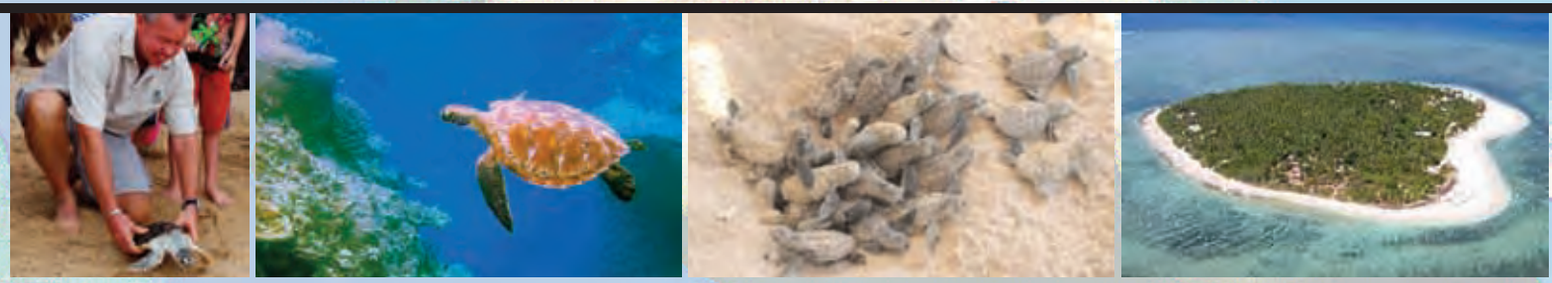
MAMANUCA
TURTLE CONSERVATION
PROJECT

BEST PRACTICES GUIDELINES AND POLICY

MAMANUCA SEA TURTLE CONSERVATION PROJECT



Compiled by Institute of Marine Resources (IMR), Mamanuca Environment Society (MES), WWF South Pacific Programme (WWF SPPO), Fiji Department of Fisheries and Fiji Department of Environment

USP THE UNIVERSITY OF THE SOUTH PACIFIC
gef
SGP The GEF Small Grants Programme
UNDP
nzaid
WWF

LIST OF ACRONYMS

BSC	Biodiversity Strategy Committee
CITES	Convention on International Trade of Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMA	Environment Management Act
EPS	Endangered and Protected Species Act
FAO	Food and Agriculture Organization of the United Nations
FNBSAP	Fiji National Biodiversity Strategic and Action Plan
IMR	Institute of Marine Resources
IUCN	The World Conservation Union (International Union for the Conservation of Nature)
MES	Mamanuca Environment Society
NBSAP	National Biodiversity Strategic and Action Plan
RMTCP	Regional marine Turtle Conservation Programme
SPREP	Secretariat of the Pacific Regional Environment Programme
TREDS	Turtle Research and Monitoring Database System
USP	University of the South Pacific
WWF	Worldwide Fund for Nature

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EXECUTIVE SUMMARY

Seven species of marine turtles exist globally, the significance of which vary widely between and within countries. Marine turtles are air breathing animals which have existed for about 200 million years. Turtles are an important source of protein in some countries and all have a high commercial value which is why they are exploited and have become endangered over time (FAO Species Catalogue 1990). The major threats to sea turtles include incidental take, direct hunting and loss of coastal habitat. Historically, the sea turtle population decline was due to the hunting for their carapace to use as jewelry and ornaments. In addition, people have continuously hunted turtles and their eggs for food (Geldiay et al. 1982). International conservation efforts include the Convention on the International Trade of Endangered Species (CITES) and the Convention of Migratory Species (CMS).

According to Pritchard (1980) usually sea turtle conservation efforts fall into one of the following categories: (a) "the passage of laws to prevent sea turtles from featuring in international commerce", (b) "the protection of nesting female turtles form poaching by the establishment of beach patrols", (c) "the movement of eggs to beach hatcheries or to artificial incubators such as Styrofoam boxes, with release of hatchlings as they emerge", (d) "maintaining hatchling turtles in captivity for a period of time until they have grown sufficiently to be deemed safe from the majority of hatchling predators ("head-starting") and (e) "the distribution of hatchling turtles (or eggs) from a healthy breeding population to areas where the turtles have disappeared due to over-exploitation".

Current turtle conservation initiatives in the Pacific region have developed in recognition of the fact that out of seven of the turtle species, five are classified as 'Endangered' or 'Critically Endangered' on the IUCN Red List (IUCN 2006). Out of the seven species of sea turtles, six occurs in the Pacific and their listed by the 2006 IUCN Red List of Threatened Species are as follows: Leatherback: critically endangered; Hawksbill: critically endangered; Olive Ridley: endangered; Loggerhead: endangered; Green: endangered; Flatback: data deficient. A Marine Turtle Action Plan 2008-2012 has been established in the Pacific Islands region by the Secretariat of the Pacific Regional Environment Programme (SPREP), the goal of which is to conserve marine turtles and their habitats, in keeping with the traditions of the people of the Pacific Island region. The main challenges to effective conservation of marine turtles in the region include the lack of data on populations, harvesting and interactions with fishing activities due to limited research and monitoring. A major constraint is limited resources, both financially and in terms of manpower (including skills) available for implementing management actions in the region (SPREP 2007).

Fiji faces numerous constraints, similar to those of other Pacific Island Nations – "the most challenging being the limited scientifically based information on turtle population stocks and also the limited technical and financial capacity within countries to strategically address turtle conservation (Fiji Sea Turtle Recovery Plan 2008). Turtles in Fiji are currently protected under the following policies, the Fisheries Act (CAP 158) – Protection of Turtles – Amendment, which was enforced on February a, 2001 and expires on the 31st December 2018; the Environment Management Act (EMA) which is based on the principles of sustainable use and development of natural resources; the EPS Act which applies to the endangered and/or protected species listed under CITES (Appendix I/II/III, Schedules 1 and 2 of this Act); the Marine Spaces Act which sets out the boundaries and rights pertaining to internal waters, archipelagic waters, territorial seas, exclusive economic zone, and the continental shelf in relation to Fiji's rights; and the Fiji National Biodiversity Strategy and Action Plan developed in compliance with obligations of the Convention on Biodiversity which enables conservation and sustainable use of Fiji's terrestrial, freshwater and marine biodiversity and to maintain the ecological processes and systems which are the foundation of national and local development.

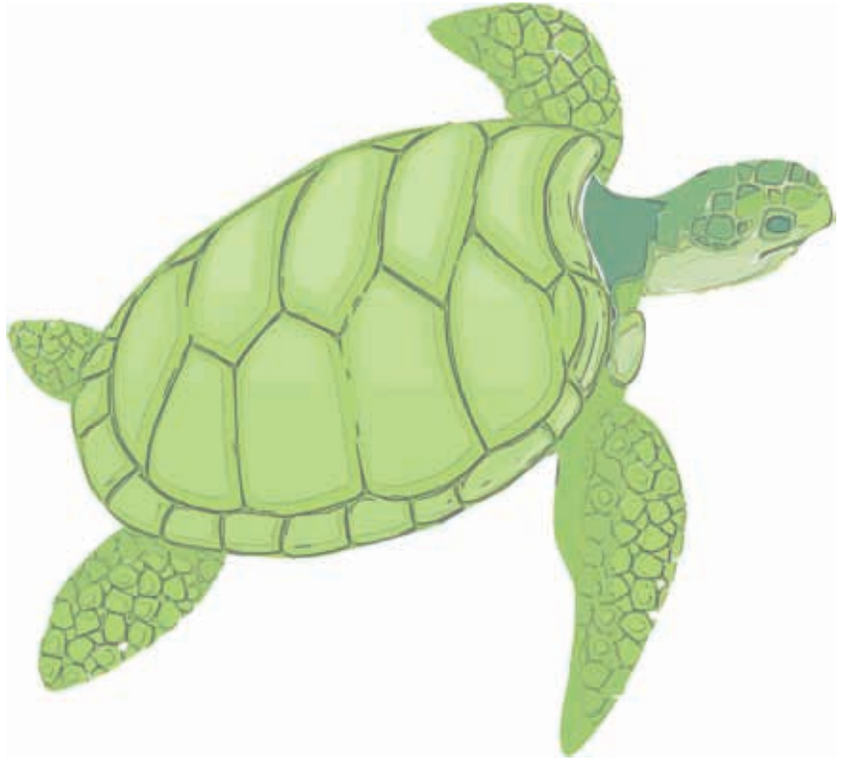
The development of the Fiji Sea Turtle Recovery Plan (FSTRP) occurred over a period two years and involved a wide range of stakeholders from Government to local communities. The overall goal of the FSTRP is that by 2026, sea turtle populations in Fiji have measurably recovered to levels allowing for sustainable harvest & traditional use. (This will be through mechanisms that facilitate community & national action to significantly reduce particular threats encountered by turtles). There are five components under which specific activities are attached. The components are: 1.Significantly reduce the mortality of marine turtles by addressing domestic consumption, by-catch and compliance with the Moratorium; 2. Develop programmes and protocols to monitor marine turtle populations (nesting and foraging) in Fiji waters; 3. Manage factors that impact on successful marine turtle nesting; 4. Identify and protect habitats that are critical to the survival of marine turtles; 5. Communicate the results of recovery actions and educate stakeholders.

The Best Practice Guidelines for turtle conservation in the Mamanuca Islands have been adopted from the "Code of Practice for the Sustainable Management of Dugong and Marine Turtle Tourism in Australia". The Guidelines have been prepared in consultation with the participants of the Best Practices Guideline workshop conducted on the 28th and 29th of August 2010, on Bounty Island and organized by the Institute of Marine Resources (IMR) and the Mamanuca Environment Society (MES). The Guidelines have been designed to aid traditional owners, tourism operators and respective government departments to work together in order to develop culturally appropriate tourism involving marine turtles.

The overall recommendations derived from the workshop discussions were: 1. Baseline information related to all species of turtles in the Mamanuca Islands would be greatly beneficial. This information needs to be updated on a regular basis and distributed to all stakeholders. Potential data includes: geographical distribution and location of all nesting beaches, peak seasons of breeding and presence, specific nest location, listing and location of turtle threats, water depths including channels and those directly around islands, and location of foraging grounds; 2. Environmental Impact Assessment for resorts should take into account important turtle life history information such as nesting areas, foraging areas, and important turtle habitat. Consideration should be given to both the effect of the proposed development and building as well as the impact of the construction of these structures; 3. Protocols and contact information for reporting of injured turtles should be developed and/or distributed.

1. INTRODUCTION

Sea turtles inhabit all parts of the globe except for Polar Regions (FAO Species Catalogue 1990). The seven species which represent sea turtles differ widely in their seasonal cycles, geographical ranges and behavior, despite their circum-tropical distribution. “All sea turtles have a high commercial value” (FAO Species Catalogue 1990).The significance of these animals varies among different countries and locally within countries. Sea turtles are considered as an important source of protein in some areas, while in other places they are used as a delicacy. They have been known to be the object of ancient rituals practices and/or as being venerated as sacred animals (FAO Species Catalogue 1990). Nowadays, sea turtles are a great attractant in the tourism industry as well. Utilizing turtles for commercial tourism comes with the responsibility to ensure that their use is not only sustainable in and of itself, but that such tourism also contributes actively to the conservation of the animals and the habitats on which they depend.



1.1 Turtle Biology

Turtles are Anapsid Reptiles and fall under the Subclass Anapsida, and Order Testudines (Chelonia) (Hickman et al. 2001). Since the time of the first appearance of turtles in the Upper Triassic (about 200 million years ago), to the present there has been very few changes to their morphology. Their body is enclosed in a shell, consisting of a dorsal carapace and a ventral plastron. The shell consists of two layers: the outer keratin layer and the inner bone layer. As the turtle grows and ages, new layers of keratin are laid beneath the old layer. The fusion of ribs, vertebrae, and many dermally-ossifying elements form the bony layer. The limbs and limb girdles of turtles are situated inside this bony layer (this morphological feature is unique among vertebrates since the turtle has its limbs and limb girdles inside the ribs). Turtles have tough, horny plates for gripping food in lieu of teeth. Turtles use lungs for breathing; the sea turtles can obtain ample oxygen by just pumping water in and out of a vascularized mouth cavity for long periods, however, they must surface more frequently for lung breathing when active. Turtles have poor hearing sense and are virtually mute; compensating for this are a good sense of smell, acute vision and color perception evidently as good as that of humans (Hickman et al. 2001).

Turtles have internal fertilization after which they bury their shelled, amniotic eggs in the ground. The sex of the eggs is temperature dependent; low temperatures during incubation produce males and high temperatures produce females (Hickman et al. 2001).

1.2 Sea Turtle Threats

The major threats that endanger sea turtles include incidental take, direct hunting and loss of coastal habitat. Due to their need to breathe at the water surface, sea turtles get trapped in nets and trawls. Incidental take of turtles by trawlers (particularly shrimp trawlers) has been identified as the single greatest cause of sea turtle mortality in commercial fisheries since the 1970s (Geldiay et al. 1982). In addition to trawlers, sea turtles also get caught in other fishing gear, including longlines and gill nets. Other issues associated with the decline of sea turtle species population include pollution, beach invasion, poaching, entanglement of set-nets and alteration of the coastal zones due to natural (cyclones) and/or human-induced factors (coastline engineering) (FAO Species Catalogue 1990).

Historically, the sea turtle population decline was due to the hunting for their carapace to use as jewelry and ornaments. Many sea turtles are slaughtered, often when they are still at the nesting beaches and their eggs raided by humans and/or other predators. There have been many courses of action initiated by conscientious observers of sea turtles during the last five decades, designed to slow the slaughter and reverse the trends towards the extinction of sea turtle populations (Pritchard 1980). Some of these are discussed in the following section.
temperatures produce females (Hickman et al. 2001).

2. TURTLE CONSERVATION PRACTICES

"All species of marine turtles are listed in Appendix I of CITES, which means that all marine turtle species are considered to be threatened with extinction under this convention and commercial international trade in specimens of these species is generally prohibited. Under the Convention on the Conservation of Migratory Species of Wild Animals (CMS), marine turtle species are listed in Appendix I (migratory species that are categorized as being in danger of extinction throughout all or a significant proportion of their range) and Appendix II (migratory species that have an unfavorable conservation status or would benefit significantly from international cooperation organized by tailored agreements)" (Secretariat of the Pacific Regional Environment Programme, 2007).

A dilemma faced by turtle conservationists is whether to permit exploitation of turtles themselves and to protect their eggs, or to allow a controlled egg harvest and to protect the turtles themselves. Both scenarios stress the sea turtle populations in a slow and unpredictable manner. The response of sea turtles to conservation measures is also slow and unpredictable (Pritchard 1980).

One of the common methods of monitoring sea turtle populations is by counting the number of females on nesting beaches (Pritchard 1980). However, the numbers of females nesting on particular beaches are not consistent every year. For instance, Limpus (1978) showed that only 19 green turtles nested on Heron Island, Australia, in 1975-76, whereas, 1 100 had nested there the previous season. Hence, turtle conservationists and biologists have attempted and/or created various sea turtle population modeling techniques. In order to derive an accurate picture of the population dynamics of any sea turtle species, the essential parameters that need to be considered include sex ratio at hatching – or at maturity or the average number of nesting seasons that a given adult female will survive (Pritchard 1980; Crouse et al. 1987; Mazaris et al. 2006).

According to Pritchard (1980) usually sea turtle conservation efforts fall into one of the following categories: (a) "the passage of laws to prevent sea turtles from featuring in international commerce", (b) "the protection of nesting female turtles form poaching by the establishment of beach patrols", (c) "the movement of eggs to beach hatcheries or to artificial incubators such as Styrofoam boxes, with release of hatchlings as they emerge", (d) "maintaining hatchling turtles in captivity for a period of time until they have grown sufficiently to be deemed safe from the majority of hatchling predators ("head-starting") and (e) "the distribution of hatchling turtles (or eggs) from a healthy breeding population to areas where the turtles have disappeared due to over-exploitation". Each of these conservation efforts have been discussed in the sections below.

2.1 International Ban on the Use of Sea Turtles and their Products in Trade

The rationale behind placing bans on the use of sea turtles and their products in trade is that if a turtle product is harder to sell because markets have been closed, prices will be lower and the pressure on the turtle populations will drop (Pritchard 1980). This approach has been used to place sea turtles under Appendix I of the CITES Convention, listed as endangered or threatened under the US Endangered Species Act, and so on. This course of action for sea turtle conservation would work perfectly in developed and wealthy countries where poaching is controllable and the income that could be generated from turtle exploitation can be denied without causing problems. However, it would be difficult to employ this method of sea turtle conservation in developing countries where significant numbers of people are hungry, and governmental resources, especially in law enforcement, are inevitably directed strongly towards commercial areas. In such countries a flat ban may be simply an illusion that the situation is under control (Pritchard 1980).

Therefore, in developing countries the question is not whether to ban sea turtle trade or not but how to effectively ban the turtle trade. Pritchard (1980) states that some industrial users of sea turtles believe that "there are definite benefits from having the highest possible price for turtle products; benefits not just for the industry, but also for the turtle populations themselves". Large scale entrepreneurs and the government would devise plans to institute some rational controls on the exploitation, which would subsidize such measures as protection of nesting beaches by such means as tax levies on each turtle caught or sold, if the turtle industry is potentially profitable. Hence, if there are no profits involved, the turtles will be killed wastefully and no money will be available to be turned back into management and conservation of the species (Pritchard 1980). However, there have been instances where Third World Countries such as Surinam and Costa Rica, have demonstrated that a country does not have to be wealthy to afford turtle protection. Other nations which have demonstrated strong protective policies in certain areas of their jurisdiction include Mexico, which protect ridleys on the Gulf Coast, and Ecuador, which protects all sea turtles in the Galapagos Islands. However, these same nations practice rapacious exploitation of ridleys on their Pacific coasts (Pritchard 1980).

Another reason as to why simple bans on taking or trading sea turtle may not be the sole salvation for these animals is the issue of incidental capture by trawls. Some form of controls or no-trawling zones need to be established in areas where incidental capture by trawls are frequent. However, by placing bans on turtle trade, those who may provide the very data needed on where trawlers often catch sea turtles would be outlawed (Pritchard 1980).

2.2 Use of Beach Patrols for Protection of Female Turtles during Nesting Seasons

One of the keys to any turtle conservation would be to protect the female turtles during the nesting season. The turtle nesting phase is a vulnerable phase whereby a nesting female can be killed by poachers inconsiderate of the high number of turtle hatchlings which would be produced from it.

The majority of the tagged female green turtles are never seen back on the nesting beach in subsequent years. Even though the green turtle species is protected and not exploited, the percentage return rate of the tagged females during the nesting season of this species is relatively low; 11.8% were found at Tortuguero, 1.8% at Ascension Island, 0.9% in Sarawak and 1.0% at Heron Island, Great Barrier Reef (Pritchard 1980). Pritchard (1980) however, states that the low percentage of the return rate may be due to other factors such as incomplete beach coverage by patrols and instances when tags are shed and the scar heals over virtually undetected, especially when a harried beach patroller is checking for tags on an uncooperative turtle under the cover of darkness.

It is essential to monitor nesting beaches by the means of beach patrols since with sea turtles some individuals can survive for three, four or five nesting seasons.

2.3 Hatchery Establishments or Artificial Incubation of Eggs by means of Styrofoam Boxes

The turtle eggs while in its nests are subjected to total or near total predation. In order to protect the eggs from being preyed upon one of the best practices would be to control or intercept its predators. However, apart from predation turtle eggs are also threatened by coastal erosion phenomena; which may be due to natural and/or human-induced causes. In order to enhance the turtle's chances of reproductive success in such cases it would seem appropriate to re-locate the eggs to a safer place (Pritchard 1980).

Although hatcheries are important and in some cases vital, the temptation to move turtle eggs should be resisted on principle. In almost all cases, the movement of turtle eggs by the usual techniques reduces hatching percentage from approximately 90% to 50-70%. Taking this percentage into consideration, if only 25% of the eggs were to be subjected to destruction by natural predation, erosion etc., the hatchery may actually constitute a net drain on the population (Pritchard 1980). In addition, there is still little known about the means by which turtles relocate to the beach of their birth when it is time for nesting. Hence, it is essential to accord particular importance to the early minutes and hours of a turtle's life, at which stage "imprinting" may take place. A number of factors may influence hatchlings if the eggs are moved to a hatchery including the artificial confinement of hatchlings within wire mesh cages until the sun is up and the placement of turtles straight into the sea without letting them run down the beach may short-circuit vital imprinting mechanisms. Other problems associated with hatchery reared turtle eggs may be that hatchery-produced turtles will not enter the sea at the optimal stage of their infantile activity frenzy, and will be subjected to excessive near shore predation or the release of hatchling at a particular time and place in the morning may caution predators of the availability of their prey at that particular time (Pritchard 1980). Therefore, running a hatchery for sea turtle eggs should only be considered if that is the only option for producing a reasonable number of hatchlings on a given beach. However, it should be ensured that the hatchery duplicates a natural nest as closely as possible during the potentially critical early hours, from emergence at the sand surface to entering the sea (Pritchard 1980).

Another issue associated with hatchery rearing of turtle eggs is that it is difficult to monitor survivorship of the young turtles produced. There are difficulties in identifying tags which had been placed on a 30-g animal when it grows to a weight of 150 kg. Apart from the difference in size of individual animals from a hatchling stage to an adult stage, there is also the problem of the great number of hatchlings that need to be tagged. It is not economical to tag enormous hatchlings that are produced, only to have a few of them surviving. The technique involving the excision of a certain marginal scute, together with the unlying bone, from large series of hatchlings may be more successful than others. The year-class of the animal will be evident if a different scute is excised each year. This technique has been used in Australia, South Africa and Florida. Although individuals have been caught in subsequent years that seemingly had been treated in this way, it could never be certain whether the injury was not inflicted by some natural cause or accident (Pritchard 1980).

Styrofoam boxes have been found to promote control and protection of turtle nests from environmental inclemencies and predators. However, the issue with this method of protection is that of severe distortion of sex ratios. Experiments related to constant temperature conditions (Styrofoam provides an almost constant temperature environment) indicate that a few degrees deviation from the optimal temperature can produce an almost or completely mono-sexual brood (Pritchard 1980).

2.4 Head Starting

The three stages of sea turtles in which the most mortality occurs include: (a) the egg stage, (b) while hatchlings are crawling to the water and (c) during their first few months to years of life at sea. Head-starting is a technique that was developed to aid sea turtles in avoiding predation during stages (b) and (c). Theoretically, turtles which have undergone the head-starting technique are grown to a point that makes them less vulnerable to predators. Once the turtles have reached a particular size, they are released into the ocean (Spotila 2004).

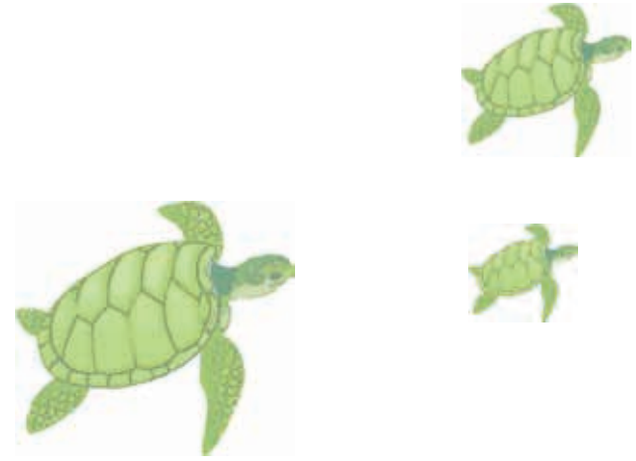
There are a number of problems associated with the head-starting technique including the danger of short-circuiting imprinting mechanisms (which is more severe than that in the operation of a hatchery), and "taming" of captive raised turtles; these turtles could then associate the appearance of man with feeding time and when released may approach random boats. A policy issue related to the releasing of the turtles could be the appropriateness of releasing the head-started turtles on their natal beach or where similar-sized wild individuals of the species already occur; for better chances of survival (Pritchard 1980).

A famous head-starting project involving Kemp's ridley turtles in Mexico, had the survival of only 15 known nesting adults after 15 years of research. Even though 15 is just the "known number" of individuals which survived, the consensus is that this technique was too expensive and the money could have been better spent in protecting the nesting beaches in Mexico. The estimated cost of head-started nesting females was about $185 525. Considering such a high cost, it would be much more cost effective to reduce or prevent deaths of sea turtles in the ocean and to protect natural nesting beaches than it would be to produce thousands of head-started juveniles which would have a low survival rate (Spotila 2004).

Ranching and Captive Breeding

"'Farming' sea turtles has been proposed for over 30 years as potentially useful activity but remains divisive and controversial. Proponents promote farming as a method to save turtles, while opponents claim that farms actively contribute to sea turtle declines. This paper discusses the general implications of sea turtle farming from a conservation perspective to provide background for a discussion of what contribution farming and ranching might make to hawksbill sea turtle conservation in the wider Caribbean region. Discussion is restricted to sea turtles raised primarily for commercial purposes, the constraints imposed by sea turtle physiology, and whether such activities might have conservation benefits. The technical aspects of turtle farming are only presented in general terms. Wood and Wood (1980) and Jacobson (1996) provide an entry to this material.

There are two ways to "farm" sea turtles: (1) maintaining captive adults who breed in captivity and whose offspring are raised for use ("Captive Breeding", often termed "Farming") and (2) collecting turtles from wild populations (as eggs or hatchlings) which are then raised in captivity for use ("Ranching"). These definitions are derived from the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which regulates international commercial trade from Captive Breeding and Ranching in different ways. In this paper, the term "farm" is used interchangeably to describe any facility holding captive turtles from either wild or captive bred sources, and sometimes both, for commercial production." (www.cites.org/eng/prog/hbt/bg/ranch_breed.shtml).



2.5 Release of Turtle Hatchlings Away from the Original Nesting Beaches

Releasing of turtle hatchlings far from their original nesting beaches and from another location where they were once common is one of the techniques employed by Archie Carr during the "Operation Green Turtle". Carr released green turtle hatchlings from a number of sites around the Caribbean at which green turtles were once common. Although Carr did not observe the return of any green turtles on the nesting beaches at the time he conducted his experiment, green turtles are once again being reported in some places from where they were released, namely Antigua and Colombia. This technique has also been employed to revive populations of Kemp's Ridley and loggerhead turtles. One of the issues relative to the use of this technique is whether the positive results obtained from this technique are desirable. If turtles are not found to be nesting in the desired locations it may be because the habitat is not suitable for them. In such a case it may be a waste of resources to revive turtle populations (Pritchard 1980).

3. REGIONAL EFFORTS ON TURTLE CONSERVATION

Current turtle conservation initiatives have developed in recognition of the fact that out of seven of the turtle species, five are classified as 'Endangered' or 'Critically Endangered' on the IUCN Red List (IUCN 2006).

3.1 Sea Turtles of the Pacific Region

Out of the seven species of sea turtles, six occurs in the Pacific. These include Flatback turtle (Natator depressus), Green turtle (Chelonia mydas), Hawksbill turtle (Eretmochelys imbricata), Leatherback turtle (Dermochelys coriacea), Loggerhead turtle (Caretta caretta) and Olive Ridley turtle (Lepidochelys olivacea). Out of these six species of sea turtles that occur in the Pacific region, the most common are the Green and Hawksbill turtles. The Green and Hawksbill turtles have also been observed to nest in most Pacific Island countries and territories. "The Flatback turtle is known to occur only in Australia and southern Papua New Guinea (Secretariat of the Pacific Regional Environment Programme, 2007).

Marine turtles of the Pacific as listed by the 2006 IUCN Red List of Threatened Species are as follows:

- Leatherback: critically endangered
- Hawksbill: critically endangered
- Olive Ridley: endangered
- Loggerhead: endangered
- Green: endangered
- Flatback: data deficient

Sea turtles have a long life and are slow to mature, using a range of habitats at different stages of their life cycle. They readily cross jurisdictional boundaries, since they are highly migratory and capable of traveling thousands of miles. Over the entire period of their existence, sea turtles are vulnerable to a variety of threats due to their life history characteristics. Due to their migratory nature, the conservation of sea turtles requires a rigorous, coordinated regional effort among a range states and territories. There is also a need for information exchange, linkages and collaboration at national, regional and international levels in order for conservation and management efforts for sea turtles to be effective (Secretariat of the Pacific Regional Environment Programme, 2007).

3.2 Marine Turtle Action Plan 2008-2012

A Marine Turtle Action Plan 2008-2012 has been established in the Pacific Islands region by the Secretariat of the Pacific Regional Environment Programme (SPREP). The goal of this action plan is to conserve marine turtles and their habitats, in keeping with the traditions of the people of the Pacific Island region. "This action plan recognizes the fundamental role that traditional knowledge and customs play in turtle conservation, and aims to address the issue of community-based management" (Secretariat of the Pacific Regional Environment Programme, 2007).

In the Pacific Islands region the status of marine turtles is generally unknown. An increasing number of initiatives are being undertaken at local and regional levels, as a response to growing concern over the last 10 years on the need for sea turtle conservation and sustainable use in the region (Secretariat of the Pacific Regional Environment Programme, 2007). The themes and objectives that the Marine Turtle Action Plan 2008-2012 addresses are summarized below.

Table 1. Themes and objectives of the Marine Turtle Action Plan 2008-2012

THEME	OBJECTIVE
Collaboration and Partnership	Increase regional collaboration and partnerships for turtle conservation and management.
Threats	Improve management and protection of marine turtles and their habitats by reducing threats to them in the Pacific Island region.
Capacity Building	Improve capacity within each participating country and territory for marine turtle protection, management, and population research and monitoring.
Education and Awareness	Provide assistance to participating member agencies to enable them to deliver effective and accurate education and awareness programmes to the people of the Pacific region.
Policy and Legislation	Ensure a more cohesive approach in policy and legislation in SPREP member countries and territories to support the Regional Marine Turtle Conservation Programme (RMTCP) that incorporates traditional knowledge and customary marine tenure.
Traditional Knowledge and Customary Practices	Encourage a cohesive approach to policy and legislation in SPREP member countries and territories that supports, promotes and formally protects traditional knowledge, practices and resource management.
Sustainable Development	Promote the sustainable use of marine turtles.
Turtle Database	Implement the Turtle Research and Monitoring Database System (TREDS) in SPREP member countries and territories.
Research and Monitoring	Identify all major turtle nesting beaches in the Pacific Islands region. Identify major turtle stocks in the Pacific Island region. Identify major foraging grounds in the Pacific Island region.

(Source: Secretariat of the Pacific Regional Environment Programme 2007)

"The main challenges to effective conservation of marine turtles in the region include the lack of data on populations, harvesting and interactions with fishing activities due to limited research and monitoring. A major constraint is limited resources, both financially and in terms of manpower (including skills) available for implementing management actions in the region (Secretariat of the Pacific Regional Environment Programme 2007).

4. SEA TURTLE CONSERVATION PRACTICES IN FIJI

4.1 Fiji's Efforts for Sea Turtle Conservation

According to documented and anecdotal records there are a total of five sea turtle species found in Fiji waters (Fiji Sea Turtle Recovery Plan 2008). These include the Green turtle (Chelonia mydas), Hawksbill turtle (Eretmochelys imbricata), Loggerhead turtle (Caretta caretta), Leatherback turtle (Dermochelys coriacea), and Olive Ridley turtle. Like numerous other Pacific Island Countries, Fiji has formulated and is implementing sea turtle conservation projects. However, Fiji faces numerous constraints, similar to those of other Pacific Island Nations – "the most challenging being the limited scientifically based information on turtle population stocks and also the limited technical and financial capacity within countries to strategically address turtle conservation" (Fiji Sea Turtle Recovery Plan 2008).

"Turtles in Fiji are currently protected under the Fisheries Act (CAP 158) – Protection of Turtles – Amendment, which was enforced on February a, 2001 and expires on the 31st December 2018. The Moratorium disallows for any killing, selling or harvesting of meat, eggs or shell during this period, unless with prior exemption obtained from the Minister of Fisheries. Anyone in breach of these regulations is liable to a fine of FJD 500 or a jail term of up to five months. This is the second such Moratorium enacted. A first was enforced in 1995 and expired in 2000. Prior to that, turtles were protected under the Fisheries Act which regulates the methods of capture, imposes size limits and close seasons and prohibited the sale of turtle shells" (Section 4.2.1) (Fiji Sea Turtle Recovery Plan 2008).

4.2 National Laws, Policies and Plans Associated with Sea Turtle Conservation

4.2.1 Fisheries Act

The Fiji Fisheries Act which is currently under review is the key legislation which regulates the marine activities in Fiji waters. The management and enforcement of the Fisheries Act is carried out by the Fisheries Department, of the Ministry of Fisheries and Forests. This Act outlines the criteria to sustainably manage marine resources by placing restrictions on the catches and fishing areas as well as policing fishing licenses.

For the purpose of conservation, size and take limits have been placed on marine fish and invertebrates; fish, crabs, turtles, trochus, davui (triton) and giant helmet shell. Taking shells and selling, offering and exporting of davui (triton), giant helmet shells and turtle shells and its derivatives are prohibited. There are also export restrictions on giant clam meat, beche-de-mer and fish. However, under Regulation 27 (Part VI, Section 9) of the Fisheries Act, written exemptions can be made on the above, by the Permanent Secretary for Agriculture and Fisheries or any person appointed by him.

4.2.2 Environment Management Act

The Environment Management Act (EMA) is based on the principles of sustainable use and development of natural resources. It recognizes the significance of the preservation of coastal zones, wetlands, lakes and rivers, the protection of outstanding natural features, the relationship of indigenous Fijians with their ancestral lands and waters and the protection of human life and health.
One of the new processes that the EMA has introduced is the Environmental Impact Assessments (EIA). "Under the Environmental Impact Assessment (EIA) procedures, any development proposals, unless exempt, are considered to have the potential for significant environmental or resource management impacts and therefore, must undergo an assessment under the EIA process. These development proposals may also be subject to approvals under the Town Planning Act. Responsibility for the undertaking of the EIAs has been tasked to the Department of Environment. Led by the EIA Administrator, the Department is responsible for examining and processing every development proposal that is referred to it by the approving authority" (Policy, Law and Institutional Capacity Report 2009). The EIA processes also give consideration to the critical habitats for endangered species.

4.2.3 The Endangered and Protected Species Act (EPS)

The EPS Act applies to the endangered and/or protected species listed under CITES (Appendix I/II/III, Schedules 1 and 2 of this Act). The Act prohibits the trade of the animal species under Appendix I or II that are bred in captivity, unless exempted by the relevant authorities. In addition, the international trade of turtle shell or its derivatives are prohibited under the CITES legislation. The breach of the CITES regulations can have a person liable to a fine of FJD 20 000 or a jail term of six months.

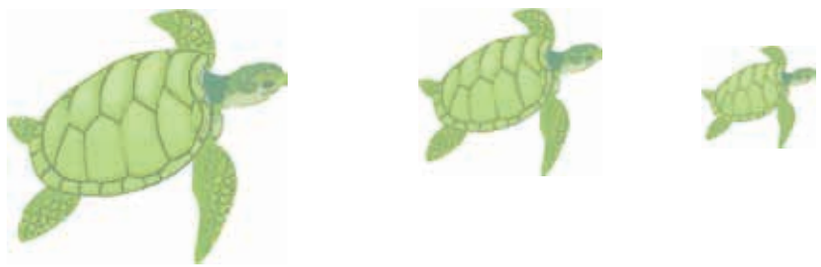
4.2.4 Marine Spaces Act

"The Act sets out the boundaries and rights pertaining to internal waters, archipelagic waters, territorial seas, exclusive economic zone, and the continental shelf in relation to Fiji's rights. The Act enables regulations pertaining to the management of fisheries to be determined by the Minister, including: allowable catches by Fijian and foreign vessels; licensing of fishing vessels; and appointment of Fisheries Officers. The Act also details penalties for misconduct under the Act's regulations including the loss of fishing license and fines, however, it does not provide for regulations of inshore fisheries with the licensing regulations and subsequent enforcement regulations applying only to EEZ" (Environment Report 2009).

4.2.5 Fiji National Biodiversity Strategic and Action Plan (NBSAP)

In compliance with obligations of the Convention on Biodiversity, the Department of Environment in collaboration with key government and non-government stakeholders, have developed a National Biodiversity Strategic Action Plan (NBSAP) for Fiji which was published in 2007. The goal of the Fiji National Biodiversity Strategy and Action Plan (FBSAP) is to "conserve and sustainably use Fiji's terrestrial, freshwater and marine biodiversity and to maintain the ecological processes and systems which are the foundation of national and local development".

The FBSAP was developed in the context of existing reports including, Fiji State of Environment (GOF, 1992), The National Environment Strategy (GOF, 1993), Sustainable Development Bill (1997) and Revised Sustainable Development Bill (1999). The FBSAP focuses on six themes each with specific objectives. The six themes are: Community support – awareness, involvement & ownership; Improving our knowledge; Species Conservation; Management of invasive species; Capacity building & strengthening;
Also contained in the FBSAP is an implementation framework with the management structure which states that the Biodiversity Strategy Committee (BSC) chaired by the Department of Environment leads and coordinates the implementation of the FBSAP and reports progress to the National Committee on Sustainable Development on an annual basis (Fiji Biodiversity and Action Plan) (www.environment.gov.fj).



4.2.6 Fiji's commitment to International Treaties and Conventions

The table below gives a summary of the International Conventions and treaties that Fiji is a party to. It also indicates the dates of signature, ratification and entry into force of each Convention.

Table 2. The treaties and Conventions which Fiji is party to.

Treaties/Conventions	Date of Signature	Date of Ratification	Entry into Force
UNCLOS III	10.12.1982	10.12.1982	
Ramsar			11.08.2006
World Heritage		21.11.1990	
United Nations Framework on Convention of Climate Change	09.10.1992	25.02.1993	21.03.1994
Kyoto Protocol	17.09.1998	17.09.1998	16.02.2005
Convention on Biological Diversity	09.10.1992	25.02.1993	
Convention on International Trade in Endangered Species in Wild Fauna and Flora			29.12.1997

(Source: Secretariat of the Pacific Regional Environment Programme 2007)

4.3 Fiji Sea Turtle Recovery Plan

The Fiji Sea Turtle Recovery Plan was compiled to act as a framework to ensure that sea turtle conservation activities and efforts are being conducted in a cohesive and comprehensive manner. The plan recognized that "collaborative effort is absolutely vital to management and conservation efforts for a species such as the marine turtle. Its migratory nature alone underlines the importance of partnerships in order to ensure success in protecting these iconic species across their range of habitats" (Fiji Sea Turtle Recovery Plan 2008).

The various issues covered by the Fiji Sea Turtle Recovery Plan include a general discussion on the ecology and biology of sea turtles, the significance of marine turtles in Fiji, the species of marine turtles in Fiji, marine turtle nesting populations of Fiji, the role of Fiji in marine turtle conservation efforts, current conservation initiatives in Fiji, and regional and international perspectives on nesting marine turtles.

The five major components of the Fiji Turtle Recovery Plan include:
Component 1: Significantly reduce the mortality of marine turtles by addressing domestic consumption, by-catch and compliance with the Moratorium.

Component 2: Develop programmes and protocols to monitor marine turtle populations in Fiji waters.

Component 3: Manage factors that impact on successful marine turtle nesting.

Component 4: Identify and protect habitats that are critical to the survival of marine turtles.

Component 5: Communicate the results of recovery actions and educate stakeholders.

5. TURTLE CONSERVATION IN THE MAMANUCA – BEST PRACTICE GUIDELINES

The Best Practice Guidelines for turtle conservation in the Mamanuca Islands presented in the tables below have been adopted from the "Code of Practice for the Sustainable Management of Dugong and Marine Turtle Tourism in Australia". The Guidelines have been prepared in consultation with the participants of the Best Practices Guideline workshop conducted on the 28th and 29th of August 2010, on Bounty Island. The workshop was organized by the Institute of Marine Resources (IMR) and the Mamanuca Environment Society (MES) and the participants of the workshop included the University of the South Pacific (USP), Worldwide Fund for Nature (WWF), the Department of Fisheries, Department of Environment, the Ministry of Tourism and the Mamanuca Island Resorts. The Guidelines have been designed to aid traditional owners, tourism operators and respective government departments to work together in order to develop culturally appropriate tourism involving marine turtles.

5.1 Recommendations for Planning and Management of Marine Turtle Tourism

The coastal Fijian communities consider the sea as part of their traditional estates, for which they have inherited cultural rights of ownership and responsibilities for its management. Although the legal recognition of these rights are more narrowly defined and enforced through the Fiji Fisheries Act, Marine Spaces Act and the Environment Management Act, the coastal and island Indigenous people maintain a strong sense of traditional ownership and obligation to their traditional marine grounds. This broader cultural link between the traditional owners and their land and sea grounds forms the basis for negotiation and collaboration between Indigenous people, management agencies and the tourism industry, in the planning and management of how marine and coastal areas are utilized for tourism.

The overall recommendations derived from the workshop discussions are:

(1) Baseline information related to all species of turtles in the Mamanuca Islands would be greatly beneficial. This information needs to be updated on a regular basis and distributed to all stakeholders. Potential data includes: geographical distribution and location of all nesting beaches, peak seasons of breeding and presence, specific nest location, listing and location of turtle threats, water depths including channels and those directly around islands, and location of foraging grounds.

(2) Environmental Impact Assessment for resorts should take into account important turtle life history information such as nesting areas, foraging areas, and important turtle habitat. Consideration should be given to both the effect of the proposed development and building as well as the impact of the construction of these structures.

(3) Protocols and contact information for reporting of injured turtles should be developed and/or distributed.

The detailed recommendations as an outcome of the Mamanuca Islands Best Practices Guidelines workshop have been illustrated in the form of tables; A – G:

Table A – General beach conditions during turtle breeding season.
Table B – Interactions with nesting marine turtles.
Table C – Interactions with marine hatchlings.
Table D – Vessels operating in marine turtle habitats.
Table E – Vessel interaction with marine turtles.
Table F – In-water interactions with marine turtles (all recreational activities, including water sports).
Table G – Recommendations and considerations for sea turtle headstarting programs.

Table A: General beach conditions during turtle breeding season

Level 1: Provisions/requirements for all areas	**Level 2: Location-specific provisions/requirements**	**Comments/explanation**	**Participant comments**
A.1 Minimal **use of small torches/lights on beaches**; lights should be limited to 2 cells/batteries (3V) maximum.	Suitably trained guides or management staff may need a brighter torch for crowd control, interpretive or research purposes. Other forms of lights may be allowed only after approval from authorized management staff.	*(i) Lights and movement on the beach can deter turtles from nesting; turtles may abort nest building and return to the water without laying their eggs.* *(ii) Lights will disorient emerging turtle hatchlings.* *(iii) Brighter lights can disturb larger sections of the beach, hence the need for as low a voltage as possible.* *(iv) Lights for video cameras, due to their intensity and continuous use, should not be brought onto turtle nesting beaches.* *(v) Avoid fluorescent, gas and higher voltage incandescent lights.*	**Lights are necessary for security so must be used in many circumstances. However, recommendations on the type, placement and specifications of lights (particularly flood lights) would be useful. In addition, advice on practices such as dimming, low-voltage torches or whether to use lanterns or lamps would be helpful.** **Suggestion: Lights to be turned off from 9pm to 7am during nesting season. Times may be adjusted based on tide.**
A.2 Keep dogs and other pets away from known nesting beaches	Dog & pet access to beaches is controlled at the local level.		
A.3 No campfires on turtle nesting beaches during breeding season.	Campfires on beaches are controlled at the local level. If campfires are permitted near nesting beaches, the light should be shielded from the beach.	*(i) Light from fires on the beach can deter female turtles from nesting or can attract hatchlings into the fire.* *(ii) Parks regulations prohibit fires within the boundaries of many protected areas.*	
A.4 Do not disturb or dig up turtle eggs.	In some cases where nests need to be relocated, only suitably trained guides or management staff with approval from the relevant management authority must do this.		
A.5 Do not drive vehicles or ride horses on beach dunes or above the high-tide mark on beaches during breeding season; avoid driving on beaches at night.	Vehicle access to beaches is controlled at the local level. In situations where a vehicle must be used, drivers should keep below the high tide mark wherever possible.	*(i) Note that on many remote northern Australian beaches, the use of vehicles may be necessary due to long distances and low turtle nesting density (e.g. 3-4 turtles over 20km).*	**Vehicles (such as mini-tractors and small trucks) are currently used at some locations. However, precautionary measures (in terms of times of use and operation) are in place.**
A.6 Do not leave litter on nesting beaches.		*(i) Nesting and hatchling turtles may become entangled in litter left on nesting beaches.*	**Limitation of litter is also favourable for aesthetics and beach care.**
A.7 Avoid leaving chairs, beach umbrellas or other obstructions in the sand on nesting beaches at night time; avoid placing deep-buried objects in the sand above the high-tide mark.	Use of beach equipment is controlled at the local level.	*(i) Nesting and hatchling turtles may become entangled in objects left on nesting beaches.* *(ii) Beach umbrellas (or anything that sticks into the sand) may accidentally be placed in clutches, destroying the incubating eggs.*	

Table B: Interactions with nesting marine turtles

Level 1: Provisions/requirements for all areas	**Level 2: Location-specific provisions/requirements**	**Comments/explanation**	**Participants**
B.1 Pre-nesting phase (emergence & body pit)		***The turtle emerges from the water and makes its way up the beach to dig a pit for laying her eggs***	
B.1.1 On sighting a turtle emerging from water, all movement should stop lights out.	An appropriate minimum approach distance to a pre-nesting turtle may need to be established at the local level.	*(i) If you can clearly see the turtle moving up the beach, you should not approach any closer.* *(ii) If you find yourself in front of a turtle moving up the beach, it is best to sit down and remain still rather than move away until the turtle has moved up the dune to begin nest building.*	
B.1.2 Allow turtle to move unimpeded.			
B.1.3 Do not use a torch before egg-laying begins.	Only do so if directed or authorised by suitably trained guides or management staff.		
B.1.4 Flash photography *not* allowed.			
B.2 Nest-building phase		*The turtle digs a nest in the sand to deposit her eggs.*	
B.2.1 Remain behind nesting turtle at all times.		*(i) Lights or movement in front of the turtle at this stage can cause her to abort the nesting attempt and return to the sea.*	
B.2.2 Do not use a torch before egg lying begins.	An appropriately trained and qualified guide may use a light (in a controlled manner from behind the turtle) to determine when nest-building ends and egg-laying begins.		
B.2.3 Flash photography *not* allowed during this phase.			
B.2.4 Do not touch turtle.			
B.2.5 Observe minimum approach distance to a nesting turtle.	An appropriate minimum approach distance to a nesting turtle needs to be established at the local level.	*(i) This distance may vary between species and environmental conditions; existing codes vary between 1 10 metres.*	
B.3 Egg-laying phase			
B.3.1 Minimise use of lights.	The maximum number of torches and time limitations of their use may vary between different sites, depending on the environmental conditions, turtle nesting density and size of the tour group.	*(i) A trained guide may use a small torch under the rear of the carapace (with the light shielded by the tur) illuminate the eggs in the chamber.* *(ii) Guides should control the time that lights should be turned on/off. This ensures minimal disturbance to the turtle being viewed and potentially other turtles that may approach the beach to nest.* *(iii) Lights should be limited to 2 cells/batteries (3V) maximum.*	

Table B: Interactions with nesting marine turtles

Level 1: Provisions/requirements for all areas	**Level 2: Location-specific provisions/requirements**	**Comments/explanation**	**Participants**
B.3.2 Flash photography <u>not</u> allowed until it is established that the turtle has settled into laying. Once this is established, keep flash photographs to an absolute minimum and only from behind the egg-laying turtle or off to one side (not from in front).	This should only be done under directions from suitably trained guides or management staff.	*(i) Guides should scan the beach for any other turtles before allowing flash photography.* *(ii) For larger groups of visitors, the guide should allow photography during a brief period of time (e.g. for 10 minutes) or during a particular activity (e.g. when turtle is filling in the egg chamber) only, to minimise disturbance.* *(iii) Flash photography for an extended time by large numbers of people in a group can decrease visitor enjoyment of the experience. In these situations selling photographs to visitors may be a preferred option.*	
B.3.3 No close up flash photography or lights	In some circumstances, authorised researchers/management staff may need to photograph the purposes.	*(i) Turtles have been known to retain eggs, which are later lost at sea, if disturbed by bright lights near the eyes during the egg-laying phase.*	
B.3.4 Do not touch nesting turtles or the eggs.	Only do so if directed or authorised by suitably trained guides or management staff.	*(ii) In specific cases where researchers are involved as guides they may be measuring nesting turtles and counting and measuring eggs, etc. Specific ethics approval should be required for a permit to handle turtle eggs.*	
B.4 Nest covering & return to sea		***The turtle buries her eggs in the sand and returns to the sea***	
B.4.1 Stand back from turtle during nest covering.		*(i) When covering their nests, turtles can move quite a lot of sand. Suggest standing back at least 10m from the turtle.*	
B.4.2 Minimal use of flash photography during nest covering and then only from behind or side of the turtle. No close up flash photos or lights near turtle			
B.4.3 Allow turtle to move unimpeded.		*(i) Allow turtle to cover the nest and return to the sea without disturbance or obstructions.*	
B.4.4 No lights or flash photography when turtle returns to sea.	Only do so if directed or authorised by suitably trained guides or management staff.	*(i) To avoid disorienting the turtle on its return to the sea.*	

Table C: Interactions with marine turtle hatchlings

Level 1: Provisions/requirements for all areas	**Level 2: Location-specific provisions/requirements**	**Comments/explanation**	**Participants**
C.1 Do not use torch / lights on hatchlings.	Only do so if directed or authorised by suitably trained guides or management staff.	*(i) Hatchlings become disorientated by artificial lights.*	**General lighting considerations for resorts (as detailed in A.1) should also specifically consider vulnerable hatchlings.**
C.2 Do not disturb nest or assist emerging hatchlings.	Only do so if directed or authorised by suitably trained guides or management staff.	*(i) Staff must be trained to determine when assistance may be needed.*	
C.3 Minimal use of camera flash, and <u>only</u> when hatchlings are emerging from nest.	Only do so if directed or authorised by suitably trained guides or management staff.	*(i) Guides should scan the beach for any other turtles before allowing flash photography.* *(ii) For larger groups of visitors, the guide should allow photography during a brief period of time only (e.g. for 10 minutes), to minimise disturbance.* (iii) *Flash photography for an extended time by large numbers of people in a group can decrease visitor enjoyment of the experience. In these situations selling photographs to visitors may be a preferred option.*	
C.4 Do not touch or handle hatchlings.	Only do so if directed or authorised by suitably trained guides or management staff.	*(i) Specific ethics approval should be required for a permit to handle turtle hatchlings.*	
C.5 Allow hatchlings to run to the sea without disturbance or assistance.	If you find a hatchling <u>obviously heading away from the sea towards an artificial light source</u>, rescue it by picking it up, carrying it to a dark section of beach and letting it run to the sea by itself; notify within 72 hours. Guides/management staff should facilitate/supervise this event if it occurs. **Most relevant local contact information needs to be inserted here.**	*(i) Allowing hatchlings to run to the sea without assistance is important for their natural imprinting of the nesting beach and its surrounds.*	**It was noted that the headstart program represents a departure from this recommendation. Discussion was undertaken regarding the material used for fencing, the structure of the fence (for e.g., openings for hatchlings). In addition, pattern of fence removal and checking was raised. More background information on fences would be useful to the group. Furthermore, specific recommendations regarding headstart operations are currently in discussion by this group and the Fisheries Department.**
C.6 Stand still when hatchlings are running down the beach to avoid stepping on them.			
C.7 No flash photography of hatchlings as they move down the beach.			
C.8 Do not illuminate hatchlings in the water.		***(i) This is important to avoid confusion and possible return to the beach.***	

Table D: Vessels operating in marine turtle habitats

Level 1: Provisions/requirements for all areas	**Level 2: Location-specific provisions/requirements**	**Comments/explanation**	**Participants**
D.1 *Go slow* in important turtle habitats (e.g. over seagrass beds, coral reefs or near turtle breeding aggregation sites or nesting beaches), keeping a lookout for turtles to avoid collision. **No chasing and harassment of animals.**	Appropriate speed limits in important habitats need to be implemented at the local level.	*(i) The risk of collision and mortality from vessel strike is significantly reduced at lower speeds.* *(ii) In important habitat areas where no speed limit is set, 10 knots is recommended as a maximum transit speed for deeper waters or clearer waters where turtles can* *shallow and low-visibility waters.*	
D.2 In high-risk areas, vessels should travel at ,) *no wake speed* . (See ( ) , , l l) 1) 1.9)	,)) 1 , speed relevant to the location (e.g. 5 knots in WA and NT, 6 knots in QLD) is recommended as a maximum speed for vessels operating in high-risk areas.	*(i) In shallow water, travelling below wake speed also minimizes sediment disturbance and damage to seagrass by propeller wash.*	
D.3 When travelling through marine turtle habitat, reduce the likelihood of collision with turtles by using wide and deep channels, away from shallow areas, seagrass beds and coral reefs. Channels that are narrow at low tide should be avoided wherever possible.	, an , established in important habitat and high risk areas; detailed spatial planning, based on local knowledge, is required to delimit such zones.	*(i) If travelling in shallow water (e.g. bottom can be affected by propeller wash), the vessel should travel at no wake speed and a lookout should be used to avoid collision.*	
D.4 Wherever possible, outboard motors on vessels in important habitat and high-risk areas should be able to tilt up in the event of a collision (i.e. not locked down) to reduce the force of impact.		*(i) Studies have shown that fractures and damage to turtles from boat-strike have been considerably less when the motor was free to tilt.* *(ii) It is noted that larger motors are unable to tilt, so lower speeds and the use of a lookout are recommended to avoid collisions.* *(iii) Note that the use of propeller guards has been shown to be ineffective at reducing injuries and mortalities from vessel impacts. The force of the impact from a vessel travelling at high speed can kill a turtle.*	**A strong recommendation for propeller guards to be put (where feasible) on all vessels was suggested. Some operators may not be in support of this option as it will incur an immediate cost however a longer term cost-benefit analysis may make it more favorable.**
D.5 **No** littering, food scraps or sewage from vessels operating in marine turtle habitats.		*(i) E.g. in the vicinity of seagrass beds, coral reefs and turtle nesting cays/beaches.* *(ii) Note: Dumping of food scraps is considered littering.*	**There was strong support and recognition from the group that the introduction of wastes and pollution into the marine environment must be minimized. It was noted that the transport of waste has been regulated and applies in this situation.**
D.6 No anchoring in seagrass beds or on coral. If observing or turtles in these areas, allowing the vessel to drift (with engine in neutral) or using a permanent mooring are Best Environmental Practices.	Where anchoring is essential, follow local Best Environmental Practices. This includes avoiding seagrass or coral areas and anchoring in mud or sand.	*(i) Motor towards anchor when hauling in.*	
D.7 Avoid overnight anchoring/mooring in the vicinity of turtle nesting beaches during the nesting/hatchling season. If vessel is anchored at night in the vicinity of a nesting beach during these periods, minimize externally visible lighting to avoid disturbing nesting turtles and/or attracting turtle hatchlings. Use only anchor light. Recommend anchoring at least 1 nautical mile from nesting location whenever possible.		*(i) Nesting turtles may be disturbed by lights and abort nesting. Anchoring in the vicinity of a nesting beach can change the nesting distribution of turtles on the beach (e.g. turtles nest on other side of the island avoiding the vessel).* *(ii) Hatchling turtles have been known to swim towards lights on vessels near nesting beaches, where the risk of predation from fishes is increased.* *(iii) Cover or switch off lights from portholes, deck lights, etc.*	
D.8 If an animal in distress (e.g. entangled) is encountered, notify the relevant authority (e.g. marine animal hotline). Help the animal through advice from the relevant authority or through common sense if this advice is not available. Notify the authority within 72 hours of the incident and of any action taken.	**Most relevant local information should be listed here.**	*(i) danger and can be saved, particularly in a remote location, you may be the only person able to act.* *(ii) Seek advice from the relevant authority. If contact with the authority cannot be made, report the incident as soon as possible.* *(iii) Act only if it is safe to do so. Do not under any circumstances put your own life at risk to save the animal (e.g. by entering the water in crocodile habitat).*	**Clear definitions of avoidance Behaviour and distress need to be outlined and distributed to assist vessel operators and swimmers.** **Basic protocols for response to an injured turtle should be developed and/or distributed.**
Recommendation for restrictions and monitoring of outboard motors			

Assumption: Tourist operators know habitats and common locations for turtles. However, if this is not the case it is important that Recommendation 1 (above) is implemented – and given more immediate support - in the near-term.

It was acknowledged that numerous types of vessels including cruise ships, ferries, sea-planes, jet skis etc. come into turtle habitat areas and in proximity to turtles. It is important that their activity and conduct is also in compliance with best practice regulations.

Table E: Vessel interaction with marine turtle

Level 1: Provisions/requirements for all areas	**Comments/explanation**	**Participants**
F.1 When approaching sites where marine turtles are seen regularly, (e.g. dive sites with resident turtles) slow to distance of 100 meters.	*(i) Turtles are likely to be killed or seriously injured from impact with high-speed boats, irrespective of whether the damage is from the keel/skeg or the propeller.* *(ii) Resident turtles at sites (e.g. coral bommies) will forage in a larger area surrounding the site during the day.*	**Recommendation: Automatic caution zone (slowing of vessel) within 100m of any island. Reasoning given is that most sightings are made in waters close to islands and also because outside vessels will not necessarily know where key habitats/pathways are.**
F.2 Vessel speed should be reduced to *no wake speed* immediately when a turtle is seen *within 30m* of the vessel.	*(i) Vessel speed should be reduced to a turtle is sighted (this is also recommended when turtles are seen at distances greater that 30m, especially in areas where the water clarity is poor), as other turtles may be nearby but not visible.*	**Size and type of vessel will determine (1) distance from which turtles can be sighted, and (2) the speed to which vessels can be slowed. Therefore, speed and distance regulations need to reflect this.**
F.3 If watching turtles, put the engine in neutral and allow animal(s) to continue their normal Behaviour without disturbance.	*(i) Do not herd, intercept path of travel or chase marine turtles.* *(ii) Let the engine idle in neutral rather than stopping/restarting to avoid startling the animal(s).*	
F.4 If travelling, go slow and steer away from the animal(s) to avoid the chance of collision.		
F.5 Be aware of any other vessels in the area and communicate to avoid collision, disturbance or entrapment of animal(s) in an area.	*(i) Be mindful of the greater risk of vessel strikes when multiple vessels are near turtles; turtles fleeing from one vessel may collide with a second vessel.* *(ii) Cumulative interactions with turtles at the same site for prolonged periods may impact on their normal behavioral patterns, health, reproductively or site preference/avoidance. Future management of vessel numbers and timing limitations at some sites may be necessary.*	
F.6 If marine turtles display any signs of avoidance Behaviour**,** or flee the area to avoid contact, does not pursue them (see definition of *avoidance Behaviour* (	*(i) Do not herd, intercept path of travel or chase turtles.* *(ii) Any close approaches to the vessel volition.*	
F.7 Do not feed or attempt to feed marine turtles or throw any object in the water near them.		**It was noted that such an activity could also introduce waste into the environment.**
F.8 Do not touch or attempt to touch a marine turtle during any interaction.		
F.9 When terminating an interaction, allow vessel to drift or idle away to a safe distance before accelerating gradually to appropriate l) . l) , , -risk areas). Keep a lookout and check the bow and stern before engaging propeller.		

A discussion regarding research activities undertaken by (or in collaboration with) tourist activities was undertaken. The general consensus was that all parties involved in any research project would need to have approval. In such circumstances, special care should be taken to ensure that observers (incl. tourists) are aware that special permission has been given for the activity. Future inclusion of tourists within research projects should be included within best practice guidelines and permitting procedures.

Table F: In-water interactions with marine turtles (all recreational activities; including water sports)

Level 1: Recommendations for all areas	**Comments/explanation**	**Participants**
G.1 Allow turtles to continue their normal Behaviour and minimize your disturbance to them, by: (i) Not attempting to chase, touch or ride turtles. (ii) When there are several divers present, avoid crowding or surrounding turtles. (iii) Remaining still, if you see mating turtles, and not approaching them. (iv) Not using underwater scooters. (v) Not approaching a turtle closer than **20m.** (vi) **No feeding**	*At popular dive sites, frequent disturbance of resident turtles could result in behavioral changes and/or site avoidance.* ***Turtles should be allowed an escape route at all times.*** ***Mating turtles will separate and cease mating if disturbed.*** ***The noise generated by underwater scooters will disturb turtles.***	**There was a discussion of underwater scooter . . language should be added to (iv) to reflect the given situation.** **Distance of 20m approach distance was based on Hawaiian regulations. It would be useful to get a copy of these regulations for reference. It was also noted that appropriate signposting could assist with compliance.**
G.2 Improve your in-water encounters with marine turtles, by: (i) Swimming slowly and calmly, (ii) Approaching turtles slowly from side-on to a distance which does not cause the turtle to change its Behaviour.	*Giving turtles space and control will enable you to watch and appreciate their normal Behaviour (e.g. feeding, foraging, resting, mating).* *This will most likely lengthen your interaction time, provide closer encounters and improve your turtle watching experience.* *Further research may be needed to establish appropriate species-specific and activity-specific approach distances.*	
G.3 When night diving, minimize disturbance to resting or sleeping turtles, by: (i) Minimizing the use of lights (e.g. torches, video lights) near turtles. (ii) only, not the head. (iii) Avoiding the use of flashes/strobes .	*Disturbing a sleeping turtle may result in a startled response and likely stress,* *Turtles will often sleep inside a coral crevice and they may flee this enclosed space if startled there may be a risk of injury to the turtle or diver as well as coral damage from sudden fleeing.*	
G.4 During turtle breeding season, find alternate dive sites to those near main nesting beaches for night dives.	*If conducting night dives near nesting beaches, ensure that vessel lights are minimized to only an anchor light. This is important to minimize impacts on turtle nesting Behaviour and hatchlings attracted to vessel lights.*	

Table G: Recommendations and considerations for sea turtle headstarting programs.

Recommendations/ Considerations	
Permits	Acquire permits from the Department of Fisheries Registration of captive breeders through the Department of Environment [needs to be confirmed]
Certification	Education programs Biology Procedures (cleaning, care, husbandry etc)
Interaction with turtles in captivity	No handling or feeding (guests)
Cleaning	Scrub once per week Change of water after every feed Animal husbandry algae on turtles
Source of hatchlings	Island nesting areas only No transportation between islands
Diet	Hatchling (G or H) raw fish, seaweed, bivalves (20 days only)
Size of the tank	1 tank: Min: 3m (length), 0.5m (depth), 1.5m (width) Max: 10m (length), 1.0 (depth), 5m (width)
Maximum number of turtles per minimum sized tank	15 (based on hawksbill)
Maximum number of turtles per maximum sized tank	30
Maximum number of tanks	2
Release criteria	2 years (maximum) Minimum size = 20cm CCL Monitoring plan in place?
Research needs	Long-term survivorship of released turtles Foraging ability of released turtles Background information Growth rates Identification of nesting sites, hatchling dates, habitat
	Diet requirements Impacts of climate change
Release procedure	Crawling on sand to water

The above recommendations relate to current sea turtle headstarting programs.

Some possible questions/suggestions that could be considered while reviewing the code of conduct for sea turtle heastarting programs include the following.

Suggestions:

1. Agree to what is feasible on the ground at the moment.
2. Keep the hatchlings for one year in the tanks, relative to the natural turtle nesting seasons from October to April.
3. Age that animal is to be released should determine the space allotted for any animal.
4. Aggression at different ages requires separation into different tanks.
5. Additional turtles might be considered based on special consideration and criteria.
6. One cohort only; perhaps for a longer year?

Research Questions:

7. Monitoring and observation of swimming activities of the hatchlings.
8. Research on the feasible age that the hatchlings should be kept in captivity. The cases studies in the Appendix indicate that the aggression in the captive turtles is noted at 4 months – should this be the age at which animals are separated? The case studies show that the feeding was done separately for the same aged but different sized individuals.
9. Researches are needed to decide the best age for the release of the sea turtles.

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APPENDIX

Headstarting Project Case Studies – Vomo and Mana Islands

In order to start sea turtle headstarting programs there will now be a need for permits and guidelines would need to be put in place. All resorts involved in headstarting will need to provide information (details of which to be drafted by Fisheries) on their respective headstarting programs. The existing sea turtle headstarting programs would continue, however, they must apply for a permit.

Information from resorts was used in guiding the requirements and background for the development of criteria for sea turtle headstarting recommendations. The following were the key points of discussion.

1. Identification of topics for discussion
2. Procedures (stocking density, feeding, cleaning of pond, duration)
3. Interaction with turtles in captivity
4. Permits
5. Certification

Appendix 1.1: Details of the headstarting projects at Vomo and Mana Islands.

	Vomo	**Mana**
Tank size	2 3.5m length 0.7m deep 1.5m wide	1 6m length 1m depth 3m wide Divided into several sections (new)
Number of turtles	1 year (16) 4 months (86)	8 months (10) But one older green turtle (from beach)
Diet	Once a day (morning) First 20 days they feed with bivalves. Fresh fish is used after that. Mackerel, tuna. Remove bones and cut into small pieces.	Twice a day Seaweed and fish (seaweed for dessert) Green turtle - seaweed
Cleaning of pond	Twice a day (first time after feeding) Scrub every fortnight Water pumps Salt water Gloves used Covers placed over the ponds overnight to stop feeding and also to stop leaves, branches etc falling in (after 5pm)	Once a week Water pumps Covered at all times Salt water Thatched roof
Species	Hawksbill	All hawksbill, 1 green
Length of time that turtles are left in captivity	Keep in tanks for 18 months	1st group currently 8 months old. Possible release at 12 months.
Where	From inland nests	Some from near Sand bank close to Mana. Others on beach. [Released 2 years ago] Green turtle was found on beach. Headstart: 10 turtles from Vomo. 1 escaped.
When		
Why	Keep their population numbers high. Marketing.	Awareness turtle conservation. Locals, staff, guests. One clutch or eggs eaten previously (2 years ago) Many hatchlings coming onshore in the area.
	Ointment (bactoban) used for treating scratches (2 weeks heal). Same used for guests with coral scratches. Some mortality has occurred in the past often in the first week. Only collects hatchlings from nests located inland. [Inland is thought to mean big waves coming so to assist survival] Turtles are re-released at high tide. 8 released in January these were 2 years 3 months old. 4 months old there were 137 individuals originally. 1 year old were 86 originally. Last release batch was 22cm x 20cm in size 2 years. Some aggression noted around 5-6 months. Indicates that more feeding is needed. Crawling on beach is done when released. Sick individuals are separated into a tub.	2nd year with headstarting Some aggression noted between the individuals. Animals were separated. Tanks are closed overnight. Rule in place that no handling should take place.

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1. Nadroga/Navosa Provincial Office
2. Turaga ni Koro's and villagers of Tavua,Yaro, Yanuya and Solevu
3. Representatives from the Chiefly village of Veiseisei, Vuda

Mamanuca Environment Society resort members:

1. South Sea Cruise and resort
2. Castaway Island
3. Mana Island Resort
4. Malolo Island Resort
5. Tokoriki Island Resort
6. Likuliku Island Resort
7. Navini Island Resort
8. Treasure Island Resort
9. Bounty Island Resort
10. Matamanoa Island Resort
11.Tavarua Island Resort
12. Namotu Island Resort
13. SeaFiji
14. Subsurface Diving
15. Sonaisali Island Resort

Non MES members:

1. Vomo Island resort
2. Conservational International
3. Institute of Marine Resources
4. WWF

Goverment Departments:

1. Department of Fisheries
2. Department of Environment