



3.5 BIODIVERSITY CONSERVATION

Due to the lack of natural resources and wealth, biodiversity particularly marine biodiversity is the most significant and vital resource base for the country. The livelihood has traditionally been marine-based as well and marine resources still continue to be the main generator of food, earnings, employment, protection and shelter.

3.5.1 Coral Mining

Coral mining for housing, although declining, has been another cause of environmental degradation. In addition to having adverse impacts on the reefs itself, it affects the islands as well as biodiversity. Coral reefs offer strong coastal protection against ocean currents, waves and tides. Mining of corals have resulted in the destruction of this protection layer in some islands causing considerable amount of beach sand to wash away from the island into the sea. As the protection layer is destroyed, waves and tides directly enter into the island causing damage to the vegetation and intruding into the freshwater aquifer. The other associated impacts

on the reefs include loss or migration of residential reef fish communities and other living organisms, loss of bait fish that are important for the local tuna fishery, and reduced coral percentage cover. Most importantly, these reefs may take several years to recover.



Cement blocks are increasingly replacing the use of coral for housing. In addition, alternatives such as cement and sand bags are being utilized for construction of seawalls and harbour walls. However, the practice of using coral for buildings and for sea walls does continue to some extent.

As population grew in crowded islands and when available land area was no longer sufficient to meet the demand for housing, reclamation of shallow reefs adjacent to the islands has been carried out. Land reclamation activities have negative implications such as destruction of shallow lagoons, sea grass and reef flat communities, and adverse effects on nearby coral reef communities through suspended sediments.

Therefore, housing issues and congestion in the face of a growing population continues to deplete the natural resources such as stock of ground water, plants and coral reefs of the fragile ecosystem. Additionally, it has increased the variety and magnitude of pollution created by human settlements.

3.5.2 Fish resources

Although tuna has historically been the major fish resource and little use was made of reef fish resources, over the last decade or so, exploitation of reef resources in the Maldives has become an important component of the country's fisheries sector. Demand for marine products such as lobsters and reef fish increased locally with increase in demand for the tourist resorts. High demand in the international market for certain reef species has increased pressure on these reef resources. Reef resources that are exploited mainly for export include groupers, sea cucumber, sharks and ornamental varieties.



A specific fishery for grouper started in the Maldives in 1992. The maximum sustainable yield for all grouper species is estimated at 1800+700 tons (Shakeel, 1994). However, these are crude estimates to be used cautiously. Export figures show a declining trend in the quantity of groupers exported as well as total value of exports (figure: 3.6). Given the pressure on the grouper resources, it is highly likely that grouper resources are being over fished.

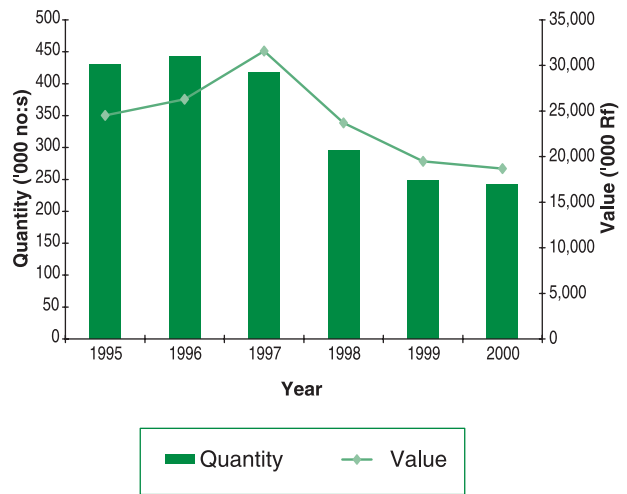


Figure 3.6: Live Grouper Exports and their Value (1995 - 2000)

Export figures for dried sea cucumber show a much lower bulk of exports in mid and late 1990's compared to the peak years during early 1990's, with correspondingly low value for exports. However, the total value increased considerably in 2000 (figure 3.7).

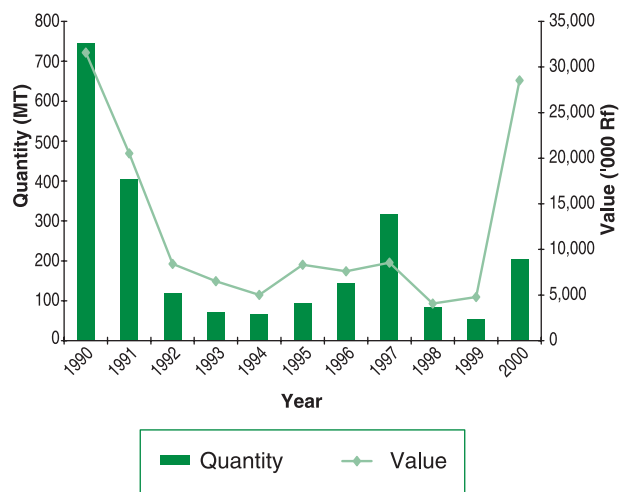


Figure 3.7: Dried Sea Cucumber Exports (1990 - 2000)

The live ornamental species export trade (Aquarium Fish) exploits about 100 species of marine organisms, majority of which are reef fish. Of these, about 20 species contribute to more than 75% of the catch (Adam, 1997). The total quantities of ornamental species exported by the "Ornamental Fish" industry too have declined in recent years.

Edwards and Shepherd (1992) found that some species were being, locally over- exploited or exploited close to maximum sustainable levels in the area around



Malé. Some species exploited by the aquarium fish trade are known to be limited in distribution or rare or not yet described for the Maldives. The Clown Fish (*Amphiprion nigripes*) is quasi-endemic with the Maldives as its centre of abundance (Adam, 1997). The species is quite commonly exported from the Maldives and 8000 Maldives Clown Fish and 500 anemones were exported in 1994 alone. The angel fish *Apolomichthys armitagei* is known to be rare in the Maldives.

Reef sharks as well as oceanic sharks are exploited mainly for the fins. Dried shark fins fetch good prices in the international market. Anderson and Ahmed (1993) suggested that reef sharks were being fished at moderate levels of fishing effort, which was probably sustainable at the time of study. However, an increase in fishing effort from that of 1993 levels would adversely affect stocks. The current status of reef shark stocks is unknown.

Threat of over-exploitation is the biggest environmental problem posed by commercial exploitation of reef resources. The export quantities of most of the reef species have declined. Since stock status is not monitored regularly it is not known if stocks are over-exploited.

3.5.3 Fishing methods

Fishing methods generally practised in the Maldives are not destructive for the environment. Figure 3.8 provides details of fish catch by fishing methods. Although the fisheries industry expanded through the mechanisation of the traditional fishing fleet, fuel distribution and fish collection systems, the fishing practice remained traditional. Most fish are caught using lines which target a certain species and thus by-catch which is wasted is almost non-existent. The tuna fishery is largely based on pole and line fishing from mechanised

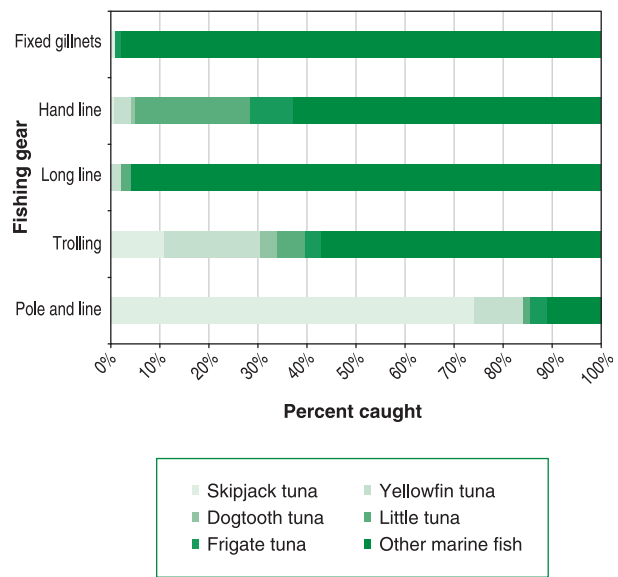


Figure 3.8: Fish Catch by Gear

dhonis, thus producing a "dolphin friendly" product. Other species such as groupers are caught using hand lines and sea cucumbers are collected by hand or using lines. Gillnets are mainly used for targeting reef sharks.

Some bait fishing practices are known to have adverse effects on the habitat. When catching species closely associated with the reef, sometimes poles or a "scarer" (palm fronds or steel chain) are used to chase the fish. This can result in damage to the coral (Anderson 1997). In recent years, the method of catching live bait have changed from the traditional method of collecting bait during the day to using light at night to attract bait. The environmental implications of this change are being studied. Although not widely practised, some isolated cases of illegal use of chemicals, which can be detrimental to the reefs, are reported. These include use of household bleach or chlorine to catch octopus.

3.5.4 Major Policy Responses and Initiatives

Recognising the importance marine biological diversity plays in sustainable development, the government has adopted a number of measures for protection and conservation of biodiversity.

The second National Environment Action Plan adopted in 1999, recognises biodiversity conservation as one of the priority issues to be addressed to achieve environmental protection and sustainable development. Other related priority issues identified in NEAP II include coastal zone management and integrated reef resources management.

The first National Biodiversity Strategy and Action Plan (NBSAP) of the country has been adopted in 2001. It was undertaken with extensive stakeholder participation throughout the country, and the draft NBSAP was discussed and endorsed at a national level workshop in April 2001. The first country report on biological diversity will also be published in 2001.

Recognising the importance of healthy coral reefs to the two major industries of the Maldives, tourism and fisheries and the need to address the problems resulting from increased reef resource usage, the Maldivian Government commenced promoting a policy of integrated reef resources management. The Ministry of Fisheries, Agriculture and Marine Resources with assistance from the Bay of Bengal Programme (BOBP) initiated the Integrated Reef Resources Management programme. Under this programme, a workshop was held in Malé in March 1996 with extensive stakeholder participation and national and international advisors, to "identify key issues and

objectives for the IRRM process, and make recommendations for its implementations" (BOBP, 1997). The Fisheries Advisory Board endorsed the recommendations made at this workshop, in 1996.

The Government has also initiated several measures for the protection of important habitats and threatened species. Since 1 October 1995, 25 marine areas have been declared protected. All forms of fishing except bait fishing with traditional methods have been banned in these areas. These are popular dive sites and 14 are popular for shark-watch diving. Turtles have also been protected since 24th June 1995.

(Table 3.4). Other measures include banning export of important bait fish as aquarium fish; banning fishing from the house reefs of tourist resorts; and the protection of threatened marine resources such as sharks, sea turtles, giant clams, and black coral (tables 3.5 and 3.6).

Table 3.4 List of the marine protected areas in Maldives

1.	North Maalhosmadulu	Vilingili Thila
2.	South Maalhosmadulu	Dhigali Haa/ Horubadhoo Thila
3.	Faadhippolhu	Fusheevaru Thila
4.		Kureddhoo Kandhu Olhi
5.	Malé Atoll	Makunudhoo Kandhu Olhi
6.		Rasfaree and the enclosed reef
7.		Thamburudhoo Thila
8.		Gaathugiri/Ad'dhashugiri
9.		Giraavaru Kuda Haa
10.		Dhekunu Thilafalhuge Miyaruvani
11.		Kollavaanee in the centre of Gulhifalhu
12.		Emboodhoo Kandhu Olhi
13.		Guraidhoo Kandhu Olhi
14.		Lankan Thila
15.	Ari Atoll	Maayaa Thila
16.		Orimas Thila
17.		Mushimasmigili Thila
18.		Kudarah Thila
19.		Karibeyru Thila
20.		Faruhuruvalhibeyru
21.	Felidhu Atoll	Miyaru Kandhu
22.		Vattaru Kandhu
23.	Mulaku Atoll	Lhazikuraadi
24.	North Nilandhe Atoll	Filitheyo Kandhu
25.	South Nilandhe Atoll	Fushi Kandhu

Protected Marine Areas of the Maldives

The following areas are protected under the Environment Protection and Preservation Act (4/93). Anchoring (except in an emergency), coral or sand mining, waste disposal, removal of any natural object or living creature, fishing of any kind (example: for sharks, reef fish or aquarium fish) with the exception of traditional live bait fishing, capturing of birds, any activity which may cause damage to the area or its associated marine life are prohibited in these areas.

Raa Atoll

- Villigili Thila

Baa Atoll

- Dhigalihaa/Horubadhoo Thila

Lavani Atoll

- Kuredhdoo Kanduu
- Fushivaruu Thila

Male' Atoll

- Makunudhoo Kanduu
- Rasfari Faru
- Giraavaruu Kuda haa
- Dhekunuthilafathuge Miyaruvani
- Gulhifalhu/Kollavani
- Thamburudhoo thila
- Gaathugiri/Adhdhashugiri
- Emboodhoo Kanduu
- Guraidhoo Kanduu
- Lankan thila

Alifu Atoll

- Maya Thila
- Orimas Thila
- Mushimasmigili Thila
- Karibeyru Thila
- Faruhulhuvaruu Beyru
- Kudarah Thila

Vaavu Atoll

- Miyaru Kanduu
- Vattaru Kanduu

Meemu Atoll

- Lhazikuraadi

Faafu Atoll

- Filitheyo Kanduu

Dhaalu Atoll

- Fushi Kanduu



Map 3.2: Protected Marine Areas of the Maldives

Your might consider including these three tables in place of tables 3.4, 3.5 and 3.6. (same source)

The 25 marine protected areas, under the Law on Protection and Preservation of the Environment are given in the table 3.4.

All fishing or collection of these animals in the Maldives is prohibited.

The items listed in the table 3.6 may not be exported

Table 3.5 List of the marine animals prohibited for fishing and collection

Black coral
Conchs
Giant Clams
Berried and small lobsters
Turtles
Napolean Wrasse
Dolphins
Whale Sharks
Whales

Table 3.6 List of marine Products Prohibited for Export

Black corals
Stony corals
Triton shell
Pearl Oyster
Lobsters
Turtles
Turtle shell
Eel
Puffer fish
Parrot fish
Skate and ray
Bigeye scad under 15 centimetres
Bait fish used in tuna fishery
Dolphin
Whale

in any form, whether as souvenirs, souvenirs products or for commercial use.

Protected species include the bird White Tern *Gygis alba monte* in 1996 and 22 additional bird species protected in 1999 under the Environmental Protection and Preservation Act, of which some are important for the local tuna fishery and others are endemic to the Maldives at subspecies level (table 3.7 and table 3.8).

Taking into consideration the importance of sharks to the fisheries and tourism sectors, on 8 September 1998, the Government banned all forms of shark fisheries for a period of 10 years, within the 12 mile zone from the atoll rim in the following atolls. (table 3.9)

Two islands, Hithaadhoo (North Huvadhu Atoll) and Hurasdhoo (South Ari Atoll), have been declared as protected islands because of their unique avian population and geological formation, respectively.

Table 3.7 Protected species of birds

SCIENTIFIC NAME	ENGLISH NAME
1- <i>Anous tenuirostris</i>	Lesser Noddy
2- <i>Anous stolidus</i>	Brown Noddy
3- <i>Sterna fuscata</i>	Sooty Tern
4- <i>Sterna anaethetus</i>	Birdled Tern
5- and 6- <i>Sterna hirundo</i>	Common Tern (2 different species of the common tern)
7- <i>Sterna bengalensis</i>	Lesser/crested Tern
8- <i>Sterna bergiii</i>	Great Crested Tern
9- Saunder's little tern	Sterna Crested Tern
10- <i>Sterna sunnatrana</i>	Black-naped Tern
11- <i>Sterna nilotica</i>	Gull-villed Tern
12- <i>Puffinus iherminieri</i>	Audobon's Shearwater
13- <i>Puffinus pacificus</i>	Wedge-tailed Shearwater
14- <i>Puffinus carneipes</i>	Fiesh-footed Shearwater
15- <i>Fergata ariei</i>	Lesser Frigatebird
16- <i>Fergata minor</i>	Great Frigatebird
17- <i>Phaethon lepturus</i>	White-tailed Tropicbird

Table 3.8 Birds specific to and living only in the Maldives

SCIENTIFIC NAME	ENGLISH NAME
1-Ardeola grallator philippensis	Maldivian Pond Heron
2-Butorides striatus albidulus	Maldivian Little Heron
3-Butorides striatus didii philippensis	Central Maldivian Little Heron
4-Phoenicurus maldivus	Maldivian water Henq Amouronis
5-Eudynamis scolopacea scolopacea	Asian Koel

Table 3.9 Atolls in which there is a shark fishery moratorium

1. South Maalosmadulu Atoll
2. Faadhippolhu
3. Malé Atoll
4. North Ari Atoll
5. South Ari Atoll
6. Felidu Atoll
7. Addu Atoll

A tree planting programme was launched nation-wide during the year 1996 with the aim of adding a million trees to the island ecosystems within 3 years. The "Million Tree Programme" was initiated by the President on 15 January 1996. The tree planting programme was a concerted effort to conserve, rehabilitate and manage the environment. The Ministry of Fisheries and Agriculture was selected as the nodal agency for the implementation of the program under the guidance of the President's Office. Due to the extensive support the programme received the initial target of one million trees was almost achieved by the end of 1996 itself. Therefore a new target of 2 million trees was set.

Following on from the two million-tree programme, a 3 year fruit tree planting programme

was launched nation-wide in June 2000 by the Ministry of Fisheries, Agriculture and Marine Resources, in an effort to increase fruit trees in the country. The objectives of the programme include increasing awareness and interest in growing fruit trees, increasing local production and generating the spirit of growing trees in all islands.

In order to protect and conserve biological diversity of the country, a pilot project on the establishment and management of protected areas has been initiated with the assistance of the Government of Australia through AUSAID. The Maldives Protected Area Systems (MPAS) project aims to assist the Government with establishment of a replicable and sustainable system for the protected area management.

Legal measures for protection of timber resources were established through regulations under the Law on Uninhabited Islands (Law no: 20/98). Under this law timber from uninhabited islands can be logged only after getting written approval for the purpose from the Ministry of Fisheries and Agriculture, and in the presence of a representative from the atoll office and a representative of the lessee. In addition, every coconut palm that is logged has to be replaced with 2 coconut palms and every tree that is logged has to be replaced by a tree under the direction of the Ministry of Fisheries and Agriculture.

The Marine Research Centre of the Ministry of Fisheries Agriculture and Marine Resources has undertaken three different coral reef monitoring programmes in collaboration with different institutions or agencies. Coral reef monitoring to assess the extent of coral bleaching has been carried out in collaboration with the Global Coral Reef Monitoring Network (GCRMN) since 1997 and Coral Reef Degradation in Indian Ocean (CORDIO) project, particularly initiated with the support from Swedish Government, to study the bleaching effects since 1998. The overall objective of the Maldives/GCRMN project is to improve management and sustainable use of coral reefs and related ecosystems by providing information on the trends in biophysical status, social cultural and economic values of these ecosystems (Anon 1999). Marine Research Centre (MRC) has also participated in the Reef Check programme since 1997, a volunteer effort carried out world-wide by recreational divers and led by experienced marine scientists. In addition MRC has an ongoing program on identification and cataloguing of fish species in Maldivian waters.



PROTECTED BIRDS



WHITE TERN
(*Gygis alba montis*)

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GREAT CRESTED TERN
(*Sterna bergii*)



BLACK-NAPED TERN
(*Sterna samarana*)



WEDGE-TAILED SHEARWATER
(*Puffinus pacificus*)



FLESH-FOOTED SHEARWATER
(*Puffinus carneipes*)



LESSER CRESTED TERN
(*Sterna bergensis*)



LESSER NODDY
(*Anous leucostriatus*)



GULL-BILLED TERN
(*Sterna gullata*)



WHITE-TAILED TROPIC BIRD
(*Phaethon lepturus*)



SOOTY TERN
(*Sterna fuscata*)



AUDUBON'S SHEARWATER
(*Puffinus auduboni*)



BRIDLED TERN
(*Sterna anaethetus*)



SAUNDERS LITTLE TERN
(*Sterna saundersi*)



BROWN NODDY / COMMON NODDY
(*Anous stolidus*)



GREAT FRIGATE BIRD
(*Fregata minor*)



LESSER FRIGATE BIRD
(*Fregata ariel*)



ASIAN KOEL
(*Eudynamis scolopacea scolopacea*)



COMMON TERN
(*Sterna hirundo*)



ROSEATE TERN
(*Sterna dougalli*)



MALDIVIAN POND HERON
(*Ardeola grayii philippi*)



CENTRAL MALDIVIAN HERON
(*Butorides striatus didi philippi*)



MALDIVIAN WATER HEN
(*Actonornis phoeniceus maldivus*)



MALDIVIAN LITTLE HERON
(*Butorides striatus albakasui*)

**The above birds are protected under the Environment Protection and Preservation Act, (4/93)
Their capture, sale and captivity is prohibited.**