period between November to March, when the turtles nest. The nests were known to contain more than 100 eggs that “were round and smaller than chicken eggs”. According to the elders, most turtles come out to nest in thunderstorms (lightning). Hawksbills were known to nest on the islet southeast of Qoma called Nukulevu, and were territorial so only one turtle would nest on one side of the islet. According to the villagers, the hawksbills climbed across the beach and bit the base of a tree as though to mark it. They then held on to the tree in an upright position when laying eggs. This may be a biological adaptation to support the turtle upright while it nests. They also said that they created a few false nests before returning to sea. The male turtles were identified as ones having a long tails and were never sighted on the beach. They also noticed that there were some hatchlings that appeared weak and therefore remained on the beach after the other hatchlings had made it to the surf.

Many green turtles were also known to nest in the white sandy beaches in Dawasamu. The turtles’ eggs were sometimes taken by the fishers in the two islets, but the green turtles’ nesting area was found to be less accessible. It was explained that the nesting beach on Dawasamu was a steep slope that dropped off into very deep water at the shoreline. The water was usually rough as well.

There are seven common traditional methods of sea turtle fishing or *kara vonu*, where the villagers use their traditional knowledge about the wind, tide, season, and their relations to turtle behavioural patterns. In one method called *raiua*, the turtle fishing

net is taken on a boat at high tide in the daytime to the known foraging areas of sea turtles, and deployed. It is checked at regular intervals of a few hours for turtles. In *taratara*, the passage plan of the sea turtles is marked in the daytime. Fishing occurs at night time when the moon is about to rise over the horizon, and the turtles are thought to be asleep. The turtles are not seen at night but the position is known, and the net is deployed on one side of it. Sticks are then used to chase the turtles into the net. The villagers explained that sometimes when a turtle was missed, then the tide, wind and time of the day was noted. They would wait for the exact conditions to reoccur and then head out to the spot to catch it. They said that they were always sure to find the same turtle in the same spot they had marked, and on the same passage plan.

Rabe also occurs at night, during high tide. This fishing starts from the coast at Dawasamu with few people on the beach, and many in boats near the coast moving slowly towards their village. Whenever a turtle is sighted the people on the beach alert the fishers in the boat. Then, about ten people holding a net that is 100 meters long and 15 meters wide swim to the turtle and encircle it. In *siwa*, a net with a rope attached to it is set up in the foraging area. The fisher waits, holding one end of the rope. When there is a tug on the rope he pulls it so that the bottom of the net ties up closing the net. *Cokavonu* is spearfishing for turtles using a wooden spear about three meters long, with a metal head. *Rebai* includes searching for a turtle. Once found, a chase occurs. A person jumps into the water and flips the turtle to make it easy to handle and carry on board. *Vakarorogo* occurs at night and considerable time is spent listening for the turtles to emerge to breathe. A distinct, loud gasp indicates a large turtle, and a small gasp suggests a small one to the fishers.

An eighth method for catching turtles involves a very rare sacred ritual in which ancestral guidance is sought, called *vakacuru luveniwai*. This method is used as a last resort when turtles are needed but turtles pass *through* the net, indicating that

someone is ‘unclean’. A person sits on a special chair, and once he is made to wear a special *salusalu* (garland) he becomes entranced, showing supernatural powers, and is believed to represent the ancestors. These people are believed to be afraid of “the people in the black and white suit”, thought to be the pastors. The entranced person will explain what the problem in catching turtles was, and will direct the fishers to an exact location where the number of turtles needed will be found.

4.6.5. Conservation and Management

The fishers explained that in comparison with the past they had to fish longer, covering wider areas to catch turtles and other fish. There was general concern that all fish, including sea turtles, were declining in *i qoliqoli* areas. In terms of threats to nests and sea turtles, the villagers thought that rats were an important predator of eggs, and that rats and possibly birds preyed on hatchlings. There was nest robbing by people. They admitted that the villagers themselves were threats. Poachers from fishing boats that were often seen anchored in Suva’s Nubukalou creek were also present in the area diving with spearguns at night. According to the villagers, sea turtles were caught by these poachers. The occurrence of poaching is a particular concern for conservation and resource management, and indicated poor enforcement and surveillance generally in the study area. There was no indication of any fish wardens or police patrols. The island is separated from the nearest town, Tailevu, by 40 kilometres of gravel road, which is in poor condition, and worse when wet. There was no electricity in the village and fresh water was from the tanks and wells, adding to infrastructural difficulties.

Technology advancement had been instrumental in increasing the efficiency with which sea turtles were being caught in the village. Some of these impacts involved synthetic turtle nets up to 100 meters long, speargun fishing and motorised boats. Coupled with the fishers’ knowledge in targeting turtles these can have a

compounded effect on sea turtle catches. It was intriguing to find that the fishers had held a meeting to discuss the decline in sea turtle numbers, and decided to make nets with bigger mesh sizes. This was something of their own initiative, which they thought would work because “smaller” sea turtles will not be caught. The fishers decided to increase the mesh size of turtle fishing nets from 12 inches to 16 inches. The semi-completed nets with the latter mesh size were observed (Figure 12). These mesh sizes have been decided without any biological basis and neither is it based on the minimum size limit (mesh size not specified) allowed by the Department of Fisheries. The minimum size limit allowed by the Department of Fisheries is 455 millimeters (18 inches), and a mesh size of 16 inches sets a minimum size at capture of less than 18 inches. However, it is useful to acknowledge the fishers’ concern about declining sea turtles.



Figure 12. The turtle fishing nets used by Qoma villagers. The net on the left is the semi-completed new fishing net with a 16 inch mesh size.

An aspect of the turtle fishing method that could be seen to have conservation value was that the turtles were not caught in excessive numbers for each function or event. Rather a net was deployed and whatever number of turtles were caught was deemed adequate – this was the belief about turtles passing through the net once the purpose was fulfilled. For example, in the Easter celebrations a single turtle with a carapace width of 1.5 meters was caught. This fed the whole village sufficiently.

The *tabu*¹⁵, a village imposed restriction on turtle and all other fishing, is observed for 100 nights following a death in the village in an area within 50 to 100 meters of the southern part of the island. There were no other *tabu* areas or MPAs.

The villagers were aware that turtle harvesting was banned. They heard it for the first time on the radio in the 1990s. Occasional reminders on the radio were about all the awareness that this village had received about sea turtle conservation. There was at least one occasion where the villagers had applied for a written approval for harvesting sea turtles to honour the chief guest at a fund raising ceremony for school children. However, there had also been incidents when the fishers had been let down by the Department of Fisheries, because nobody was available to approve the permit resulting in a wasted trip, and a dilemma about whether or not to go ahead and catch the turtles.

Considering the effort the villagers made to travel to request for a permit, and the total bus fare paid of \$11.50 (\$ 4.45 to Suva in one bus, then another to Lami \$1.50, one way), it begins to make sense why the ban is ineffective in controlling traditional harvests. This is the simplest way of demonstrating the probably fatal weakness of the current ban, legislation and enforcement. It also demonstrates that Qoma villagers have really attempted to work with the measures. The village is subsistence based, therefore the time spent travelling equated to a few hours of fishing time that can be equated to \$10 (sale value of two fish that would have been caught). Therefore, the sum of \$21.50 is equivalent to four kilograms of turtle meat sold, or 23 loaves of bread bought, or enough fuel to last a week for the villagers. Does this mean that the villagers have been forced to pay the extra cost of sea turtle conservation, without any immediate return on investment? There is also no guarantee when sustainable sea turtle fisheries will occur, or if it is going to occur at all.

¹⁵ The Fijian equivalent of no-take zones.

Oldfield (2003) explained that the consequence of wildlife regulations is to relocate costs of conservation efforts and control behaviour. She also notes that while regulations may conceal the real costs of conservation, the costs are real. She acknowledges that indigenous communities are likely to resent such regulations as contrary to their culture and aspirations to use their own traditional resources. This seems to be the environment induced by the current moratorium on sea turtles in Qoma. When reminded about the penalty of \$500 for harvesting sea turtles and three to six month imprisonment, at least one villager interviewed confidently said that if it has to come, he will go to jail because there is no other alternative. It has already been discussed that compliance is needed together with enforcement, but the environment for compliance has to be improved by gaining the community's trust in national sea turtle conservation measures.

Alternative food sources in for village are difficult to find; there is no grazing land for large animals such as cattle. The only farm animals are a few domestic fowl and about 60 pigs kept in pens on the island.¹⁶ So, the moratorium to conserve sea turtles is a failure (even if not a complete failure) in this context.

There is a need for two way communication for compliance to improve at village level. They are interested in learning about sea turtles. After I explained to them the importance of tagging and retrieval of tags, they produced three turtle tags that were collected from turtles caught in the village (Figure 13). The villagers had to be assured that the tags were their contribution to research, and it would be unethical to penalise them for turtles harvest on that basis as that would serve only as a deterrent to genuine research. Two tags (with sequential numbers) were from an Australian university, and the third tag was from a Hawaiian University. They estimated the year in which the turtles had been caught, and the kind of turtles the tags belonged to.

¹⁶ The impact of 60 pigs on the coastal environment in the long run may become, if it has not already, another threat to sea turtles by becoming a threat to the coral reefs and seagrass beds (Castro & Huber, 1997).

They indicated that each tag was from a different turtle. After correspondence with turtle conservation expert Dr Colin Limpus¹⁷, it was discovered that two tags (T54044 and T54045) belonged to the same turtle. He indicated that the suggestion that these tags came from separate captures must raise doubts about the accuracy of these dates; validation of data coming from memories is tricky. Although there is ambiguity about exact capture date, this was a significant capture of a green turtle in Fiji that had been tagged nesting in the southern Great Barrier Reef, over 3,000 km from its breeding site. The details of the turtle with the Hawaiian tag are unknown at this time.



Figure 13. The three turtles tags revealed in Qoma village.

In an exercise to determine how many turtles should be allowed to be taken by the fishers in one year, interesting statistics were derived (Table 4). To some conservationists these figures may look absurd, but they were quite reasonable for the fishers. The figures indicate that a total of 153 turtles a year could satisfy some of the need for turtles in the village. It must be considered that houses are not built too often on the island. From 1986 to 1996, there was a positive increment of three houses in the village. The carrying capacity of the island may well have been reached, because from 1976 to 1986 there were 11 new houses built. Subsistence catch could not be

¹⁷Senior Principal Conservation Officer (Head of Queensland Turtle Research Programme), Queensland Parks and Wildlife Service, Environment Protection Agency, Department of Environment, Queensland, Australia.

estimated. The villagers were very keen about community involvement in sea turtle conservation, including quota setting for traditional harvest.

Table 4. The village perspective on the number of turtles needed by the village.

Occasion	Number of turtles per occasion or event	Number of turtles per year
Easter	1 per <i>tokatoka</i> ¹⁸	7
Christmas	1 per <i>tokatoka</i>	7
Mother's Sunday	1 per <i>tokatoka</i>	7
Palm Sunday	1 per <i>tokatoka</i>	7
Children's Sunday	1 per <i>tokatoka</i>	7
Marriage	3	9
Other traditional functions, including deaths and graveyard cleaning	1	5
Fundraising	18 (3 turtles per child per term)	54
House construction	Not determined	Not determined
Subsistence	Not determined	Not determined

Oldfield (2003) explains that socio-economic factors and culture importantly shape peoples' values and goals for conservation, and therefore effective incentives should exist for reaching sustainable goals. Sea turtles have to be conserved, but drastic changes in regulation, expecting to achieve positive behaviours without offering alternative solutions, is not fair for the indigenous harvesters, and neither is it fair for the sea turtle populations. In Qoma, evidence suggests that the villagers were concerned about sea turtles declines, and using their own inventions to conserve turtles. However, there is much that has to be learnt by the villagers about sea turtle conservation. The incentives and disincentives for Qoma are important in the context for effective national conservation regimes, and present a challenge for the future of sea turtle conservation.

Troëng & Drews (2003) suggest that governments, international agencies and non-governmental agencies can genuinely conserve sea turtles by favouring local incentives. Some suggestion given by the authors in this regard to community turtle

¹⁸ There are seven *tokatokas* in Qoma.

harvesters were: creating employment for them in turtle management; preventing them from over-exploiting sea turtles; promoting regulations that *guide* usage of resources; enforcement of restrictive legislation; establishing fines comprehensive of turtle values; facilitating funding, providing subsidies for non-consumptive use; and establishing concession or utility fees. The harvesters were receptive to alternatives such as these, and could commence engaging effectively as soon as the resources and technical assistance was given to address their issues discussed earlier.

4.7. Summary

This chapter outlines strengths and weaknesses in legislation, compliance and enforcement significant to sea turtle conservation, and presents a village based case study as evidence of findings for the coastal-based aspect of turtle conservation. The management and conservation turtles, particularly green turtles and hawksbills, has been attempted by the Department of Fisheries mainly through legislation and policy. The role of the Department of Fisheries is most effective in enforcing the ban on external trade of sea turtles, and in minimising incidental turtle capture in the domestic offshore fishery.

There are major inadequacies in conserving turtles at the policy level, such as the exclusion of specific sea turtle focus in MPAs under FLMMA; absence of any form of prioritisation (or even biodiversity surveys) at national for Heemskereq reefs and Ringgold Isles as turtles or marine sanctuaries; absence of ecotourism guidelines for sea turtles; ineffective regulation and enforcement of harvests, traditional or illegal; and, perhaps most importantly, lack of incentives (or equal alternatives) for coastal communities.. The permit process for traditional capture was often ineffective even in generally policed areas due to traditional protocols for everyone involved with a tendency for fishers to catch greater numbers than permitted by the Department of Fisheries. The moratorium on sea turtle capture during nesting and breeding season

was found to be ineffective in remote locations where enforcement was minimal or nonexistent, but the moratorium was effective for minimising sales in the open market. Isolation of coastal communities added to the limited powers for enforcement by the Department of Fisheries and Police due to limited manpower and resources. Whilst the Department of Fisheries attempts to manage the fisheries' impacts on turtles, they have neither the jurisdiction nor the competence to undertake conservation actions over several critical stages of the turtles' life-cycle, particularly the land-based reproductive stages. For this, a cross-sectoral approach is recommended. The recognition (through the enactment of new legislation) of sustainable development by Fiji is a major breakthrough for the consideration of sea turtle nesting and breeding areas in development projects.

It can be said that international legal instruments for sea turtle conservation are applied at the national level in Fiji in light of key drivers such as advocacy by international or regional bodies, and national and local public concerns. In its current status, the laws and regulations will need some changes to accommodate provisions for CMS and Ramsar. The changes will be more prominent in legislation enactment than current practice as the FLMMA, in principle, already follows fisheries best practice. Traditional fishing rights are the best means to address the issue of coastal turtle harvests through community-based management, and marine protected areas are an opportunity to develop a bridge between customs and conservation science. However, FLMMA is not so much focussed on sea turtle conservation at present. Conservation activities in Fiji are significant, and it appears that Fiji Islands is a hub of conservation activities in the Pacific Islands region. The interest in conserving Fiji's heritage has already resulted in positive attitudes and behaviour in respect to conservation, but there is a need to emphasise the importance of sea turtle conservation. There are activities such as the engagement of regional bodies which assists the government in developing the mechanisms for sea turtle education and awareness activities, and research.

In 1995, a Fiji Sea Turtle Working Group was the first national lobby group formed (with assistance from SPREP) for sea turtle conservation, and became instrumental in the ban of turtle shell export from Fiji. CITES is implemented in national legislation and is currently enforced effectively as there is no evidence of illegal export or import of sea turtles or turtle products.

Another is the Sea Turtle Strategy Workshop (organised by WWF with the Department of Fisheries) in 2006, where there was a similar gathering of non governmental bodies, academics, and governmental agencies as in 1995, with the additional participation of a few village chiefs to work towards an updated Sea Turtle Conservation Strategy. This group highlighted the need to recognise traditional and social barriers and optimise the existing traditional structure and protocol of village communities. The idea is that village chiefs, who are respected and revered, will be able to set sea turtle conservation principles and activities within the village. This event portrayed a more holistic acknowledgement of the status of sea turtles by government officials and village chiefs. It is a small step, but a very encouraging one.

Although slow, there is positive change in the attitude of people towards sea turtle conservation in recent years. It appears that the Department of Fisheries and dedicated non government organisations like WWF are headed in the right direction to meet effective and long term sea turtle conservation. In the short term circumstances will continue to present challenges in terms of adequate legislations, research and compliance by village communities. The challenge is also for conservation of turtles to occur within the context of Fiji's social and cultural environment. Perhaps the *vanua* concept can serve as a key cultural basis in turtle conservation (as well as other biodiversity). A suggestion is to use a quota system for traditional harvests set up *with* adequate consultation and participation of all relevant stakeholders (bottom-up approach).

In the Qoma case study, a lack of alternatives to sea turtles as a means of livelihood exists, and there is a lack of empowerment, education and awareness at the village-level. This village is currently out of the scope for tourism activities because of its isolation, limited land area and infrastructural problems, so it will be a challenge to develop conservation regimes for sea turtles that will be effective and fair for this village. The challenge is to provide positive incentives or fair alternatives to coastal communities as a measure of compliance. This will result in a shift of the responsibility onto communities to themselves manage and conserve sea turtles making the impact of conservation more powerful without increasing enforcement costs.

Even though Fiji is lagging in the implementation of conservation activities for turtles at the community level, conservation activities on the whole are progressing in Fiji. There is acknowledgement for the need for turtle conservation at GCC level, which is an enormous achievement. The efficiency and full effect of conservation activities, however, are hindered by inadequate resources, insufficient legislation, inadequate enforcement, compliance issues in many areas, and insufficient research. However, the political strength of the environment sector in Fiji is growing and so the environment is receiving the much awaited consideration in national planning.

Chapter Five

5.0 Conclusions

This study provides information on sea turtle conservation efforts in Fiji at the international, regional, national and local levels. The existing international and regional regimes play an important role in turtle conservation through advocacy and assistance, but efforts will fail unless the national drive is present and measures are strategically applied to effectively conserve sea turtles in local communities. Fiji's continued effort to conserve sea turtles has been driven partially by national awareness on the plight of sea turtles, and partially by international regimes such as UNCLOS and CBD, implemented through a regional network. Overall, there is a need to strengthen turtle conservation at the national and local community levels.

All four species of turtles in Fiji Islands are in the IUCN Red List. Green turtles and hawksbills are known to nest and forage in significant numbers in the country. There are gaps in the knowledge of local stock status, range and distribution. Local conservation of sea turtles is as old as its traditional exploitation, but changing circumstances over time have contributed to possible overexploitation of this valuable species related to the increased importance of cash incomes and a greater demand for food. Sea turtle bycatch probably also attributes to the decline: there are insufficiencies in quantifying bycatch in the lucrative tuna fisheries in Fiji at present. Other likely reasons for decline to be considered in turtle conservation are degradation of sea turtle nesting and feeding areas and climate change. A holistic approach to sea turtle conservation is needed to include coastal threats to sea turtles as well as bycatch issues.

As a party to UNCLOS, Fiji is obliged to ensure that its tuna fisheries do not contribute to further endangering sea turtles through unsustainable levels of bycatch, and that sea turtles that are incidentally caught are released using proper procedures designed to maximise their chances of survival after release. Despite the apparent low sea turtle bycatch in Fiji, there needs to be scientific research to determine if the bycatch is low throughout the tuna fishing fleet, and whether the estimated bycatch levels are acceptable.

The WCP Convention gives expression to UNCLOS within the Western and Central Pacific region in terms of bycatch issues. Contracting parties contribute to the Convention's activities based on catch and national wealth. Fiji contributes about one percent of the USD 3.5 million budget proposed for 2007. Given the advent of the WCPFC it seems likely that the coverage and quality of observer coverage in Fiji (as part of the region) will improve (from less than five percent to 20 percent), and there will be increased efforts to improve fishing techniques to reduce bycatch under FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations.

Some key challenges for Fiji in meeting its obligations to international conventions include the lack of a complete inventory of biodiversity in Fiji, lack of local vulnerability status of populations, and the inadequate demarcation of critical habitat sites for turtles. Fiji's accession to CMS is likely to prove beneficial for sharing of technical resources, research and expertise.

As part of the regional network SPREP, with Canadian aid, and recently the US fisheries management funding assistance, has been instrumental in providing the vision for sea turtle conservation under the RMPCT. The regional strategies have particularly assisted Fiji in conservation, especially through education, awareness-raising activities and facilitation of sea turtles research (including funding of tagging programmes and nesting beach monitoring).

Initiatives by SPREP and the WWF Asia-Pacific Programme look promising, but the concern is whether or not project efforts can continue over the long term, which is necessary for effective conservation. There are fortunately no apparent conflicts between the two organisations as their visions are similar, but greater collaboration would increase the efficacy of sea turtle programmes for a greater impact. The scale of the response from local communities needed for the sea turtle populations across their range, and the urgency of this response, requires significant resources and collaborative partnerships within and beyond the Pacific Islands region. The regional focus currently was to raise the importance of improved communications and environmental education to coastal communities; include turtle conservation issues in school curriculum; campaign to legislators and policy-makers; and establish good relationships with stakeholders, including presentation of facts and shared experience. There was also a need for further localised research translating into regional networks of protected habitats.

Funding for programmes and projects is a critical issue, and not usually aimed specifically at sea turtles. Does it really need to be specified? Sea turtles are as much a part of biodiversity as any other species. What makes them special is that despite scientific research worldwide to understand their range, populations and behaviour, the local turtle populations' nesting and breeding status data collection is largely incomplete and unverified. There is a need for scientific, ethnobiological and social-economic studies on sea turtles to better understand the links of turtles to Fiji's environment and its people. Ecotourism is an avenue that needs to be explored further collaboratively by NGOs and local communities, as it had the potential for acceptance by local communities therefore supporting conservation efforts.

At the national level, the role of the Department of Fisheries is most effective in enforcing the ban on external trade of sea turtles, and in minimising incidental turtle

capture in the domestic offshore fishery. There are some gaps in the current national direction setting for sea turtle conservation: Policy needs to include specific sea turtle focus in MPAs under FLMMA; Prioritisation (or even biodiversity surveys) at national level for Heemskereq reefs and Ringgold Isles as turtles or marine sanctuaries; ecotourism guidelines for sea turtles; effective regulation and enforcement of turtle harvests, traditional or illegal; and, incentives (or equal alternatives) for coastal communities to conserve sea turtles.

Sea turtles have been iconic in Fijian traditions and culture for as long as can be recalled, with great impacts on ceremonial and prestigious occasions. Although there have been slight changes in practices, the traditional significance of turtles is still strong. Turtles are a source of food and income and an important traditional food offering. However, advancements in technology, modernisation, and increased human population have increased the pressure on sea turtles, contributing to the decline in sea turtle nesters. There is a strong need to prevent exploitation of sea turtles beyond that which is strictly necessary for traditional occasions and to avoid loss of livelihood for the turtle-dependent villages.

A distinction can be drawn between genuine harvest for traditional purposes, and that for non-traditional purposes. Since both are sourced from villages, conservation is best addressed by community-based management, and leaders have a large role to play in culling out non-traditional exploitation of sea turtles. It would assist sea turtle conservation efforts significantly if the GCC was to be involved in the making of conservation decisions. Overall, a holistic approach with stakeholder consultation and participation is strongly recommended.

Fiji has declared a series of moratoriums since 1994 in an attempt to stop sea turtle harvest; the current one was gazetted under the Fisheries (Protection of Turtles) Amendment Regulations 2004 and expires in 2008. The moratorium on sea turtle

capture during nesting and breeding season was found to be ineffective in remote locations where enforcement was minimal or nonexistent, but the moratorium was effective for minimising sales in the open market. However, there is a possibility that the moratorium on sea turtle harvest is allowing sea turtles exploitation to continue in the black market, where turtle fishers (including indigenous communities) have to make quick sales at low prices for the invaluable sea turtles.

Traditional harvest is permitted through the Fiji's Department of Fisheries where the limit for harvest is upto a maximum of three turtles per ceremonial occasion. However, there are no guidelines to establish the issue of the permits and neither has there been consultation with traditional and subsistence fishers (like Qoma) to determine an appropriate quota limit. Traditional protocols and structures continue to impinge on the enforcement of regulations.

Compliance and enforcement are major challenges faced by Fiji with respect to the design of sea turtle conservation measures. There is evidence that although penalties exist, sea turtle fishers are rarely, if ever, penalised for illegal capture or sale of turtles or their products. Enforcement is difficult to achieve given resource and staff implications and relative geographical isolation of many of the turtle fishers. Given such difficulties, a community-based management approach may be the key to controlling turtle fishing if tailored to Fiji's circumstances with the balance tipped to village level compliance rather than relying solely on enforcement. This will result in a shift of the responsibility onto communities to themselves manage and conserve sea turtles without increasing enforcement costs.

Community-based management is widely accepted among conservationists in Fiji Islands as the best way forward for effective conservation of sea turtle nesting beaches and inshore foraging habitats. This is because communities are the customary custodians, and hence in the best position to monitor fisheries and to enforce

regulations through the customary fishing warden system. Fiji has been exemplary worldwide in community-based management, especially through FLMMA because of their grassroots approach towards sustainable fisheries, and focus on sustainable livelihoods on the whole.

FLMMA has received worldwide recognition for the community-based work it has done. Inclusion of carefully planned strategies for sea turtle conservation in FLMMA is the best way forward. MPAs also need a legislative framework, especially to include land-based activity that affects the ecosystem, and clearly defined guidelines developed in consultation with the existing agencies and community representatives that are involved in community-based management. Education and awareness is among the top priorities for conservation groups in Fiji Islands, and one that is currently being implemented quite effectively. Once communities are aware of the reasons why the ban and other laws are in place and they are given the knowledge or resources for alternative food sources or money, they can be expected to take responsible actions to remedy the problem of declining sea turtle populations. One of the most important challenges would be to provide local communities with positive incentives to reduce sea turtles harvests to predetermined levels that are reasonable. Together with FLMMA, the Department of Fisheries can establish a set quota for traditional sea turtle harvest in village-level consultations. The department and FLMMA could facilitate training of turtle monitors, and awareness-raising as well. The Qoma case study proves that the establishment of a sea turtles quota system is acceptable, but will depend critically on the cooperation of, and consultation with, local communities.

From the local case study it was found that the people of Qoma found it difficult to comply with the particular requirements of the moratorium on sea turtles harvest with its provisions for traditional harvest. This was due to their reliance on sea turtles for traditional ceremonies, financial needs and food. They only have enough land for

farming, which is also unreliable in terms of meeting subsistence and financial needs. There was no grazing land for large animals and there were also infrastructural deficits, such as poor road and communication links. The permit system was attempted by the villagers, but the system failed them because of their geographical isolation from the permit-issuing authority. Qoma is a traditional sea turtle fishing village, and probably not the only one in coastal parts of Fiji. There is very little documented information about the traditional sea turtles practices and knowledge among Fiji's communities, suggesting that very little has been done in terms of addressing village-level issues. Addressing this gap would be the basis of establishing and implementing effective sea turtle conservation measures in Fiji.

Sea turtle conservation strategies need to be embedded in long term programmes to make a significant change in people's attitudes and behaviour towards sea turtles. Long term strategies are also important because sea turtles are long-lived species, which require several decades to sexually mature. It will therefore it will take a long time to observe the outcomes of conservation efforts. Sea level rise also needs to be considered as a factor in long term conservation.

Land-sourced pollution issues need to be dealt with nationally at the cross-sectoral level. The Sustainable Development Act is a major breakthrough for sea turtle conservation in Fiji due to the requirements for an environmental impact assessment for development projects. Sea turtles need a wide range of habitats to complete different life-cycle stages; these habitats include beaches, tropical and subtropical coastal waters, seagrass beds, coral reefs, and open ocean pelagic waters. Turtle conservation therefore requires coordinated management actions between land and sea agencies. A helpful approach would be to investigate and broaden sea turtle conservation activities to encompass sustainable fisheries, ensure cross-sectoral policies to protect ecosystems, and secure access to and benefits from marine resources for local communities. This approach may also lead to a greater

appreciation and support from local communities, as it will impact on sustainable livelihoods.

Heemskereq and Ringgold Isles need special protection and should become a gazetted MPA because of its importance to green turtles, as well as Namena Lala for its importance to hawksbills. These need to be included among priority areas in the final NBSAP. Other important nesting areas and foraging areas could be identified and managed under a network of MPAs, or the FLMMA initiative.

In discussions during the Sea Turtle Conservation Strategy Workshop, priority sea turtle conservation issues were identified: local traditional, subsistence and commercial (black market) harvesting of sea turtles; bycatch; and degradation of nesting beaches. The need to reach local communities through churches and the involvement of children (such as through schools) was recommended. The workshop recognised the need to review the permit system and to set up a quota system for sea turtles in consultation with the local communities. The need for more research was also identified.

It was sufficient for the purposes of this study to determine that coordinated mechanisms, led by SPREP and WCPFC, are already in place for collecting data and information that will allow us to understand the behaviour of sea turtles in the Pacific Ocean, in order to devise better conservation measures. This study recognised that there is a wide gap in knowledge about sea turtle nesting and foraging behaviour and bycatch in Fiji, and that there is a need to concentrate effort and resources on documenting and protecting sea turtle nesting and foraging areas. Despite the large gaps in the knowledge of local sea turtle population status, range and distribution, the poor conservation status of the turtles themselves present the best evidence that sea turtle populations cannot withstand current mortality rates and a reversal of the process is needed to ensure that sea turtles do not go extinct.

It can be concluded that the ban or moratorium, as a blanket measure for sea turtle conservation, may be ineffective at local community level especially where the traditional harvest for sea turtles is beyond that allowed by law, or where there is subsistence intake to make a livelihood. There is a strong need for the involvement of local communities for effective conservation of sea turtles and their nesting beaches and inshore foraging areas. Fortunately, the political strength of the environment sector in Fiji is growing and so the environment is gaining some profile in national planning.

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7.0 Appendices

Appendix 1: People Consulted in this study:

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|-----|--|-----------------------------------|
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| 4. | Sandeep Maharaj
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| 5. | Neema Nand
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| 6. | Babitu Rarawa
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| 6. | Alifereti Tawake
Scientific Officer | Institute of Applied Science, USP |
| 7. | Dr Hugh Govan
Programme Manager | Coastal Programme, FSPI |
| 8. | Dr Tim Adams
Director (<i>formerly</i> Director for Fiji Fisheries Department) | Marine Resources Division, SPC |
| 9. | Lindsay Chapman
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| 10. | Dr Joeli Veitayaki
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| 11. | Ms Mere Ratanabuabua
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| 12. | Lui Bell
Turtle Project Officer | SPREP |

- | | |
|---|-----------------------------------|
| 13. Helen Sykes | Consultant |
| Resort Support | |
| 14. Prof. Kenneth McKay | USP |
| Director, Institute of Marine Resources | |
| 15. Prof. Robin Meakins | USP |
| Former Lecturer (Biology) | |
| 16. Prof Leon Zann | USP |
| Head of School of Marine Studies | |
| 17. Etika Rupeni | Wildlife Conservation Society |
| Assistant Director | |
| 18. Prof. Bill Aalbersberg | Institute of Applied Science, USP |
| Director | |
| 19. Dave Lucas | Solander (Pacific) Limited |
| Managing Director | |
| 20. Grahame Southwick | Fiji Fish Marketing Group |
| Managing Director | |
| 21. Ian Chute | Celtrock Holdings Ltd |
| Managing Director | |

Appendix 2: Guidelines to Reduce Sea Turtle Mortality in Fishing Operations

(Source: FAO, 2005)

Preamble

The FAO Code of Conduct for Responsible Fisheries calls for sustainable use of aquatic ecosystems and requires that fishing be conducted with due regard for the environment. Some sea turtle stocks are seriously impacted by fishing and require urgent attention. Because of the critical status of these stocks a broad suite of measures is recommended that includes reduction of fishery-related mortality in addition to other conservation measures.

Because of the concern regarding the status of sea turtles and the possible negative effects of fishing on these populations, the twenty-fifth Session of the FAO Committee on Fisheries (2003) raised the question of sea turtle conservation and interaction with fishing operations and requested that a Technical Consultation be held on the subject matter to consider, *inter alia*, the preparation of guidelines to reduce sea turtle mortality in fishing operations. These guidelines respond to the request of the Committee on Fisheries (COFI) and have been developed on the basis of the report of the Expert Consultation, held in Rome in March 2004.

These guidelines are intended to serve as input to the preparation of FAO Technical Guidelines as well as to offer guidance to the preparation of national or multilateral fisheries management activities and other measures allowing for the conservation and management of sea turtles. These guidelines are voluntary in nature and non-binding. They apply to those marine areas and fisheries where interactions between fishing operations and sea turtles occur or are suspected to occur. They are global in scope but in their implementation national, subregional and regional diversity, including cultural and socio-economic differences, should be taken into account.

These guidelines are directed towards members and non-members of FAO, fishing entities, subregional, regional and global organisations, whether governmental or non-governmental concerned with fisheries management and sustainable use of aquatic ecosystems.

All activities associated with these guidelines should be undertaken with the participation and, where possible, cooperation and engagement of fishing industries, fishing communities and other affected stakeholders.

Implementation of the guidelines should be consistent with the Code of Conduct for Responsible Fisheries as well as with the Reykjavik Declaration on Responsible

Fisheries in the Marine Ecosystem with regard to ecosystem considerations and based on the use of best available science.

1. Fishing operations

A. Appropriate handling and release.

In order to reduce injury and improve chances of survival:

(i) Requirements for appropriate handling, including resuscitation or prompt release of all bycaught or incidentally caught (hooked or entangled) sea turtles.

(ii) Retention and use of necessary equipment for appropriate release of bycaught or incidentally caught sea turtles.

B. Coastal trawl

(i) In coastal shrimp trawl fisheries, promote the use of turtle excluder devices (TEDs) or other measures that are comparable in effectiveness in reducing sea turtle bycatch or incidental catch and mortality.

(ii) In other coastal trawl fisheries, collect data to identify sea turtle interactions and conduct where needed research on possible measures to reduce sea turtle bycatch or incidental catch and mortality.

(iii) Implementation of successful methodologies developed as a result of B(ii).

C. Purse seine

(i) Avoid encirclement of sea turtles to the extent practical.

(ii) If encircled or entangled, take all possible measures to safely release sea turtles.

(iii) For fish aggregating devices (FADs) that may entangle sea turtles, take necessary measures to monitor FADs and release entangled sea turtles, and recover these FADs when not in use.

(iv) Conduct research and development of modified FADs to reduce and eliminate entanglement.

(v) Implementation of successful methodologies developed as a result of C(iv).

D. Longline

(i) Development and implementation of appropriate combinations of hook design, type of bait, depth, gear specifications and fishing practices in order to minimise bycatch or incidental catch and mortality of sea turtles.

Recent research has shown positive results for:

- Use of large circle hooks with no greater than a 10 degree offset, combined with whole fish bait. These measures have shown to be effective in reducing sea turtle interactions and mortality;

- Arrangement of gear configuration and setting so that hooks remain active only at depths beyond the range of sea turtle interaction; and

- Retrieval of longline gear earlier in the day and reducing soak time of hooks.

(ii) Research should include consideration of the impact of various mitigation measures on sea turtles, target species and other bycaught or incidentally caught species, such as sharks and seabirds.

(iii) Retention and use of necessary equipment for appropriate release of bycaught and incidentally caught sea turtles, including de-hooking, line cutting tools and scoop nets.

E. Other fisheries

(i) Assessment and monitoring of sea turtle bycatch or incidental catch and mortality in relevant fishing operations.

(ii) Research and development of necessary measures for reducing bycatch or incidental catch or to control mortality in other fisheries with a priority on reducing bycatch or incidental catch in gillnet fisheries.

(iii) In other setnet fisheries, collect data to identify sea turtle interactions and conduct when needed research on possible measures to reduce sea turtle bycatch or incidental catch and mortality.

(iv) Implementation of successful methodologies developed as a result of E (ii) and (iii).

F. Other measures as appropriate for all fishing practices

(i) Spatial and temporal control of fishing, especially in locations and during periods of high concentration of sea turtles.

(ii) Effort management control especially if this is required for the conservation and management of target species or group of target species.

(iii) Development and implementation, to the extent possible, of net retention and recycling schemes to minimise the disposal of fishing gear and marine debris at sea, and to facilitate its retrieval where possible.

2. Research, monitoring and sharing of information

A. Collection of information and data, and research

(i) Collection of data and information on sea turtle interactions in all fisheries, directly or through relevant RFBs, regional sea turtle arrangements or other mechanisms.

(ii) Development of observer programmes in the fisheries that may have impacts on sea turtles where such programs are economically and practically feasible. In some cases financial and technical support might be required.

(iii) Joint research with other states and/or the FAO and relevant RFBs.

(iv) Research on survival possibilities of released sea turtles and on areas and periods with high incidental catches.

(v) Research on socio-economic impacts of sea turtle conservation and management measures on fishers and fisheries industries and ways to improve communication.

(vi) Use of traditional knowledge of fishing communities about sea turtle conservation and management.

B. Information exchange

(i) Sharing and dissemination of data and research results, directly or through relevant RFBs, regional sea turtle arrangements or other mechanisms.

(ii) Cooperation to standardize data collection and research methodology, such as fishing gear and effort terminology, database development, estimation of sea turtle interaction rates, and time and area classification.

C. Review of the effectiveness of measures

(i) Continuous assessment of the effectiveness of measures taken in accordance with these guidelines.

(ii) Review of the implementation and improvement of measures stipulated above.

3. Ensuring policy consistency

A. Maintaining consistency in management and conservation policy at national level, among relevant government agencies, including through inter-agency consultations, as well as at regional level.

B. Maintaining consistency and seeking harmonization of sea turtle management and conservation-related legislation at national, sub-regional and regional level.

4. Education and training

A. Preparation and distribution of information materials such as brochures, manuals, pamphlets and laminated instruction cards.

B. Organisation of seminars for fishers and fisheries industries on:

- Nature of the sea turtle-fishery interaction problem
- Need to take mitigation measures
- Sea turtles species identification
- Appropriate handling and treatment of bycaught or incidentally caught sea turtles
- Equipment to facilitate rapid and safe release
- Impacts of their operations on sea turtles
- Degree to which the measures that are requested or required to adopt will contribute to the conservation, management and recovery of sea turtle population.
- Impacts of mitigation measures on profitability and success of fishing operations
- Appropriate disposal of used fishing gear

C. Promotion of awareness of the general public of sea turtle conservation and management issues, by government as well as other organisations

5. Capacity building

A. Financial and technical support for implementation of these guidelines in developing countries.

B. Cooperation in research activities such as on status of sea turtle incidental catch in coastal and high seas fisheries and research at foraging, mating and nesting areas.

C. Establishment of a voluntary support fund.

D. Facilitation of technology transfer.

6. Socio-economic and cultural considerations

A. Taking into account:

(i) socio-economic aspects in implementing sea turtle conservation and management measures.

(ii) cultural aspects of sea turtles interactions in fisheries as well as integration of cultural norms in sea turtle conservation and management efforts.

(iii) sea turtle conservation and management benefits to fishing and coastal communities, with particular reference to small-scale and artisanal fisheries.

B. Promotion of the active participation and, where possible, cooperation and engagement of fishing industries, fishing communities and other affected stakeholders.

C. Giving sufficient importance to participatory research and building upon indigenous and traditional knowledge of fisherfolk.

7. Reporting

Reporting on the progress of implementation of these guidelines as part of Members' biennial reporting to FAO on the Code of Conduct for Responsible Fisheries and, as appropriate, and, voluntarily, to other relevant bodies such as regional sea turtle conservation and management arrangements.

8. Consideration of other aspects of sea turtle conservation and management

Fishers, research institutions, management authorities and other interested parties dealing with fisheries conservation and management should collaborate with relevant conservation and management bodies, at national, sub-regional and regional level, in the following subject matters:

A. Collection and sharing of information on sea turtles relative to:

(i) Biology and ecology (population dynamics, stock identification, behaviour, diet selection, habitats, breeding, nesting, foraging, migration patterns/areas, nursery grounds, etc).

(ii) Sources of mortality other than fisheries.

(iii) Status of sea turtle populations, including human-related threats.

B. Improvement and development of conservation and management measures applied throughout the sea turtle life cycle (habitat/nesting beach protection, enhancement of sea turtle populations).

C. Promotion, as appropriate, of participation in regional sea turtle conservation and management arrangements with a view to cooperate on sea turtle conservation and management.

Appendix 3: Activity Matrix for SPREP YOST Campaign for 2006

(Source: SPREP, 2006)

Objective 1 of 3:

Objective 1: Promote the conservation of sea turtles at site-level targeting relevant communities and industry				
Key areas	Regional Actions	National Actions	Indicator	Potential partners
1.1 Identify turtle nesting and foraging grounds in the Region	<ul style="list-style-type: none"> Produce a regional map highlighting key turtle nesting sites and foraging areas 		Report documenting important turtle areas in the Pacific region	<ul style="list-style-type: none"> USP SPREP National Governments SPC
1.2 Improve information base to be used by communities and schools	<ul style="list-style-type: none"> Promote the use of TREDIS as a key tool of turtle conservation in the Pacific; Produce/compile relevant educational and awareness material 	<ul style="list-style-type: none"> Adapt TREDIS for national turtle database; Timely submission of turtle data to SPREP; Incorporate relevant material in school curriculum; Disseminate material 	TREDIS installed and used in countries/territories; Material produced.	<ul style="list-style-type: none"> SPREP SPC National Governments
1.3 Strengthen community and industry involvement to reduce threats from: <ul style="list-style-type: none"> over-harvesting habitat destruction marine debris & pollution 	<ul style="list-style-type: none"> Facilitate the replication of successful community based initiatives throughout the region (eg: WanSmolBag community theatre, Village Development Trust) Promote community-based turtle conservation programme. Create Community Award Scheme Work with fishing/shipping industry to encourage best practice for the: <ul style="list-style-type: none"> reduction of turtle by-catch in commercial fishing; prevention of oil-spills/rubbish from boats; reduction of turtle boat strikes. Develop regional blue-bag programme to reduce use of plastic bags 	<ul style="list-style-type: none"> Awareness workshops in communities near important nesting and foraging grounds on issues affecting turtle populations; Develop community turtle nesting monitoring and catch data & occurrence programmes; Develop community programme for turtle nesting areas rehabilitation and protection Advocate the use of a form of agreement between Gov relevant agency & traditional land-owners of turtle nesting areas for conservation of these areas Disseminate available information such as the SPC's guide "Releasing hooked turtles" 	<p>Workshops conducted</p> <p>Community programme initiated;</p> <p>Agreement formed.</p> <p>Fishing boat crews enforcing best practices.</p> <p>Programme initiated in at least 1 country</p>	<ul style="list-style-type: none"> SPREP FSPI WanSmolBag Village Development Trust SPC SPREP NGOs National Governments Communities USP SPC FFA Tuna Commission USP SPREP National Governments SPREP, NGOs, Private Sector/SPC National governments

Objective 2 of 3

Objective 2: Improve Status Information and Promote sustainable management of sea turtle populations and protection of their habitats through effective national legislation and policies				
Key areas	Regional Actions	National Actions	Indicator	Potential partners
2.1 Improve national management framework for turtle conservation	<ul style="list-style-type: none"> ▪ Review effectiveness and relevancy of existing legislation and policies concerning turtle conservation ▪ Support development of national conservation protocols 	<ul style="list-style-type: none"> • Adopt national policies and legislation for the effective conservation of turtles and protection of their habitats including: <ul style="list-style-type: none"> - guidelines for turtle eco-tourism activities based on turtles; - Incorporation of guidelines in policies and legislation; - Incorporation of provisions prohibiting the keeping of turtles in captivity for any other purpose, and for reduction of threats, in relevant national in policies and legislation; Incorporation of consideration for turtle nesting areas in policies and legislation for EIAs and coastal development. Special attention should be paid to the nesting beaches for the highly endangered leatherback turtles so that they are placed under special protection via informal agreements or nationally gazetted. 	<p>Regional turtle legislation review completed;</p> <p>Improved policies and legislation developed.</p>	<p>SPREP SPC National Governments NGOs</p>
2.2 Increase scientific knowledge	<ul style="list-style-type: none"> ▪ Strategy to support national turtle research and surveys ▪ Regional satellite tagging programme 	<ul style="list-style-type: none"> • Identify nesting sites and species nesting; • Assist national surveys on turtle nesting • Satellite tagging programme in at least 3 "new" countries/territories 	<p>National reports</p> <p>Turtles tagged/ released and information available</p> <p>Programme in place</p>	<p>All</p> <p>SPREP SPC USP SPC</p>
	<ul style="list-style-type: none"> ▪ Collect specific data on sea turtle interaction from commercial fisheries 			SPC
	<ul style="list-style-type: none"> ▪ Collect data to produce a status of the sea turtle document by PICT by 2007 		Report	SPC SPREP

Objective 3 of 3

Objective 3: Establish a collaborative strategy and advance Partnership for Long-term support for turtle conservation in the Pacific Region				
Key areas	Regional Actions	National Actions	Indicator	Potential partners
3.1 Foster regional coordination and collaborative mechanisms	<ul style="list-style-type: none"> ▪ Re-activate and improve coordination and collaboration of the RMTCP 	Active participation of representatives	RMTCP meeting	SPREP All
	<ul style="list-style-type: none"> ▪ Develop a collaborative strategy for the ongoing and long-term monitoring and evaluation of sea turtle populations and the success of the YOST campaign 		Strategy formulated	All
3.2 Promote regional and international arrangement for conservation of turtles.	<ul style="list-style-type: none"> ▪ Encourage and facilitate accession to relevant international conventions, such as CMS; ▪ Promote/facilitate development and participation in regional arrangement for the conservation of turtles and their habitats e.g. a regional arrangement under CMS; ▪ Explore international arrangements for the conservation and protection of the highly endangered leatherback turtles. 	<ul style="list-style-type: none"> • Accession to relevant conventions; • Participation in regional effort/arrangement for the conservation of turtles and their habitats 	<p>Increased number of Pacific Islands countries becoming members to relevant conventions such as CMS;</p> <p>Regional turtle conservation arrangement undertaken</p>	SPREP All

**Appendix 4 : Participants from the Sea Turtle Conservation Strategy
Workshop, 31 May to 1 June, 2006.**

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