An Assessment of the Status and Exploitation of Marine Turtles in the British Virgin Islands

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The full report is hosted in PDF format at the Project website: http://www.seaturtle.org/mtrg/projects/tcot/finalreport/

This project was implemented by the Marine Turtle Research Group (University of Exeter in Cornwall, UK), the Marine Conservation Society (UK), and Duke University (USA) in association with the Cayman Islands Department of Environment, Cayman Turtle Farm, and University of Cardiff (UK). This initial consortium was expanded to include a large number of organisations across the Overseas Territories.

6. Status and Exploitation of Marine Turtles in the British Virgin Islands

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Summary

At least three species of marine turtle (leatherback, green and hawksbill turtles) nest in the British Virgin Islands (BVI) but in critically low numbers (see table 6.1). Although there may have been a modest recovery of some species in recent years, much needs to be done to ensure the continued existence of marine turtles nesting in the BVI and facilitate their recovery. Foraging marine turtles (generally green and hawksbill turtles) are widespread in BVI coastal waters of the BVI and, based on preliminary work carried out as a result of TCOT, appear to be locally abundant at some sites, despite having been subject to direct exploitation for a long period of time. Direct exploitation still occurs at levels much reduced from the recent past but we estimate that >150 green turtles and >50 hawksbills are likely taken per year in a directed fishing effort.

TCOT recommends that the Government of the British Virgin Islands takes all necessary steps to ensure the sustained existence of nesting and foraging populations of marine turtles in the BVI and facilitate their recovery.

This will require actions under the following headings:

6.1.1. Increasing the capacity for marine turtle management

6.1.1.1. Increasing the capacity of the BVI Conservation and Fisheries Department.
6.1.1.2. Establishing a multi-stakeholder marine turtle management process.

6.1.2. Amend legislation and policy to facilitate marine turtle population recovery

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6.1.3.2. Establish constant-effort in-water monitoring programmes.

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6.1.4.1. Encourage and implement sensitive practices at existing nesting beaches.
6.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the BVI.

Additionally, we make a major overarching recommendation to the UK Government to support the conservation and management of marine biodiversity in the UK OTs under the Environment Charters.

The Overseas Territories of the UK have long been acknowledged as being rich in biodiversity (Proctor & Fleming 1999). The small islands or island archipelagos of the Caribbean UK Overseas Territories currently do not or are unable to carry out sufficient monitoring, research, management and educational outreach required to ensure the sustainability of their marine and coastal natural resources. TCOT strongly recommends that the UK Government further contributes to marine biodiversity conservation and management in the UK Overseas Territories through provision of funding and expertise under the FCO/DfID Overseas Territories Environment Programme (OTEP), Defra's Darwin Initiative and through the provision of bespoke scholarships for tertiary education in biodiversity/conservation related subjects for citizens of the OTs. Additionally, much of the environmental legislation in the OTs is in need of revision to facilitate the conservation of marine turtles and their habitats, and therefore TCOT strongly recommends that HMG provide the necessary support to the OTs to facilitate the required legislative amendments.

Specific Recommendations

6.1.1. Increase capacity for marine turtle management in British Virgin Islands

TCOT has significantly contributed to the skills and technical knowledge of BVI Conservation and Fisheries Department (CFD) officers. However, their enforcement patrol, research and monitoring capacity is currently compromised due to a shortage of staff, equipment and a limited budget. It is essential that the CFD receives adequate resources to effectively carry out their custodianship of the BVI's highly valuable marine and coastal resources on which the country's economy so heavily depends.

To date there has been long-term dedicated marine turtle research in the BVI, yet no permanent decision-making process that involves all stakeholders. Marine turtle conservation and management in the BVI is of significant public interest, especially among certain sectors (fisheries, diving, sailing). It is essential that public compliance with marine turtle management measures continues and, to facilitate such compliance, it is necessary that stakeholders have meaningful input into a decision-making progress.

6.1.1.1. Increase the capacity of the Conservation and Fisheries Department

a) Ensure CFD has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry and analysis for turtle monitoring programmes as part of their overall marine and coastal environment monitoring and research.

Species	Nesting	Foraging	Harvest
Green Turtle (*Chelonia mydas*)	Small numbers Trend unknown	Adults & juveniles present Large numbers in some areas	Still present at reduced levels largely targeting foraging juveniles Probably low levels of egg harvest
Hawksbill Turtle (*Eretmochelys imbricata*)	Small numbers Trend unknown	Adults & juveniles present Large numbers in some areas	Still present at reduced levels largely targeting foraging juveniles Probably low levels of egg harvest
Leatherback Turtle (*Dermochelys coriacea*)	Small numbers Possibly increasing	Rarely encountered at sea	Almost eliminated Possibly very occasional egg harvest
Loggerhead Turtle (*Caretta caretta*)	Possible occasional nest	Occasionally encountered	Unlikely

Table 6.1. Marine turtle species present and summary of harvests in the BVI.

b) Given the importance of all natural resources of Anegada, a priority for increased capacity would be a field-base (for visiting staff in addition to permanent personnel) and supporting infrastructure, including a research/enforcement vessel, based in Anegada.
c) Ensure that all new research staff are adequately trained in marine turtle biology, as well as research and conservation techniques.

6.1.1.2. Establish a multi-stakeholder marine turtle management process

Identify and establish a Marine Biodiversity Working Group to promote the conservation of marine resources and include representatives of all interest groups and stakeholders (e.g. government agencies and departments such as CFD, BVI National Parks Trusts, Planning and Tourism; NGO's; hoteliers; dive operators; construction industry, fishers, H. Lavity Stoutt Community College and interested members of public). The working group should meet regularly (ca. 4 times per year) to discuss and advise government (esp. CFD) on marine turtle management issues, paying particular attention to fisheries issues, habitat protection, possibilities for sourcing funding, further research/population monitoring, as well as investigating potential economic benefits of marine turtle conservation, and should seek external advice from appropriate experts. Some resources may be required to support stakeholder participation (e.g. travel expenses from other islands).

6.1.2. Amend legislation and policy to facilitate marine turtle population recovery

The legislation that currently regulates the harvest of marine turtles and their eggs in the BVI does not facilitate the sustained management of the country's nesting and foraging populations of marine turtles.

TCOT recognises that cessation of all marine turtle fishing would significanlty contribute to the recovery of depleted turtle populations. TCOT also recognises that, although direct exploitation of marine turtles is no longer a major economic activity of many fishers, turtle meat is a component of the traditional BVI diet and trunk oil is highly valued. However, we recommend that any/all future harvest of turtles must be carried out in a highly regulated and controlled manner, with programmes in place to monitor stock abundance and mechanisms to reduce or close the fishery in response to measured decreases in turtle stocks. Furthermore, if the CFD are responsible for the management of a future turtle fishery, it is vital that they have the human, technical and financial resources to effectively monitor the fishery and enforce supporting legislation.

TCOT recommends a number of legislative changes required to increase the likely sustainability of any harvest. In addition, it is noted that the regulation of use alone will not serve the sustainable management of turtles in the BVI. TCOT therefore also makes recommendations regarding legislation and policy changes to facilitate protection of critical marine turtle habitat in the BVI.

6.1.2.1. Harvest legislation recommendations

Although not monitored, the BVI turtle harvest is regulated by the Turtles Ordinance 1959 as amended in 1986 and the Fisheries Act 1997. This legislation is not comprehensively upheld or enforced, e.g. as evidenced by the high prevalence of turtle meat consumed at the Virgin Gorda Easter Festival during the designated closed season for the turtle fishery in 2004. We recommend a number of changes below. Any future harvest must be accompanied by meaningful, long-term and systematic monitoring programmes to ascertain trends in abundance in addition to adequate surveillance and enforcement.

In 2001, the Government of the BVI produced a draft document entitled *Fisheries Regulations, 2001,* which we were allowed to view. Sections 22, 26 and 27 dealt with regulations pertaining to the harvest of marine turtles and their eggs. Section 22 contained text that is contradictory to text in section 26 with respect to closed seasons for marine turtle harvest. Text in section 22 also contradicted the text of section 27 with respect to moratoria on the harvest of certain species of marine turtle. We felt that this needed reconsideration in order to become a more meaningful piece of legislation. The Regulations have now been gazetted, but we have not been able to obtain a final copy in time for final reporting. Based on the draft regulations, TCOT recommends the following amendments of the legislation to further facilitate sustainable harvest of BVI's foraging green and hawksbill turtles;

a) Ensure permanent and complete prohibition of harvest of any large, reproductively valuable turtles by instigating a maximum size limit. A suggested maximum may be 50lbs (22.7kg) or less, but should be based on additional research on the fishery and turtle stocks. This research should yield an equivalent maximum curved carapace length that should be stipulated in any amended legislation.
b) Consider a continued minimum size limit, as most fishers already accept this as a conservation measure. A suggested minimum would be 20lbs (9.07kg), with an equivalent minimum curved carapace length that should be stipulated in any amended legislation.
c) Establish a limited turtle fishing licensing scheme, whereby especially licensed turtle fishers agree to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including compulsory reporting to and catch biometric measurement/sampling by the BVI CFD of all turtles caught in advance of slaughter. Quotas should be reactive and based on number of licensed turtle fishers and stock assessments established through the monitoring regimes.
d) Ensure prohibition of the harvest of loggerhead and leatherback turtles given their very low numbers in the BVI.
e) Increase fines for infringments to a more punative level in line with those recommended by other OTs.

6.1.2.2. Strengthen and enhance BVI's marine protected areas system

In order to preserve the marine biodiversity of the BVI, including marine turtles, it is recommended that the BVI marine parks are strengthened and extended. Current CFD-led monitoring of marine turtles will allow "hot spots" of marine turtle abundance to be defined and integrated within the BVI National Parks Trust (BVINPT) system plan for marine protected areas. From limited monitoring carried out to date it appears that the only important turtle nesting beach included in the National Parks Plan is Rogue's Bay, Tortola. Although coastal areas of Windlass Bight in Anegada are proposed for protection, this does not seem to be the most important area for turtle nesting in Anegada.

6.1.2.3. Amend planning policy and beach management

The nesting marine turtles of the BVI undoubtedly represent remnants of depleted populations and are at critically low levels. However, the adverse impacts of increased beachfront development on the nesting populations using the beaches of the BVI must be considered in addition to the potential adverse impacts of turtle harvest. Every effort should be made to protect the remaining turtle nesting habitat in the BVI, and therefore TCOT recommends the following:

a) Ensure that key nesting habitats highlighted by ongoing CFD monitoring work are incorporated in the BVINPT systems plan and afforded protected status where no beachfront development will be permitted.
b) Introduce planning regulations to mitigate the adverse impacts of development, including, for example light pollution, disturbance of nesting turtles and erosion on all other nesting beaches.
c) Under the guidance of the working group, develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.

6.1.2.4. Revision of MEA legislation

The Endangered Animals and Plants Act, 1987 (Cap. 89) should be amended to prohibit commercial import and export of turtles and all wild turtle products of marine turtle species, so that this legislation fully transposes CITES to domestic law.

6.1.3. Establish systematic monitoring of marine turtle populations to determine trends in abundance

The BVI hosts nesting populations of green, hawksbill and leatherback turtles, and foraging populations of green and hawksbill turtles with occasional loggerhead turtles also reported. Trends in abundance will only be determined by long-term systematic monitoring. In order to understand the conservation status of these populations and inform effective conservation management, it is vital to work towards establishing data that will reveal any trends in their abundance. TCOT therefore recommends that the following monitoring programmes be established, under the guidance of the Marine Biodiversity Working Group, as a matter of priority:

6.1.3.1. Establish systematic monitoring efforts of nesting beaches

a) Continue with ongoing leatherback nesting monitoring, increasing the level of ground-truthing and assessment of nesting success (the proportion of adult emergences that result in egg laying).
b) Expand monitoring efforts to include hardshell turtle nesting sites.
c) Establish a sustainable programme of morning nesting beach monitoring. This would include expanding the current aerial surveying protocol to ca. 2 flights per month throughout the nesting season to ensure

biodiversity managers are aware of the most important sites for marine turtle nesting. At key index beaches, ground surveys should be carried out on foot to determine nesting abundance trends, facilitate ground truthing of aerial surveys and to facilitate genetic analysis of nesting population through nest excavation and sampling. This programme should preferably engage local interest groups and residents and could eventually be developed, under the guidance of the working group, into seasonal, revenue-generating tourist turtle walks in order to raise funds to sustain marine turtle management efforts.

6.1.3.2. Establish sustainable, regular and frequent (monthly), constant-effort monitoring programmes for both green and hawksbill turtles at a range of sites around the BVI, including Anegada

This would incorporate additional genetic sampling to facilitate the further determination of trends in genetic stock composition of green and hawksbill turtle populations. It should be noted that efforts should be focussed on yielding meaningful CPUE data although this may, at times, lead to a lower sampling rate per survey trip. Under the guidance of the Marine Biodiversity Working Group, steps should be taken to encourage the involvement of interested local fishers in all monitoring programmes and financial incentives should be considered so long as they fit within the remit of a sustainable programme.

6.1.4. Establish further conservation and awareness programmes to sensitise those living in and visiting British Virgin Islands to marine turtle conservation requirements

Increased awareness of turtles and their conservation requirements in the BVI can provide short and long-term mitigation against the threats faced by marine turtles due to development. TCOT recommends the following actions, to be implemented under the guidance of the Marine Biodiversity Working Group, to facilitate public contribution to marine turtle conservation:

6.1.4.1. Encourage and implement sensitive practices at existing nesting beaches

a) Develop a network of hoteliers, beach residents and other beach users to ensure swift reporting of nests not on index beaches, so that they can be marked, protected and monitored. A toll-free hotline may be of utility. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergences.
b) Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure CFD has the capacity to collect, necropsy and document all strandings.
c) Raise awareness through a dedicated campaign to sensitise Islanders to the importance of protecting the nests of such small nesting populations, and to encourage reporting of any illegal take of eggs or nesting females.
d) Develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.
e) Ensure school participation in any rookery monitoring programmes to sensitise children to the importance of rookery protection.

6.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the British Virgin Islands

a) Raise awareness among BV Islanders of the presence of distinct foraging and nesting turtle populations through informational materials, web sites and media outputs.
b) Establish a programme of stakeholder meetings to raise awareness of marine turtle biology (including presence of distinct foraging and nesting populations), turtle and habitat conservation needs, national legislation and MEA's.
c) Establish a programme of awareness raising presentations and workshops in fishing communities, schools and other public fora.
d) Establish a programme of awareness raising presentations and workshops to sensitise the tourism industry to the potential impacts of tourism and possible mitigation measures.
e) Develop BVI specific turtle related educational materials, and expand them to include further curriculum linked, multi-media educational materials where appropriate.

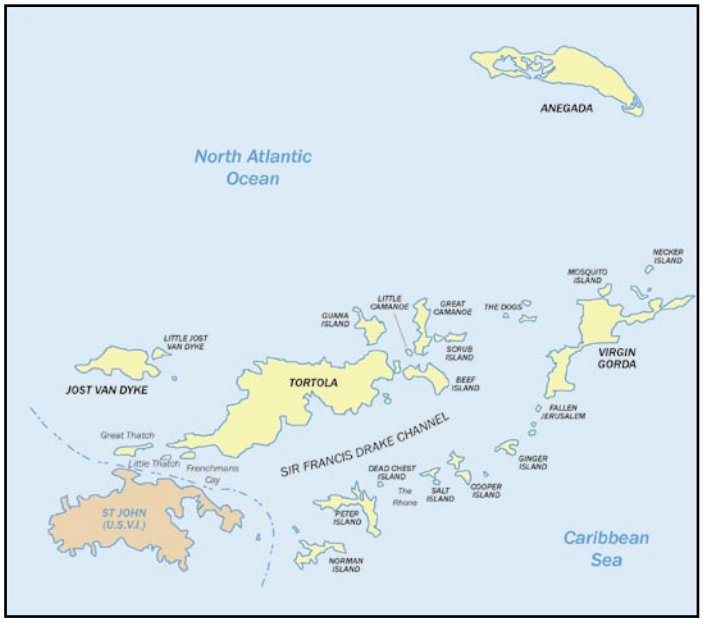

Figure 6.1. Map of the British Virgin Islands.

6.2. Geographic Overview

The British Virgin Islands (18°30'N, 64°30'W; Fig 6.1) consists of 36 islands, only 16 of which are inhabited. The major islands of this group are Tortola, Virgin Gorda, Anegada and Jost Van Dyke. The total land area of the islands is 150km^2 with a coastline of over 300km. The population currently stands at 22,187 (2004 est.) and the GDP per capita is $16,000 (2002 est.) (CIA Factbook, www.cia.gov). The economy is highly dependant on tourism (Photo 6.1), which generates an estimated 45% of the national income, with around 350,000 tourists, most from the USA, visiting in 1998. BVI also has a thriving offshore finance industry.

Photo 6.1. Large cruise liners call into BVI regularly (Photo B. Godley).

6.3. Historical Overview

We found no historical sources referencing marine turtles and their exploitation prior to the twentieth century.

6.4. Organisations Involved with Marine Turtles in the British Virgin Islands

6.4.1. BVI Conservation and Fisheries Department

The primary organisation involved with marine turtles in the BVI is the BVI Conservation and Fisheries Department (CFD). This was formed by the amalgamation of the Fisheries Division of the Agriculture Department and the Conservation Office. It operates within the Ministry of Natural Resources and Labour and its functions as articulated in the BVI Government website <http://dpu.gov.vg/Plans/NIDS/Environmentplanning.htm> are: 1. Manage the Natural Resources of the BVI (Biodiversity Conservation and Endangered Species Monitoring, Environmental Planning and Development Monitoring, Environmental and Coastal Resources Monitoring, Legislation Surveillance and Enforcement, Pollution and Natural Disaster Preparedness and Response); 2. Educate the Public about Environmental Issues; 3. Acquire and Manage Information to assist in the Decision Making Process. CFD has a staff of 44, compromising 6 admin staff; 4 part-time beach wardens, 10 full time beach wardens, 8 management staff, 3 research staff; 3 enforcement staff and 10 other support staff. The overall operating budget estimate for 2004-2005 was US$1,485,500 (S. Gore (CFD) pers. comm. 2004).

Involvement with marine turtle conservation and research has been extensive since a seminal leatherback monitoring programme was established in the 1980s (Photo 6.2), limited monitoring for hardshells in the early 1990's, extensive contribution to the WIDECAST network (Eckert *et al.* 1992) and, more recently, full support of the TCOT process and the Darwin Initiative Assessment of the Coastal Biodiversity of Anegada.

6.4.2. BVI National Parks Trust (BVINPT)

As articulated on the BVINPT website <http://www.bvinationalparkstrust.org/>. The BVINPT has a mission: *"To preserve and manage designated natural and cultural areas in order to improve the quality of life in the British Virgin Islands."* The Trust is further described as a Statutory Body, or a semi-governmental organization, operated by a Board of Directors appointed by Government. It receives an annual subvention from Government through the Ministry of Natural Resources and Labour. It has grown from a purely voluntary organization to a professionally-staffed operation with a complement of 27 employees. Its responsibilities have also substantially increased, from managing one National Park (Sage Mountain) in 1964, to managing 20 National Parks, including one marine park, today. Currently, the total area of land managed as national parks is 1079 acres (2.8% of the BVI land area) whereas 810 acres are included in the marine park. The total proposed MPA network of substantially expanded areas would be 99,319 acres or 0.49% of the total BVI marine area. The recently acquired OTEP project funding will seek to assess the representativeness of the marine resources contained within this expanded MPA system and be utilised to amend the proposed MPA network as needed. The NPT moorings programme has sought to protect the marine habitat, traditionally of coral reef areas, using the Halas mooring system, but seagrass areas are recognised as an equally

Photo 6.2. CFD staff with a nesting leatherback (Photo CFD).

important habitat, particularly for marine turtles. The NPT is currently expanding its mooring system to use sand screws that can be used within seagrass habitats.

BVINPT typically see marine turtle affairs as falling under the aegis of Conservation and Fisheries Department, but staff contribute to general environmental education, the Trust has an active moorings/reef protection programme and is one of the key partners in the Darwin Initiative Assessment of the Coastal Biodiversity of Anegada, of which sea turtles are a key element.

6.4.3. H. Lavity Stoutt Community College (HLSCC)
Although primarily a teaching institution, there are a number of trained biologists on staff who are actively involved in biodiversity research and environmental awareness-raising initiatives in the BVI. These include active involvement in the Tortola-based leatherback rookery monitoring programme, lead by CFD and HLSCC's partnership in the Darwin Initiative Assessment of the Coastal Biodiversity of Anegada.

6.5. Status of Nesting Marine Turtles in the British Virgin Islands

6.5.1. Data from beach monitoring

Leatherback turtles
To summarise the status of leatherback turtle monitoring in the BVI, Hastings (2003) is quoted below with additional more recent data added. A full copy of this article can be accessed with figures at <http://www.seaturtle.org/mtn/archives/mtn99/mtn99p5.shtml>:

"Since 1988, the Conservation and Fisheries Department of the BVI Government and dedicated volunteers, have conducted annual monitoring surveys of trunk nesting beaches. The main aim has been to determine the size of the remnant population, which has survived many years of harvesting and egg poaching. Moreover, the presence of Government officers was intended to help deter illegal taking of turtles.

Prior to 1994, monitoring surveys were limited to the retrospective assessment of tracks and other signs of egg laying following the departure of the female (see Cambers & Lima 1989; Hastings 1991; Morris 1990). Since 1994, additional staff has made it possible to increase efforts to locate and tag females, and to quantify and add new dimensions to education, public awareness and promotion of the tourism potential of remaining populations of sea turtles. Logistics dictate that daytime monitoring of nesting activities by a network of volunteers is still the most efficient means to collect the majority of data, but, since 2000, every attempt has been made to locate nesting turtles during beach patrols mounted most nights of the nesting season. More comprehensive nocturnal monitoring is hindered by the difficult terrain leading to many important nesting beaches, the large number of beaches to cover, and, perhaps most importantly, the low frequency of nesting activity, which quickly dampens the enthusiasm of volunteers. Notwithstanding, nightly patrols are carried out at Long Bay Lambert, Little Bay Lambert and Josiah's Bay from March to August.

It is very clear that, although the trunk nesting population in the BVI is dangerously small, it appears to be on the increase. From a low of three reported nesting activities in 1990, numbers have increased fairly steadily to an all time high of 63 verified nesting activities in 2001 (Editors note: 47, 65, and 39 in each of 2002-2004 respectively; S. Gore (CFD) pers. comm. 2004). This is a remarkable turnaround in a few years. With increasing numbers it has been possible for turtles to be tagged and identified as individuals. Of these, one had previously nested in Culebra, Puerto Rico, and five have been encountered nesting in the BVI in more than one season (Photo 6.3).

Photo 6.3. Leatherback descends to sea (Photo BVI CFD).

Although numerous factors may be responsible, changes in local legislation, in concert with increasing law enforcement, have certainly had a positive effect. The trunking tradition was curtailed with the introduction of the revised Turtle Act of 1986, which made it illegal to take turtles except during an annual period of 1 December to 31 March. The Act largely eliminated the legal trunk harvest, as most trunks nest from April to June in the BVI. However, demand for trunk oil remains high, and trunkers continually ask for exemptions to catch a turtle, but very few trunk turtles have been killed in recent years. We are aware of one successful killing in 1996 and one aborted attempt in 1999. Meanwhile, despite enforcement efforts, poaching of the eggs continues to occur sporadically."

Hardshell turtles
The first scientific surveying to assess turtle nesting in the BVI was carried out in July 1981 for Western Atlantic Turtle Symposium (WATS) by Fletemeyer (1984). In conjunction with limited ground truthing and interviews with local people, rough estimates of the number of females in the annual nesting populations were given as:

Photo 6.4. Bill Bailey with green turtle nest, Anegada (Photo B. Godley).

Green:	75± 25
Hawksbill:	50± 25
Leatherback:	2
Loggerhead:	few and infrequent

Surveying for hardshelled marine turtles resumed in the 1990s with a network of volunteers activated to survey by foot (Hastings 1991; 1992). In 1990, between 21 August and 22 October, 1 green turtle nest (Prickly Pear), 4 hawksbill turtle nests (Virgin Gorda, 1 Tortola), and 1 nest of unknown species (Scrub Island) were recorded. In 1991, between 1 September and 25 November, 1 green turtle nest (Tortola), 14 hawksbill turtle nests (9 Scrub Island, 4 Tortola, 1 Jost Van Dyke) and 2 nests of unknown species (Little Camanoe) were recorded. Green turtle nests were recorded in September only. Hawksbill turtle nests were recorded between August and November.

In the interim period, occasional nests have been reported by interested members of the public, highlighting the potential for an organised re-activation of the once extant volunteer network in line with recommendations below. This has also allowed collection of a small number of genetics vouchers from hatchling turtles (see section 10.6.).

As part of TCOT fieldwork, in collaboration with local conservationist, Bill Bailey, CFD and MTRG staff recorded nesting of green (Photo 6.4) and hawksbill turtles on Anegada in August 2002. This lead to a chain of events that resulted in the successful application to the Darwin Initiative for the Assessment of the Coastal Biodiversity of Anegada <http://www.seaturtle.org/mtrg/projects/anegada/>.As part of this project, systematic surveys are being made of Anegada's beaches by foot in 2004. Data to date include a total of 5 green turtle nests and 6 hawksbill turtle nests in July. Although hosting small numbers of nests, Anegada is undoubtedly very important for marine turtle nesting in the BVI, with nesting being recorded between Windlass Bight and East End.

To augment these data, intermittent flights across the whole archipelago are being carried out with the support of the Royal British Virgin Islands Police aircraft. This included a complete survey of Anegada, Necker, Prickly Pear, Eustatia, Virgin Gorda, Ginger, Peter, Norman, Jost Van Dyke, Sandy Cay, Sandy Spit, Tortola, Guana, Little Camanoe, Great Camanoe, Scrub and Beef Islands. To date three flights have been made (25 May 04, 15 June 04, 14 July 04). No activities were recorded on the first flight, 2 leatherback activities were recorded on Tortola on the second flight and 3 leatherback activities were recorded on Tortola on the third flight. On this third flight, an additional seven activities of green and hawksbill turtles were recorded on Anegada, which were subsequently confirmed through ground-truthing surveys.

6.5.2. Data from TCOT socio-economic questionnaire

As part of the TCOT SEQ, 4 former egg collectors (one of whom also used to capture turtles on the nesting beaches) commented on the changing abundance of marine turtles nesting in BVI (Q105a-c). Their views on changing abundance by species are summarized in table 6.2. Although these data represent very few respondents, it is worth noting that most respondents suggest that abundance has decreased in the last 5 years, while it has or stayed the same since they can remember (only one respondent cites an increase, for leatherbacks in the last 5 years, while 2 respondents cite a decrease since they can remember for leatherbacks and hawksbills).

All questionnaire respondents were also asked about changes in nesting numbers over time (in the last five years and since they can remember), both in general and for specific species (Q105a-c). Fourteen respondents noticed

Photo 6.5. Genetics sampling, Tortola (Photo B. Godley).

In the last 5 years…

	Increasing	Decreasing	Same	Don't know	NR
Green	0	1	0	0	3
Leatherback	1	1	0	0	2
Hawksbill	0	2	0	1	1
General	0	0	1	0	3

Since you can remember…

	Increasing	Decreasing	Same	Don't know	NR
Green	0	0	1	0	3
Leatherback	0	1	1	1	1
Hawksbill	0	1	1	1	1
General	0	0	1	0	3

Table 6.2. Perceptions of changing abundance (by species) in the last 5 years, and since you can remember (n=4 former egg collectors. NR-not recall).

change, and 42 did not. For those who did notice change, for each species (except the leatherback) and in general, more people believed turtle nesting was decreasing or stayed the same versus increasing, in the past five years and since they can remember. Alternatively, most people believe leatherback nesting has increased over both time periods. (The perception of increased leatherback nesting may be a result of publicity received by the leatherback monitoring efforts). Perceptions of species decline and increases are summarised in table 6.3 below.

6.5.3. Genetics

TCOT genetic analyses (Photo 6.5) has shown that the haplotypes of nesting samples collected in the BVI have also been described in a number of other nesting sites and foraging areas (see section 10.4.3).

For wild green turtles no genetics vouchers have yet been collected.

For hawksbill turtles haplotypes described in nesting turtles/hatchlings from BVI have been described from

In the last 5 years…

	Increasing	Decreasing	Same	Don't know	NR	NA
Green	1	2	1	1	6	3
Leatherback	6	2	0	1	3	2
Loggerhead	0	0	1	0	8	5
Hawksbill	2	4	2	1	2	3
General	0	3	2	0	7	2

Since you can remember…

	Increasing	Decreasing	Same	Don't know	NR	NA
Green	1	3	2	1	4	3
Leatherback	5	2	1	1	3	2
Loggerhead	0	0	1	0	9	4
Hawksbill	2	3	3	1	2	3
General	0	2	2	0	8	2

Table 6.3. Perceptions of changing abundance (by species) in the last 5 years, and since you can remember (n=14 respondents who noticed change: NR- not recall, NA-not applicable).

Photo 6.6. Trunk Bay, key nesting site for leatherbacks but currently subject to development plans (Photo P. Richardson).

foraging grounds in Anguilla, BVI, Cayman Islands, Cuba, Mexico, Puerto Rico, TCI. These haplotypes have also been described from **nesting** aggregations in Belize, BVI, Cuba, Puerto Rico and USVI.

It should be noted however, that these are only potential linkages as haplotypes are not unique to individual nesting colonies. Complex mathematical analyses will be run on full sample sets following the next batch of analyses at the end of 2004 and more definitive answers will be available at that point. Despite the small size of the nesting populations in the BVI and the limited sampling to date (n=2), a previously undescribed haplotype was described for hawksbill turtles, highlighting the potential that the small remnant population in the BVI may be unique. More definitive answers will be available at that point. Data will be disseminated as part of a cross-territory FCO Overseas Territories Environment Programme (OTEP) funded project, which will focus on turtle Conservation, the Environment Charter and Multilateral Environment Agreements.

6.5.4. Threats

The threats to nesting turtles as outlined by CFD (S. Gore. (CFD) pers. comm. 2004) include:

1. Occasional illegal take of nesting females and/or eggs.
2. By catch in marine fisheries.
3. Loss of beach habitat due to erosion and sand mining.
4. Problems related to increased development at nesting beaches such as anthropogenic lighting (Photo 6.6).
5. Pollution, including marine borne litter on beaches, particularly on Anegada.

Recommendations

6.1.3.1. Establish systematic monitoring efforts of nesting beaches

a) Continue with ongoing leatherback nesting monitoring, increasing the level of ground-truthing and assessment of nesting success (the proportion of adult emergences that result in egg laying).
b) Expand monitoring efforts to include hardshell turtle nesting sites.
c) Establish a sustainable programme of morning nesting beach monitoring. This would include expanding the current aerial surveying protocol to ca. 2 flights per month throughout the nesting season to ensure biodiversity managers are aware of the most important sites for marine turtle nesting. At key index beaches, ground surveys should be carried out on foot to determine nesting abundance trends, facilitate ground truthing of aerial surveys and to facilitate genetic analysis of nesting population through nest excavation and sampling. This programme should preferably engage local interest groups and residents and could eventually be developed, under the guidance of the working group, into seasonal, revenue-generating tourist turtle walks in order to raise funds to sustain marine turtle management efforts.

6.1.2.2. Strengthen and enhance BVI's marine protected areas system

In order to preserve the marine biodiversity of the BVI, including marine turtles, it is recommended that the BVI marine parks are strengthened and extended. Current CFD-led monitoring of marine turtles will allow "hot spots" of marine turtle abundance to be defined and integrated within the BVI National Parks Trust (BVINPT) system plan for marine protected areas. From limited monitoring carried out to date it appears that the only important turtle nesting beach included in the National Parks Plan is Rogue's Bay, Tortola. Although coastal areas of Windlass Bight in Anegada are proposed for protection, this does not seem to be the most important area for turtle nesting in Anegada.

6.1.2.3. Amend planning policy and beach management

The nesting marine turtles of the BVI undoubtedly represent remnants of depleted populations and are at critically low levels. However, the adverse impacts of increased beachfront development on the nesting populations using the beaches of the BVI must be considered in addition to the potential adverse impacts of turtle harvest. Every effort should be made to protect the remaining turtle nesting habitat in BVI, and therefore TCOT recommends the following:

a) Ensure that key nesting habitats highlighted by ongoing CFD monitoring work are incorporated in the BVINPT systems plan and afforded protected status where no beachfront development will be permitted.

b) Introduce planning regulations to mitigate the adverse impacts of development, including, for example light pollution, disturbance of nesting turltes, and erosion on all other nesting beaches.

c) Under the guidance of the working group, develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.

6.1.4.1. Encourage and implement sensitive practices at existing nesting beaches

a) Develop a network of hoteliers, beach residents and other beach users to ensure swift reporting of nests not on index beaches, so that they can be marked, protected and monitored. A toll-free hotline may be of utility. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergences.

b) Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure CFD has the capacity to collect, necropsy and document all strandings.

c) Raise awareness through a dedicated campaign to sensitise Islanders to the importance of protecting the nests of such small nesting populations, and to encourage reporting of any illegal take of eggs or nesting females.

d) Develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.

e) Ensure school participation in any rookery monitoring programmes to sensitise children to the importance of rookery protection.

	Green	Hawksbill
Trellis Bay – Tortola	3	2
Jost Van Dyke	1	
Anegada (pre-DARWIN)		6
Guana Island		8
Tortola-East	1	1
Peter Island	2	4
Beef Island		2
Tortola-West		1
Norman Island	1	
Cooper Island	1	1
Great Camanoe		6
Little Thatch Island		1
Virgin Gorda - Little Dix Bay	1	1
Virgin Gorda -The Baths		1
TOTAL	**10**	**34**

Table 6.4. showing number of turtles of each species captured at a range of sites around Tortola and nearby Islands.

6.6. Status of Foraging Marine Turtles in the British Virgin Islands

6.6.1. In-water sampling around Tortola and nearby Islands

As part of the TCOT initiative, the first in-water tagging and sampling in the BVI was initiated. Methods have involved prospecting by boat-based observers followed by the rodeo technique, man-on tow followed by hand capture using free divers, purse seine netting of lagoonal areas, and using a large set net purchased for CFD from TCOT funds. Sampling was initiated by CFD (Photo 6.7) in partnership with TCOT and with the collaboration of local turtle fisher Tony Lettsome (Photo 6.8) and is now carried out regularly throughout the year at the sites listed in table 6.4. According to CFD officers, this sampling should be developed to include more effort in the waters of Virgin Gorda and Anegada, where turtles are reported to be in relative abundance (A. Pickering & S. Gore (CFD) pers. comm. 2004) .

Photo 6.7. BVI CFD in-water turtle team August 2002 (Photo B. Godley).

Photo 6.8. Turtle fisher Tony Lettsome releases tagged turtle (Photo B. Godley).

Species	<25cm	26-50cm	51-75cm	>76	Unknown Size	Total	Site
Green	1	4	2	8	0	**15**	1-6,9-12
Hawksbill	1	19	19	15	1	**54**	1,8,9,11-27
Loggerhead	0	0	3	3	0	**6**	21,22,28
Leatherback	0	0	0	2	0	**2**	29,13
Unidentified	0	0	0	0	4	**4**	5,13,30,31

Table 6.5. Summary of species and size class of individual turtles observed by divers in BVI Jan 02-Dec. 03. Key to locations: [1]Mountain Point - VG, [2]Kellys Cove, [3]Mellon Wall- Guana Island, [4]National Parks, [5]Wreck Alley - Cooper, [6]Coral Gardens, [7]Bronco Billy, [8]Brewers Bay, [9]Cooper Island, [10]Norman Island, [11]Angelfish Reef- Norman [12]The Rhone - Salt Isl., [13]Alice in Wonderland, [14] Spyglass Wall – Peter,[15]Diamond Reef, [16]Blue Chromis-Cooper, [17]Cistern Rock, [18]Trellis Bay, [19] Thumb Rock – Cooper, [20]Maryground – Guana [21]Pelican Island, [22]Privateers Bay Norman Isl., [23]The Chimney's, [24]Scrub Island, [25]Vanishing Rock, [26]Playgorund – JostVanDyke, [27]The Baths, [28]Salt Island, [29]Sir Francis Drake Channel, [30]Carvel Rock, [31]Ginger Steps- Ginger.

6.6.2. In-water sampling at Anegada

Growing out of the TCOT Initiative, sampling has been an integral part of the Darwin Initiative Assessment of the Biodiversity of Anegada. This has included the full range of techniques used around Tortola and is carried out by Anegada Project staff, including members of the Anegadian Fishing Community (Photo 6.9 - Damon Wheatley and Jim White). Personnel from the Darwin Project partner organisations regularly take part in fieldwork. To date (July 2004), 102 hawksbill turtles and 50 green turtles have been captured as part of this initiative.

6.6.3. Data gathered through Caribbean Turtlewatch

One of the methods used to gather information on foraging populations was *Caribbean Turtlewatch,* a questionnaire designed to be completed by recreational divers/snorkelers. More detailed methodology is given in Section 2 of this report. Copies of the materials used are given in Appendices 2.2-2.4.

During the period January 2002 – December 2003, 156 *Caribbean Turtlewatch* forms were completed, detailing dives and turtle sightings in the BVI. On 69 occasions turtles were observed. On 9 dives more than one turtle was observed (5 dives two turtles; 4 dives three turtles). In table 6.5 we summarise the species and size class of individuals observed. The dive operators involved included: Commercial Dive Services, Blue Water Divers, Dive BVI, Sail Caribbean, UBS, and White Squall.

Photo 6.9. Field team in Anegada (Photo B. Godley).

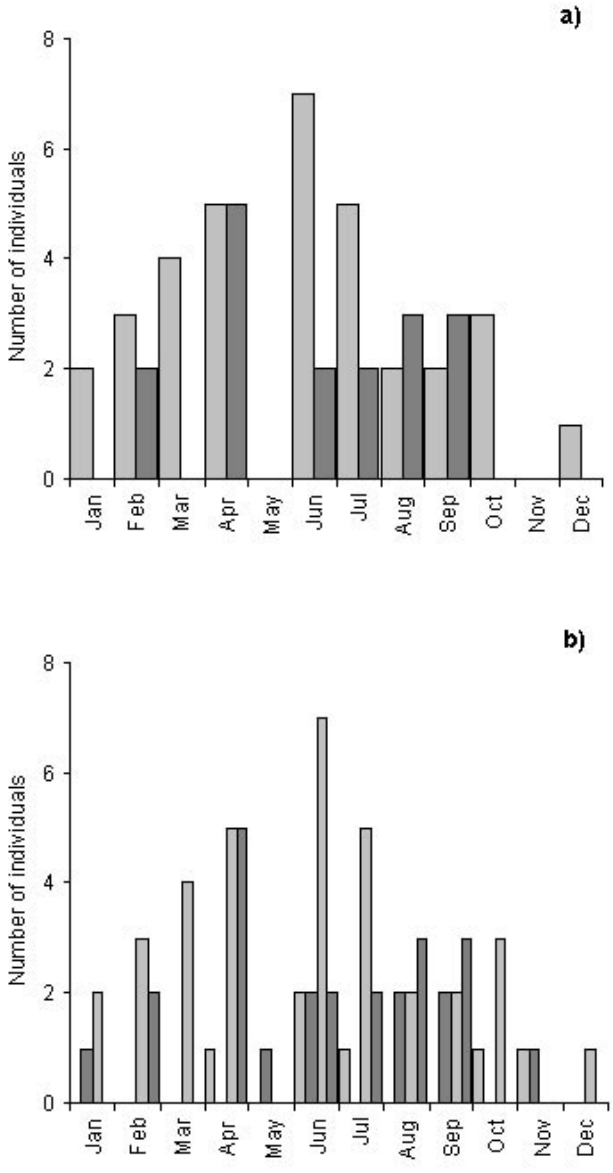

Figure 6.2. Temporal distribution of sightings of a) hawksbill and b) green turtles in the BVI. Pale shaded columns represent individuals of <75cm in carapace length estimated by observers. Dark shaded columns represent those >75cm, considered adults.

	Green		Hawksbill		Loggerhead		Leatherback		Unidentified		Total
	Juv	*Adult*	*Juv*	*Adult*	*Juv*	*Adult*	*Juv*	*Adult*	*Juv*	*Adult*	
Jan	0	0	0	0	0	0	0	0	0	7	7
Feb	0	0	0	0	0	0	0	1	0	0	1
Mar	0	0	0	0	0	0	0	0	0	0	0
Apr	0	0	6	3	0	0	0	0	0	0	9
May	0	4	10	4	0	0	0	0	2	0	20
Jun	4	2	8	2	0	0	0	0	0	0	16
Jul	2	1	4	3	3	2	0	1	0	0	16
Aug	0	1	5	2	0	0	0	1	0	1	9
Sep	0	0	2	2	0	0	0	0	0	0	4
Oct	0	0	2	0	0	0	0	0	0	0	2
Nov	0	0	0	0	0	1	0	0	0	0	1
Dec	0	0	0	0	0	0	0	0	0	0	0

Table 6.6. Temporal distribution of observations of all species in the BVI 2002/2003. Juveniles are classed as those <75cm in carapace length and adults those >75cm.

The most frequently observed species in the BVI is the hawksbill turtle (66% of sightings; Photo 6.10). Green turtles are also relatively commonly in these waters (20% of sightings). Loggerhead and leatherback sightings are relatively infrequent, and these species may be passing through the waters as they forage or migrate. Green and hawksbill turtles commonly reside on reefs or seagrass beds and thus there is a greater chance of them being observed by divers. The months during which individuals were observed are given in table 6.6. In addition, data on the temporal distribution of hawksbill and green turtle sightings are presented in figure 6.2.

Divers were asked the question: *Did the chance of seeing a turtle influence your decision to choose this particular dive?* Of the 128 individuals that responded, 16 answered yes, 110 answered no and 2 were unsure. When asked the question: *How important was your turtle sighting to the enjoyment of the dive?* 26 individuals responded that the experience was very important, 44 that it was important, and 55 that it was of no importance.

Photo 6.10. Juvenile hawksbill turtle in reef habitat, Beef Island (Photo P. Richardson).

These answers reflect that few individuals select dive sites for the specific purpose of seeing a turtle during their dive. Once seen however, turtles are appreciated by the majority of divers who rank the sighting as important or very important to their enjoyment. That 55 divers stated turtle sightings were not important corresponds with comments made during interviews by dive operators. While 4 of the 6 operators interviewed as part of TCOT SEQ ranked turtles as 'very important' to their businesses, 5 of the 6 also stated that the loss of turtles from OT waters would not affect the use of their services. One interviewee described turtles as one of many possible animals to be sighted that make a dive special. Nevertheless, turtles are used to promote tourism in the BVI. In the July 2004 edition of *Dive Magazine*, apparently Britain's best–selling dive magazine, BVI is featured in an article entitled *Eastern Caribbean Hotspot*s, which stated that *'the islands are renowned for the high number of turtles.'* Furthermore, in an advertisement issued by the BVI Tourism Board to UK newspapers in 2003, the BVI's tropical paradise qualities are exemplified by reference to a turtle basking on the beach.

6.6.4. Information gathered from sailing community

Inspired by the Caribbean Turtlewatch Initiative, Shannon Gore of CFD set up an analogous project to stimulate records from the sailing fraternity in the BVI. A form was distributed through Moorings Crewed Yacht Charters, Dive BVI and Serendipity Adventures. A total of 17 forms were received. These data are currently being analysed, and will offer increased insights into the distribution of marine turtles in BVI waters. Partners in this project included the crews from Serendipity (Serendipity Adventures), Hound Dog (The Moorings) and Capricious Cat (The Moorings).

In the last 5 years…

	Increasing	Decreasing	Same	Don't know	NR
Green	4	3	0	1	2
Leatherback	1	2	0	3	3
Loggerhead	0	3	0	2	4
Hawksbill	2	2	2	2	1
General	0	2	1	2	4

Since you can remember…

	Increasing	Decreasing	Same	Don't know	NR
Green	3	2	2	1	9
Leatherback	1	1	1	3	3
Loggerhead	0	2	1	2	4
Hawksbill	2	3	1	2	1
General	0	1	2	2	4

Table 6.7. Perceived changes in abundance of turtles found in OT waters (by species and in general) in the last 5 years and since the respondent can remember (n=9 turtle fishermen who noticed a change; NR- not recall).

6.6.5. Trends in abundance gathered from the TCOT socio-economic questionnaire

Turtle fishers were asked to provide their views on changes in abundance of turtles in general in BVI waters (Q24a-c), when asked about trends for all animals they fish for. Of 17 turtle fishers, 9 responded to the question. Four turtle fishers felt there has been a general decrease in marine turtle numbers in the short term (5 years) and 3 saw this decrease in the long term (since they started fishing). One believed turtle numbers had increased in the short and long term. The others believed numbers had stayed the same (n=1 in the short term, n=2 in the long term), or were uncertain of the nature of change (n=3, both time periods). While there is no strong pattern in responses, only 1 fisher described an increase over either time period.

All TCOT SEQ respondents were asked about trends in abundance of turtles found in OT waters (in general and by

In the last 5 years…

	Increasing	Decreasing	Same	Don't know	NR
Green	7	7	5	6	3
Leatherback	6	3	1	10	8
Loggerhead	1	5	2	9	11
Hawksbill	7	5	7	6	3
General	5	5	5	6	7

Since you can remember…

	Increasing	Decreasing	Same	Don't know	NR
Green	7	6	5	5	5
Leatherback	6	2	2	9	9
Loggerhead	0	5	4	7	12
Hawksbill	7	6	6	5	4
General	6	6	5	2	9

Table 6.8. Perceived changes in abundance of turtles found in OT waters (by species and in general) in the last 5 years and since the respondent can remember (n=28 respondents who noticed a change; NR-not recall)

species) in the last 5 years and since they can remember (Q104a-c). Views of all respondents are shown in table 6.8, while views of turtle fishers are isolated in table 6.7. Nine fishers noticed change, while 7 did not, and 1 did not answer. In contrast to responses for turtles in general (where few fishers recognized increases as discussed above), some fishers perceived increased abundance in green turtles in the short and long term. Also, equal numbers perceived an increase, decrease, and lack of change in abundance for hawksbills in the short term, and leatherbacks in the long term. Thus, while fishers agree on decreased abundance overall, they have more diverse views on changes in abundance by individual species.

Of all 55 respondents to the TCOT SEQ, 28 respondents perceived a change, while 25 did not, and 3 did not answer the question. The responses of the 28 perceiving a change are shown in table 6.8. There are no strong patterns among responses to this question, for either time period, for green or hawksbill turtles; approximately the same number of respondents believed that abundance has increased, decreased, stayed the same, or didn't know. In contrast, there is some perception of increased abundance of leatherbacks over both time periods, and of decreased abundance of loggerheads over both time periods.

6.6.6. Genetics

TCOT genetic analyses has shown that the haplotypes of samples from foraging turtles collected in the BVI have also been described in a number of other nesting sites and foraging areas (see section 10.4.3).

Photo 6.11. Sediment rich run-off follows all major rain events in Tortola (Photo P. Richardson).

For wild green turtles, haplotypes described in **foraging** turtles in the BVI have been described in **foraging** aggregations in Anguilla, Bahamas, Barbados, Montserrat, Nicaragua, TCI, USA and West Africa. These haplotypes have also been described from **nesting** aggregations in Ascension Island, Costa Rica, Mexico, USA, Venezuela.

For hawksbill turtles haplotypes described in **foraging** turtles in BVI have been described from **foraging** grounds in Anguilla, Cayman Islands, Cuba, Mexico, Montserrat, Puerto Rico, TCI. These haplotypes have also been described from **nesting** aggregations in Anguilla, Antigua, Barbados, Brazil, Cuba, Montserrat, Puerto Rico, TCI, USVI.

It should be noted, however, that these are only potential linkages as haplotypes are not unique to individual nesting colonies. Complex mathematical analyses will be run on full sample sets following the next batch of analyses at the end of 2004, and more definitive answers will be available at that point. At this point, however, it can be clearly highlighted that the turtles foraging in BVI waters will undoubtedly include those originating from a number of nesting colonies across the Caribbean region. Data will be disseminated as part of a cross-territory FCO Overseas Territories Environment Programme (OTEP) funded project, which will focus on Turtle Conservation, the Environment Charter and Multilateral Environment Agreements.

6.6.7. Threats

Perceived threats to turtles in BVI waters as outlined by CFD (S. Gore (CFD) pers. comm. 2004) include:

1. Direct take.
2. Incidental take in marine fisheries.
3. Increasing marine traffic in the BVI leading to boat strike.
4. Pollution and general environmental degradation (Photo 6.11).

Recommendations

6.1.3.2. Establish sustainable, regular and frequent (monthly), constant-effort monitoring programmes for both green and hawksbill turtles at a range of sites around the BVI, including Anegada.

This would incorporate additional genetic sampling to facilitate the further determination of trends in genetic stock composition of green and hawksbill turtle populations. It should be noted that efforts should be focussed on yielding meaningful CPUE data although this may, at times, lead to a lower sampling rate per survey trip. Under the guidance of the working group, steps should be taken to encourage the involvement of

interested local fishermen in all monitoring programmes and financial incentives should be considered so long as they fit within the remit of a sustainable programme.

6.1.2.2. Strengthen and enhance BVI's marine protected areas system

In order to preserve the marine biodiversity of the BVI, including marine turtles, it is recommended that the BVI marine parks are strengthened and extended. Current CFD-led monitoring of marine turtles will allow "hot spots" of marine turtle abundance to be defined and integrated within BVI National Parks Trust (BVINPT) system plan for marine protected areas. From limited monitoring carried out to date it appears that the only important turtle nesting beach included in the National Parks Plan is Rogue's Bay, Tortola. Although coastal areas of Windlass Bight in Anegada are proposed for protection, this does not seem to be the most important area for turtle nesting in Anegada.

Photo 6.12. Carrying out TCOT SEQ Survey (Photo P. Richardson).

Measures of direct exploitation	Past	Present	Never	NR or NA
By life stage				
Females on beaches	1	0	-	-
Eggs from beach	4	0	-	-
Turtles in water (intentional)	8	8	-	-
Turtles in water (incidental)	-	-	-	-
By product				
Meat				
Fishers who sell meat	5	6	-	-
Meat vendors	1	3	15	-
Meat consumers	15	18	22	-
Eggs				
Collectors who sell eggs	0	0	-	-
Egg vendors consumers	0	0	-	-
Egg consumers	11	18	-	-
Non-edible				
Fishers who sell shells	2	1	-	-
Shell vendors	0	1	-	-
Shell consumers	5	6	-	-
Measures of indirect exploitation				
Turtles indirectly used in business	18	-	-	
Total interviews	**55**			

Table 6.9. Numbers of TCOT SEQ respondents involved in exploitation, by exploitation category (NR-no response; NA - not applicable).

6.7. Direct Use of Marine Turtles in the British Virgin Islands

6.7.1.Overview

The main domestic legislation covering marine turtle exploitation in the BVI is The Turtles Ordinance 1959 as amended (1986, 1987; Anon 1986) and the Fisheries Act, 1997. The updated legislation extends a moratorium on hunting leatherback turtles, prohibits egg harvest and contains at sea take to an open season (December-March inclusive) with a minimum take size (20lbs, 9.07kg). See Section 3 of this report for a full overview.

The Fishing Laws of the BVI are promoted in an attractive coloured pamphlet produced by CFD (Appendix 6.1). This outlines methods of capture which are illegal, the need for licenses, the marine protected areas and closed seasons for the four groups of concern: leaf or queen conch (*Strombus gigas*), Nassau grouper (*Epinephelus striatus*), red hind (*Epinephelus guttatus*) and marine turtles.

Data on use of marine turtles were gathered by combining published literature, information from project partners, and data gathered using the TCOT SEQ (See Section 2.1; Photo 6.12). Fifty-five questionnaires were completed in the BVI and a breakdown of information gathered on marine turtle exploitation is digested in table 6.9.

6.7.2. Harvest of adults on the nesting beach

Leatherback turtles

In his overview of the regional turtle fishery, Rebel (1974) states that in the BVI turtles are netted and turned on the beaches and that the leatherback turtle was 1 of 4 sea turtle species caught, although he does not give an indication of magnitude. Based on interviews with fishers, Fletemeyer (1984) suggested that approximately 2 individuals of this species nested in 1981, but he did not quantify take. The work carried out by Fletemeyer was a contribution towards the first Western Atlantic Turtle Symposium, which marked the start of marine turtle research in the BVI.

In the 1980s, CFD began gathering data on marine turtles and their fisheries. Lettsome (1989) overviewed the leatherback turtle fishery, highlighting how there was no overlap between the activities of the leatherback turtle fishers or “trunkers”, who captured leatherback turtles on the nesting beaches, with those of “turtle fishers”, who set nets for green/hawksbill turtles as part of other marine fishing activities. The trunk harvest was not considered one of massive economic importance, but of profound cultural significance involving sharing of meat, eggs and the oil derived from the tissues. The oil was produced by dismembering the carcass, and the head, carapace, plastron, flippers and fat were boiled in seawater in a copper kettle on the beach. Oil was siphoned off as it rose to the surface of the water. The oil is reputed to have aphrodisiac qualities and have medicinal value, particularly with regard to respiratory complaints (Eckert *et al*. 1992; Lettsome 1989).

	“Crawls” Recorded	Estimated Number of Females	Number Killed
1986	7	3	1
1987	6	4	1
1988	1	1	0
1989	0	0	0
1990	5	3	1
1991	9	2-4	2
1992	6	4-5	0

Table 6.10. The number of leatherback turtle “crawls” i.e. nesting emergences, the estimated number of females nesting and estimated take per annum (data after Eckert *et al.* 1992).

In his report, Lettsome (1989) notes that the trunk fishery was concentrated in villages close to leatherback nesting beaches on Tortola, Virgin Gorda and Anegada and that within living memory it had declined significantly along with the nesting population. He records how as many as six leatherback turtles were reported to have nested per night on some key beaches, such as Josiah’s Bay in the 1920s, with further popular accounts suggesting that in the 1960s it was not unusual to take two or more turtles per night. By the 1980s, only a handful of nesting activities were recorded each year, and it was feared that the population would soon become extinct in the BVI (Cambers & Lima 1989; 1990). While the 1959 Ordinance specifically excluded leatherbacks in the text by stating *“turtle means sea or river turtle save and except trunk turtles”,* two successive amendments to the Ordinance in 1986 and 1987 resulted in leatherbacks becoming partially legally protected. These amendments prohibited take on the beach and during the closed season, which encompassed the vast majority of the nesting season.

However, legal protection did not immediately stop the harvest. See table 6.10 below. In 1991, one leatherback was slaughtered under a special permit from the Ministry of Natural Resources, one was slaughtered illegally, and another was rescued and released by local community members before it could be slaughtered (Hastings 1991).

Although numerous factors may be responsible, changes in local legislation in concert with increased law enforcement and awareness raising efforts appear to have had a positive effect. The leatherback nesting population in the BVI is showing signs of recovery (Hastings 2003 - see above). Although the trunking tradition was curtailed with the introduction of revised legislation in 1986 and 1987, demand for trunk oil remains high, and trunkers continually ask for exemptions to take a leatherback. Currently, all such requests are refused (B. Lettsome (CFD) pers. comm. 2003). It is perhaps not surprising that these requests persist and that illegal take is contemplated given: 1. the cultural importance of leatherback turtle derived products, and 2. that each leatherback has the potential to yield a profit of several thousand US dollars (Eckert *et al.* 1992). Some still watch

for the nesting females, but very few leatherback turtles have been killed in recent years. Since 1993, authorities are aware of one successful killing in 1996 and one aborted attempt in 1999 (Hastings 2003).

During the TCOT SEQ, attempts were made to interview one of the older 'trunkers' who currently assists the CFD with monitoring leatherback nesting. Unfortunately, he refused to be interviewed. Only one SEQ interviewee reported formerly consuming trunk oil, and thus little insight was gained into this culturally important turtle use in BVI.

Hardshell turtles

We have not sourced any historical accounts of the level of exploitation of nesting hardshells. Rebel (1974) states green, loggerhead and hawksbill turtles are all caught in nets or on the nesting beach, but gives no indication of magnitude. Based on interviews with fishers and aerial surveys flown in July 1981, when 38 "fresh nests" were recorded, Fletemeyer (1984) estimated the annual nesting populations for the three hardshell species (green turtles 50-100 females; hawksbill turtle 25-75 females; loggerhead turtles: very small, perhaps a few individuals). He also suggested that a take of 20% or 25 nesting females per annum. Although the report concentrates on the leatherback fishery, Lettsome (1989) notes that by the time of writing there had been a considerable decline in the local family/ community oriented turtle fishery. Although anecdotes were gathered by the TCOT team regarding occasional take of nesting females, there are now few, if any areas, where hardshell turtles nest regularly in sufficient numbers to warrant harvest effort (Hastings 1992) other than perhaps Anegada. From interviews carried out by Downs (1997), it appeared that capture of turtles on the beaches of Anegada had declined in recent years.

6.7.3. Harvest of eggs

Fletemeyer (1984) suggested 50% mortality of eggs, with human poaching as the major cause (table 10 in Fletemeyer 1984). He estimated some 12,000 eggs were taken per annum, which equates to ca. 100 clutches. Nesting levels at all sites, other than perhaps certain stretches of the Anegada coastline, are now very low. Although occasional anecdotes are received by CFD that eggs have been taken for human consumption (Eckert *et al.* 1992; Hastings 2003), this is now exceedingly rare in Tortola and the other populous islands, and is certainly reduced from levels recorded in the early 1990's (Eckert *et al.* 1992). From interviews carried out by Downs (1997) on Anegada, it appeared that turtle egg collection, although prolific in the past, had all but ceased.

The TCOT SEQ reinforces Downs (1997) findings, as no respondents reported that they currently collect eggs. We interviewed 4 former egg collectors, however, three of whom had stopped approximately 15 years ago (range 12 to 18 years) and one of whom stopped 'a long time ago.' Reasons for stopping collection were cited as: laws (2), lack of opportunity (1), and because of not liking eggs (1). When they collected, 2 preferred hawksbills because of their greater availability and 2 had no preference. One of these respondents collected eggs only once, while 2 collected them once a year, and 1 collected them once a week. None of these collectors sold their eggs.

TCOT SEQ interviewed 11 former egg consumers, but found no current consumers. Of the former consumers, 2 reported having eaten them long ago in childhood, 2 reported stopping eating because of lack of opportunity, 1 cited conservation reasons, 1 cited laws, 1 claimed he no longer liked them, and 1 gave no reason. Two people did not respond to the question. Three could not remember when they had stopped, while 1 stopped in the 1970s, 1 in the 1980s, 2 in the 1990s and 2 in the 2000s. This highlights that although legislation may have curbed egg consumption it did not stop it. Only one former consumer expressed a species preference for hawksbill eggs. Of the five respondents who answered a question about changes in availability of eggs over time, all believed that availability had decreased.

No vendors of turtle eggs (past or present) were found during the TCOT SEQ.

6.7.4. Harvest at sea

There is a long history of marine turtle harvest in the BVI, both for meat and shell. Although we cannot preclude take of leatherback turtles at sea, and some take of the loggerhead has been recorded (Eckert *et al.* 1992; Rebel 1974), the vast majority of this take is likely to have been made up of green and hawksbill turtles. The earliest literature record we could locate outlined how in 1929, a total of 2,268lb (1031kg) of "Turtles (alive)" were imported into the US Virgin Islands from Tortola (Fiedler & Jarvis 1932). It is not possible to accurately translate this into numbers of turtles, but it probably represents some 10-40 individuals, given that the range of sizes likely to have been traded would have been 50-250lbs. In addition, Rebel (1974) outlines how approximately one quarter of green and hawksbill meat is exported to the USVI and that this catch was 5,880lb (value $4,140) in 1967. These limited data highlight that turtles were exported from the BVI at this time and, although this may have been a small-scale enterprise, it conflicts with Eckert *et al.* (1992) which states that it did "not appear that there was ever an established commercial export of sea turtles."

The accounts of Fiedler and Jarvis (1932) of how fishers in the US Virgin Islands used turtle nets are illuminating. Nets were 20 inch stretched mesh, 2-3 fathoms deep and 5 to 50 fathoms long with a cork floated line and a leaded ground line. They were set as drift or sunken nets, and a roughly turtle shaped wooden decoy was attached to each net to attract turtles. The authors also outline how live green turtles were stored in wooden kraals until shipment to New York City and how hawksbill shell was typically shipped to England at a price of the order of $20 per lb of scutes/tortoiseshell. Of further interest from the arcane literature was the account of novel turtle marking procedures for research on marine turtles carried out in the USVI (then Danish VI) two decades earlier by Shmidt (1916) who writes:

"*It is well known that the yield of turtle catching at the present time is far less than in former years. Every report on fishery conditions in the West Indies mentions this and there is a consensus of opinion that measures must be taken to prevent this important industry from dying out.*"

Thus, concerns were present as to the status of the turtle fishery in the region very soon after the start of the 20th century.

In his seminal work, Fletemeyer (1984) detailed how the main turtling ports were also the main fish landing sites: Settlement (Anegada), Fish Bay and East End (Tortola). Turtle fishing methods included seine nets and harpoons (Sept-June). He was not able to give any firm quantitative estimates per fishing harbour, but estimated through interviews with local fishers that the 1981 directed catch was of the region of 600 green turtles and 300 hawksbill turtles (table 12 in Fletemeyer 1984). An estimated 200 turtles were caught incidentally in other fisheries (table 13 in Fletemeyer 1984), but it is not clear whether any of these were landed. Later in the same report however, the number of turtles caught at sea is only given as 100, although this may be a typographical error intended as 1000. It was estimated that in 1981 this industry was valued at $40,000, employing 20 persons (table 16 in Fletemeyer 1984).

From this benchmark, it appears that in general the turtle fishery has continued to decline (Eckert *et al.* 1992; hawksbill turtles: 200 in 1985, 71 in the 1990/91 season; green turtles: 75 in 1985; 32 in 1990/91). At the start of the TCOT project, CFD staff felt that the turtle fishing effort was much reduced, with some opportunistic take by fishers focusing on other taxa and a total of some 5-6 active turtle fishers in the BVI (1 in Tortola, 2-3 in Anegada, 1 on Cooper and 1 on Jost Van Dyke). CFD estimates of the number harvested of both species during the season given at the beginning of this survey were: 1999 - 60, 2000 - 50, 2001 - 40 (M. Hastings & A. Pickering (CFD) pers. comm. 2002).

In a preliminary interview with a Tortola based turtle fisher, he suggested he took 20-50 turtles per season using floating swing nets. Most of these were green turtles (50-250lb) with occasional hawksbills. All turtles are captured alive and sold directly by himself for $2.5 per lb live weight or $5 per lb butchered.

As part of open ended interviews with community members in Anegada, Downs (1997) gained the impression that although turtle consumption is considered traditional, community sharing of meat, as carried out in the past, no longer takes place. Although some fishers still took turtles, some had stopped for commercial reasons i.e. the price per lb was so low that the enterprise was no longer commercially viable.

It is worthy of note that Overing (1996) recorded suspected fibropapilloma on three individual green turtles at Peter Island and recommended that since:

Photo 6.13. Large juvenile green turtles are found in seagrass beds (Photo C. Clubbe).

"*health risks posed to human by tumor-afflicted turtles have not been investigated, it seems prudent that fishers be warned not to keep or sell meat from diseased turtles*."

In total, 7 former turtle fishers and 10 current turtle fishers were interviewed as part of the TCOT SEQ. Of the former fishers, only 2 expressed preferences for species (one preferring greens and the other hawksbills). Five of them sold turtles, 1 did not and 1 did not answer. Three fishers identify turtles as having been very important to them, 1 somewhat important, 1 not important, and 1 did not answer the question. Reasons for no longer fishing for turtle included: retired from fishing (2), law (1), lack of market (1), no longer comes across them (1).

Of the 10 current turtle fishers, most preferred green turtles (n=7), and one stated a preference for hawksbills. Only 1 fisher reported having caught a loggerhead (1 in his life). For green turtles, numbers caught ranged from a minimum of 1 to a maximum of 60 per year (median=4, IQ range = 2-22.5) with a total reported catch of 172 per annum (n =10 fishers). Fishers catch green turtles of varying sizes, with the minimum size reported being 28lbs and the maximum being 400lbs. The reported 'average' sized catch ranged from 40-300lbs. For hawksbill turtles, between 1 and 35 turtles were reported captured per year (median=2, IQ range=2-8.5) with a total reported catch of 69 per annum (n=8 fishers). Similar size ranges are reported, with a minimum of 20lbs and a maximum of 300lbs. The reported averaged size ranged from 28-150lbs. Hand capture and nets are the reported methods of capture, with approximately equal numbers of fishers using them.

Turtle fishers in Anegada allowed us to measure some of their legal catch in February 2004. We measured 8 turtles (7 green turtles ranging from 59-85 cm CCL (Photo 6.13) and one hawksbill turtle 44cm CCL). From our available length to weight data as part of our research in Anegada, these green turtles would have weighed approximately 23-66kg and the hawksbill would weighed approximately 8kg.

All of the current turtle fishers fish both for cash and subsistence, and 9 are full time fishers. Few provide information on sale prices. For both greens and hawksbills, the price received for turtle meat ranges from $2-5/lb (average $3).

There is no catch recording system and we did not interview all fishers or turtle fishers, but based on all available data it appears that marine turtle catch is higher than originally estimated by CFD personnel with approximate catches, based on cumulative total of all turtles captured in all estimates of current directed take, of >150 green turtles and >50 hawksbills being reasonable minimum estimates. The true number captured could actually be of the order of 2-3 times greater than this as: 1. we did not interview all turtle fishers and Virgin Gorda was particularly underrepresented; 2. this does not incorporate an estimate for incidental take and subsequent use.

Consumption of meat

We interviewed 15 former turtle meat consumers. Reasons these individuals no longer consume meat included: losing interest (8), laws (3), no opportunity (2), conservation (1), opposed to it (1), and became a vegetarian (1). Three reported eating it 'long ago', and 2 provided no reasons. These respondents stopped eating turtle an average of 19 years ago, but ranging from 'since I was a child' to 'in the past few years.'

Eighteen current meat consumers were interviewed. Nine preferred green turtle meat, 6 preferred hawksbill meat, and 3 had no preference. Five interviewees reported prices paid for meat products, with meat costing between $3-4/lb, and a meal in a restaurant costing $10-12. Six of these respondents also give gifts of meat to friends and family.

Estimates of quantity of meat currently consumed, and how quantity was estimated, varied. Three consumers (all fishers) reported eating the meat of 2-3 turtles per year. One person eats 25lbs/year, and a second eats less than 5lbs/year. One person reported eating turtle once a month, while 2 report eating it on a weekly basis. A final respondent eats turtle 'as often as he can get it.' Those who purchase meat buy it from the harbour (n=1), from restaurants (n=4), and through fishers (n=1). Four do not purchase, and the other respondents did not answer the question.

Consumers were asked to comment on changes in availability of meat for consumption over time (short and long term). Those who responded said that that meat availability had decreased in the long term (since they could remember, n=3) or that they did not know (n=3). Views on availability in the last 5 years varied: 3 believed availability had decreased, while 2 believed it had stayed the same, and 1 did not know.

Meat vendors

We interviewed one former vendor of meat products, a store owner who stopped selling meat in 1998 due to protests by expatriate customers, an important component of his clientele. Before he stopped, he claimed that sales of turtle meat were somewhat important to his business.

We interviewed 3 current meat vendors, all of whom were running restaurants (Photo 6.14). They all purchase their products for sale differently; 1 directly from a fisher who brings it to the restaurant, 1 at the market, and 1 at a fish landing. Two purchase on a monthly basis and 1 on a weekly basis. Both hawksbill and green turtle meat is purchased. All reported selling turtle meat during the season, but 2 suggested that demand increases around festivals and holidays. Two of the vendors believed that the availability of meat has decreased, and 1 did not answer. Two of the vendors ranked the sale of turtle meat as 'very important' to their businesses, while 1 said it was of little importance.

Illegal Activities

Turtle harvest was controlled by the 1959 Turtle Ordinance, which was amended in 1986 and revised in 1987. However, Lettsome (1987) reports that in November 1986 and 1987 there were confirmed reports of infringements, including illegal fishing, landing and retail of turtle products despite extensive publicity. Ignorance of the new legislation was apparently forgiven in these years, but was not to be tolerated in 1988, when a fishing vessel valued at US$140,000.00 was seized at Red Hook, St. Thomas (U.S. Virgin Islands) by the US National Marine Fisheries Service as a result of its involvement in violations of the U.S. Endangered Species Act of 1973. It was alleged that the vessel was used to import sea turtle meat into the U.S. Virgin Islands from Anegada, BVI, in January of 1988 in violation of both U.S.

Photo 6.14. Turtle on the menu (Photo P. Richardson).

and BVI laws. The meat was subsequently sold to several recipients in St. Thomas, one of whom was an undercover agent working for the U.S. National Marine Fisheries Service. One of the 3 persons implicated in the smuggling operation pleaded guilty to knowingly importing and selling the sea turtle meat. Under terms of a plea agreement with the U.S. Attorney's Office, he received a US$1,000 fine. Criminal charges against 2 other persons allegedly involved, including the owner of the vessel, were reported as pending in 1989 (Anon 1989). Additional possible illegal trade links with the USVI are highlighted by Fleming (2001).

During the Virgin Gorda Easter Festival (10 April-12 April 2004) BVI CFD staff observed 8 stalls selling marine turtle meat out of season. A warning letter has been sent to both the BVI Festival & Affairs Committee as well as all those selling turtle (S. Gore (CFD) pers. comm. 2004).

Relationship within the wider fishery sector

The marine fishery is a small yet significant part of the BVI Economy, contributing some $4m in 1997; just less than 1% of GDP. Most recently available statistics (Pomeroy 1999) state that this industry employs 174 commercial fishers on a full or part-time (fishing >1 time per week) basis including:

Tortola	104
Virgin Gorda	40
Anegada	21
Jost van Dyke	6
Outer Islands	3

The marine turtle harvest is no longer a significant monetary component of the overall marine fishery and it is not surprising that there was no mention of it within the Fisheries Management Plan for the British Virgin Islands (OECS/NRMU 1998).

a	**There should be regulations for which species of turtle can be caught**			
	Yes	no opinion	no	na
n	11	1	3	2
%	65	6	18	12
b	**There should be regulations for the type of fishing gear and methods that can be used to catch turtles**			
	yes	no opinion	no	na
n	11	3	1	2
%	65	18	6	12
c	**There should be regulations for the number of turtles that can be caught**			
	yes	no opinion	no	na
n	9	2	4	2
%	53	12	24	12
d	**There should be size limits for turtles caught**			
	yes	no opinion	no	na
n	13	2	0	2
%	76	12	0	12
e	**Open and closed zones should be set for turtle fishing**			
	yes	no opinion	no	na
n	6	3	6	2
%	35	18	35	12
f	**Open and closed seasons should be set for turtle fishing**			
	yes	no opinion	no	na
n	13	2	0	2
%	76	12	0	12
g	**Who should be involved in setting regulations?**			
	fishermen	gov't authorities	conservationists	experts
n	12	9	3	1
%	71	53	6	18

Table 6.11. Views of turtle fishers on options for managing the turtle fishery.

6.7.5. Views of turtle fishers on regulation of the fishery

Turtle fishers were asked for their views on potential fisheries management options, and the results are shown in table 6.11. As the table shows, there is wide support for particular types of regulations (size limits and seasons), and majority support for others (species caught, fishing gear). There is less support for geographic restrictions on fishing. The apparent extent of support for size limits should be treated with caution, as no size limit (maximum or minimum) was stated. As the fishery currently has a minimum size limit, fishers may be confirming their support for this, rather than for size limits in general (i.e. they may resist a change to maximum size limits). Whatever the policies adopted, fishers see themselves as central to policy making. The majority also see an important role for government authorities in this process.

Photo 6.15. Hawksbill turtle scutes in garden of turtle fisher (Photo P. Richardson)

6.7.6. Trade in shells and shell products

As well as being a source of meat, shells, particularly of the hawksbill, were traditionally cleaned, cured and sold for both a domestic and possible export market, but this had markedly declined by 1992 (Eckert *et al.* 1992). Retail of non-edible turtle products has all but disappeared, but occasional items are undoubtedly sold. Fleming (2001) reports that a hawksbill shell jewellery box was found for sale in Cane Garden Bay. It had purportedly been imported from the Dominican Republic unknowingly. During a TCOT survey of all possible retail outlets in March 2002, the only shell product we observed was one small hawksbill shell for sale at the market at cruise ship dock, priced at $100. When TCOT personnel tried to photograph this, we were prevented from doing so and the shell was obscured. In April 2003, TCOT staff found several tortoiseshell bangles and earrings in one gift shop in Road Town during the TCOT SEQ. The vendor had purchased these products from the Cayman Turtle farm some years ago. She sells few items, primarily due to import restrictions in other countries, and has no intention to purchase further stock once current supplies run out (although she would if trade restrictions changed). No other potential vendors reported ever selling turtle shell products. In the garden of one turtle fisher interviewed, carapace scutes were stored but were not treated as if they had any real value (Photo 6.15)

6.7.7. Incidental catch in marine fisheries

Lettsome (1989) reports concern regarding long-lining impacts on leatherback turtles and confirms 2 captures of leatherbacks in BVI waters in 1988. The fate of these animals is unknown and the magnitude of this impact has not been assessed. Additional records (minimum 2) from 1990 were recorded by Tobias (1991). On February 22, 2002, a leatherback turtle was found entangled in the ropes of a fish pot off Peter Island and was rescued, tagged and released (S. Gore (CFD) pers. comm. 2004). Lettsome (1988) reports that one adult leatherback turtle nesting in Anegada was disorientated by lights, became dehydrated and died.

The TCOT SEQ interviewed 26 fishers, 11 of whom reported occasionally catching sea turtles as by-catch (of note, 8 of these are current or former turtle fishers, who reported by-catch when fishing for other animals). Nine of these were full time fishers, while the other 2 fish and have other employment. The number of turtles caught ranges, from a low of once in their life (n=2) to a high of 10 per year (n=1). Turtles are found mostly alive (n=9), with 1 fisher reporting they are mostly dead, and 1 reporting equal numbers alive and deal.

Of the three non-turtle fishers, 2 report releasing whatever they catch, while 1 will keep hawksbills (to use himself). Of the current and former turtle fishers, 2 reported accidentally capturing leatherbacks and loggerheads, and stated that they release these. The others reported accidentally capturing green and hawksbill turtles, which are kept (to use, sell or gift).

Six fishers believe that other fishers catch turtles accidentally, mostly greens and hawksbills, and 3 believed these would be kept (the others did not know or did not answer).

Recommendations

6.1.2.1. Harvest legislation recommendations

Although not monitored, the BVI turtle harvest is regulated by the Turtles Ordinance 1959 as amended 1986 and the Fisheries Act 1997. This legislation is not comprehensively upheld or enforced, e.g. as evidenced by the high prevalence of turtle meat consumed at the Virgin Gorda Easter Festival during the designated closed season for the turtle fishery in 2004. We recommend a number of changes below. Any future harvest must be accompanied by meaningful, long-term and systematic monitoring programmes to ascertain trends in turtle abundance, in addition to adequate surveillance and enforcement.

In 2001, the Government of the BVI produced a draft document entitled Fisheries Regulations 2001, which we were allowed to view. Sections 22, 26 and 27 dealt with regulations pertaining to the harvest of marine turtles and their eggs. Section 22 contained text that is contradictory to text in section 26 with respect to closed seasons for marine turtle harvest. Text in section 22 also contradicted the text of section 27 with respect to moratoria on the harvest of certain species of marine turtle. We felt that this needed reconsideration in order to become a more meaningful piece of legislation. The Regulations have now been gazetted, but we have not been able to obtain a final copy in time for final reporting. Based on the draft regulations, TCOT recommends the following amendments of the legislation to further facilitate sustainable harvest of BVI's foraging green and hawksbill turtles;

a) Ensure permanent and complete prohibition of harvest of any large, reproductively valuable turtles by instigating a maximum size limit. A suggested maximum may be 50lbs (22.7kg) or less, but should be based on additional research on the fishery and turtle stocks. This research should yield an equivalent maximum curved carapace length that should be stipulated in any amended legislation.

b) Consider a continued minimum size limit, as most fishers already accept this as a conservation measure. A suggested minimum would be 20lbs (9.07kg), with an equivalent minimum curved carapace length that should be stipulated in any amended legislation.

c) Establish a limited turtle fishing licensing scheme, whereby especially licensed turtle fishermen agree to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including compulsory reporting to and catch biometric measurement/sampling by CFD of all turtles caught in advance of slaughter. Quotas should be reactive and based on number of licensed turtle fishers and stock assessments established through the monitoring regimes.

d) Ensure prohibition of the harvest of loggerhead and leatherback turtles given their very low numbers in the BVI.

e) Increase fines for infringments to a more punative level in line with those recommended by other OTs.

6.1.2.4. Revision of MEA legislation

The Endangered Animals and Plants Act, 1987 (Cap. 89) should be amended to prohibit commercial import and export of turtles and all wild turtle products of marine turtle species, so that this legislation fully transposes CITES to domestic law.

6.8. Indirect Use of Marine Turtles in the British Virgin Islands

6.8.1. Turtle watching on beaches

Given the small numbers of turtles nesting, there is not as yet any formal turtle watching**.** Hastings (2003) writes:

> "*Besides obtaining scientific and technical information about the animal and its biology, our work seeks to change the traditional reliance on the taking of animals and replace it with the idea that organized "eco-tours" to see the trunks nesting (and the hatchlings emerge) can provide both a source of sustainable income and an opportunity for the community to interact with these ancient creatures in ways that promote their survival over the long term. A serious limiting factor to drawing visitors to the beach has been the small number of turtles that nest and the concomitant uncertainty of whether observers might ever see a turtle. Notwithstanding, it is hoped that as nesting continues to increase it will reach a level where "eco-tours" can play a significant role in helping to ensure the continued presence of trunk turtles on the beaches of the BVI."*

6.8.2. Dive/snorkelling tourism

Dive tourism is a significant business in the BVI, with approximately 15 operators employing approximately 150 people (S. Gore (CFD) pers. comm. 2004). There has been reasonable uptake of *Caribbean TurtleWatch* by the industry. There is only one mention of marine turtles in the diving and snorkelling guide to the British Virgin Islands (Handler 2001).

Photo 6.16. BVINPT and dive shop make use of turtle imagery on leaflets.

Snorkel tours are also a significant business with approximately 25 operators employing some 200 people (S. Gore (CFD) pers. comm. 2004). Most of these operate around Tortola and surrounding islands, where turtles can be observed, although not in great numbers.

As mentioned above, turtles can be a valued feature of a dive, but most people do not select dives on the basis of whether or not they might see a turtle. As the SEQ revealed, of the 6 dive operators surveyed, 4 ranked turtles as 'very important' to their businesses, but 5 of the 6 also stated that the loss of turtles from OT waters would not affect the use of their services. Turtles appear to be one of many attractions the BVI has to offer divers.

6.8.3. Aquaria holding captive turtles

There are no such facilities in the BVI, although turtles are occasionally encountered in home or shop aquaria (S. Gore (CFD) pers. comm. 2004)

Photo 6.17. Turtle themed merchandise (Photo L. Campbell).

6.8.4. Other marketing uses

As part of BVI Tourism's "*Nature's Little Secrets*" marketing strategy, BVI was put forth as a Caribbean Ecotourism destination; with a website module appearing dedicated to "Turtles" (see Appendix 6.2). Although it details the fact that green turtles, hawksbill turtles and leatherback turtles visit BVI annually, and it stipulates that turtles face many threats, it does not mention BVI's turtle harvest, instead stating:

> "*Because turtles face so many challenges to their survival, international laws, or moratorias, have been instituted against their capture or harassment. We can do much, locally, to help turtles survive. We can dispose of our garbage properly. We can encourage restaurants and hotels to turn off their beachfront lights off during the nesting season, on known nesting beaches*."

This type of sentiment is reflected in the results of the TCOT SEQ that found coexisting high levels of support for turtle conservation with acceptance of the local use of marine turtles (see section 6.9. below)

Other uses of marine turtles in marketing and promotion are diverse, although far below the level of usage elsewhere, e.g. in the Cayman Islands. For example, the logo of the BVI National Parks Trust Contains a turtle and this appears widely in educational materials, websites, with a turtle icon representing a national park on a widely distributed map of the islands (Photo 6.16). At least one dive operator (Blue Water Divers) uses a marine turtle as its logo (Photo 6.16). Although the Spring 2002 BVI Welcome Tourist Guide magazine contained a three page feature on the BVI Conservation and Fisheries Departments turtle monitoring project, no other mention is made regarding turtles (compare with Section 7 regarding the Cayman Islands). One of the most important nesting sites on Tortola is that of Long Bay backed by the Lambert Beach Resort. Its brochure features a picture of a hatchling leatherback turtle and the turtle theme is heavily merchandised in the hotel, with t-shirts and artwork on a turtle theme for sale (Photo 6.17).

6.8.5. Data from the TCOT socio-economic questionnaire

We interviewed 18 indirect users of marine turtles, and their uses of turtles varied. Seven businesses view live turtles as an attraction (dive operators/boat charters), 4 use images of marine turtles in advertising, 3 incorporate marine turtles in their official logos, 2 sell merchandise depicted or representing turtles, 2 sell photographs of turtles, 1 scientist studies turtles, and 1 conservationist focuses in part on turtles (multiple answers permitted). Nine respondents said that turtles were very important to their businesses, 5 said somewhat important, and 2 said unimportant. However, when asked how the absence of turtles from OT waters would impact on their businesses, 12 respondents believed their business would stay the same, 3 thought theirs would decrease, 2 didn't know, and 2 did not answer the question.

6.9. Attitudes to conservation

TCOT SEQ sought to assess overall attitudes towards conservation of marine turtles, and options for marine turtle management. Respondents could agree, disagree, or have no opinion. In some cases, they could choose 'not applicable'. Basic results are summarized here. The most common response is cited. In general, most respondents agreed that:

- It is important that sea turtles exist in the wild in the future (96%)
- The government needs to actively work to protect sea turtles (89%)
- Turtles play an important ecological role in out natural environment (86%)
- Turtles should be protected, regardless of their use to humans (84%)
- Turtles are culturally valuable in this OT (79%)
- Local people should be allowed to catch and eat sea turtles, provided it doesn't threaten the regional population (77%)
- As turtles are migratory, they should be managed in cooperation with neighbouring states (77%)
- Some income from tourism should be used to support sea turtle conservation efforts (75%)
- The government needs to do more to ensure that existing laws regarding marine turtles are effectively enforced (75%)
- Local people should be allowed to purchase sea turtle meat (71%)
- Turtles are economically valuable in this OT (66%)
- Turtles should be used both as tourist attractions and as a source of food (63%)
- Turtle fishing should be stopped until more information is known on the size and health of the populations (55%)
- Turtles should be used as a tourist attraction rather than as a source of food (50%)

Close to an equal number of respondents agreed and disagreed with the following statements:

- Tourists should be allowed to purchase sea turtle meat (48% agreed, 45% disagreed)
- Existing laws protecting marine turtles are effectively enforced (43% agreed, 41% disagreed)

Most respondents disagreed with the following statements:

- Turtle fishing should be unregulated (88%)
- Turtle fishing should be stopped completely (61%)
- Tourists should be allowed to purchase sea turtle shell and take it home with them (59%)

The results shown above suggest that there is a high level of support for general conservation statements (i.e. it is important that sea turtles exist in the wild in the future), and for the local capture, consumption and sale of sea turtle meat. Respondents agree that government has a critical role to play in turtle conservation, but disagree with regards to whether not it is currently doing this effectively. Views on whether or not tourists should be able to consume and/or buy turtle products are divided.

Initial and cursory analysis of responses to these questions by stakeholder group suggests that there are some important areas of disagreement amongst some stakeholders. For example, turtle fishers as a group generally agree with many of the responses of the surveyed population as a

Photo 6.18. Mervin Hastings gives BVI country report at TCOT workshop (Photo S. Ranger).

Photo 6.19. Arlington "Zeik" Pickering assists with satellite transmitter attachment in Bermuda (Photo P. Richardson).

Photo 6.20. Staff from BVINPT and CFD join with Anegada community members to undertake turtle research (Photo B. Godley).

whole, though their support (or lack there of) for statements is often stronger. However, there are several questions for which their opinions differ:

- Tourists should be allowed to purchase sea turtle meat (76% agreed)
- Turtle fishing should be stopped until more information is known on the size and health of the populations (71% disagreed)
- Turtles should be used as a tourist attraction rather than as a source of food (71% disagreed)
- Tourists should be allowed to purchase sea turtle shell and take it home with them (53% agreed)
- Turtles are economically valuable in this OT (47% agreed and 47% disagreed)

Thus, it appears that turtle fishers disagree with the general population primarily regarding tourist access to marine turtle products. Turtle fishers are not only defensive of their rights to fish turtles, but of the rights of others to consume them. However, this may be less of a defence of tourist rights and more a resistance to regulations on consumption and sale.

Due to the non-random sampling employed in this survey, interpreting the results of these opinion questions in particular should be done with caution, as respondents are not representative of the BVI population.

6.10. Capacity Building and Outreach Activities During TCOT

6.10.1. Capacity building

Mervin Hastings (Photo 6.18) and Arlington "Zeik" Pickering of CFD took part in the TCOT training workshop in Grand Cayman in August 2002, and Arlington Pickering (Photo 6.19) and Shannon Gore attended the training course in Bermuda in August 2003. BVI partners were subject to all the generic TCOT assistance (see Section 11), and despite poor online access, communications were very good. In-water turtle work has expanded rapidly since the advent of TCOT, and is being progressed in Anegada as part of the Darwin Initiative Assessment of the Coastal Biodiversity of Anegada (Photo 6.20).

6.10.2. Outreach activities

BVI has been part of the generic dissemination outputs of the TCOT project (see section 12), and in collaboration with project partners we were successful in attaining media items. This was particularly true of MCS sponsored satellite tagging of a leatherback turtle in 2002, which created a great level of interest in the local community (Photo 6.21) despite the track being short lived (transmissions were lost off the nesting area of Puerto Rico, possibly as the result of male reproductive advances). TCOT staff have met with a number of community and school groups through the course of the project (Photo 6.22).

Recommendations

6.1.1.1. Increase the capacity of the Conservation and Fisheries Department

a) Ensure CFD has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry and analysis for turtle monitoring programmes as part of their overall marine and coastal environment monitoring and research.

b) Given the importance of all natural resources of Anegada, a priority for increased capacity would be a field-base (for visiting staff in addition to permanent personnel) and supporting infrastructure, including a research/enforcement vessel, based in Anegada.

c) Ensure that all new research staff are adequately trained in marine turtle biology, as well as research and conservation techniques.

6.1.1.2. Establish a multi-stakeholder marine turtle management process

Identify and establish a Marine Biodiversity Working Group to promote the conservation of marine resources and include representatives of all interest groups and stakeholders (e.g. government agencies and departments such as CFD, BVI National Parks Trusts, Planning and Tourism; NGO's; hoteliers; dive operators; construction industry representatives, fishers, H. Lavity Stoutt Community College and interested members of the public). The working group should meet regularly (ca. 4 times per year) to discuss and advise government (esp. CFD) on marine turtle management issues, paying particular attention to fisheries issues, habitat protection, exploring possibilities for sourcing funding, further research/population monitoring, as well as investigating potential economic benefits of marine turtle conservation, and should seek external advice from appropriate experts. Some resources may be required to support stakeholder participation (e.g. travel expenses from other islands).

6.1.4.1. Encourage and implement sensitive practices at existing nesting beaches

a) Develop a network of hoteliers, beach residents and other beach users to ensure swift reporting of nests not on index beaches, so that they can be marked, protected and monitored. A toll-free hotline may be of utility. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergences.

b) Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure CFD has the capacity to collect, necropsy and document all strandings.

Photo 6.22. Leatherback turtle with satellite transmitter attached (Photo BVI CFD).

c) Raise awareness through a dedicated campaign to sensitise Islanders to the importance of protecting the nests of such small nesting populations, and to encourage reporting of any illegal take of eggs or nesting females.
d) Develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.
e) Ensure school participation in any rookery monitoring programmes to sensitise children to the importance of rookery protection.

6.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the British Virgin Islands

a) Raise awareness among BV Islanders of the presence of distinct foraging and nesting turtle populations through informational materials, web sites and media outputs.
b) Establish a programme of stakeholder meetings to raise awareness of marine turtle biology (including presence of distinct foraging and nesting populations), turtle and habitat conservation needs, national legislation and MEA's.
c) Establish a programme of awareness raising presentations and workshops in fishing communities, schools and other public fora.
d) Establish a programme of awareness-raising presentations and workshops to sensitise the tourism industry to the potential impacts of tourism and possible mitigation measures.
e) Develop BVI specific turtlerelated educational materials, and expand them to include further curriculum linked, multi-media educational materials where appropriate.

Additionally, we make a major overarching recommendation to the UK Government to support the conservation and management of marine biodiversity in the UK OTs under the Environment Charters.

The Overseas Territories of the UK have long been acknowledged as being rich in biodiversity (Proctor & Fleming 1999). The small islands or island archipelagos of the Caribbean UK Overseas Territories currently do not or are unable to carry out sufficient monitoring, research, management and educational outreach required to ensure the sustainability of their marine and coastal natural resources. TCOT strongly recommends that the UK Government further contributes to marine biodiversity conservation and management in the UK Overseas Territories through provision of funding and expertise under the FCO/DfID Overseas Territories Environment Programme (OTEP), Defra's Darwin Initiative and through the provision of bespoke scholarships for tertiary education in biodiversity/conservation related subjects for citizens of the OTs. Additionally, much of the environmental legislation in the OTs is in need of revision to facilitate the conservation of marine turtles and their habitats, and therefore TCOT strongly recommends that HMG provide the necessary support to the OTs to facilitate the required legislative amendments.

Photo 6.23. Contributing to BVI CFD Environmental Summer School (Photo B. Godley)

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