

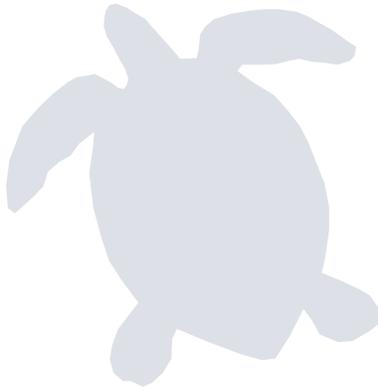


# An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean



Foreign & Commonwealth Office





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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.

# An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean

## CONTENTS

	Page
1. Executive Summary	1-4
2. General Introduction and Methods	5-15
3. Overview of Legislation Pertinent to Marine Turtle Harvest	16-38
4. Status and Exploitation of Marine Turtles in Anguilla	39-77
5. Status and Exploitation of Marine Turtles in Bermuda	78-95
6. Status and Exploitation of Marine Turtles in the British Virgin Islands	96-123
7. Status and Exploitation of Marine Turtles in the Cayman Islands	124-154
8. Status and Exploitation of Marine Turtles in Montserrat	155-179
9. Status and Exploitation of Marine Turtles in the Turks and Caicos Islands	180-222
10. Towards a Molecular Profile of Turtles in the UKOT's in the Caribbean	223-236
11. Capacity Building and Support: Essential Components of TCOT	237-247
12. TCOT Publicity: Getting the Message Across	248-253

## Appendices

(only available online at <<http://www.seaturtle.org/mtrg/projects/TCOT/finalreport/>>)

### Section 2:

- 2.1. TCOT Socioeconomic Questionnaire
- 2.2. Caribbean TurtleWatch Poster
- 2.3. Caribbean TurtleWatch Advice Note
- 2.4. Caribbean TurtleWatch Data Sheet

### Section 3.

#### 3.1. Pertinent Legislation - Anguilla

- 3.1.1. Fisheries Protection Act
- 3.1.2. Fisheries Protection (Amendment) Regulations
- 3.1.3. Marine Parks Act
- 3.1.4. Marine Parks Regulations
- 3.1.5. Beach Protection Act
- 3.1.6. Beach Protection Order

#### 3.2. Pertinent Legislation - Bermuda

- 3.2.1. Fisheries Act 1972
- 3.2.2. Fisheries (Protected Species) Order 1978
- 3.3.3. Fisheries (Protected Areas) Order 2000
- 3.4.4. Protected Species Act 2003

#### 3.3. Pertinent Legislation - British Virgin Islands

- 3.3.1. Turtles Ordinance 1959 (1986 revision)
- 3.3.2. Turtles Ordinance 1959 (1987 revision)

#### 3.4. Pertinent Legislation - Cayman Islands

- 3.4.1. Marine Conservation Law 1978
- 3.4.2. Marine Conservation (Turtle Protection) Regulations 1996
- 3.4.3. Marine Conservation (Marine Parks) Regulations 1996
- 3.4.4. The Restricted Marine Areas (Designation) Regulations 1998
- 3.4.5. Endangered Species Protection and Propagation Law 1978 (1999 revision)
- 3.4.6. Rules for Cayman Islands Marine Parks
- 3.4.7. The Endangered Species Law 2004

### **3.5. Pertinent Legislation - Montserrat**

3.5.1. Turtle Ordinance 1951

3.5.2. Turtle Act 2002

### **3.6. Pertinent Legislation - Turks and Caicos Islands**

3.6.1. Fisheries Protection Ordinance 1941 and Regulations  
(including subsidiary legislation and amendments)

3.6.2. National Parks Ordinance (including subsidiary legislation  
and amendments)

### **Section 4. Anguilla**

4.1. Leaflet: *Help Us Grow Stop the Glow*

### **Section 5. Bermuda**

5.1. Leaflet: *Protected Areas*

5.2. *Turtle Alert Leaflet*

### **Section 6. British Virgin Islands**

6.1. CFD Fishing Laws Leaflet

6.2. Website: *Nature's Little Secrets*

### **Section 7. Cayman Islands**

7.1. CIDoE Leaflet

### **Section 10. Towards a Molecular Profile**

10.1. Genetics Sampling Sheet

### **Section 11. Capacity Building**

11.1. Workshop Report

11.2. Advice Note-Foraging

11.3. Advice Note Nesting

11.4. TCOT Tourism Leaflet

11.5. TCOT Bibliography

### **Section 12. Publicity**

12.1. Leaflet for CITES CoP

12.2. Press Release 1

12.3. Press Release 2

12.4. Press Release 3

12.5. TCOT Postcard

## **General Acknowledgements**

The TCOT project would not have been possible without the massive commitment of personnel and resources from our OT partner organisations. We acknowledge this in detail in each chapter of this report but in particular the support of Cayman Islands Department of the Environment and the Cayman Turtle Farm from the inception of the project is gratefully appreciated. In addition, our own organisations have contributed significantly by donation of personnel time and substantial reduction in overhead costs. The TCOT team acknowledges the substantial in-kind donations of staff time, travel costs, equipment and other resources provided by the Marine Conservation Society (MCS). MTRG acknowledge the support of University of Exeter (Prof. C. Moody, Prof. D.M. Bryant, Prof. H. Lappin-Scott) and University of Wales Swansea (Prof. A. Rowley). In addition, Dr. G. Hays (UWS) gave logistical support during the initial bid writing process. Further academic and support time was donated by the University of Western Ontario and Duke University to allow the involvement of Dr. L. Campbell and her team. We thank Prof. M. Bruford and Dr. A. Formia for extensive donation of personnel time and equipment, which has allowed the molecular work to proceed with such great success. The project benefitted tremendously from online hosting and email listserv provided by Michael Coyne and SEATURTLE.ORG.

## Executive Summary

We report on the results of a 3-year UK Government (Defra and FCO) funded project involving diverse collaborative research initiatives, capacity building and awareness raising efforts regarding the Status and Exploitation of Marine Turtles in the UK Caribbean Overseas Territories (TCOT). This included Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Montserrat and the Turks and Caicos Islands. In each OT, each species present can occur in both nesting population and foraging aggregations. For management purposes, these nesting and foraging populations need to be considered as different entities.

### Nesting

Nesting populations in Bermuda have been considered extirpated for over 50 years. The nesting populations of four species in the other regional UK OTs are either critically reduced or extirpated. Given the fact that turtles return to the region of their birth to breed, these populations hold significant biodiversity value as they may constitute unique demographic units. There are green turtle nesting populations (Anguilla, British Virgin Islands, Cayman Islands, Montserrat and Turks and Caicos Islands); hawksbill nesting populations (Anguilla, British Virgin Islands, Montserrat, Turks and Caicos Islands with possible remnant nesting in Cayman Islands), leatherback nesting populations (Anguilla, British Virgin Islands with occasional nesting activities in Cayman Islands and Montserrat); loggerhead nesting populations (Cayman Islands with occasional nesting in Montserrat and unconfirmed nesting in Turks and Caicos Islands).

Rookery monitoring including genetics analysis is underway in all OTs. Although a few sites in Anguilla and Turks and Caicos Islands are yet to be subject to detailed scrutiny, it is possible that in each OT, the total combined nesting populations of all species numbers fewer than 50 females per year.

### Foraging

Despite having been subject to direct harvest for centuries, all 6 OTs in the Wider Caribbean host aggregations of foraging marine turtles. Although other species may be found occasionally, two species are widespread and can be found in regionally important local pockets of abundance, typically in the less developed parts of near-shore environments. These are the green turtle (Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Turks and Caicos Islands with unknown densities being present in Montserrat) and the hawksbill turtle (Anguilla, British Virgin Islands, Cayman Islands, Turks and Caicos Islands with small populations found in Bermuda and unknown densities being present in Montserrat). In Bermuda, in-water work was well developed but in the other five OTs, detailed work to allow patterns of distribution and abundance and genetic profiles was launched as part of the TCOT project. Turtles are likely to be the progeny of breeding colonies across the Caribbean and possibly across the whole Atlantic, highlighting the need for a regional approach to management of these species.

### Direct Exploitation

Turtles are afforded a very high degree of protection in Bermuda, are subject to a moratorium in Anguilla and subject to a legal catch in each of the other 4 OTs in this study. Egg take and harvest of adult nesting females are no longer prevalent with most take focussing on turtles at sea. Preliminary data using site-specific methodological approaches gathered as part of TCOT highlights that the take is variable across the OTs;

**British Virgin Islands:** >150 green turtles and >50 hawksbill turtles per annum;

**Cayman Islands:** >20 turtles per annum constituting green, hawksbill, and loggerhead turtles;

**Montserrat:** 10-30 turtles per annum - constituting green and hawksbill turtles;

**Turks and Caicos Islands:** up to 1130 green turtles and 900 hawksbills per annum.

Adjustments to size classes targeted, seasonality, current legislation and levels of enforcement would increase the likelihood that any continuing harvests take place at a sustainable level.

Sea turtles are considered economically and/or culturally valuable in all OTs. Sea turtle consumption is prevalent and culturally important in all of the OTs other than Bermuda. Its economic importance varies between OTs (depending on levels of harvest, trade, and numbers of fishers involved), but most turtle fishers and vendors of turtle products rate this importance as moderate or low. Turtle harvesting is arguably most important in Turks and Caicos Islands, where it fulfils both a subsistence and commercial need for a large number of fishers; prior to the moratorium on turtle fishing in Anguilla, turtle fishing was likely of comparable importance.

### Indirect Exploitation

Tourism is an important activity in the economies of all of the OTs, although the absolute size of the industry varies greatly between OTs. Turtles are featured in some marine activities (i.e. snorkelling and diving), and are used in advertising (especially in the Cayman Islands). Surveys of both divers and business owners suggest that the economic importance of turtles to these businesses is currently low. While divers appreciate seeing turtles in the water, most do not seek out dive operators based on the possibility of seeing turtles. While businesses appreciate the attraction of turtles to customers, most believe that use of their services would not change if turtles disappeared from OT waters. In the rich marine environment of the Caribbean, turtles are one of many natural features that tourists appreciate. Given the low density of nesting of most species in most of the OTs, organized turtle walks are unlikely to become an important economic activity. Nevertheless, there are

ways that tourists and the tourist industry can participate in turtle conservation, and we make related recommendations with the aim of increasing the value of turtles to the tourism industry and increasing the tourism industry's investment in turtle conservation.

## **Recommendations**

We make detailed, OT specific recommendations, to OT governments:

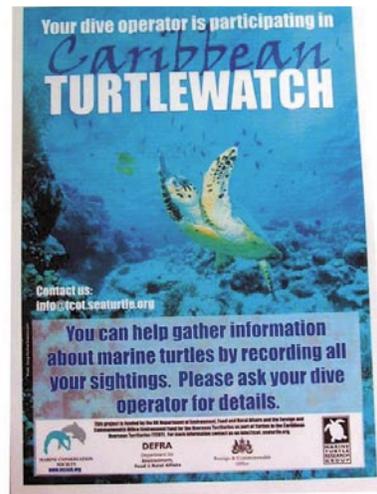
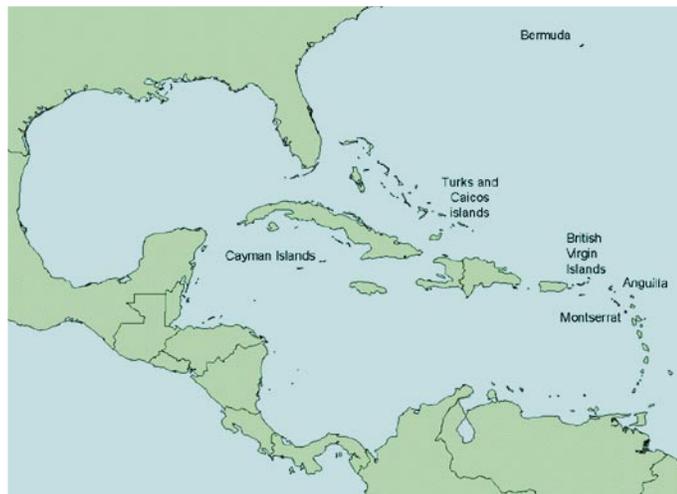
- 1. To increase capacity for marine turtle management.**
- 2. Amend legislation and policy to facilitate marine turtle population recovery.**
- 3. Continue and enhance systematic monitoring of marine turtle populations.**
- 4. Establish further conservation and awareness programmes to sensitise residents and visitors to marine turtle conservation requirements.**

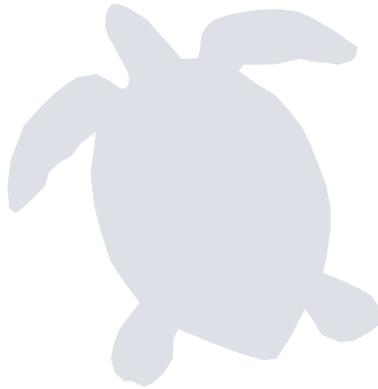
Additionally, we make a major overarching recommendation to the UK Government to support the conservation and management of marine biodiversity in the UK OTs under the Environment Charters through the provision of funding and expertise under FCO/DfID's Overseas Territories Environment Programme (OTEP), Defra's Darwin Initiative and through the provision of bespoke scholarships to OT citizens to undertake tertiary education in biodiversity/conservation related subjects.





# General Introduction and Methods





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## **2. General Introduction and Methods**

### **Contents**

	Page
<b>2.1. Summary</b>	<b>6</b>
<b>2.2. Background to TCOT</b>	<b>6-8</b>
<b>2.3. Methods Used in TCOT</b>	<b>8-15</b>
2.3.1. The Questionnaire Based Approach: A description and assessment of the socio-economic survey.	8-14
2.3.2. Use of the Caribbean Turtlewatch Package	14-15
<b>2.4. Acknowledgements</b>	<b>16</b>
<b>2.5. References</b>	<b>16</b>

## 2.1. Summary

This short chapter summarises the background, structure and ethos of the TCOT project. In addition, two unique data collection packages are outlined: 1) The TCOT socioeconomic survey and; 2) Caribbean Turtlewatch. We describe how these were carried out and give preliminary discussion to the caveats that must be considered in interpreting data gathered using these mechanisms.

## 2.2. Background to TCOT

It is widely acknowledged that some of the UK Overseas Territories (OTs) support significant populations of foraging and nesting marine turtles (e.g. Aitken *et al.* 2001; Eckert *et al.* 1992; Godley *et al.* 2001a). However the legal status of turtles in the OTs varies from Territory to Territory, and there are little or no current quantitative data on the extent of exploitation or current status of marine turtles (Fleming 2001; Proctor & Fleming 1999). As a result, it has not yet been possible to assess the impact of current harvests on turtle populations. Turtles are highly migratory and the impact of any harvests or bycatch in the OTs may detrimentally affect populations breeding elsewhere. The converse is also true.

Cuba's bids to resume international trade in hawksbill turtles at two successive CITES Conferences of the Parties (CoP 10 & 11) were rejected. This was primarily because some Parties and conservation organisations were concerned that Cuba's proposed harvest would impact regional breeding populations (Richardson 2000). At the Caribbean Hawksbill Range State Dialogue Meeting held by CITES in Mexico in May 2000 and attended by the UK and representatives from five OTs, it was agreed by the Parties that:

*“ -Critical knowledge gaps should be identified and standardised monitoring protocols developed for key parameters to monitor population trends and status.*

*-Monitoring of harvest and trade (legal and illegal, domestic and international) and their impacts on hawksbill populations should be improved in the wider Caribbean region.*

*-Different existing hawksbill turtle management programmes and policies in the wider Caribbean should be reviewed to assess their conservation impacts and relative benefits for hawksbill turtle population recovery.*

*-An effective hawksbill turtle conservation strategy and management plan should be established at a regional level taking into account the full range of national conservation objectives and development needs in the wider Caribbean” (CITES communiqué 2001).”*

This led to the following relevant decisions being adopted at CITES CoP 12:

### **Directed to Parties**

12.44 States and territories in the wider Caribbean region should:

- a) develop further a collaborative regional conservation strategy, based on the outline of a strategic plan provided in Annex 4 <<http://www.cites.org/eng/decis/valid12/annex4.shtml>> to these Decisions, to enhance the conservation status of hawksbill turtles and, where appropriate, other marine turtles within the wider Caribbean;
- b) implement the strategy through the development and implementation of national management plans;
- c) adopt and implement standard protocols for the monitoring, at recommended and agreed index sites, of populations of nesting and foraging hawksbill turtles and that similar efforts should be made to monitor legal harvests, by-catch in other fisheries and illegal take;
- d) implement measures to reduce illegal catch and illegal trade in hawksbill turtles and parts and derivatives thereof, including measures to improve the control of stocks of hawksbill turtle parts and derivatives by identifying, marking, registering and securing all such stockpiles; and
- e) Report on progress with the implementation of the regional conservation strategy and national management plans at the 13<sup>th</sup> meeting of the Conference of the Parties.

### **Directed to Parties, intergovernmental organizations, international aid agencies and non-governmental organizations.**

12.45 Governments and intergovernmental organizations, international aid agencies and non-governmental organizations are encouraged to provide funds to enable the implementation of the Caribbean regional hawksbill strategy and to support the regional dialogue process.

In order for the UK and the OTs to fulfil these recommendations, it is clearly important that following be assessed in the OTs:

1. the status of marine turtles;
2. the harvest/bycatch of marine turtles;
3. genetic stock of turtles;
4. current marine turtle research, conservation and management efforts.

These data will assist the UK, the OTs and other countries in the region to support, develop and manage co-ordinated regional conservation programmes for hawksbills and other marine turtle species, and allow relevant policy makers to make informed decisions regarding future trade in marine turtles or products derived from them.

In early 2001, the UK Department of Environment, Food and Rural Affairs (Defra) issued a call for bids for a project that would:

- a) Assemble data on the harvest and uses of marine turtle populations in OTs;
- b) Assess the current conservation status of, and trends in, marine turtle populations;
- c) Determine by DNA analysis the genetic profile of turtles in OTs and the origin of harvested animals;
- d) Provide an assessment of the sustainability of any harvest;
- e) Provide recommendations for the future conservation, monitoring and management of marine turtles in the OTs.

This report outlines the work of this project, which included Bermuda. Although not strictly in the Caribbean, Bermuda can be considered in the Wider Caribbean (See Figure 2.1 for map of TCOT geographic range). The successful consortium that executed "Turtles in the Caribbean Overseas Territories" (TCOT) consisted of the following:

#### **Lead Partner**

Marine Turtle Research Group (MTRG), initially at the University of Wales Swansea, moving to University of Exeter in Cornwall mid-contract.

#### **Subcontractor**

Marine Conservation Society (MCS)

#### **In association with**

Cayman Islands Department of Environment (CIDoE)  
Cayman Turtle Farm (CTF)  
University of Cardiff (UC)  
Duke University, USA (DU)

This group were joined by a number of interested individuals and the following organisations in the OTs:

#### **Anguilla**

Department of Fisheries and Marine Resources (DFMR)  
Anguilla National Trust (ANT)  
Local Dive Operators

#### **Bermuda**

The Bermuda Turtle Project (BTP)  
Bermuda Government Ministry of the Environment  
Bermuda Government Department of Conservation Services  
Bermuda Aquarium Museum and Zoo (BAMZ)

#### **British Virgin Islands**

Conservation and Fisheries Department (CFD)  
BVI National Parks Trust (NPT)  
H. Lavity Stout Community College  
Island Resources Foundation  
Local Dive Operators

#### **Cayman Islands**

Local Dive Operators  
University College of the Cayman Islands

#### **Montserrat**

Montserrat Department of Agriculture  
Montserrat Department of Fisheries  
Montserrat National Trust  
Montserrat Volcano Observatory  
Local Dive Operators

#### **Turks and Caicos Islands**

Department of Environment and Coastal Resources (DECR)  
Turks and Caicos Protected Areas Department (formerly: Coastal Resources Management Project)  
Local Dive Operators

For the purposes of this report, the term 'TCOT staff' refers to researchers from MTRG (B.J. Godley, A.C. Broderick), MCS (S. Ranger, P. Richardson), and DU (L. Campbell). 'TCOT partners' refers to all other individuals participating in TCOT and representing the various organizations listed above. 'TCOT team' refers to both staff and partners.

The proposal outlined 5 inter-related yet divisible work packages that constitute the main body of the bid:

#### **A Scoping study**

#### **B Harvests**

#### **C Status**

#### **D Genetics**

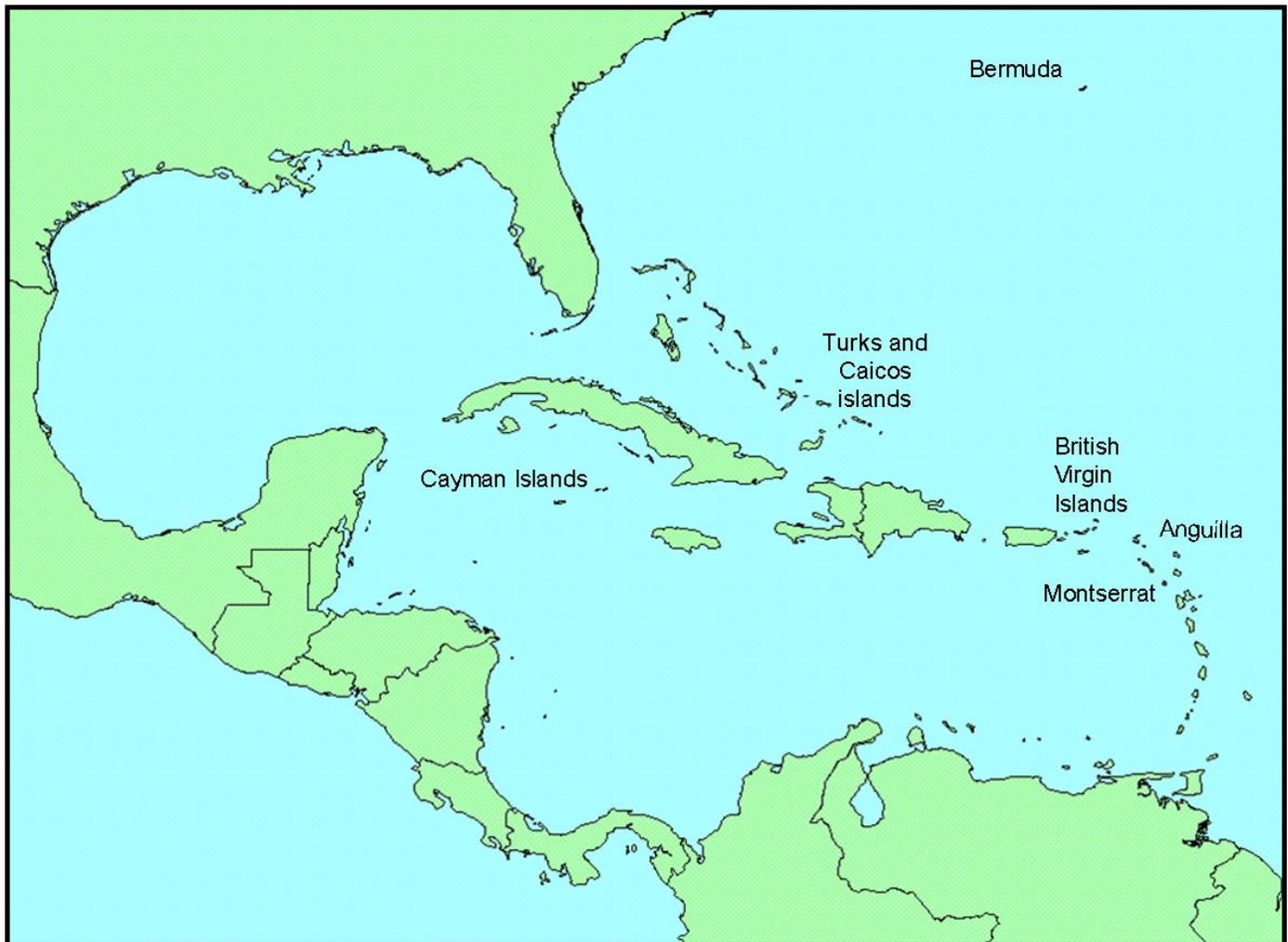
#### **E Recommendations**

In negotiations with Defra representatives, it was decided that a previously included work package on "Training and Capacity Building", although laudable and a high priority for funding, could not be supported within the current Defra initiative. This work package and some additional smaller elements of other work packages were removed, and submitted as a separate bid to the FCO Environment Fund for the Overseas Territories. This was successful and contributed to essential capacity building by:

- 1) Supporting a dedicated workshop
- 2) Facilitating OT networking
- 3) Providing *ex-situ* support

Here we report on all the results of the TCOT project as funded by Defra/FCO. We integrate findings and recommendations into the following sections:

1. **Executive Summary**
2. **General Introduction and Methodology**
3. **Legal Overview**
- 4-9. **Status and Exploitation of Marine Turtles: Individual OT Reports**
10. **Towards a Molecular Profile of Turtles in the UKOTs in the Caribbean**
11. **Capacity Building**
12. **Information Dissemination**



**Figure 2.1.** Geographic coverage of the TCOT project.

In addition, we facilitate the transmission of large bodies of ideas and information through extensive use of online appendices stored as PDF's at the project reporting website at: <http://www.seaturtle.org/mtrg/projects/tcot/finalreport/>

### 2.3. Methods Used in TCOT

Each chapter of this report stands largely independently, and recommended marine turtle monitoring strategies varied according to site specific factors such as turtle abundance, time and financial resources, and other logistical considerations. Methods used to date as part of TCOT for collecting biological data are standard and described in volumes such as Eckert *et al.* (1999). However, two methods were custom designed for use in the TCOT project and are described here:

#### 2.3.1. The Questionnaire Based Approach: A description and assessment of the socio-economic survey.

A socio-economic questionnaire (TCOT SEQ) was designed to assess the nature and value of marine turtle use (direct and indirect) to different user groups, including fishers (general), turtle fishers, direct vendors, indirect vendors, and consumers. The TCOT SEQ is available in downloadable PDF format as appendix 2.1 to this report. Researchers are welcome to use and/or adapt this survey for

their own purposes. However, our experiences conducting the questionnaire provided valuable insight into which questions worked best, and which were most problematic for respondents. We recommend that researchers contact Lisa Campbell <Lisa.m.Campbell@duke.edu> or Sue Ranger <sue@mcsuk.org> prior to use.

All respondents were asked to provide information on household demographics and livelihoods (sections 1 and 2), their opinions on trends in numbers of turtles nesting and seen in-water and on a variety of conservation options, and their awareness of laws regulating marine turtle use (section 9).

The stakeholder specific sections were designed to elicit information related to the various ways in which turtles are used, both in the past and in the present. General fishers were interviewed to assess fishing activities overall and the importance of marine turtles in these (if relevant), and the levels of marine turtle by-catch experienced when fishing for other things (section 3). Turtle fishers were questioned regarding importance of turtle fishing, fishing effort and seasonality, preferences for and knowledge of specific species, commercial sale of marine turtles and their parts, and their opinions on a variety of options for

sea turtle management (section 4). An important aspect of this assessment was how marine turtle fishing had changed over time. Section 5 targeted egg collectors, and questioned them regarding frequency and seasonality of collecting, species knowledge and preferences, and the commercial sale of turtle eggs. Vendors of marine turtle products were questioned in section 6. Information on the importance of marine turtles to overall vending activities, changes in the availability of products for sale over time, and market dynamics were sought. We also targeted non-consumptive 'users' of marine turtles, either through advertising, as an attraction, or through professional activities (section 7). Non-consumptive users were questioned regarding the importance of turtles to such activities, and customer responses to marine turtles. Consumers of marine turtle products were questioned in section 8, and were asked about frequency and purpose of use, seasonality of consumption, species preferences, market dynamics, and changes in availability of products for consumption over time.

In-country partners were trained on the principles of questionnaire administration in general (e.g. ethics, neutrality, etc.) and on the TCOT questionnaire specifically at the Cayman workshop (Photo 2.1). Additional training to partners in TCI, BVI and Anguilla was carried out when TCOT staff were in the field (Photo 2.2). The questionnaire was pilot tested by partners, both for clarity and for training purposes, at the Cayman workshop.

The questionnaire was developed collaboratively. An initial draft was developed by TCOT staff, in accordance with principles of questionnaire design (e.g. Kitchen & Tate 1999; Lindsay 1997) and based on the objectives of the research. It was then presented to TCOT partners participating at the Cayman Islands workshop in August 2002. That draft underwent considerable revision (Photo 2.3) as a result of partner input at the workshop, and a second version was ready some months later. This was circulated for comment to all partners, and finalized.

While consultations on the questionnaire delayed administration, TCOT staff felt it necessary for two key

reasons:

1) to increase partner buy-in and ownership of the questionnaire, and familiarity with the research tool in general. These were important concerns due to the proposed role of partners in administering the questionnaire and their general lack of experience with this research technique;

2) to account for the subtle differences between OTs and include specific issues of interest to particular OTs where possible. To a certain extent, this approach may have increased overall length. For example, at the request of some partners, a section evaluating use of turtles in a professional capacity (i.e. through research or advocacy efforts) was added. Although the questionnaire was already long, TCOT staff felt it was important to respond to partner requests.

### Sampling

The sample of respondents answering the questionnaire was stratified into the target interest groups (e.g. fishers, consumers, etc., see Table 2.1). Within stratifications, sampling was both purposive (i.e. deliberate) and opportunistic, for a variety of reasons. For example, if the TCOT team identified 7 dive operators in a particular OT, all were approached to complete a survey (purposive sampling), as potentially important non-consumptive users of marine turtles. In contrast, more selective sampling was employed for larger stakeholder groups. For example, the number of fishers operating in South Caicos, TCI, was estimated at 200. While randomly sampling from this population was theoretically possible, it was practically infeasible, due to lack of formal lists of fishers and unpredictable availability. Fishers were opportunistically sampled, normally at fish landing sites, and possible known turtle fishers were purposively sampled to ensure their activities and views were included in the data.

While this approach limits the extent to which results can be considered representative of the larger population, it provided the flexibility to target specific people (i.e. known turtle fishers), to capitalize on opportunities in the field, and to ensure adequate coverage of each interest group.



**Photo 2.1.** Lisa Campbell outlining TCOT SEQ as part of training workshop (Photo S. Ranger).



**Photo 2.2.** Training of TCOT partners in the field.

Country	Fishers	Turtle Fishers	Turtle Egg Collectors	Turtle Vendors (Direct)	Turtle Vendors (Indirect)	Turtle Consumers	Refusals	Q'naires completed
Anguilla	36	28	20	27	27	63	2	72
Bermuda	26	5	2	0	1	23	0	71
BVI	30	20	9	28	23	41	3	56
Cayman	12	5	3	18	22	78	17*	107
Montserrat	30	17	7	26	8	50	11	71
TCI	59	50	27	21	20	85	6	92
<b>TOTAL</b>	<b>193</b>	<b>125</b>	<b>68</b>	<b>120</b>	<b>101</b>	<b>340</b>	<b>39</b>	<b>469</b>

**Table 2.1.** A summary of the number of questionnaires completed from each of the OT's in this study, with the number of completed sections of the questionnaire. \*represents minimum number of refusals.



**Photo 2.3.** Revising TCOT SEQ.



**Photo 2.4.** Carapace on midden recovered as a result of SEQ.

### Coverage

The socio-economic survey has been completed in all 6 of the OTs within the geographic range of TCOT. Details of stakeholder group coverage in each OT are summarized in Table 2.1. Because the questionnaire asked about current and past activities, numbers shown in Table 2.1. do not reflect current levels of activity. For example, the vast majority of egg collectors hadn't collected eggs for several decades. Turtle vendors (direct) included vendors who *could have* sold turtle products, but who chose not to. Details on past versus present use are reported in the exploitation sections for individual countries (section 4-9).

A total of 469 questionnaires were completed and returned to TCOT staff. With each taking between 30-120 minutes to complete, this is a huge achievement. In addition, a great deal of time was taken to source individuals within the community to target for interviews; turtle fishers in particular. The relatively small number of refusals (39, or 8%) indicates the willingness of the individuals to participate in this information sharing process. Reasons for refusals included suspicion of the process, lack of interest in the topic, or lack of time to commit to the interview. Additional benefits of the TCOT SEQ process were the localisation of additional samples and data as an extension of the interview (Photo 2.4) and the formation of relationships that have resulted in subsequent reporting, e.g. of turtle capture statistics as has occurred in Anegada, BVI (see section 6).

The benefits of conducting these interviews go beyond the actual data collected; interviews provided members of the community with the opportunity to state their opinions on subjects such as marine turtle fishing. Previous research has suggested that if these opinions are taken into account in decision-making by authorities, interview participants are likely to feel a greater sense of ownership of and stake in resulting policies (Holland *et al.* 1998; Jentoff 2000). In addition, the presence of the team conducting interviews will undoubtedly have led to increased discussions of this subject within the community and a rise in public awareness.

### Survey administration

The original intention was that local partners would take the lead administering questionnaires, with TCOT staff providing support only. In most cases, this did not occur, for a variety of reasons. The challenges to survey administration and the



**Photo 2.5.** P. Richardson conducting a SEQ Interview (Photo S. Ranger).

way these were met were different in each OT, and have variable repercussions for understanding and interpreting results. Thus, they are described separately in the Table 2.2 below.

All surveys were administered in person, by 1 or 2 people (Photo 2.5 and 2.6). In all cases, administrators asked the questions and, when present, an assistant recorded responses. This was necessary due to the complex nature of the questionnaire, which prohibited written completion by respondents. If no assistant was available, the administrator recorded responses. The majority of questions were structured to facilitate comparison. For example, opinions were gauged using an adapted Likert-like scale (see Kitchen and Tate 1999). In many cases, however, respondents were asked to elaborate on their answers. Furthermore, administrators noted any additional, relevant information provided in margins and in end of section notes. While difficult to analyse, this type of qualitative data may provide a context for better understanding quantitative responses.

### **Local partner responses to the survey**

As Table 2.2. shows, the participation of TCOT staff (Ranger, Richardson and Campbell) or other contracted researchers (McGowan, Martin and Silver) was required to complete survey administration in all OTs except CI and Bermuda. Several factors were at work in this: 1) small staff numbers in partner agencies, all of whom took on TCOT in addition to, rather than instead of, their regular duties, with no additional resources; 2) lack of familiarity with social surveys in general, which detracted from individual confidence in ability to conduct the survey; 3) the complexity of the questionnaire, and the impression that it was lengthy (true in the case of fishers, but not so in the case of other stakeholders); 4) a lack of interest in participating in questionnaire administration. While it is easy to cite lack of resources as the main reason capacity building in this area was not as successful as anticipated, honest reflection on this has to include a simple lack of interest among partners as a possible factor. In some cases, TCOT staff were greeted with initial enthusiasm,

only to see it wane, sometimes in a matter of hours. Thus, while initial consultations with partners at the Cayman Islands Workshop and the substantial revisions made to the questionnaire afterwards were designed to increase partner 'ownership', this did not generally occur.

### **Potential for bias among respondents**

All surveys need to consider the potential for bias among survey respondents. Possible sources of bias, and efforts taken to overcome these, are listed in Table 2.3. For brevity, the discussion in this report is limited to bias that may have affected turtle fishers. Fishers were asked to provide the most quantitative data (on abundance, fishing effort, etc.), and were the group most likely to perceive the TCOT survey as possibly threatening to their livelihoods. Thus, potential bias in responses was most likely to arise among this group, and to be most problematic for interpreting results.

While a statement of potential sources of bias is necessary, it is worth remembering the very low refusal rate experienced in all OTs, suggesting most fishers (and other stakeholders) were willing to engage in the TCOT process. Furthermore, J. Silver's work in TCI exposed positive responses to participation, in addition to the sources of apprehension discussed in Table 2.3. For example, many fishers were happy to participate and saw benefits to doing so. Benefits included the opportunity for input on the specific issue, and more general communication with the government. Fishers participated in an effort to be helpful, and due to both their



**Photo 2.6.** Interviewing in the BVI.

Country	Adminstrator(s)	Data entry	Analysis	Benefits	Limitations
Anguilla	Ranger; Richardson;	Ranger	Ranger	Consistency across admin, data entry and analysis; High familiarity with survey by surveyors; Long term presence by Ranger allowed for additional study on the impacts of the moratorium	Additional and unanticipated costs to TCOT; Local capacity building goals not met
Bermuda	J. Constable (Bermuda Aquarium Volunteer)	Constable	Campbell	Consistency across admin, and data entry; No cost to TCOT; Local capacity building	Constable was not formally trained to administer the questionnaire. However, there are very few inconsistencies in the data, so this limitation is negligible
British Virgin Islands	Campbell; Richardson; S. Gore, A. Pickering (BVI CFD); A. McGowan (MTRG Darwin Fellow)	J. Silver & Z. Meletis (Campbell graduate students)	Campbell	High familiarity with survey by some surveyors; High coverage of indirect vendors by S. Gore	Some inconsistencies in data recording; Fewer questionnaires completed in BVI; Additional and unanticipated costs to TCOT; Limited local capacity building
Cayman Islands	J. Solomon, C. Bell, Staff of CI DoE (ca.15%); Students in local college course (ca.85%)	J. Abbott (Campbell graduate student)	Campbell	Cayman partners found a locally appropriate solution that ensured data were collected, and the questionnaire was conducted in accordance with accepted ethical standards for working with human subjects*; Local capacity building (though with unintended group)	Many different administrators, with minimal training, and resulting high errors in data collection and recording; Administrators could not be contacted for follow-up questions by data analysts; Minimal coverage off Grand Cayman; High number of students interviewed (by friends and family)
Montserrat	C. Martin (MTRG post-doctoral researcher)	Martin	Campbell	Consistency in admin and data entry; Due to the small staff of the Department of Fisheries, hiring outside labour allowed the survey to be completed	Additional and unanticipated costs to TCOT; Local capacity building goals not met
TCI	A. Thomas, J. Parker & T.Fisher (DECR staff) <i>with</i> Silver (Campbell graduate student); Richardson. L.Slade (volunteer)	Silver; Richardson	Richardson	Consistency across admin, data entry and analysis; Long term presence by Silver allowed for additional study on fisher responses to participation in TCOT; DECR staff present for most surveys administered	Additional and unanticipated costs to TCOT; Additional costs incurred by Campbell; Limited local capacity building

**Table 2.2.** Benefits and limitations of survey administration strategies in each OT. \*Following a discussion of the ethics of collecting data from fishermen at the 2000 TCOT workshop, Cayman Island partners decided they could not fulfil their ethical obligations to participants who might reveal illegal activity, due to their enforcement mandate and responsibilities.

---

**Issue****TCOT Response*****Enforcement responsibilities of local partners***

The enforcement role of many local partners was problematic. Even when individuals administering the survey did not have enforcement responsibilities (e.g. Thomas and Parker in TCI), the agency they worked for did. Thus, there was potential for fishers to modify responses, particularly those implicating themselves in any illegal activities.

The ethics statement preceding the survey was intended to assure participants that their participation was anonymous and that information provided by them would not be used against them. While fishers may have been suspicious of this, in many cases fishers did report illegal activities. Whether this was because they believed the statement re: ethics, or because enforcement is low in many areas (e.g. TCI, Bennett *et al.* 2001) is unknown.

***Perceived views of marine turtles***

Faced with a group of researchers interested in marine turtles, many interviewees may have perceived the research team to have its own bias, and pitched their responses accordingly. For example, fishers may have understated/overstated catch levels (likewise, tourism operators may have overstated the importance of turtles to their businesses). J. Silver's MA research in TCI found fishers convinced of the 'turtle-hugging' nature of the TCOT research team.

All administrators were informed of the importance of remaining neutral while conducting interviews. While working with partners in the field, TCOT staff noticed an increased ability of individuals to do this over time. TCOT staff also made attempts to engage fishers in informal discussions of their work, and to express interest in the fishery rather than turtles.

***Memory***

In many OTs, respondents were talking about activities undertaken years ago, e.g. trends in nesting numbers since they started fishing, or about egg collecting undertaken when they were children. Memory reliability is thus an issue for consideration.

The questionnaire double-checked some important information. For example, fishers commented on trends in numbers of turtles in general and by species, in two slightly different questions in separate sections of the questionnaire. Where memory was fuzzy, qualitative responses were accepted, and individuals were never forced to provide a numeric estimate. While this made data more difficult to analyse, it preserved the original intent of the respondents.

***Levels of interest***

In many OTs, marine turtles are of minor importance overall, and fished primarily on an opportunistic basis. Thus, a lack of interest in turtles may have led some respondents to treat the survey lightly, answering questions without giving them full attention or consideration (J. Silver, unpublished MA data).

Beyond being patient and friendly in such scenarios, there is little a researcher can do to increase participant interest.

***Resentment of UK government***

The relationship between the UK government and its Overseas Territories varies from OT to OT. In some cases, resentment and/or distrust of the UK may have influenced responses.

Working with local partners may have helped to dilute such resentment.

***Distrust of research in general***

J. Silver found some resentment of researchers in general, based on past experiences where researchers didn't adequately respect local views or failed to return research results to the community.

Because of the potential policy implications of the research, respondents may have seen the utility of participating in spite of such distrust, and their desire to have their concerns heard may have overridden it.

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**Table 2.3.** Potential for bias among turtle fishers.

beliefs in the importance of the issue and in the value of the knowledge they have.

The TCOT team is committed to finding the means to allow for effective and meaningful feedback and hope to begin this process as part of a new initiative funded under the Overseas Territories Environment Programme (OTEP). The nature of concerns raised by fishers about researchers and the research process suggests that much goodwill and improved relations could be secured through such a return of information.

### 2.3.2. Use of the Caribbean Turtlewatch Package

Data on the in-water abundance of marine turtles were gathered via a series of methods. One of these was *Caribbean Turtlewatch*, a questionnaire designed to be completed by recreational divers/snorkellers. Dive operators were approached by members of the TCOT team and asked to engage their customers in (and assist them with) completing the questionnaire. Specifically, divers/snorkellers were asked to: a) record presence or absence of turtles on all dives, and location of and conditions during sightings, b) estimate size and species of turtles sighted; c) evaluate the importance of possibly sighting turtles to their selection of dive sites/operators, and the contribution of positive sightings to the enjoyment of their dives. Operators were given forms, posters and information sheets to assist them with promoting and participating in this reporting programme (included in Appendix 2.2-2.4; Photo 2.7).

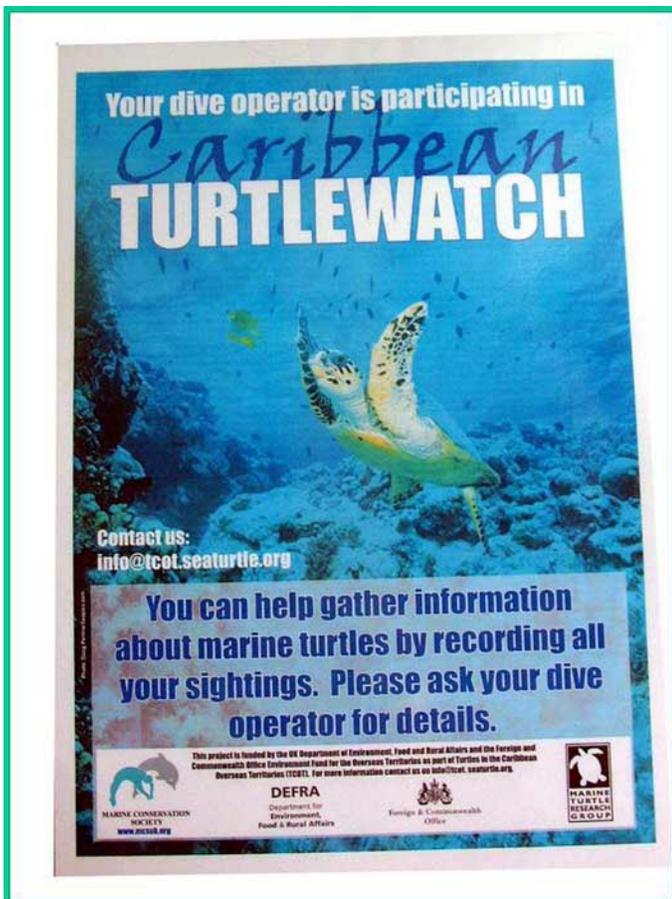


Photo 2.7. Caribbean Turtlewatch.

The purpose of this survey was to obtain data on the species and size composition, relative abundance and location of marine turtles in-water, and to undertake a preliminary assessment of the value of marine turtles to the dive industry. As with the socio-economic questionnaire, sources of potential error and bias are discussed here:

- There is a tendency for individuals to report more positive results than negative ones, thus data are probably over-representative of the numbers of dives resulting in observations of marine turtles. In some cases, e.g. Anguilla, we know definitively that only turtle sightings have been reported. However, with careful data filtering and close attention to ensure reporting of negative results, perhaps through ensuring dive masters record dives with no turtles, this methodology could have utility for setting baselines at key dive sites as locations for monitoring of relative abundance.
- Reef dwelling turtles, especially hawksbills, are more likely to be observed, and hawksbills were generally the most reported. Furthermore, there is high likelihood that the same turtles were seen on multiple occasions, as dive operators often frequent the same dive sites, particularly those that result in high customer satisfaction.
- Diving conditions are better in certain months, thus increasing both the number of dives and observations, and visibility in water. Furthermore, dive operations may scale-up operations during the tourist season. Thus data regarding the temporal spread of sightings should be treated with caution until a full analysis corrects for these factors.
- Although we cannot be certain that identification of the species of turtle observed is correct, the Caribbean Turtlewatch form allowed the recorder to state whether they were very sure, sure or not sure of the species. If they were unsure, we attributed the observation to species unknown.
- The estimate of the size of the individual turtle observed is likely to have high error. However, for the purpose of this survey, the information gathered at least allows us to roughly classify observed individuals as juvenile or as possible adult size.

Despite the many caveats associated with this system of monitoring, the method was useful for ascertaining species presence and giving some idea of relative abundance. In addition, it highlighted the areas where divers most commonly see turtles. It also raised awareness amongst the dive community and enabled their active involvement in monitoring and reporting.

Caribbean Turtlewatch was unsuccessful in Bermuda as, while dive operators were interested in participating in the programme, no turtles are recorded at these dive sites. In Anguilla, BVI and Montserrat, limited yet useful data were collected. In Anguilla there were three dive operators who initially expressed an interest in participating, but the TCOT project partners did not have the time to regularly liaise with them to maintain enthusiasm for the project. In BVI, project

partners were limited in their ability to spend time liaising with dive operators, and in Montserrat the one dive operator operated intermittently during the period of the TCOT study until the recent cessation of volcanic activity.

Caribbean Turtlewatch was most successful in the CI and TCI, primarily because there were TCOT partners in these territories who were able to commit the time and resources to the considerable dive operator liaison necessary to maintain the programme. Data in these OTs were collated, entered and analysed in a preliminary manner for this report by Catherine Bell (CIDoE) and Lorna Slade (TCI-based independent researcher). These data will undergo further analysis and be written up as manuscripts in the near future by these individuals and their collaborators.

## 2.4. Acknowledgements

Literally hundreds of people have come together to make the TCOT project such a great success. Many are mentioned in the individual chapters describing the area of work in which they were involved. Specifically for the work detailed in this chapter:

**For the TCOT socioeconomic survey** we thank the 469 interviewees who participated, gladly giving a great deal of time and information. Many thanks to all TCOT workshop attendees (see Appendix 11.1) for their inputs into the content and format of the questionnaire. In **Anguilla**: Thanks to the Department of Fisheries and Marine Resources for invaluable support in structuring the survey sample and to Carlos Sasso in particular for using his intimate knowledge of Anguilla's fishing community to track down interviewees; Karim Hodge for his time and support in administering the survey and arranging interviews. **Bermuda**: Jennifer Constable carried out all surveys and a portion of the data input with logistical support from Jennifer Gray. **BVI**: On Tortola, surveys were carried out by Shannon Gore and Arlington "Zeik" Pickering who also facilitated many interviews conducted by TCOT staff. On Anegada, Jim White and Damon Wheatley of the Darwin Anegada Project were instrumental in making introductions, with Andrew McGowan (MTRG) carrying out the interviews. **Cayman**: Professor Lilian Hayball, University College of the Cayman Islands and the students of her classes BIO 101 College Biology I, BIO 102 College Biology II and EVO 100 Introduction to Environmental Science. The Staff of the Cayman Islands Department of the Environment. The restaurant owners, fishers, and members of the public in Cayman who agreed to participate in the pilot interviews. **Montserrat**: Questionnaires were administered by Corinne Martin (MTRG) with support from the staff of the Montserrat Fisheries Department, Montserrat Governors Office, Montserrat Ministry of Agriculture, Montserrat National Trust, Montserrat Volcano Observatory, Royal Society for the Protection of Birds, Sea Wolf Diving School, and the following individuals: Crystal & Dean Archer, Mrs Hilda Blake, Helen & Gerard Cooper, Bo Dalsgaard, Mr & Mrs Darby, Alfred Edwards, Lexvern Fenton, Anne-Marie & David Graham, Linda Green, John Keller, Joe Philips, Sarah Sweeney, Mr & Mrs Walker.

**TCI**: Jasmine Parker, Amber Tomas, Michelle Fulford-Gardiner, Judith Campbell, Duncan Vaughan and Tatum Fisher. Jennifer Silver, and the University of Western Ontario. Special thanks to Lorna Slade and family for putting up the TCOT staff in their house during TCOT field trips.

**For Caribbean Turtle Watch: Anguilla**: Thanks to Anguillian Divers. **BVI**: Co-ordination was initially carried out by Mervin Hastings and was then taken on by Shannon Gore (both BVI CFD). The dive operators involved included: Commercial Dive Services, Blue Water Divers, Dive BVI, Sail Caribbean, UBS, and White Squall. **Cayman**: Co-ordination was carried out by Catherine Bell (CIDoE) and the dive operators involved included: Wall to Wall, Cayman Submarines, Paradise Divers, Ocean Frontiers, Tortuga Divers, Seaview, Pirates Point and Southern Cross. **Montserrat**: Many thanks to Seawolf and Montserrat Divers. **TCI**: Very many thanks to Lorna Slade (independent researcher) who co-ordinated Caribbean Turtlewatch in TCI, and who was kindly supplied with completed datasheets by Flamingo Divers and Dive Provo of Providenciales, to whom we also extend our thanks.

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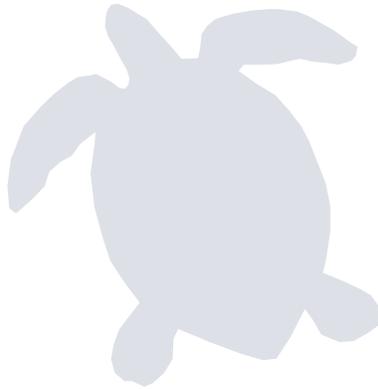
# Overview of Legislation Pertinent to Marine Turtle Harvest



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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.

## 3. Overview of Legislation Pertinent to Marine Turtle Harvest

### Contents

	<b>Page</b>
<b>3.1. Harvest Legislation in the UK Overseas Territories in the Caribbean</b>	<b>17-25</b>
3.1.1 Anguilla	20-21
3.1.2 Bermuda	22
3.1.3 British Virgin Islands	22
3.1.4 Cayman Islands	22
3.1.5 Montserrat	23
3.1.6 Turks and Caicos Islands	23-24
<b>3.2. Multi-lateral Environmental Agreements (MEA's) and Turtle Harvest Legislation</b>	<b>25-29</b>
3.2.1. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	25-27
3.2.2. Convention on Migratory Species (CMS or Bonn Convention)	27
3.2.3. Protocol Concerning Specially Protected Areas and Wildlife (SPAW) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region	27-28
3.2.4. Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	29
<b>3.3. TCOT Recommendations for Changes to National Legislation</b>	<b>29-37</b>
3.3.1. Anguilla	29-32
3.3.2. Bermuda	32
3.3.3. British Virgin Islands	32-34
3.3.4. Cayman Islands	34
3.3.5. Montserrat	34-36
3.3.6. Turks and Caicos Islands	36-37
<b>3.4. Acknowledgements</b>	<b>37</b>
<b>3.5. References</b>	<b>37-38</b>

Reflecting the historical importance of turtle fisheries in the Wider Caribbean, all 6 Territories involved in the TCOT project have enacted legislation specifically designed to regulate marine turtle fisheries. Indeed, in 1620 the First Bermuda Assembly produced what is thought to be the world's first marine turtle protection legislation, by passing an Act that prohibited the harvest of young turtles (see section 5).

Currently, there is a diversity of legislation pertaining to the harvest and sale of marine turtles and their products in the UK Overseas Territories, ranging from complete prohibition in Bermuda, to regulated harvest of turtles and take of eggs in Montserrat. This section presents an overview of this legislation, highlights those multi-lateral environmental agreements (MEAs) that provide specific protection to marine turtles in the UK Overseas Territories in the Caribbean, and presents TCOT's recommended legislative changes. Where available, the full text of the pertinent legislation for each Territory is given in Appendices 3.1 to 3.6.

### 3.1. Harvest Legislation in the UK Overseas Territories in the Caribbean

The national legislation that regulates turtle harvest in each UK Overseas Territory in the Caribbean is, in most cases, based on legislation drafted several decades ago when scientific understanding of marine turtle ecology was less developed than it is today. While marine turtle population



**Photo 3.1.** Nest protection is an important component of depleted population conservation and recovery (Photo P. Richardson).

ecology is a relatively new field of study, Heppell *et al.* (2003) provide a comprehensive overview of the current status of understanding. The key points of the review by Heppell *et al.* are highlighted here.

**Egg harvest:** It is widely accepted that individual mortality at the hatchling and egg stage is common and is of minimal significance to the population when compared to mortality at other age classes. Female marine turtles have evolved to produce thousands of eggs during their reproductive lifetime to compensate for the inevitably high levels of egg and hatchling mortality to natural predators. However, survival at this life stage leads to recruitment into the population of the more valuable older age classes, and extensive harvest of eggs can prevent recruitment and lead to long-term nesting population collapse. As turtles are long-lived, the effects of sustained egg harvest at the nesting beach will only become evident within a nesting population several decades after the egg harvest has occurred. It is now fully accepted that when attempting to facilitate the recovery of small or depleted turtle populations, the protection of turtle nests from human harvest is an important component of an effective conservation strategy.

**Harvest of juveniles, sub-adults and adults:** Protecting nests alone will not facilitate the recovery of marine turtle populations if there is high mortality in later age classes. Maintenance of long-lived, slow-growing species like marine turtles depends heavily on high survival rates of juvenile, sub-adult and adult age classes within particular populations. Populations that suffer extensive and prolonged harvest of individuals within these age classes are liable to collapse. The UK Overseas Territories' traditional turtle fisheries typically targeted (and continue to target) foraging populations, nesting females and in some cases mating adults. Minimum size limits are a common feature of the Territories' harvest legislation, thereby permitting the take of the most reproductively valuable age classes. Prohibiting the take of older age classes is essential for effective marine turtle population management and therefore harvest legislation must include a maximum size limit.

The TCOT Socio-economic Questionnaire (TCOT SEQ) revealed that many turtle fishermen appreciate the need for a minimal size limit 'to protect the turtle nursery', and often fishermen release very small turtles simply because of their limited value. Any change in turtle fishery legislation that limits a fisherman's activities and income is likely to be met with some opposition amongst the fishing community. Territory authorities often have limited enforcement capacity with regard to fishery management and therefore fishing community acceptance of legislation change is essential to avoid widespread illegal and covert turtle fishing. There is little biological justification for imposing a minimum size limit on a turtle fishery. However, in Territories where a harvest is desired and the fishermen appreciate this fishery conservation ethic, it may be justifiable to maintain the minimum size limit of the old legislation. This may give amended legislation introducing maximum size limits some familiarity, accessibility and thereby promote much



**Photo 3.2.** Most turtle fishermen interviewed during the TCOT SEQ accepted minimum size limits as a conservation measure (Photo P. Richardson).

needed acceptance and ownership amongst the fishing communities. Once appropriate awareness programmes have sensitised fishers to legislation amendments and have increased fisher understanding of turtle fishery management, the necessity of maintaining a minimum size limit can be reviewed.

Marine turtles are migratory, with females often travelling vast distances between foraging grounds and nesting beaches. Following their initial pelagic life stage, juvenile cheloniid turtles may settle on inshore foraging habitat located thousands of kilometres from their natal beach. Consequently, inshore foraging turtle populations, largely consisting of juvenile and sub-adult individuals, will represent nesting populations from throughout the region. Therefore, the foraging assemblage of any given species found in the waters of a particular Overseas Territory will be distinct from and largely unrelated to the population of adults of the same species that nest on the beaches of that same Territory. This is the case for green, hawksbill and loggerhead turtles. Leatherbacks are generally pelagic and do not regularly forage in inshore waters in the Caribbean. The two distinct aggregations, foraging and nesting, have completely different conservation management requirements, especially where harvest is permitted.

***It is essential that this fundamental and critical concept is understood by all stakeholders involved in marine turtle population conservation and management in the UK Overseas Territories in the Caribbean.***

Fisheries that extensively target mixed-stock foraging populations can have adverse impacts on the recruitment of the various contributing nesting populations within the region. Such fisheries could not only affect nesting populations elsewhere, but in turn may eventually impact the recruitment into the foraging population targeted. It is therefore prudent to ensure that any harvest is controlled, measured and limited, with, for example, measures such as closed seasons, geographical no take zones (e.g. Marine Protected Areas), quotas and permitting systems for marine turtle harvest. The TCOT SEQ assessed fisher acceptance of different management options. In most instances restrictions on fishing gear, seasons, and numbers of turtles captured were more acceptable than geographic no take zones, and efforts to implement the latter will need to work with fishers if these are to succeed.

**Harvest of nesting females:** Female green, hawksbill and loggerhead turtles exhibit high levels of fidelity to the nesting beaches they use, which are more than likely within close proximity to the beach that they themselves emerged from as hatchlings. Nesting females are perhaps the most valuable life stage of any turtle population, but are extremely susceptible to human predation given their predictable nesting behaviour and vulnerability on the nesting beach. Extensive and prolonged harvest of nesting females on the beaches of an Overseas Territory will rapidly deplete the nesting populations using those beaches. This has famously occurred in the Cayman Islands, once the location of one of the largest green turtle rookeries in the Caribbean (Aiken *et al.* 2001), in Bermuda, and has probably occurred on Salt Cay, Grand Turk and Providenciales, Turks and Caicos Islands. The extensive harvest of nesting females almost led to the extinction of the leatherback population frequenting Tortola, BVI in the 1980s (Hastings 2003).



**Photo 3.3.** Harvest of nesting turtles should be completely prohibited in all the UK Overseas Territories in the Caribbean (Photo P. Richardson).

Legislation provisions	Anguilla	Bermuda	British Virgin Islands
<b>Harvest legislation</b> <sup>3.1.1</sup>	Fisheries Protection Act, Revised Statutes of Anguilla, Chapter F40, Fisheries Protection Regulations, Revised Regulations of Anguilla, Chapter F40-1 <sup>3.1.2</sup>	Fisheries Act 1972, Fisheries (Protected Species) Order 1978, Protected Species Act 2003	The Turtles Ordinance 1959 as amended 1986, Fisheries Act, 1997 <sup>3.1.3</sup>
<b>Harvest, sale and possession of turtle eggs &amp; nesting females</b>	Prohibited until 15 <sup>th</sup> December 2005	No nesting turtle population but harvest of all marine turtles species is prohibited	Prohibited
<b>Open season</b>	NA	NA	NA
<b>At sea capture, sale and possession</b>	Prohibited until 15 <sup>th</sup> December 2005	Prohibited	Allowed with conditions
<b>Open season</b>	NA	NA	December through to March inclusive
<b>Quota</b>	NA	NA	No quotas
<b>Size restrictions</b>	NA	NA	Captured turtles must be 20lbs (9.07kg) in weight.
<b>Species restrictions</b>	NA	NA	No species restrictions, although legislation effectively protects leatherbacks as they are most likely encountered as nesting females.
<b>Geographical restrictions</b>	NA	NA	Fishing is prohibited within Marine Parks and Protected Areas
<b>Method restrictions</b>	NA	NA	Fishing using spear guns, SCUBA gear and explosives is prohibited
<b>Penalties</b>	<i>A fine of up to EC\$50,000 or up to one year imprisonment, or a fine of EC\$250,000 and imprisonment for 2 years for a second or subsequent offence or to both such fine and imprisonment.</i>	<b>Fisheries Act:</b> <i>Imprisonment for one year or a fine of \$5,000 or both such imprisonment and fine, and any forfeiture of any fish so taken and any vessel, instrument and equipment used in such taking.</i> <b>Protected Species Act:</b> <i>Fine of \$5,000 or imprisonment for 6 months or, in the case of a second or subsequent offence, to a fine of \$10,000 or imprisonment for 6 months and, where the offence is a continuing offence, is liable on summary conviction to a fine of \$1,000 for each day on which the offence continues.</i>	<b>Fisheries Act:</b> <i>For offences involving using prohibited fishing methods, offenders are liable to fines of up to \$15,000, forfeiture of equipment and seizure of catch.</i> <b>Turtles Ordinance:</b> <i>Fines up to \$1,000, forfeiture of equipment and seizure of catch.</i>

**Table 3.1.a** A summary of all legislation relevant to the harvest of turtles and their eggs, and the sale of turtle products in Anguilla, Bermuda and BVI. (NA - Not Applicable).

Legislation provisions	Anguilla	Bermuda	British Virgin Islands
<b>Protected Area Legislation</b>	Marine Parks Act, Chapter M30, Revised Statutes of Anguilla; Marine Parks Regulations, Chapter M30-1, Revised Regulations of Anguilla. <sup>3.1.2</sup>	The Fisheries (Protected Areas) Order 2000	Marine Parks and Protected Areas Act, 1979, Marine Parks and Protected Areas Regulations, 1991
<b>Penalties</b>	<i>A fine of EC\$5,000 or a term of imprisonment of 6 months, and in the case of a continuing offence to a further fine of EC\$100 for each day on which the offence continues (for non-Anguillians fishing turtles in a marine park – superceded by moratorium).</i>	<i>Imprisonment for one year or a fine of \$5,000 or both such imprisonment and fine, and forfeiture of any fish so taken and any vessel, instrument and equipment used in such taking.</i>	<i>For conviction on indictment, fine up to \$1,000 and imprisonment for 1 year, or for summary conviction, fine up to \$500, imprisonment for a term of 6 months, or to both such fine and imprisonment.</i>

**Table 3.1.b.** A summary of all legislation relevant to protected habitats of marine turtles in Anguilla, Bermuda and BVI.

Depletion and extinction of turtle nesting populations in the Overseas Territories will not only deprive the Territory inhabitants of a rich and valuable natural resource, but will also have adverse impacts on the foraging populations elsewhere in the region to which the Territory nesting populations contribute.

The harvest of nesting female turtles in recovering populations should be completely prohibited in any harvest legislation. When given complete protection, nesting populations appear to have the capacity to recover rapidly, as is currently being shown by the leatherbacks of Tortola, and by nesting populations of other species around the Caribbean (IUCN 2002; Seminoff 2004).

Closed seasons for turtle harvest should be set to begin before the onset of the nesting season. Adult turtles are generally believed to mate within proximity of the nesting beach and about one month prior to when the female nests. A closed season that begins one month prior to the composite nesting season of all appropriate species will mitigate accidental capture (for example, in nets) of mating turtles prior to the nesting season. Some current harvest legislation already provides closed seasons, perhaps in recognition of the need to protect nesting females, but again, the legislation was drafted at a time when there was incomplete knowledge of marine turtle nesting seasonality. In most cases, the closed season period requires revision.

Table 3.1 (a-f) presents an overview of the current legislation in the UK Overseas Territories pertinent to the take and sale of marine turtles and their products, including marine protected areas legislation and, where appropriate, national legislation that transposes the Convention on International Trade in Endangered Species (CITES) into domestic legislation. This legislation is briefly described

here and TCOT's recommended amendments are outlined and discussed in section 3.3.

### 3.1.1. Anguilla

Anguilla hosts nesting and foraging populations of green and hawksbill turtles, nesting populations of leatherback turtles, and occasional foraging loggerheads. (See section 4 for further discussion).

Prior to 1995, the harvest of turtles and their eggs in Anguilla was regulated by the Fisheries Protection Regulations 1988, which was an updated version of Anguilla's original Turtle Ordinance gazetted in 1947. The Fisheries Protection (Amendment) Regulations, 1995 introduced a 5-year moratorium on the harvest that was extended for a further 5 years from the 15<sup>th</sup> December 2000 under the Fisheries Protection Regulations, Chapter F40-1.

The penalty for violating the current moratorium is a fine of up to EC\$50,000 or up to 1 year imprisonment. For a second or subsequent offence, a fine of EC\$250,000 and imprisonment for 2 years or both such fine and imprisonment applies. These penalties are significantly more severe than most other offences under the Fisheries Protection Regulations. This penalty was repeatedly criticised by respondents to the TCOT SEQ, and the point was raised that that such a high initial penalty might even discourage the Department of Fisheries and Marine Resources (DFMR) from prosecuting offenders. Since 1995, the authorities have apprehended a few individuals for breaking the moratorium, but no prosecutions have resulted from these cases (see section 4).

The TCOT SEQ revealed that most interviewees perceived turtle fishing as the main reason for a perceived decline in Anguilla's turtle populations prior to the moratorium. The

Legislation provisions	Anguilla	Bermuda	British Virgin Islands
<b>Domestic CITES legislation</b>	Legislation in draft	Protected Species Act 2003	Endangered Animals and Plants Act, 1987 (Cap. 89)
<b>Penalties</b>	NA	See above	<i>Fine up to \$1,000 or to imprisonment for 12 months for provision of false information on application for export/ import license, or forfeiture of article if unlawfully exported from or imported to the BVI.</i>

**Table 3.1.c.** A summary of domestic CITES legislation relevant to the harvest of turtles and their eggs, and the sale of turtle products in Anguilla, Bermuda and BVI (NA - Not Applicable).

Fisheries Protection Regulations, 1988 would not have facilitated sustainable turtle populations for a number of reasons, and this perceived decline possibly reflects real historical trends in Anguilla's turtle populations. Harvest of turtles at sea, nesting females and turtle eggs were all permitted between the 1<sup>st</sup> of October and the 31<sup>st</sup> May in any year, and the minimum size limit for harvested turtles was 20lb (9.07kg). Turtle eggs, nesting females and older age classes within the foraging populations were therefore legally targeted.

CITES does not extend to Anguilla and therefore there is no national legislation that regulates the import or export of marine turtles. Prior to the moratorium there was a strong demand for Anguillian turtle meat and shells from other Caribbean states (e.g. St Martin, Puerto Rico, USVI). By the early 1980s, the levels of turtle harvest had reached unprecedented levels, primarily because lobster fishermen and spear fishermen began targeting turtles to benefit from the overseas demand for hawksbill shell (Meylan 1983). While spear fishing is highly selective, it is also relatively efficient compared to hand capture, and a change to extensive use of spear guns could have increased the number of turtles caught beyond sustainable levels.

TCOT SEQ interviews revealed that prior to the moratorium, former egg collectors harvested eggs throughout the nesting season, with peak egg collection occurring in the middle of the closed season. Furthermore, harvest of nesting females would have deleteriously impacted the nesting populations, especially if the closed season was flouted for nesting females in the same way as it was for eggs. The full nesting seasons for the turtles species found in Anguilla are unknown, but recent (but incomplete) monitoring efforts indicate that the nesting season for all species of marine turtle in Anguilla extends from at least March to September. To get a more comprehensive picture of real nesting seasons, one must consider regional patterns. The leatherbacks nesting in USVI sometimes begin in February and the season can extend to August (Boulon *et al.* 1996), whereas the hawksbill nesting season in USVI is year round with peak nesting activity occurring between May and November (Starbird *et al.* 1999). Therefore, if we consider

that turtle nesting in Anguilla could extend from February to November, the old closed season would not have protected nesting leatherbacks during a significant period of their nesting season, and would not have protected hawksbills at the end of their nesting season. However, TCOT SEQ indicated that adult leatherbacks were rarely targeted and rarely became entangled in turtle nets.

The green turtle nesting season in USVI extends from May to October (in Hirth 1997) and so would largely have been covered by the old closed season, but early nesters entering Anguilla's waters to mate prior to nesting would not have been protected by the closed season and neither would females nesting at the tail-end of the season in October. Anguilla's nesting green turtle population has been small for the last few decades (Meylan 1983) and any take of the highly valued adult green turtles would have deleteriously impacted such a small population. Leatherback and loggerhead turtles appear to be relatively scarce in Anguilla's waters, and any occasional take of these species under the old fishery regime would have had a significant impact on the nesting leatherback population and the resident foraging population of loggerheads.

The moratorium was introduced in response to growing public and government concerns about the decline of Anguilla's foraging turtle populations. TCOT SEQ indicates a general perception that turtle populations have responded to the moratorium, although biological data describing recent trends in abundance have not been gathered. Heppell *et al.* (2003) suggest that small, depleted populations cannot withstand even moderate harvest, and without an understanding of Anguilla's real turtle population trends, it is prudent to proceed with caution when considering the reopening of a turtle fishery. However, TCOT recognises that some Anguillians desire the reopening of the turtle fishery and acknowledge that if the perceived turtle population increases are reflected by real trends in abundance, then Anguilla's foraging turtle populations may be able to sustain a limited fishery. In the event that a turtle fishery is reopened in Anguilla, TCOT recommends critical changes to the Fisheries Protection Regulations, 1988, as discussed in section 3.3 below.

### 3.1.2. Bermuda

Bermuda's waters host foraging populations of green and hawksbill turtles. There is no longer any turtle nesting in Bermuda. (See section 5 for further discussion).

The harvest of marine turtles and their eggs is prohibited under the Fisheries (Protected Species) Order 1978 of the Fisheries Act 1972, and will be under the Protected Species Act 2003, once a list of 'protected species' as defined under section 5 of the Act is completed (J. Gray (BAMZ) pers. comm. 2003). TCOT does not recommend any changes to this legislation, and the TCOT SEQ revealed little demand for access to turtles, their eggs or other products.

### 3.1.3. British Virgin Islands

BVI hosts nesting and foraging populations of green and hawksbill turtles, nesting populations of leatherback turtles and occasional foraging loggerheads. (See section 6 for further discussion).

The current turtle harvest in BVI is regulated by the Turtles Ordinance 1959 as amended 1986, while the Fisheries Act, 1997 prohibits certain fishing methods. The Ordinance permits the take of all species of turtles at sea weighing 20lb or over during an open season from the 1<sup>st</sup> of December to the 31<sup>st</sup> of March in any year (closed season April to November inclusive). Older age classes are therefore legally targeted in BVI's turtle fishery, although harvest of nesting females (on the beach and at sea within 100 yards of the shore) and their eggs is prohibited. Fishing with spear guns, SCUBA and explosives is prohibited under the Fisheries Act, 1997 and fishing within BVI's Marine Parks is prohibited by the Marine Parks and Protected Areas Regulations, 1991.

Loggerhead turtles are occasionally reported in BVI waters, and are therefore probably quite rare, but are not protected in BVI waters. Harvest of leatherbacks at sea is not prohibited, but nesting females are protected and therefore enjoy protection so long as they are on a beach or at sea and within one hundred yards of the shore.



**Photo 3.4.** The British Virgin Islands hosts the largest leatherback nesting population in the UK Overseas Territories in the Caribbean (Photo S. Gore).

BVI has the longest closed season for marine turtle harvest of all the Caribbean OTs that still permit turtle harvest, and would provide sufficient protection to nesting green and hawksbill turtles if an appropriate maximum size limit was also imposed. TCOT SEQ did not reveal any reports of leatherback entanglement in nets set for other turtle species, although incidents of entanglements in ropes have been reported. TCOT recommends legislative changes for BVI in section 3.3 below.

### 3.1.4. Cayman Islands

The Cayman Islands host nesting and foraging populations of green and hawksbill turtles and a nesting population of loggerhead turtles. (See section 7 for further discussion).

The Marine Conservation (Turtle Protection) Regulations 1996 regulate the turtle fishery and provide for the most comprehensive and regulated turtle fishery of all the OTs. All species of turtle can be harvested between the 1<sup>st</sup> of November and the 30<sup>th</sup> of April in any year, with minimum size limits set at 120lbs for green turtles and 80lbs for hawksbills and loggerheads. The larger size classes are therefore specifically excluded from protection, and while the harvest of nesting females is not specifically prohibited, all turtles must be caught outside of the 'reef crest' and therefore cannot be taken on the beaches. Harvest of eggs is prohibited and turtles may not be taken with harpoons or spear guns. The fishery has been licensee-only since 1978, and there are only 24 islanders who can apply for a turtle fishing license from the Cayman Island Department of Environment (CIDoE). Eligible licensees are individuals from families that have a long tradition of turtling. Licenses are non-transferable, and under the current legislation, the fishery will die with the last of the 24 traditional turtle fishermen. Only 8 of these fishers have current licenses, and each is allowed a quota of 6 turtles per open season. All harvested turtles must be fitted with CIDoE issued tags after capture and presented to CIDoE for inspection, biometric measurement and genetic sampling prior to slaughter.

Turtles may not be taken along West Bay Beach, in George Town Harbour (Grand Cayman), or in any of the bays or sounds within the reef crest and may not be fished in any Marine Park or Environmental Zone as defined in the Marine Conservation (Marine Parks) Regulations (1996 Revision).

The combined nesting seasons of green, hawksbill and loggerhead turtles in the Cayman Islands extend from May to September (Aiken *et al.* 2001). Hence, the current closed season does not necessarily mitigate the capture of female loggerhead turtles (nesting season from May to August) entering Cayman's waters in April to mate in preparation for nesting in May. Data on legally recorded captures of marine turtles show only 3 loggerheads captured from 1999 to 2004 (see Table 7.9), but any take of adult loggerheads in Cayman's waters could adversely impact the recovery of the island's small nesting population.

TCOT recommends a number of changes to the legislation summarised above, as discussed in section 3.3.

Legislation provisions	Cayman Islands	Montserrat	Turks and Caicos Islands
<b>Harvest legislation<sup>1</sup></b>	The Marine Conservation (Turtle Protection) Regulations 1996	Turtles Ordinance Cap. 112 1951 <sup>3,1,4</sup>	Fisheries Protection Ordinance (1998)
<b>Harvest, sale and possession of turtle eggs &amp; nesting females</b>	Harvest of eggs is prohibited unless by a person with a license issued by the Marine Conservation Board. Nesting females not specifically protected in the legislation.	Allowed with conditions.	Prohibited
<b>Open season</b>	NA	Nesting females and eggs can be harvested, possessed, bought and sold from October through to May inclusive.	NA
<b>At sea capture, sale and possession</b>	Board-issued license holders (traditional turtle fishermen) only can fish for turtles in Cayman. There are currently 24 such fishermen and in 2003 only 8 had renewed their licenses.	Allowed with conditions	Allowed
<b>Open season</b>	November through to April inclusive	October through to May inclusive.	Harvest allowed year round
<b>Quota</b>	Licence use stipulates a maximum of 6 turtles shall be caught per licensed person per season	No Quotas	No Quotas
<b>Size restrictions</b>	Captured green turtles must weigh at least 120lbs (54.4kg), whereas hawksbill and loggerhead turtles must weigh at least 80lbs (36.4kg)	Captured turtles must weigh at least 20lbs (9.07kg).	Hawksbill and green turtles must measure 20inches (50.8cm) from the neck scales to the tailpiece and weigh at least 20lbs (9.07kg). Any other turtles must weigh at least 20lbs (9.07kg)
<b>Species restrictions</b>	Green, hawksbill and loggerheads only are mentioned in the license stipulation although the Marine Conservation (Turtle Protection) Regulations 1996 apply to all extant marine turtle species.	No species restrictions	No species restrictions
<b>Geographical restrictions</b>	Turtles may not be taken along West Bay Beach or in George Town Harbour (Grand Cayman), or in any of the bays or sounds within the reef crest. Turtles may not be fished in any Marine Park Zone or Environmental Zone as defined in the Marine Conservation (Marine Parks) Regulations (1996 Revision)	Limited fishing within the Maritime Exclusion Zone.	Capture of turtles in National Parks is prohibited.
<b>Method restrictions</b>	Turtles may not be taken with harpoons or spear guns.	No gear restrictions.	Use of spear gun and Hawaiian sling is prohibited
<b>Penalties</b>	<b><i>The Marine Conservation (Turtle Protection) Regulations 1996: Fine of \$5,000 and to imprisonment for twelve months.</i></b> <b><i>Marine Conservation (Marine Parks) Regulations (1996 Revision): Fine of \$500,000 and imprisonment for twelve months; confiscation of any vessel or equipment used for the purpose of committing or facilitating the offence or intended to be used for the offence.</i></b>	<b><i>Turtles Ordinance: Fine of up to EC\$48 and forfeiture of equipment used in the offence.</i></b> <b><i>Fisheries Act: Fine of up to EC\$25,000 and six months imprisonment.</i></b>	<b><i>Harvesting undersized turtles or collecting or possessing eggs: Fine of \$5,000 and/ or imprisonment for 6 months.</i></b> <b><i>Use or possession of spear gun or Hawaiian sling: Fine of \$50,000 and/ or imprisonment for 12 months.</i></b>

**Table 3.1.d.** A summary of all legislation relevant to the harvest of turtles and their eggs, and the sale of turtle products in the Cayman Islands, Montserrat and TCI. (NA - Not Applicable).



**Photo 3.5.** Marine turtle nests are completely protected in the Cayman Islands (Photo P. Richardson).



**Photo 3.6.** The harvest of nesting females is permitted at certain times of year in Montserrat (Photo J. Jeffers).

### 3.1.5. Montserrat

Montserrat hosts nesting and foraging populations of green and hawksbill turtles, with leatherback and loggerhead nesting rarely reported and occasional loggerheads reported foraging in Montserrat's waters. (See section 8 for further discussion).

The Turtles Ordinance Cap 112 (1951) regulates Montserrat's turtle harvest. It permits the harvest of any turtle weighing at least 20lbs, the harvest of nesting females, and the harvest of eggs. The open season for turtle and egg harvest extends from the 1<sup>st</sup> of October to the 31<sup>st</sup> May in any year. This fishery therefore targets the older age classes, including nesting females and allows harvest of eggs.

TCOT surveys suggest that the combined turtle nesting seasons for green and hawksbill turtles in Montserrat extend from June to October. The closed season therefore does not mitigate the capture of nesting turtles in October or the capture of female turtles arriving in Montserrat's waters to mate in May prior to nesting in June. TCOT therefore recommends some amendments to this legislation, as discussed in section 3.3 below.

### 3.1.6. Turks and Caicos Islands

The Turks and Caicos Islands (TCI) host nesting and foraging populations of hawksbill and green turtles, while occasional foraging loggerhead turtles are reported. Fletemeyer (1983) also suggests that loggerheads nest in the TCI. Although TCOT found no physical evidence of loggerhead nesting, it must be noted that TCOT nesting surveys were far from complete. Furthermore, 32.6% (n=30) of the TCOT SEQ respondents identified loggerheads as a species that nests in TCI. Some loggerhead nesting cannot be discounted and this must be taken into consideration when amending the harvest legislation. If there is loggerhead nesting in TCI, it is likely to be low-level, and every effort should be made to protect it. (See section 9 for further discussion).

The TCI turtle harvest is regulated under the Fisheries Protection Ordinance (1998). This legislation permits the year round take of any turtles weighing at least 20lbs, but the use of spear guns and Hawaiian slings is prohibited. Harvest of nesting females and their eggs is prohibited and turtle fishing is prohibited within TCI's extensive network of National Parks under the National Parks Ordinance, 1998, Cap. 80. TCOT SEQ and sampling has revealed that illegal turtle fishing occurs in TCI's protected areas,

Legislation provisions	Cayman Islands	Montserrat	Turks and Caicos Islands
<b>Protected Area Legislation</b>	Marine Conservation Law, 1978 (1995 Revision); Marine Conservation (Marine Parks) Regulations (1996 Revision)	Forestry, Wildlife, National Parks and Protected Areas Ordinance 1996	National Parks Ordinance, 1998, Cap. 80
<b>Penalties</b>	See above	Fines up to EC\$5,000 and six months imprisonment	Fine of \$50,000 or a term of imprisonment for 12 months or both, or in the case of a continuing offence, \$100 for every day or part of a day on which the offence continues

**Table 3.1.e.** A summary of all legislation relevant to protected habitats of marine turtles in the Cayman Islands, Montserrat and TCI (NA - Not Applicable).

Legislation provisions	Cayman Islands	Montserrat	Turks and Caicos Islands
<b>Domestic CITES legislation</b>	The Endangered Species (Trade and Transport) Law (2004 revision)	Endangered Animals and Plants Ordinance 1976	Legislation in draft
<b>Penalties</b>	<i>A fine of US\$500,000 or imprisonment for 4 years or both, and forfeiture of article if unlawfully exported or imported</i>	<i>For provision of false information when applying for a license, fine up to EC\$500 or up to 6 months imprisonment, or forfeiture of article if unlawfully exported or imported</i>	NA

**Table 3.1.f.** A summary of domestic CITES legislation relevant to the harvest of turtles and their eggs, and the sale of turtle products in the Cayman Islands, Montserrat and TCI (NA - Not Applicable).

particularly the Nature Reserve along the southern shores of North, Middle and East Caicos (a wetland of international importance designated under the Ramsar Convention). The TCI Protected Areas Department (PAD) and Department of Environment and Coastal Resources (DECR) will need to address the issue with increased enforcement patrols, and increased public awareness amongst the fishermen regarding fishing practices within protected areas.

TCI's harvest regulations specifically allow the harvest of older age classes and do not protect reproductive females at sea. Fletemeyer (1983) suggests that the combined nesting season for turtle species nesting in TCI extends from April to August, but the turtle nesting season is largely unknown. TCOT surveys revealed hawksbill and green turtle nesting on some remote Cays during September 2002. In nearby Cuba, the hawksbill season extends from August to February, with peak nesting activity occurring between September and January (Moncada *et al.* 1999). Green turtle nesting in the Bahamas occurs from June to September (in Hirth 1997). In the absence of reliable turtle nesting seasonality data from TCI, and based on regional seasonality, it is reasonable to expect the combined green and hawksbill nesting seasons in TCI extend from June to January.



**Photo 3.7.** Adult green turtle landed at Cockburn Harbour, South Caicos in September 2002 (Photo P. Richardson).

CITES does not extend to TCI and therefore there is no domestic legislation that regulates the export of marine turtles from TCI. TCOT recommends several amendments to the country's legislation as discussed in section 3.3 below.

### 3.2. Multi-lateral environmental agreements (MEA's) and turtle harvest legislation

There are four widely ratified MEAs that require contracting Parties to provide specified protection for marine turtles, and these are briefly discussed in this section. Table 3.2 provides an overview of the status of these MEAs in each UK Overseas Territory in the Caribbean.

#### 3.2.1. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) *Adapted from*

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**CITES** was adopted in Washington DC, USA in March 1973 and entered into force in July 1975. The UK ratified CITES in August 1976. The Convention aims to regulate international trade in endangered species or those species that may become endangered if trade is not regulated and controlled. CITES lists species in Appendices I, II and III, with different trade restrictions applying to the different appendices. All species of marine turtle are currently listed in CITES Appendix I, and therefore international commercial trade in wild marine turtles and their parts is prohibited between all contracting Parties to CITES.

The convention provides for Parties to enter reservations on CITES Appendix listed species. A reservation allows the Party to be exempt from the provisions of the Convention relating to trade in named species listed in the Appendices. While the reservation is in effect, the Party is formally treated as a non-Party with respect to trade in the species (or specimen) concerned. However, the convention recommends that Parties that have entered reservations for Appendix I species should treat the species as if it were in CITES Appendix II and should therefore monitor trade in these species and report any trade to the Secretariat.

CITES currently extends to Bermuda, British Virgin Islands, Cayman Islands, and Montserrat, and legislation that

UKOT	CITES <sup>1</sup>	CMS <sup>2</sup>	SPAW Protocol <sup>3</sup>	IAC <sup>4</sup>
<b>Anguilla</b>	Does not currently extend to Anguilla - high priority	Does not extend - medium priority	UK has not ratified	UK has neither signed nor ratified
<b>Bermuda</b>	Extends to Bermuda	Extends to Bermuda	NA	UK has neither signed nor ratified
<b>BVI</b>	Extends to BVI	Extends to BVI	UK has not ratified	UK has neither signed nor ratified
<b>Cayman Islands</b>	Extends to Cayman	Extends to Cayman	UK has not ratified	UK has neither signed nor ratified
<b>Montserrat</b>	Extends to Montserrat	Extends to Montserrat	UK has not ratified	UK has neither signed nor ratified
<b>TCI</b>	Does not currently extend to TCI - high priority	Extends to TCI	UK has not ratified	UK has neither signed nor ratified

**1 CITES** – Convention on International Trade in Endangered Species

**2 CMS** – Convention on Migratory Species

**3 SPAW Protocol** - Protocol Concerning Specially Protected Areas And Wildlife (SPAW) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region

**4 IAC** – Inter-American Convention for the Protection and Conservation of Sea Turtles

**Table 3.2.** Status of MEA's with provisions for the protection of marine turtles and whose geographical scope includes the Wider Caribbean (Source: FCO).

transposes CITES to domestic law is described briefly below and in tables 3.1.c and 3.1.f.

**Bermuda:** The commercial export of 'protected species' is prohibited under the Protected Species Act, 2003, although a list of protected species under this Act has not yet been finalised.

**British Virgin Islands:** The commercial export of marine turtles from BVI is prohibited under the Endangered Animals and Plants Act, 1987 (Cap. 89). Import and export of live or dead turtles of all Caribbean species is prohibited under the Act, as is the export any shell, scales and claws of '*any animal of the family Cheloniidae*'. Curiously, export of shell, scales or claws is not prohibited if the objects are '*cut to shape*'.

**Cayman Islands:** The Endangered Species (Trade and Transport) Law (2004 revision) fully transposes CITES to domestic law. Import, export and re-export of all turtle products must be accompanied by permits from relevant authorities in the Cayman Islands and destination/source countries. As Appendix I species, permits for marine turtle products would not be issued for commercial purposes (G Ebanks-Petrie (CIDoE) pers. comm. 2004).

**Montserrat:** All marine turtle species are listed in Schedule 1 of the Endangered Animals and Plants Ordinance, 1976, and therefore the import and export of live and dead specimens of all marine turtle species is specifically

prohibited. This Ordinance also states that the importation and exportation of articles listed in Schedule 3 is also prohibited. However, Schedule 3 includes '*The shell and scales, whether unworked or simply prepared but not if cut to shape, the waste of the shell and scales, and the claws of any animal of the family Cheloniidae.*' Therefore, this Ordinance does not currently prohibit the import or export of turtle products that are cut to shape (e.g. tortoiseshell jewellery).

**Anguilla and TCI:** CITES does not extend to Anguilla and the Turks and Caicos Islands, but both these Territories consider CITES extension as high priority and are in the process of preparing appropriate domestic legislation (K. Hodge (Govt. of Anguilla) pers. comm. 2003; J Campbell (DECR) pers. comms. 2003). Meylan (1983) and the TCOT SEQ indicate that foreign demand for turtle products from neighbouring Caribbean states, including St Martin, Puerto Rico, St Lucia and the US Virgin Islands, triggered the high and possibly unsustainable levels of turtle harvest witnessed in Anguilla prior to the moratorium (see section 4). St Martin, Puerto Rico, St Lucia and the US Virgin Islands have now all acceded to CITES and therefore the demand for Anguillian turtle products from overseas has probably declined. However, extension of CITES to Anguilla would provide for the regulation of any commercial export trade of turtle products to non-CITES states in the region (e.g. Haiti), therefore minimising the potential for Anguilla's turtle populations to be adversely impacted by significant future foreign demand.

In TCI, TCOT SEQ interviewees corroborated claims in Fleming (2001) by suggesting that hawksbill turtle shell harvested in TCI waters is currently smuggled out of the country by Dominican and Haitian migrant fishermen (see section 9). Future CITES extension to TCI is therefore particularly important with respect to enforcing against this potentially damaging and unmonitored trade.

### 3.2.2. Convention on Migratory Species (CMS or Bonn Convention)

*Adapted from* ©Joint Nature Conservation Committee, [www.jncc.gov.uk](http://www.jncc.gov.uk)

**CMS** was adopted in Bonn, Germany in 1979 and came into force in 1985. Contracting Parties work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species (listed in Appendix 1 of the Convention), concluding multilateral Agreements for the conservation and management of migratory species that require or would benefit from international cooperation (listed in CMS Appendix 2), and by undertaking co-operative research activities.

The UK ratified the Convention in 1985, but it does not currently extend to Anguilla (D. Dudgeon (FCO) pers. comm. 2003). All Caribbean species of marine turtle are listed on Appendix I of the CMS. Species in this appendix receive the highest levels of protection under CMS, and Article III, clause 5 reads:

*'Parties that are Range States of a migratory species listed in Appendix I shall prohibit the taking of animals belonging to such species. Exceptions may be made to this prohibition only if:*

- a) the taking is for scientific purposes;*
- b) the taking is for the purpose of enhancing the propagation or survival of the affected species;*
- c) the taking is to accommodate the needs of traditional subsistence users of such species; or*
- d) extraordinary circumstances so require; provided that such exceptions are precise as to content and limited in space and time. Such taking should not operate to the disadvantage of the species.'*

It is therefore possible that the UK is not satisfying its obligations under this convention, with respect to the legal and commercial harvest and trade of turtles currently regulated in Cayman Islands, BVI, Montserrat and TCI. The term *'traditional subsistence users'* is not defined by the convention text, but regardless of the ambiguity of this term, the UK does not have any current reservations to Article III registered on behalf of any its Overseas Territories.



**Photo 3.8.** Regional demand for turtle products, such as these old hawksbill turtle scutes in a fisher's garden, has probably declined in the last 20 years (Photo P. Richardson).

### 3.2.3. Protocol Concerning Specially Protected Areas And Wildlife (SPA) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region

The Cartagena Convention is the only legally binding environmental treaty for the Caribbean region and includes the Gulf of Mexico, the Caribbean Sea and adjacent areas of the Atlantic Ocean (Fleming 2001). The Convention was adopted in 1983, when the Protocol to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region (Oil Spills Protocol) was also adopted. Both the Cartagena Convention and the Oil Spills Protocol entered into force in 1986 after having been ratified by 9 governments. In addition, the Convention opened the **Protocol Concerning Pollution from Land-Based Sources and Activities** (The LBS Protocol) for signature in 1999.

The Convention is designed to facilitate national and joint management of coastal and marine resources within the region. It identifies sources of pollution that require control (i.e. pollution from ships, dumping, land-based sources and sea bed activities, as well as airborne pollution) and identifies environmental management issues that require co-operation between Parties, including specially protected

areas and wildlife, co-operation in cases of emergency, environmental impact assessment and scientific and technical co-operation (UNEP 2000a).

The UK ratified the Cartagena Convention and the Oil Spills Protocol on behalf of the Cayman Islands and Turks and Caicos Islands on 28 February 1986, and reserved the right to extend it at a future date to include other territories. On 21 November 1987, the Convention and the Oils Spills Protocol were extended to the British Virgin Islands. The UK has not signed or ratified the LBS Protocol.

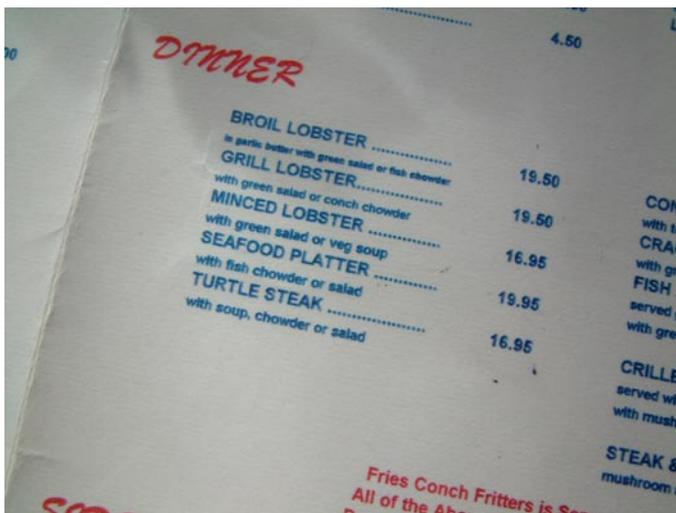
Protocol Concerning Specially Protected Areas and Wildlife (SPA) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region was adopted by the Convention in 1990. The UK signed the SPAW Protocol in 1990, but is yet to ratify it. Although the UK remains committed to working towards ratification of the SPAW Protocol, this is entirely dependent upon the relevant Overseas Territories having the necessary domestic legislation in place (D. Dudgeon (FCO) pers. comm. 2004). Therefore none of the provisions of the SPAW Protocol currently apply to any of the UK Overseas Territories in the Caribbean.

This Protocol requires that Parties take the necessary measures to:

*'protect, preserve and manage in a sustainable way:*

- a) areas that require protection to safeguard their special value; and*
- b) threatened or endangered species of flora and fauna.'*

The six species of marine turtle found in the Wider Caribbean are included in Annex II of this Protocol.



**Photo 3.9.** Given that Article III of CMS accommodates the needs of traditional subsistence users of marine turtles, the Overseas Territories Governments may have to consider the role of trade in subsistence economies, and limit commercial activities regarding the sale of turtle products (Photo S. Ranger).

Paragraph 1(b) of Article 11 '**CO-OPERATIVE MEASURES FOR THE PROTECTION OF WILD FLORA AND FAUNA**', reads,

*'Each Party shall ensure total protection and recovery to the species of fauna listed in Annex II by prohibiting:*

- (i) the taking, possession or killing (including, to the extent possible, the incidental taking, possession or killing) or commercial trade in such species, their eggs, parts or products;*
- (ii) to the extent possible, the disturbance of such species, particularly during periods of breeding, incubation, aestivation or migration, as well as other periods of biological stress.'*

However, Article 14 '**EXEMPTIONS FOR TRADITIONAL ACTIVITIES**', reads:

*'Each Party shall, in formulating management and protective measures, take into account and provide exemptions, as necessary, to meet traditional subsistence and cultural needs of its local populations. To the fullest extent possible, no exemption, which is allowed for this reason, shall:*

- (a) endanger the maintenance or areas protected under the terms of this Protocol, including the ecological processes contributing to the maintenance of those protected areas; or*
- (b) cause either the extinction of, or a substantial risk to, or substantial reduction in the number of, individuals making up the populations of species of fauna and flora within the protected areas, or any ecologically inter-connected species or population, particularly migratory species and threatened, endangered or endemic species.*

*Parties which allow exemptions with regard to protective measures shall inform the Organization accordingly.'*

It is presently unclear whether or not the legal turtle harvests in the UK Overseas Territories in the Caribbean are compliant with this Protocol, as there is little or no data regarding the extent of these harvests or on the abundance and trends of local marine turtle populations. In BVI, Montserrat and TCI the impacts of these harvests cannot yet be determined due a complete lack of long-term and consistent turtle fisheries data, however, Bell and Austin (2003) state that the current harvest in Cayman severely impacts the resident breeding population of marine turtles and hinders this depleted population's recovery (see section 7). This suggests that the Cayman harvest does not meet the requirements of the SPAW Protocol. The uncertainties presented by these unmonitored turtle harvests would need to be addressed before the UK considers ratification of the SPAW Protocol. Bermuda lies outside of the geographic scope of the Cartagena Convention.

### 3.2.4. Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)

The IAC entered into force in 2001 and is the only international treaty dedicated exclusively to sea turtles (Hykle 2002). It covers the *'land territory in the Americas of each of the Parties, as well as the maritime areas of the Atlantic Ocean, the Caribbean Sea and the Pacific Ocean'*. To date, the IAC has been ratified by Brazil, Belize, Costa Rica, Ecuador, Honduras, Mexico, the Netherlands, Peru, USA and Venezuela ([www.seaturtle.org/iac](http://www.seaturtle.org/iac)). The UK has neither signed nor ratified this treaty and accordingly, the provisions of the convention do not currently apply to any of the UK Overseas Territories in the Caribbean.

The IAC requires Parties to protect and conserve marine turtle populations and habitats; to reduce the incidental capture, injury and mortality of marine turtles due to commercial fisheries; to prohibit the intentional harvest, international and domestic trade in turtles and turtle products; and encourage international cooperation in research and management programmes.

Article IV requires that Parties prohibit *'the intentional capture, retention or killing of, and domestic trade in, sea turtles, their eggs, parts or products'*. Exceptions are allowed to *'satisfy economic subsistence needs of traditional communities'*, but Parties allowing such exceptions must *'establish a management program that includes limits on levels of intentional taking'*. Again, the largely unmonitored but legal harvests of marine turtles in the UK Overseas Territories in the Caribbean probably do not satisfy the requirements of the IAC. This issue would need some resolution if the UK were to sign this treaty on behalf of those Territories.

### 3.3. TCOT Recommendations for Changes to National Legislation

In this section, TCOT presents recommendations regarding amendments and progress with the pertinent legislation in all the UK Overseas Territories in the Caribbean. Table 3.3 presents an overview of the recommended changes to national marine turtle harvest legislation in each Territory.

#### 3.3.1. Anguilla

Amendments to environmental legislation and policy to facilitate the effective management and protection of marine resources in Anguilla, including turtles, should be given priority. TCOT acknowledges that recent successful bids by the Government of Anguilla for funding from the Foreign and Commonwealth Office Overseas Territories Environment Programme (OTEP) will facilitate vital amendments to environmental legislation including some of the recommendations below.

Prior to the Fisheries Protection (Amendment) Regulations, 1995, the legislation that regulated the harvest of marine turtles and their eggs in Anguilla did not facilitate the sustained management of the country's nesting and foraging populations of marine turtles. Indeed, the harvest may also

have impacted nesting and foraging populations of turtles found elsewhere in the Wider Caribbean Region.

TCOT recognises that cessation of all marine turtle fishing is likely to facilitate recovery of depleted turtle populations. However, in Anguilla, despite a 9 year moratorium on turtle harvest, the data that would allow for a scientific assessment of the status of turtles and recommendations on future management options are only now beginning to be gathered.

TCOT recognises that turtle meat is a component of the traditional Anguillian diet and that turtle populations may recover to an extent that they could support a future limited sustainable harvest of green and hawksbill turtles. A requirement of any future harvest of turtles is that it is carried out in a 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 stock. If DFMR are responsible for the management of a future turtle fishery, it is vital that they have the skills and the human, technical and financial resources for effective monitoring. TCOT does not believe that this is currently the case and it is unlikely that such resources could be put in place by the end of 2005. TCOT therefore believes that effective management and monitoring of a turtle fishery cannot currently be guaranteed.



**Photo 3.10.** Carlos Sasso (DFMR) with a sub-adult green turtle sampled during TCOT. DFMR officers must be provided with the necessary training and resources if they are to effectively manage a future turtle fishery in Anguilla (Photo P. Richardson).

Prohibition of egg harvest	Specific prohibition of nesting female harvest	Change size limits	Prohibition of harvest of leatherback & loggerhead turtles	OT-specific amended closed seasons
<b>Anguilla: Fisheries Protection Regulations</b>				
NA	NA	NA	NA	NA
<b>Notes &amp; overall TCOT recommendations for Anguilla:</b> Replace moratorium with 3-year, participatory research programme (see <b>section 3.3.1</b> below)				
<b>Bermuda: Protected Species Act 2003</b>				
NA	NA	NA	NA	NA
<b>Notes &amp; overall TCOT recommendations for Bermuda:</b> Turtle harvest already prohibited				
<b>BVI: The Turtles Ordinance 1959 as amended 1986</b>				
No change recommended	No change recommended	<b>Change recommended</b>	<b>Change recommended</b>	No change recommended
<b>Notes &amp; overall TCOT recommendations for BVI:</b> 'Fisheries Regulations 2001' pending but draft needs attention (see <b>section 3.3.3</b> below)				
<b>Cayman Islands: The Marine Conservation (Turtle Protection) Regulations 1996</b>				
No change recommended	<b>Change recommended</b>	<b>Change recommended</b>	<b>Change recommended</b>	Extend closed season from April to October inclusive
<b>Notes &amp; overall TCOT recommendations for the Cayman Islands:</b> The turtle fishery licensing scheme operated in Cayman may serve as a model for the other UKOT's that plan to continue (or reinstate) their turtle harvests				
<b>Montserrat: Turtles Ordinance Cap. 112 1951</b>				
<b>Change recommended</b>	<b>Change recommended</b>	<b>Change recommended</b>	<b>Change recommended</b>	Extend closed season to March to November inclusive
<b>Notes &amp; overall TCOT recommendations for Montserrat:</b> Turtle Act 2002 pending but first draft needs attention (see <b>section 3.3.5</b> below)				
<b>TCI: Fisheries Protection Ordinance (1998)</b>				
No change recommended	No change recommended	<b>Change recommended</b>	<b>Change recommended</b>	Introduce a closed season from July to January inclusive
<b>Notes &amp; overall TCOT recommendations for TCI:</b> Significant changes recommended				

**Table 3.3.** TCOT recommended changes to marine turtle harvest legislation.

Therefore, TCOT recommends replacing the moratorium on turtle fishing in Anguilla with a 3 year active and participatory research programme. For the duration of this research programme there should be no harvest of marine turtles in Anguillian waters. The programme should assess the viability of establishing a highly regulated experimental turtle fishery by 2009 and should be characterised by active involvement of fishers and open dialogue between all stakeholders. Capacity building to ensure that the DFMR

will be equipped to effectively manage a turtle fishery, should it be established, should begin immediately.

While making this recommendation, TCOT would like to highlight and acknowledge that fishers appear to have been largely compliant with the moratorium since 1995. TCOT SEQ interviews indicate that fishers perceived that the aim of this temporary legislation was to facilitate turtle population recovery and allow the authorities to measure

population recovery through monitoring. Inaction on the part of the relevant authorities on this matter means that it is not currently possible to ascertain whether the desired increase in the turtle population has occurred. In the absence of any long term, meaningful research, the fishers have repeatedly been asked to compromise and to date have been given no scientific justification for this compromise – hence the TCOT recommendation that fishers should be at the heart of future research. In order to facilitate fisher participation in this research, funding should immediately be sought to initiate the recommended research programme, which should include financial incentives for fisher participation.

In the event of a future marine turtle harvest in Anguilla, TCOT recommends that there are a number of legislative changes required to facilitate the sustainability of such a harvest. In addition, Anguilla's turtles face a host of threats imposed by the growing human population (2004 estimate: 1.98%, [www.cia.gov](http://www.cia.gov)) and the rapid growth of tourism. The regulation of use alone will not serve the sustainable management of these turtle populations. TCOT therefore also makes recommendations regarding legislation changes to facilitate protection of critical marine turtle habitat in Anguilla:

### **3.3.1.1. Amend the Fisheries Protection Regulations**

#### **Short to medium term**

- a) The Advisory Committee described in section 4.1.1.2 should immediately start to seek funding for a participatory marine turtle research programme and solicit the participation of interested fishermen in the in-water and nesting beach monitoring and sampling regimes described in section 4.
- b) Change the current penalty for contravening the moratorium under the Fisheries Protection regulations, to a more appropriate penalty in line with other offences under the Act (e.g. Fine of EC\$5,000 and or imprisonment for up to 12 months).

#### **Long-term**

Once abundance trends of green and hawksbill turtles have been established through the programmes described below, and if they are deemed favourable to reopen a turtle harvest, amend the Fisheries Protection Regulations as follows:

- a) Ensure permanent and complete prohibition of the harvest of nesting female turtles and turtle eggs.
- b) Ensure a closed season that protects breeding turtles in Anguillian waters from the 1<sup>st</sup> of April to the 30<sup>th</sup> of November inclusive, to be reviewed every five years (in order to react to possible shifts in nesting seasons due to climate change).
- c) 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 also yield an equivalent maximum curved carapace length for all harvested turtle species that should be stipulated in any amended legislation.

- d) Consider a continued minimum size limit, as most fishermen already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for all harvested turtle species that should also be stipulated in any amended legislation.
- e) Establish a limited turtle fishing licensing scheme, whereby licensed turtle fishers are required to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including statutory monthly catch reporting by fishers to DFMR (including incidental catch), and voluntary reporting of all turtles caught in advance of slaughter for biometric measurement and sampling by DFMR. Quotas should be reactive and based, inter alia, on number of licensed turtle fishers and stock assessments established through the monitoring regimes. The DFMR should have the statutory power to implement spot checks at fish landing sites to assess compliance and to close the fishery if stock monitoring reveals abundance declines below a pre-established and measurable level\*.
- f) Establish regulations with regard to the type of gear that can be used to capture turtles. Possible regulations could ensure permanent and complete prohibition of all turtle capture methods excluding hand capture and use of turtle nets, with strict specifications for legal net structure and use.
- g) Ensure prohibition of the harvest of loggerhead and leatherback turtles in Anguillian waters. The Government of Anguilla have also expressed that they would recommend prohibition of any future take of hawksbill turtles.

**NB.** Any future turtle fishery must be accompanied with systematic monitoring regimes as described in section 4, along with a programme to monitor Catch per Unit Effort of licensed fishermen, and biometrics of turtle catch, which should also be implemented by the DFMR. In the event of the reopening of Anguilla's turtle fishery, the Fisheries Protection Act must be further revised to provide statutory powers to react to the ongoing results of the abundance trend monitoring programmes. In the event of declining abundance trends or declining Catch per Unit Effort below pre-established thresholds, the DFMR must have the power to temporarily or permanently close the turtle fishery.

### **3.3.1.2. Amend the Marine Parks Act**

Anguilla's Marine Parks provide important habitat for foraging populations of juvenile and sub-adult green and hawksbill turtles. Island Harbour and Little Bay support relatively large numbers of green turtles, whereas hawksbills are encountered in all the Marine Parks. In order to facilitate

turtle population recovery, it is important that these areas are free of disturbance and take by turtle fishermen under any future harvest regime. To facilitate this Management Plans should be drafted for all marine parks to ensure the effective implementation and enforcement of Marine Parks Regulations and, the Marine Parks Act should be amended to:

- a) Ensure that all five 'designated' marine parks are fully described in Schedule 1 of the Marine Parks Regulations.
- b) Ensure that marine turtles have permanent and complete protection within Anguilla's Marine Parks. This should include no take zones as well as policies to curb potential negative tourism impacts e.g. through SCUBA diving and snorkelling.

### **3.3.1.3. Amend Planning Policy and Beach Protection Act**

Anguilla's nesting marine turtles are at critically low levels. The adverse impacts of increased beachfront development on the nesting populations using Anguilla's mainland beaches 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 Anguilla, and therefore TCOT recommends the following legislative and policy changes:

- a) Revise the Planning Department's proposed Land Use Plan (1996) so that Captain's Bay and Savannah Bay and all land at least 100m landward of the high tide marks of these Bays are protected from the adverse impacts of development. E.g. by being re-designated as Conservation Areas.
- b) Introduce planning regulations to mitigate the adverse impacts of development, including, for example light pollution, disturbance of nesting females and erosion on all other nesting beaches.
- c) Ensure that all developments that impact on marine turtle nesting or foraging habitat are required to undertake an environmental assessment that includes an evaluation of impacts and measures to mitigate negative impacts.
- d) Amend the Beach Protection Act (2000) in order to prohibit all sand mining at Windward Point (and any other turtle nesting beach), thereby allowing natural sand accretion and beach rehabilitation for marine turtle nesting.
- e) Under the guidance of the advisory committee (see 4.1.1.2), develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings and distribute recently produced National Trust advisory leaflet to all hotels to advise on mitigating against light pollution.

### **3.3.1.4. Recommendations regarding Multilateral Environmental Agreements**

- a) Gazette legislation to transpose CITES to domestic law.
- b) Given that Article III of CMS allows for harvests to accommodate the needs of subsistence users of marine turtles, the Government of Anguilla may have to consider the role of trade in subsistence economies, and limit commercial activities regarding the sale of turtle products if it requests that the UK Government extend the Convention on Migratory Species (CMS) to Anguilla.

### **3.3.2. Bermuda**

Bermuda's current legislation provides complete protection for all species of marine turtle found in her waters. TCOT makes no recommendations regarding this legislation, but urges the Government of Bermuda to finalise a draft of the list of protected species, to include all species of marine turtle, under the Protected Species Act, 2003.

### **3.3.3. British Virgin Islands**

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

TCOT recognises that cessation of all turtle fishing would significantly contribute to the recovery of depleted turtle populations in the BVI. 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 British Virgin Islands. TCOT therefore also makes recommendations regarding legislation and policy changes to facilitate protection of critical marine turtle habitat in the British Virgin Islands:

#### **3.3.3.1. 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 at the Virgin Gorda Easter Festival

during the designated closed season for the turtle fishery 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 and adequate surveillance and enforcement.

In 2001, the Government of the BVI produced a draft document entitled *Fisheries Regulations, 2001*, that 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 this report. 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 also yield an equivalent maximum curved carapace length for all harvested turtle species that should be stipulated in any amended legislation.
- b) Consider a continued minimum size limit, as most fishermen already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for all harvested turtle species that should also be stipulated in any amended legislation.
- c) Establish a limited turtle fishing licensing scheme, whereby licensed turtle fishers are required to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including statutory monthly catch reporting by fishers to BVI CFD (including incidental catch), and voluntary reporting of all turtles caught in advance of slaughter for biometric measurement and sampling by CFD. Quotas should be reactive and based, inter alia, on number of licensed turtle fishers and stock assessments established through the monitoring regimes. The CFD should have the statutory power to implement spot checks at fish landing sites to assess compliance, and to close the fishery if stock monitoring reveals abundance declines below a pre-established and measurable level.\*
- d) Ensure prohibition of the harvest of loggerhead and leatherback turtles given their very low numbers in the BVI.

- e) Increase fines for infringements to a more punitive level in line with those recommended in other OTs.

\*NB. Any future turtle fishery must be accompanied by systematic monitoring regimes as described in section 6, along with a programme to monitor Catch per Unit Effort of licensed fishermen, and biometrics of turtle catch, which should also be implemented by the CFD.

### **3.3.3.2. 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 Park 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.

### **3.3.3.3. Amend planning policy and beach management**

The nesting marine turtles of the British Virgin Islands 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 British Virgin Islands 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 British Virgin Islands, and therefore TCOT recommends the following:

- a) Ensure that key nesting habitats highlighted by ongoing BVI 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, nesting female disturbance 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.

### **3.3.3.4. Recommendations regarding Multilateral Environmental Agreements**

- a) 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.

- b) Given that Article III of CMS allows for harvests to accommodate the needs of subsistence users of marine turtles, the Government of BVI may have to consider the role of trade in subsistence economies, and limit commercial activities regarding the sale of turtle products.

#### **3.3.4. Cayman Islands**

It is felt by CIDoE that data from their ongoing in-water monitoring provide convincing evidence that the fishery should be closed, and they have made such a recommendation to the Marine Conservation Board (G. Ebanks-Petrie (CIDoE) pers. comm. 2004). Available data suggest the fishery, although small, as currently structured is likely to be affecting nesting population recovery. TCOT recognises that a complete ban on marine turtle fishing is the most effective management option to facilitate rapid and lasting recovery of depleted turtle populations in the Cayman Islands. TCOT also recognises that turtle meat is a component of the traditional Caymanian diet, but that in the Cayman Islands, turtle meat can be obtained from farmed stocks. Complete closure of the traditional turtle fishery may, however, be deemed politically and socially unacceptable. At minimum, it is recommended regulations governing the traditional harvest be altered.

In addition, the Cayman Islands' turtles face a host of threats imposed by the growing human population (2.71%, 2004 est.), and the regulation of utilisation alone will not serve the sustainable management of these turtle populations. TCOT therefore also makes recommendations regarding legislation and policy changes to facilitate protection of critical marine turtle habitat in the Cayman Islands.

##### **3.3.4.1. Harvest legislation recommendations:**

While the Cayman Islands have relatively sophisticated regulations to monitor marine turtle harvest, this harvest must be accompanied by meaningful, long-term and systematic monitoring programmes to ascertain trends in turtle abundance. TCOT makes the following recommendations:

- a) Prohibit the capture of all adult marine turtles in Cayman waters. Ensure permanent and complete prohibition of the harvest of reproductively active turtles by extending the closed season to include the 1<sup>st</sup> of April to the 30<sup>th</sup> of November inclusive.
- b) 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 also yield an equivalent maximum curved carapace length for all harvested turtle species that should be stipulated in any amended legislation.
- c) Consider a continued minimum size limit, as most fishermen already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved

carapace length for all harvested turtle species that should also be stipulated in any amended legislation.

- d) Ensure prohibition of the harvest of loggerhead and leatherback turtles.

#### **3.3.4.2. Increase the network of Protected Areas in the Cayman Islands**

a) **Key nesting sites should be given protected status.** At present, none of the key nesting beaches in the Cayman Islands is afforded protected status. It is recommended that key nesting sites for marine turtles are given a high level of protection from the deleterious effects of inappropriate coastal development. While there is currently no legislation to implement this recommendation, the Draft National Conservation Law would provide the necessary legal framework. Therefore, TCOT recommends the immediate enactment of this law.

b) **Key foraging sites should be given protected status.** Based on the ongoing and recommended expanded in-water monitoring programme, key foraging sites not already protected should be given protected status to ameliorate the effects of coastal development and recreational use. In so doing, it is likely that key coral reef and seagrass habitats will be preserved. The Draft National Conservation Law would provide a comprehensive framework for management of protected areas and species.

#### **3.3.4.3. Recommendations regarding Multilateral Environmental Agreements**

a) TCOT recommends that the CIDoE be adequately resourced to implement the provisions of the recently enacted Endangered Species Trade and Transport Law, and that the necessary commencement orders be issued by Cabinet as soon as possible. When this legislation comes into effect, it should fully transpose CITES to domestic law.

b) Given that Article III of CMS allows for harvests to accommodate the needs of subsistence users of marine turtles, the Government of the Cayman Islands may have to consider the role of trade in subsistence economies, and limit commercial activities regarding the sale of wild turtle products.

#### **3.3.5. Montserrat**

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

TCOT recognises that cessation of all turtle fishing would significantly contribute to the recovery of depleted turtle populations. TCOT also recognises that turtle meat is a component of the traditional Montserratian diet and a

moratorium is unlikely to receive enough support from the fishing community, especially given the current economic situation in Montserrat. However, we make a suite of recommendations to allow future harvest of turtles to be carried out in a highly regulated and controlled manner, minimising its impact on the local nesting populations. We suggest programmes to monitor stock abundance and mechanisms to reduce or close the fishery in response to measured future decreases in turtle stock. The fishing community should be involved in this process, and their interest in doing so was expressed as part of the TCOT SEQ results (see section 8.9). Furthermore, given that GoM will be responsible for the management of a future turtle fishery, it is vital that they have the skills, as well as the human, technical and financial resources to effectively monitor the fishery.

Regulation of use alone will not serve the sustainable management of these turtle populations. TCOT therefore also makes recommendations to facilitate protection of critical marine turtle habitat in Montserrat.

#### **3.3.5.1. Revise Turtle Ordinance Cap 112 1951**

We recommend the following based on the draft revisions drawn up by the GoM as “the Turtle Act 2002” (not yet gazetted), but with additional changes:

- a) Ensure permanent and complete prohibition of the harvest of nesting female turtles and turtle eggs.
- b) Ensure a closed season from the 1<sup>st</sup> of March to the 30<sup>th</sup> of November inclusive, to be reviewed every 5 years (to facilitate legislative adaptation to possible nesting season shift caused by climate change).
- c) 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 also yield an equivalent maximum curved carapace length for all harvested turtle species that should be stipulated in any amended legislation.
- d) Consider a continued minimum size limit, as most fishermen already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for all harvested turtle species that should also be stipulated in any amended legislation.
- e) Establish a limited turtle fishing licensing scheme, whereby licensed turtle fishers are required to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including statutory monthly catch reporting by fishers to the Government of Montserrat (including incidental catch), and voluntary reporting of all turtles caught in advance of slaughter for biometric measurement and sampling by Government of Montserrat. Quotas should be reactive and based,

inter alia, on number of licensed turtle fishers and stock assessments established through the monitoring regimes. The Government of Montserrat should have the statutory power to implement spot checks at fish landing sites to assess compliance and to close the fishery if stock monitoring reveals abundance declines below a pre-established and measurable level.\*

- f) Ensure permanent and complete prohibition of all turtle capture methods except hand capture and use of turtle nets, with strict specifications for legal net structure and use.
- g) Ensure prohibition of the harvest of loggerhead and leatherback turtles.

**\*NB:** Any continuing turtle fishery must be accompanied by systematic monitoring regimes as described in section 8, along with a programme to monitor Catch per Unit Effort of licensed fishermen, and biometrics of turtle catch, which should also be implemented by the GoM.

#### **3.3.5.2. Establish Marine Protected Areas**

Montserrat does not currently have any marine protected areas. It is advised that, based on holistic assessment of the marine biodiversity of Montserrat, key areas be set aside for protection.

#### **3.3.5.3. Consider Marine Turtles as part of Planning Policy and Beach Management**

Montserrat’s nesting marine turtles probably represent remnants of depleted populations and are at critically low levels (see section 8.5). However, the adverse impacts of increased beachfront development on the nesting populations using Montserrat’s mainland beaches 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 Montserrat, and therefore TCOT recommends the following policies:

- a) Ensure all development, other than non-permanent structures designed for daytime beach use, is 100m landward of the high tide mark.
- b) Introduce planning regulations to mitigate the adverse impacts of development on marine turtles, including, for example light pollution, nesting female disturbance and erosion.
- c) Ensure marine turtles are considered in the current beach sediment extraction projects being carried out in support of Montserrat’s reconstruction.

#### **3.3.5.4. Recommendations regarding Multilateral Environmental Agreements**

- a) The Endangered Animals and Plants Ordinance, 1976, should be amended to prohibit commercial import and export of wild turtles and all wild turtle products of all marine turtle species, so that this legislation fully transposes CITES to domestic law.

- b) Given that Article III of CMS allows for harvests to accommodate the needs of subsistence users of marine turtles, the Government of Montserrat may have to consider the role of trade in subsistence economies, and limit commercial activities regarding the sale of turtle products.

### 3.3.6. Turks and Caicos Islands

The turtle fishery in the Turks and Caicos Islands incurs the largest legal take of marine turtles in the UK Overseas Territories in the Caribbean. From a biological perspective, the Fisheries Protection Ordinance 1998 does not facilitate the sustained management of TCI's nesting and foraging populations of marine turtles. TCOT recognises that a cessation of all turtle fishing in TCI would significantly contribute to the recovery of depleted populations. However, TCOT also recognises that turtle meat is a component of the traditional TCI diet, and that a demand for turtle meat remains amongst TCI's residents and visitors. TCOT SEQ suggests that foraging turtle populations may be either stable or increasing, which indicates that a ban on turtle fishing in TCI would not receive majority support and that such a ban would probably present significant enforcement problems. However, we recommend that future harvest of turtles must be carried out in a highly regulated and controlled manner, with legislation in place to permanently and strictly protect adult turtles, programmes established to monitor stock abundance, and mechanisms in place to reduce or close the fishery in response to measured decreases in turtle stock. It is important to note that the DECR must have the skills, as well as the human, technical and financial resources to effectively manage the fishery.

TCOT recommends a number of legislative changes required to increase the likelihood of sustainability of a turtle harvest in TCI. In addition, it is noted that the regulation of use alone will not serve the sustainable management of turtles in the Turks and Caicos Islands. TCOT therefore also makes recommendations regarding the promotion and publicising of the National Parks Ordinance 1998, which should protect critical marine turtle habitat (see section 9.1.4.2).

#### 3.3.6.1. Amend harvest legislation:

TCOT recommends that the Fisheries Protection Ordinance, 1998 is amended to include the following provisions:

- 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 also yield an equivalent maximum curved carapace length for green and hawksbill turtles that should be stipulated in any amended legislation.
- b) Consider a continued minimum size limit, as most fishers already accept this as an established conservation

measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for green and hawksbill turtles that should also be stipulated in any amended legislation.

- c) Establish a limited turtle fishing licensing scheme, whereby licensed turtle fishers are required to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including statutory monthly catch reporting by fishers to DECR (including incidental catch), and voluntary reporting of all turtles caught in advance of slaughter for biometric measurement and sampling by DECR. Quotas should be reactive and based, inter alia, on number of licensed turtle fishers and stock assessments established through the monitoring regimes. The DECR should have the statutory power to implement spot checks at fish landing sites to assess compliance and to close the fishery if stock monitoring reveals abundance declines below a pre-established and measurable level\*.

**\*NB.** Any future turtle fishery must be accompanied by systematic monitoring regimes as described in section 9, along with a programme to monitor Catch per Unit Effort of licensed fishermen, and biometrics of turtle catch, which should also be implemented by the DECR.

- d) Establish a closed season (see NB below) to be reviewed every five years (to facilitate legislative adaptation to possible nesting season shift caused by climate change) to prevent capture of adult turtles entering TCI's waters to breed.

**NB.** Estimates of composite turtle nesting seasonality for green, hawksbill and loggerhead turtles in TCI, based on regional seasonalities, suggest that while turtle nets are still used in TCI, the ideal closed season would extend from the 1<sup>st</sup> of April to the 31<sup>st</sup> of January inclusive (see section 9.5.1). However, it is important to note that no evidence of loggerhead nesting has been recorded in TCI in the last 20 years. TCOT also acknowledges that almost all turtles currently caught in TCI are caught by hand, and the use of spearguns and Hawaiian slings is already prohibited. Therefore, if the suggested maximum size limits are introduced, and the use of turtle nets is prohibited as suggested below, then accidental, fatal capture of adult turtles entering TCI's waters to breed will be unlikely. Furthermore, the introduction of a 10 month closed season to the current fishery may present significant enforcement difficulties for the DECR. TCOT therefore suggests that a preliminary 6 month closed season from the 1<sup>st</sup> of July to December the 31<sup>st</sup> be considered, to encompass the majority of both the green and hawksbill turtle nesting seasons. This can be reviewed in the future when systematic rookery monitoring, as suggested below, reveals the actual composite turtle nesting season in TCI.

- e) Establish regulations with regard to the type of gear that can be used to capture turtles. Possible regulations could ensure permanent and complete prohibition of all turtle capture methods except hand capture (i.e. jumping turtles from a boat and in-water hand capture using only hands and lobster hook) as suggested by turtle fishers during TCOT SEQ.

- f) Ensure prohibition of the harvest of loggerhead and leatherback turtles given their very low numbers in TCI.

**NB.** It is important that all legislative changes are designed under the marine turtle conservation and management advisory process in consultation with the fishing community. Forty-two percent of the turtle fishers surveyed in the TCOT SEQ said that they thought fishers should be consulted when regulations are set.

### 3.3.6.2. Amend Planning Policy and Beach Management

Historical records suggest that marine turtle nesting populations in TCI have been subject to prolonged harvest and therefore, while trends in abundance of nesting turtles are unknown, these populations may represent remnants of depleted populations. However, the adverse impacts of increased beachfront development on the nesting populations using TCI mainland beaches 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 TCI, and therefore TCOT recommends the following:

- a) Where possible, protected status should be extended to all nationally important nesting sites within TCI.
- b) Introduce planning regulations to mitigate the adverse impacts of development, including, for example light pollution, nesting female disturbance and erosion on all other nesting beaches.
- c) Where the extension of protected status to identified nesting beaches is not possible, TCOT recommends that TCI Government ensures, as a matter of priority, that any development occurring adjacent to important turtle rookeries is undertaken sensitively under the planning regulations mentioned above, to mitigate disturbance and destruction of habitat.
- d) Under the guidance of the marine turtle conservation and management process, develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings (e.g. property lighting regimes).

### 3.3.6.3. Recommendations regarding Multilateral Environmental Agreements

- a) CITES should be extended to TCI as soon as possible, and the appropriate domestic legislation drafted and gazetted, to address the possible trade of hawksbill scutes from TCI to neighbouring states.
- b) Given that Article III of CMS accommodates the needs of traditional subsistence users of marine turtles, the Government of TCI should consider the role of trade in the subsistence fishery economy of TCI, and limit commercial activities regarding the sale of turtle products.

**NB.** CITES does not currently extend to TCI and TCOT SEQ corroborates previous reports that suggest there is limited trade in hawksbill turtle shell between TCI, the Dominican Republic and possibly Haiti. TCOT SEQ also suggests that turtle meat may be occasionally and illegally smuggled into the USA via Miami.

## 3.4. Acknowledgements

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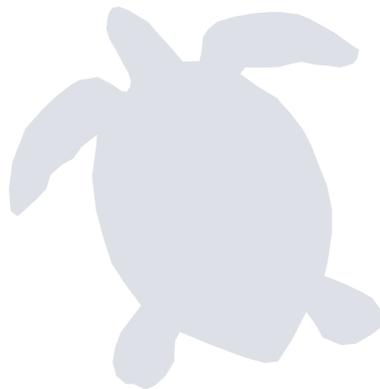
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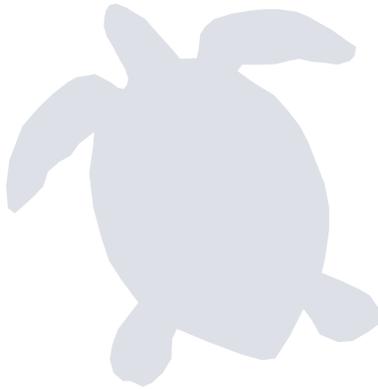
# An Assessment of the Status and Exploitation of Marine Turtles in Anguilla



Foreign & Commonwealth  
Office



Department for Environment  
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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.

## 4. Status and Exploitation of Marine Turtles in Anguilla

### Contents

	Page
<b>4.1. Summary and Recommendations</b>	<b>40-44</b>
<b>4.2. Geographic Overview</b>	<b>44</b>
<b>4.3. Historical Overview</b>	<b>45</b>
<b>4.4. Organisations Involved with Marine Turtles in Anguilla</b>	<b>45-46</b>
<b>4.5. Status of Nesting Marine Turtles in Anguilla</b>	<b>46-54</b>
4.5.1. Monitoring efforts and TCOT	47-51
4.5.1.1. Hawksbill and loggerhead turtles	47-48
4.5.1.2. Leatherback turtles	48-49
4.5.1.3. Green turtles	49
4.5.1.4. Mainland nesting beaches	49-50
4.5.1.5. Nesting on the cays and islands	50-51
4.5.2. Data from the TCOT SEQ	51-53
4.5.3. Genetics of nesting populations	53-54
<b>4.6. Status of Foraging Marine Turtles in Anguilla</b>	<b>55-59</b>
4.6.1. Monitoring efforts	56-57
4.6.1.1. Caribbean Turtlewatch – Anguilla	56
4.6.1.2. In-water sampling	56-57
4.6.2. Data from the TCOT SEQ	57-58
4.6.3. Genetics of foraging populations	58-59
<b>4.7 Direct Use of Marine Turtles in Anguilla</b>	<b>60-71</b>
4.7.1. Overview	60-62
4.7.2. Harvest of adults on the nesting beach	62-63
4.7.3. Harvest of eggs	63-65
4.7.4. Harvest at sea	65-66
4.7.5. Trade in turtle meat	66-68
4.7.5.1. Sale of meat by turtle fishers	66-67
4.7.5.2. Sale of turtle meat by direct vendors	67-68
4.7.5.3. Consumption of turtle meat	68
4.7.6. Trade in shells and shell products	68-70
4.7.6.1. Sale of shells and shell products by turtle fishers	69
4.7.6.2. Sale of shells and shell products by direct vendors	69-70
4.7.6.3. Consumption of turtle shell and shell products	70
4.7.7. Incidental catch in marine fisheries	70-71
<b>4.8. Indirect Use</b>	<b>72-73</b>
<b>4.9. Attitudes to Conservation</b>	<b>73-75</b>
<b>4.10. Capacity Building and Outreach Activities During TCOT</b>	<b>75-76</b>
4.10.1 Capacity building	75
4.10.2. Outreach activities	75-76
<b>4.11. Acknowledgements</b>	<b>76</b>
<b>4.12. References</b>	<b>76-77</b>

## 4.1. Summary and Recommendations

At least three species of marine turtle (leatherback, green and hawksbill turtles) nest in Anguilla, but in critically low numbers and much needs to be done to ensure the continued existence of the nesting populations and facilitate their recovery. Foraging marine turtles (generally green and hawksbill turtles) are widespread in Anguillian coastal waters and appear to be locally abundant at some sites (see table 4.1.).

Until 1995, there was a turtle fishery in Anguilla and, from information gathered through the TCOT Socio-Economic Questionnaire, it appears that thousands of green turtles and hundreds of hawksbill turtles were caught each year. The 5-year moratorium on turtle fishing introduced in 1995 was extended for a further 5 years in 2000. To date, there has been no consistent monitoring of marine turtle populations, but there is a general perception amongst the local population that the number of turtles in Anguillian waters is on the increase. By all accounts, direct exploitation has been drastically reduced by the moratorium with only occasional take for personal use.

### Recommendations

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

This will require actions under the following general headings:

### 4.1.1. Increase capacity for management of the marine environment including marine turtles

4.1.1.1. Increase the capacity of the Department of Fisheries and Marine Resources (DFMR).

4.1.1.2. Establish an advisory mechanism to support DFMR marine turtle work.

### 4.1.2. Amend legislation to facilitate marine turtle population recovery

4.1.2.1. Amend the Fisheries Protection Regulations.

4.1.2.2. Amend the Marine Parks Act.

4.1.2.3. Amend Planning Policy and Beach Protection Act.

4.1.2.4. Recommendations regarding Multilateral Agreements.

### 4.1.3. Establish systematic monitoring of marine ecosystems including turtle populations to determine trends in abundance

### 4.1.4. Establish further conservation and awareness programmes to make residents and visitors in Anguilla aware of marine turtle conservation requirements

**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,

Species	Nesting	Foraging	Harvest
<b>Green Turtle</b> ( <i>Chelonia mydas</i> )	Very small numbers	Adults and juveniles present Large numbers of juveniles in some areas	Low level of illegal harvest at sea Low levels of illegal egg harvest
<b>Hawksbill Turtle</b> ( <i>Eretmochelys imbricata</i> )	Moderate numbers, the most frequently encountered species nesting in Anguilla	Adults and juveniles present Large numbers of juveniles in some areas	Low level of illegal harvest at sea Low levels of illegal egg harvest
<b>Leatherback Turtle</b> ( <i>Dermochelys coriacea</i> )	Small numbers	Rarely encountered	No adult harvest reported since moratorium Low levels of illegal egg harvest
<b>Loggerhead Turtle</b> ( <i>Caretta caretta</i> )	No reliable records of nesting	Adults and juveniles occasionally encountered	Unlikely

**Table 4.1.** Marine turtle species present and summary of exploitation in Anguilla.

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**

### **4.1.1. Increase Anguilla's capacity for management of the marine environment including marine turtles**

TCOT has significantly contributed to the skills and technical knowledge of the Department of Fisheries and Marine Resources (DFMR) 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 DFMR receive adequate human and financial resources, as well as governmental support to effectively carry out their custodianship of Anguilla's highly valuable marine and coastal resources on which the country's economy so heavily depends.

To date there has been limited dedicated marine turtle research in Anguilla and no permanent decision-making process that involves all stakeholders. Marine turtle conservation and management in Anguilla is of significant public interest, particularly in fishing communities. It is essential that public compliance with marine turtle management measures continues and, to facilitate such compliance, it is necessary that stakeholders feel they have meaningful input into a decision-making process.

#### **4.1.1.1. Increase the capacity of the Department of Fisheries and Marine Resources**

- a) Ensure DFMR has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine resource management. This includes the ability to effectively collect, enter, manage and analyse data for turtle monitoring programmes.
- b) In order to make best use of available resources, ensure that every opportunity to carry out marine turtle research and monitoring in tandem with other essential fisheries research and monitoring is fully utilised.
- c) Ensure that all new Fisheries Officers and appropriate staff affiliated to the Marine Parks are adequately trained in marine turtle biology, as well as research and conservation techniques.

- d) Ensure that appropriate members of staff within DFMR and Marine Parks are given powers of arrest under the Fisheries Protection Act in order to ensure that they are able to enforce regulations.

#### **4.1.1.2. Establish an advisory mechanism to support DFMR marine turtle work**

Ensure that marine turtle management issues are included on the agenda of an appropriate national advisory committee, e.g. the National Environmental Advisory Committee (NEAC), or a stakeholder group established to implement the Environment Charter. This group would fulfil an important advisory role for the DFMR and could help maintain the momentum of future work, as well as bolstering the profile of marine turtle research and conservation at a high level within the government. Particular attention is required on issues surrounding the current moratorium, habitat protection, exploring possibilities for sourcing funding for further research/population monitoring, as well as investigating potential economic benefits of marine turtle conservation. The Advisory Committee should seek external advice from appropriate experts where necessary. Resources may be required to facilitate the participation of some stakeholders.

#### **4.1.2. Amend legislation and policy to facilitate marine turtle population recovery**

Amendments to environmental legislation and policy to facilitate the effective management and protection of marine resources in Anguilla, including turtles, should be given priority. TCOT acknowledges that recent successful bids by the Government of Anguilla for funding from the Foreign and Commonwealth Office Overseas Territories Environment Programme (OTEP) will facilitate vital amendments to environmental legislation including some of the recommendations below.

Prior to the Fisheries Protection (Amendment) Regulations, 1995, the legislation that regulated the harvest of marine turtles and their eggs in Anguilla did not facilitate the sustained management of the country's nesting and foraging populations of marine turtles. Indeed, the harvest may also have impacted nesting and foraging populations of turtles found elsewhere in the Wider Caribbean Region.

TCOT recognises that a complete ban on marine turtle fishing is an effective management option to facilitate rapid and lasting recovery of depleted turtle populations. However in Anguilla, despite a 9 year moratorium on turtle harvest, the data that would allow for a scientific assessment of the status of turtles and recommendations on future management options are only now beginning to be gathered.

TCOT recognises that turtle meat is a component of the traditional Anguillian diet and that turtle populations may recover to an extent that they could support a future limited sustainable harvest of green and hawksbill turtles. A requirement of any future harvest of turtles is that it is carried out in a 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 stock. If the DFMR are to be responsible for the management of a future turtle fishery, it is vital that they have the skills, and the human, technical and financial resources to effectively monitor the fishery. TCOT does not believe that this is currently the case and it is unlikely that the necessary structures could be put in place by the end of 2005. TCOT therefore believes that effective management and monitoring of a turtle fishery cannot currently be guaranteed.

Therefore, TCOT recommends replacing the moratorium on turtle fishing in Anguilla with a 3 year active and participatory research programme. For the duration of this research programme there should be no harvest of marine turtles in Anguillian waters. The programme should assess the viability of establishing a highly regulated experimental turtle fishery by 2009 and should be characterised by active involvement of fishers and open dialogue between all stakeholders. Capacity building to ensure that the DFMR will be equipped to effectively manage a turtle fishery, should it be established, should begin immediately.

While making this recommendation, TCOT would like to highlight and acknowledge that fishers appear to have been largely compliant with the moratorium since 1995. TCOT SEQ interviews indicate that fishers perceived that the aim of this temporary legislation was to facilitate turtle population recovery and allow the authorities to measure population recovery through monitoring. Inaction on the part of the relevant authorities on this matter means that it is not currently possible to ascertain whether the desired increase in the turtle population has occurred. In the absence of any long term, meaningful research, the fishers have repeatedly been asked to compromise and to date have been given no scientific justification for this compromise – hence the TCOT recommendation that fishers should be at the heart of future research. In order to facilitate fisher participation in this research, funding should immediately be sought to initiate the recommended research programme, which should include financial incentives for fisher participation.

In the event of a future marine turtle harvest in Anguilla, TCOT recommends that there are a number of legislative changes required to facilitate the sustainability of such a harvest. In addition, Anguilla's turtles face a host of threats imposed by the growing human population (2004 estimate: 1.98%, [www.cia.gov](http://www.cia.gov)) and the rapid growth of tourism. The regulation of use alone will not serve the sustainable management of these turtle populations. TCOT therefore also makes recommendations regarding legislation changes to facilitate protection of critical marine turtle habitat in Anguilla.

#### **4.1.2.1. Amend the Fisheries Protection Regulations**

##### **a) Short to medium term**

- i. The Advisory Committee described above should immediately start to seek funding for a participatory

marine turtle research programme and solicit the participation of interested fishers in the in-water and nesting beach monitoring and sampling regimes described below.

- ii. Change the current penalty for contravening the moratorium under the Fisheries Protection regulations to a more appropriate penalty, in line with other offences under the Act (e.g. fine of EC\$5,000 and/or imprisonment for up to 12 months).

##### **b) Long-term**

Once abundance trends of green and hawksbill turtles have been established through the programmes described below, and if they are deemed favourable to reopen a turtle harvest, amend the Fisheries Protection Regulations as follows:

- i. Ensure permanent and complete prohibition of the harvest of nesting female turtles and turtle eggs.
- ii. Ensure a closed season that protects breeding turtles in Anguillian waters from the 1<sup>st</sup> of April to the 30<sup>th</sup> of November inclusive, to be reviewed every 5 years (in order to react to possible shifts in nesting seasons due to climate change).
- iii. Ensure the 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 also yield an equivalent maximum curved carapace length for green and hawksbill turtles that should be stipulated in any amended legislation.
- iv. Consider a continued minimum size limit, as most fishers already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for green and hawksbill turtles that should also be stipulated in any amended legislation.
- v. Establish a limited licensing scheme for turtle fishing whereby turtle fishing is restricted to licensed individual fishers who are required to abide by strict regulations regarding fishing practice. Harvest quotas should be adaptive and based, inter alia, on the number of licensed turtle fishers and stock assessments established through the monitoring regimes\*.
- vi. Establish regulations with regard to the type of gear that can be used to capture turtles. Possible regulations could ensure permanent and complete prohibition of all turtle capture methods excluding hand capture and use of turtle nets, with strict specifications for legal net structure and use.
- vii. Ensure prohibition of the harvest of loggerhead and leatherback turtles in Anguillian waters. The Government of Anguilla have also expressed that they would recommend prohibition of any future take of hawksbill turtles.

**NB.** Any future turtle fishery must be accompanied by systematic monitoring regimes as described below, along with a programme to monitor Catch per Unit Effort of licensed fishers, and biometrics of turtle catch, which should also be implemented by the DFMR. In the event of the reopening of Anguilla's turtle fishery, the Fisheries Protection Act must be further revised to provide statutory powers to react to the ongoing results of the abundance trend monitoring programmes. In the event of declining abundance trends or declining Catch per Unit Effort below pre-established thresholds, the DFMR must have the power to temporarily or permanently close the turtle fishery.

#### **4.1.2.2. Amend the Marine Parks Act**

Anguilla's Marine Parks provide important habitat for foraging populations of juvenile and sub-adult green and hawksbill turtles. Island Harbour and Little Bay support relatively large numbers of green turtles, whereas hawksbills are encountered in all the Marine Parks. In order to facilitate turtle population recovery, it is important that these areas are free of disturbance and take by turtle fishers under any future harvest regime. To facilitate this, Management Plans should be drafted for all marine parks to ensure the effective implementation and enforcement of Marine Parks Regulations and the Marine Parks Act should be amended to:

- a) Ensure that all 5 'designated' marine parks are fully described in Schedule 1 of the Marine Parks Regulations.
- b) Ensure that marine turtles have permanent and complete protection within Anguilla's Marine Parks. This should include no take zones as well as policies to curb potential negative tourism impacts e.g. through SCUBA diving and snorkelling.

#### **4.1.2.3. Amend Planning Policy and Beach Protection Act**

Anguilla's nesting marine turtles are at critically low levels. The adverse impacts of increased beachfront development on the nesting populations using Anguilla's mainland beaches 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 Anguilla, and therefore TCOT recommends the following legislative and policy changes:

- a) Revise the Planning Department's proposed Land Use Plan (1996) so that Captain's Bay and Savannah Bay and all land at least 100m landward of the high tide marks of these Bays are protected from the adverse impacts of development. E.g by being re-designated as Conservation Areas.
- b) Introduce planning regulations to mitigate the adverse impacts of development, including, for example light pollution, disturbance of nesting females and erosion on all other nesting beaches.

c) Ensure that all developments that impact on marine turtle nesting or foraging habitat are required to undertake an environmental assessment that includes an evaluation of impacts and measures to mitigate negative impacts.

d) Amend the Beach Protection Act (2000) in order to prohibit all sand mining at Windward Point (and any other turtle nesting beach), thereby allowing natural sand accretion and beach rehabilitation for marine turtle nesting.

e) Under the guidance of the advisory committee (see 4.1.1.2), develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings and distribute recently produced National Trust advisory leaflet to all hotels to advise on mitigating against light pollution.

#### **4.1.2.4 Recommendations regarding Multilateral Environmental Agreements**

Gazette legislation to transpose CITES to domestic law.

#### **4.1.3. Establish systematic monitoring of marine turtle populations to determine trends in abundance**

Anguilla hosts nesting populations of green, hawksbill and leatherback turtles, and foraging populations of green and hawksbill turtles with occasional loggerhead turtles also reported. TCOT SEQ revealed a general public perception that the numbers of turtles foraging in Anguilla's waters and nesting on the beaches has increased in recent years due to the moratorium, but perceptions were that nesting and foraging populations had declined in living memory.

Anguilla's nesting turtle populations are at critically low levels, and while Dog Island and Scrub Island may host nationally or even regionally significant populations of all three species, levels of nesting on these islands remain unknown. The foraging populations may be in the process of recovery, but 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 advisory committee (see 4.1.1.2), as a matter of priority:

##### **4.1.3.1. Establish systematic monitoring efforts at mainland index nesting beaches, as well as Dog and Scrub Islands**

- a) Establish a sustainable programme of weekly morning nesting beach monitoring at index beaches on mainland Anguilla (e.g. Blackgarden Bay, Captain's Bay, Savannah Bay) and at least monthly monitoring on Dog and Scrub Islands to determine nesting abundance and to facilitate genetic analysis of the nesting population through nest excavation and sampling.

**NB.** This programme should preferably engage local interest groups and residents and could eventually be developed, under the guidance of the advisory committee, into seasonal, revenue generating turtle walks for tourists in order to raise funds to contribute to marine turtle management efforts.

b) Establish sustainable, regular and frequent (monthly), constant-effort monitoring programmes at Island Harbour and other identified green turtle foraging sites (nets & CPUE), and on the stretch of coast from Little Bay to Sandy Ground and other identified and accessible hawksbill turtle foraging sites (snorkel surveys) to determine abundance trends.

c) Establish a regular and frequent (quarterly) genetic sampling regime at Island Harbour (nets), Scrub Island (nets), Shoal Bay (hand capture) and Little Bay/ Sandy Ground (hand capture) to increase understanding of genetic stock composition of green and hawksbill turtle populations.

**NB.** Steps should be taken to encourage the involvement of interested local fishers in all monitoring programmes (e.g. CPUE monitoring in Island Harbour and elsewhere), and financial incentives should be considered.

#### **4.1.4. Establish further conservation and awareness programmes to make residents and visitors to Anguilla aware of marine turtle conservation requirements**

Increased awareness of turtles and their conservation requirements in Anguilla can provide short and long-term mitigation against the threats faced by marine turtles. TCOT recommends the following actions, to be implemented under the guidance of the advisory committee, to encourage a public contribution to marine turtle conservation and raise general awareness about these species:

##### **4.1.4.1. 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. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to observe hatchling emergencies.

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

c) Raise awareness through a dedicated campaign to sensitise Anguillians 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, and distribute the recently produced National Trust advisory leaflet to all hotels to advise on mitigating against light pollution.

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

##### **4.1.4.2 Implement general awareness programmes regarding marine turtle conservation in Anguilla**

a) Develop the Anguilla National Trust turtle specific educational materials, and expand them to include further curriculum linked, multi-media educational materials where appropriate.

b) Raise awareness among Anguillians of the presence of distinct foraging and nesting turtle populations through informational materials and media outputs.

c) Establish a programme of awareness raising presentations and workshops in fishing communities, schools and other public fora.

d) 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.

e) Establish a programme of awareness raising presentations and workshops to sensitise the tourism industry to the potential impacts of tourism and possible mitigation measures.

#### **4.2. Geographic overview**

Anguilla is a low-lying coralline limestone island, of about 91 sq km, situated at the northern end of the Leeward island chain in the Eastern Caribbean at 18°N 63°W (FCO 1999; Proctor & Fleming 1999). The estimated population is 13,008 (www.cia.gov 2004). It is comprised of one inhabited island and 8 small uninhabited islands and cays, including Dog Island, Prickly Pear Cays, Scrub Island, and Sombrero Island 61km to the northwest. Sea depths are 23m to 45m within 1km of the shore (Gell & Watson 2000). The Anguillian economy depends heavily on tourism (31% of revenue) with a very high standard of hotels. Traditional industries, such as boat building, fishing, farming, salt production and livestock rearing have, in recent years, been overshadowed. Though the island has limited natural resources, it does have about 35 sandy beaches and one of the most important largely unbroken coral reefs in the Eastern Caribbean (FCO 1999; Gell & Watson 2000). Its coastal and marine biodiversity is probably its most important natural asset.

### 4.3. Historical Overview

Anguilla preserves a rich archaeological record reflecting nearly 4000 years of human habitation. Studies of Amerindian settlement sites on the island have revealed a very strong reliance on sea-foods including fish, shellfish and turtles for at least the last 1,000 years (Peterson & Crock 2001). Peterson and Crock point out that organic materials like bones and scutes will not always survive archaeologically, so it is possible that turtles have been used for as long as the island has been inhabited. No Amerindians remained in Anguilla by the time of colonisation in the 1650s (Peterson & Crock 2001). Although turtle meat and eggs are notably absent from the only accounts of the diet in Anguilla from the 17<sup>th</sup> Century and until the early 20<sup>th</sup> Century (Jones 1976; Petty 1993), anecdotal accounts suggest that turtles have long been part of Anguilla's food culture (Connor & Connor 1998).

### 4.4. Organisations Involved with Marine Turtles in Anguilla

#### 4.4.1. Department of Fisheries and Marine Resources (DFMR)

The DFMR was established in 1991 in recognition of the need to place more emphasis on the fishing industry and the marine environment. The department currently has 6 members of staff. In addition to the Acting Director, there is a Marine Biologist, a Senior Clerical Officer, 2 Fisheries Officers and a Casual Worker. The DFMR has an extensive remit and is responsible for the development and management of Fisheries and Marine Parks and all Coastal Zone Management. Though the department has made significant progress in a relatively short period of time, the shortage of human resources at the Department and a limited budget continue to limit productivity at present (Gumbs 2003). DFMR is responsible for enforcing fisheries legislation in Anguilla's Exclusive Fisheries Zone (EFZ) of approximately 85,500km<sup>2</sup>, which includes an extension of 200 miles to the north into open ocean, but sea patrols have recently been curtailed due to budget constraints and staff shortages (Gell & Watson 2000; Gumbs 2003). The Department is equipped with 3 boats, a 30' vessel with 2 x 200hp engines, a 15' whaler with a 45hp engine and a 6' dinghy with a 6hp engine, with the engine on the whaler 'in a state of disrepair' (Gumbs 2003). Furthermore, no-one in the department currently has powers of arrest as the head of department is working in the capacity of Acting-Director only (O. Vanterpool (DFMR) pers. comm. 2004).

The DFMR has been central to achieving the goals of TCOT over the last 3 years. DFMR staff have been involved in every aspect of TCOT work including nesting beach and foraging site surveys, nest excavations, in-water sampling, identification of a target audience for the TCOT Socio-economic Questionnaire and administration of questionnaires. Management and staff have prioritised TCOT work and enthusiastically supported fieldwork during TCOT field visits. Some rookery monitoring and in-water sampling was also carried out between field visits.



Figure 4.1. Map of Anguilla

#### 4.4.2. Anguilla National Trust (ANT)

The Trust is currently experiencing major staff changes, with the Associate Executive Director having left for a government post in 2003, the Chief Executive leaving office in 2004 and a Biodiversity Officer post currently pending. The Trust led all marine turtle research and education efforts in Anguilla in advance of TCOT. They have carried out sporadic nesting beach monitoring and some socio-economic surveys regarding historical turtle fishing (Connor & Connor 1998). With funding from the United Nations Development Programme, the Trust has recently produced an 'Anguilla Sea Turtle Educator's Guide' and with funding from the FCO published 'The Reptiles and Amphibians of Anguilla, British West Indies'. In 1997, Karim Hodge of the ANT and Ms Chantal Lewis, formerly of Albenha Lake Hodge Comprehensive School, attended the Jumby Bay Hawksbill Training Workshop in Antigua. The workshop was aimed at equipping participants with the necessary and most useful skills in sea turtle conservation work. Anguilla has received technical assistance from the Wider Caribbean Sea Turtle Network (WIDECAS) and the Bellairs Research Institute in Barbados. With WIDECAS, it is currently preparing a *Sea Turtle Recovery Action Plan (STRAP)* for Anguilla (K. Hodge (Government of Anguilla) pers. comm. 2002). National Trust staff regularly attend regional WIDECAS meetings and international turtle symposia.

While the DFMR has provided technical, informational and practical support to TCOT staff during field visits, the Trust has provided essential advice, input and logistical support for the duration of the project. The Trust also provided essential ground support during the development and implementation of the Socio-economic Questionnaire.

## Recommendations

### 4.1.1.1. Increase the capacity of the Department of Fisheries and Marine Resources

a) Ensure DFMR has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine resource management. This includes the ability to effectively collect, enter, manage and analyse data for turtle monitoring programmes.

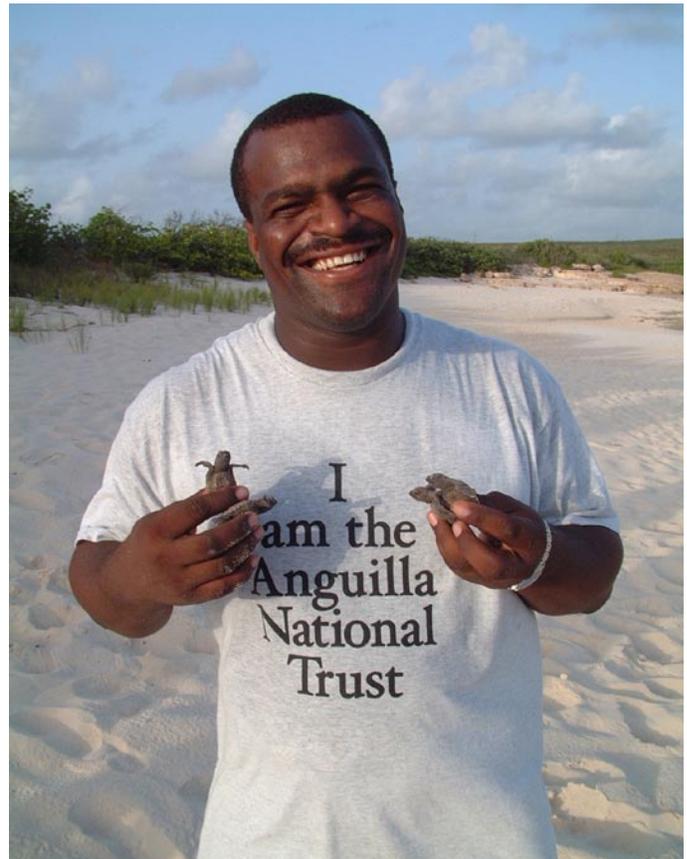
b) In order to make best use of available resources, ensure that every opportunity to carry out marine turtle research and monitoring in tandem with other essential fisheries research and monitoring is fully utilised.

c) Ensure that all new Fisheries Officers and appropriate staff affiliated to the Marine Parks are adequately trained in marine turtle biology, as well as research and conservation techniques.

d) Ensure that appropriate members of staff within DFMR and Marine Parks are given powers of arrest under the Fisheries Protection Act in order to ensure that they are able to enforce regulations.

### 4.1.1.2. Establish an advisory mechanism to support DFMR marine turtle work

Ensure that marine turtle management issues are included on the agenda of an appropriate national advisory committee e.g. the National Environmental Advisory Committee (NEAC) or a stakeholder group established to implement the Environment Charter. This group would fulfil an important advisory role for the DFMR and could help maintain the momentum of future work, as well as bolstering the profile of marine turtle research and conservation at a high level within the government. Particular attention is required on issues surrounding the current moratorium, habitat protection, exploring possibilities for sourcing funding for further research/population monitoring, as well as investigating potential economic benefits of marine turtle conservation. The Advisory Committee should seek external advice from appropriate experts where necessary. Resources may be required to facilitate the participation of some stakeholders.



**Photo 4.1.** Karim Hodge, formerly of the Anguilla National Trust with hawksbill hatchlings at Captain's Bay (Photo: P. Richardson).

## 4.5. Status of Marine Turtle Nesting in Anguilla

The numerous short wide sandy beaches of Anguilla are potentially good nesting sites for turtles, but recent monitoring efforts by the Anguilla National Trust and a student of the University of East Anglia concur with observations made by Meylan in the early 1980s that suggest a low level of nesting on the island (Connor & Connor 1998; Meylan 1983). There are no quantitative data in the literature to give an indication of historical nesting levels and it is therefore impossible to state with any confidence how current nesting compares to past levels. It is possible that Anguilla's nesting populations represent remnants of larger populations.

Hawksbill turtles are believed to be the most abundant species nesting in Anguilla, with smaller numbers of leatherbacks and green turtle nests, and no reliable reports of loggerhead nesting (Meylan 1983). Meylan states that hawksbills nest most frequently on Dog Island, with some nesting on Prickly Pear Cays and also on the mainland. Green turtles are also reported to nest on the smaller islands and cays (Proctor & Fleming 1999; Richardson & Gumbs 1983). Local lore suggests that green turtles do not nest in Anguilla, but migrate to Aves Island, west of Guadeloupe to nest (Meylan 1983). During the TCOT SEQ, a number of the local fishers indicated that they believe that green turtles lay their eggs at sea where they float on the surface of the water until they hatch.

#### 4.5.1. Monitoring efforts and TCOT

Sporadic monitoring of nesting beaches on mainland Anguilla has occurred since 1998 (see Table 4.2), when the Anguilla National Trust's *Anguilla Turtle Project* monitored 17 beaches from April to November (Connor & Connor 1998). Further monitoring was carried out on at least 8 beaches in 2000 (carried out by Connor & Connor for an unspecified monitoring period), and 19 beaches were monitored by a volunteer from the USA from 5<sup>th</sup> April to the 22<sup>nd</sup> September 2001 (K. Hodge (Government of Anguilla) pers. comm. 2003). No systematic nesting data was collected during 2002 and from 17<sup>th</sup> June to the 12<sup>th</sup> September 2003, Marianne Fish, a PhD student from the University of East Anglia, monitored 20 beaches on mainland Anguilla for TCOT on a voluntary basis while carrying out her PhD fieldwork. These surveys used varying identification techniques, employed different effort regimes and were carried out for varying periods throughout the year. The robustness of these data is therefore difficult to ascertain, but when taken at face value, they provide preliminary indications of turtle nesting patterns on mainland Anguilla.

Given what is known about nesting seasons for these species in this region (see 4.5.1.1), the 2001 survey, which recorded the highest number of green (n=8) and leatherback (n=33) turtle nests covered approximately 80% (4 out of 5 months) of the likely leatherback nesting season in Anguilla, and approximately 70% (5 out of 7 months) of the green turtle nesting season. The 2003 survey recorded the highest number of hawksbill nests (n=39) and covered approximately 40% (3 out of 7 months) of the nesting season.

It is highly likely that some nests were laid outside survey periods and it is impossible to estimate how many actual nests these surveys did not record, but because the 2001 and 2003 surveys covered the likely peak nesting seasons for the 3 species it may be that only a relatively small number of nests went unrecorded. However, the most that

can be surmised from the available data is that marine turtle nesting in Anguilla is at critically low levels and in order to facilitate population growth, adult turtles, nesting females and their eggs must be given full protection by Anguilla's legislation.

##### 4.5.1.1. Hawksbill and loggerhead turtles

While hawksbills seem to be the most common nesters in Anguilla, it is important to note that even experienced turtle researchers find it difficult to distinguish hawksbill and loggerhead turtle tracks (Schroeder & Murphy 1999) and that hawksbill nests are often difficult to detect, as hawksbills prefer to nest above the vegetation line and will often nest on narrow, low-energy beaches (Pritchard & Mortimer 1999). However, the TCOT SEQ revealed that less than 10% (n=7) of interviewees believed that loggerheads nest in Anguilla, with only one fisherman claiming to have actually seen a loggerhead nest on Prickly Pear Cay. This is the only report of a loggerhead nest on record in Anguilla. Despite the inevitable confusion between hawksbill and loggerhead nests, it is therefore likely that loggerheads rarely, if ever, nest in Anguilla and that most hawksbill nests recorded during monitoring have been correctly identified. However, it is possible that some hawksbill nests may have been missed during these surveys and that hawksbill nesting has been under-reported. Given the number of nests recorded in these studies, and despite this species being the most numerous nester in Anguilla, Table 4.2 suggests that the mainland hawksbill nesting population is critically low.

Figure 4.2 shows that the most important beaches for hawksbill turtles are, in order of importance, Captain's Bay, Windward Point, Savannah Bay, Limestone Bay and Blackgarden Bay, with occasional nesting occurring on 9 other beaches. Figure 4.3 shows the seasonality of nesting indicated by the 2001 and 2003 data for hawksbill turtles. Hawksbill nesting appears to commence in June, peak in August/ September and tail off by the end of September. This is in general concordance with regional seasonality

Year and Surveyors	Survey Period	Survey Area	Number of nests recorded per year			
			Green	Hawksbill	Leatherback	Unidentified
1998 (R. Connor & J. Connor)	April- November (8 months)	17 mainland beaches	0	17	12	0
2000 (R. Connor & J. Connor)	Unspecified	8 mainland beaches	6	25	13	0
2001 (P. McShane)	5 April-22 September (5 ½ months)	19 mainland beaches	8	18	33	0
2003 (M. Fish)	17 June – 12 September (3 months)	20 mainland beaches	2	39	8	10

**Table 4.2.** Summary of nesting beach monitoring effort in Anguilla between 1998 and 2003 with number of nests recorded on mainland beaches for each species and each survey year.

(Richardson *et al.* 1999; Starbird *et al.* 1999), although at Buck Island, USVI, nesting occurs year round with peak nesting between May and November. Low-level nesting may occur year round in Anguilla, but this will not necessarily have been recorded in any of the existing datasets due to the limited survey periods.

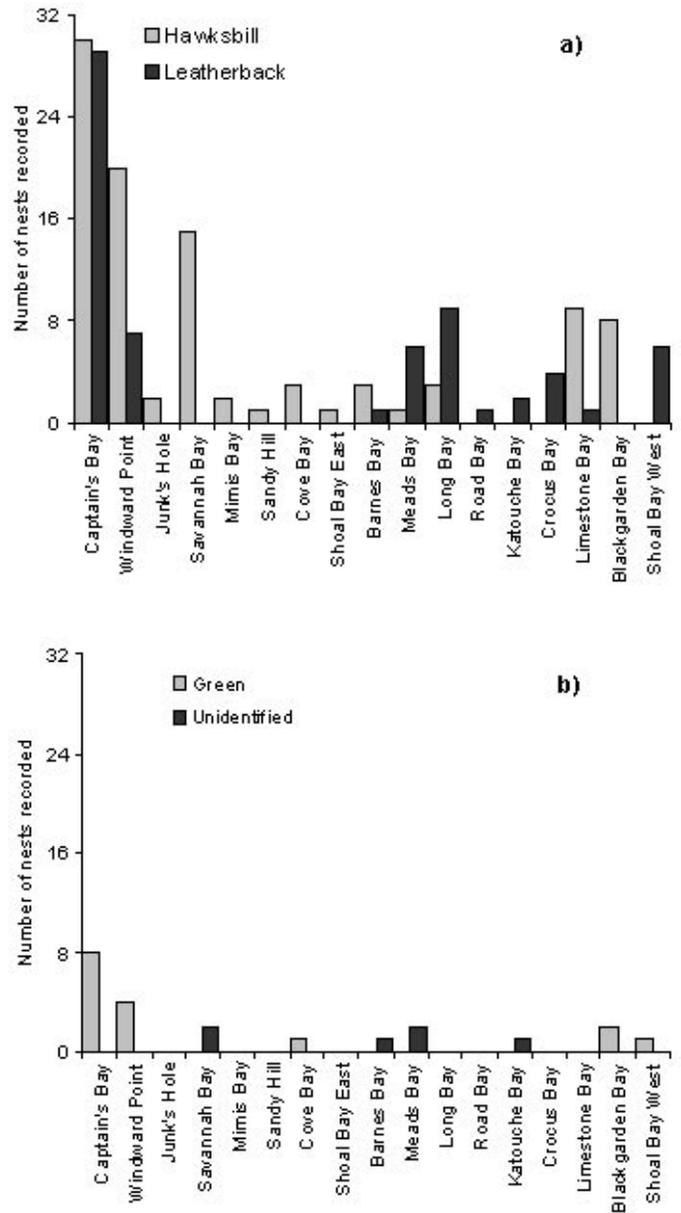
**4.5.1.2. Leatherback turtles**

In May 2004, TCOT staff tagged a nesting leatherback on Maunday’s Bay, that already bore one flipper tag that had been attached by the Fish and Wildlife Service while it nested on Culebra in 2001 (H. Horta (FWS, Puerto Rico) pers. comm. 2004). Nesting leatherbacks do not always show strong nest site fidelity (Plotkin 2003) and individual females have been recorded nesting on different islands within the Puerto Rico (including Culebra and Vieques), British Virgin Islands, USVI and Anguilla island complex, either within one nesting season or in subsequent seasons (Boulon *et al.* 1996; Eckert *et al.* 1989; Hastings 2003). The leatherbacks nesting in Anguilla are therefore likely to belong to the same genetically distinct population that also nests in BVI, USVI, and Puerto Rico (Dutton *et al.* 2003).

It is currently impossible to ascertain trends in nesting leatherback abundance in Anguilla given the historical lack of systematic rookery monitoring (Eckert 2001). However, monitoring in USVI, BVI and Puerto Rico suggests that nesting leatherback populations are increasing (Boulon *et al.* 1996; Eckert 2001; Hastings 2003). Trends are particularly encouraging in Tortola, BVI, where nesting has increased from 3 recorded nests in 1990, to 63 recorded nests in 2001 (Hastings 2003). It is possible that Anguilla’s leatherback population is also showing (unrecorded) signs of recovery. Although turtle eggs, including leatherback eggs, were regularly taken and leatherback meat was consumed in Anguilla before the moratorium, and this seems to have been curtailed by the legislation, any recovery of nesting in Anguilla is more likely to be due to improved more long-term protection of nesting females in Puerto Rico and the US Virgin Islands in the last few decades.

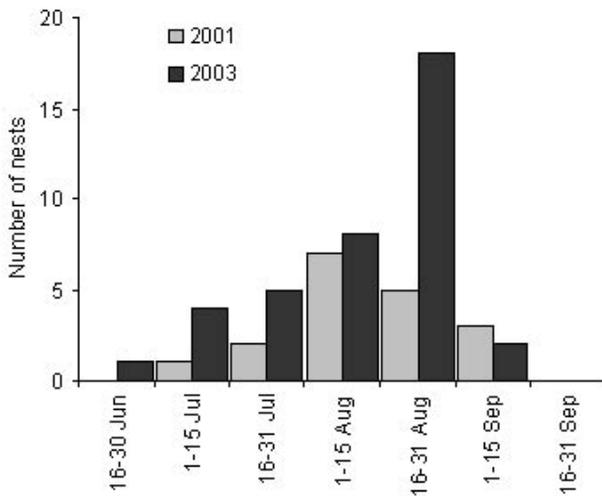


**Photo 4.2.** Leatherback turtle nesting on Maundays Bay, May 2004 (Photo P. Richardson).



**Figure 4.2.** a) Distribution of leatherback and hawksbill turtle nesting on all mainland beaches monitored in 1998, 2000, 2001 and 2003. b) Distribution of green turtle nesting and nests where the species was unidentified on all mainland beaches monitored in 1998, 2000, 2001 and 2003. NOTE: Beaches listed clockwise from Captain’s Bay in the north-east.

Leatherback nesting was definitely under-reported in 2003, because monitoring efforts did not start until mid-June, when leatherback hatchlings were beginning to emerge. Based on known average incubation periods of approximately 63 days for the region (Boulon *et al.* 1996), these emerging nests would have been laid in early to mid-April, concurring with the findings of the 2001 survey when the first leatherback nest recorded occurred on the 5<sup>th</sup> April. During the first TCOT field trip to Anguilla in 2002, TCOT staff recorded a fresh leatherback nest on Captain’s Bay on the 15<sup>th</sup> of March. The known leatherback nesting season on mainland Anguilla extends from mid-March to early July, which is in accordance with regional seasonality recorded in USVI and BVI (Boulon *et al.* 1996; Hastings 2003).



**Figure 4.3.** Seasonality of hawksbill nesting activity recorded during 2001 and 2003 survey periods.

The 2001 survey probably represented the most consistent and comprehensive effort during the leatherback season and this is probably why more leatherback nests were recorded than any other year. However, table 4.2 suggests that the leatherback nesting population is critically low and this is confounded by the likelihood that this population is shared with Puerto Rico, USVI and BVI. It is likely that the leatherbacks nesting in Anguilla represent a depleted population as in BVI (Hastings 2003). Indeed, one TCOT SEQ interviewee recalled a night in early 1982 when he visited Mead's Bay. At the time, this beach was completely undeveloped, and the interviewee claims to have seen about 18 leatherback turtles nesting on one night. He also reported that the following morning Anguillians were on the beach excavating the nests for eggs. This is the only record of such nesting in Anguilla, but introduces the possibility that as in BVI, the leatherback nesting population was once far more numerous.

Figure 4.2 shows that the most important mainland beach for leatherbacks is Captain's Bay, with between 6 and 9 nests having been recorded at Long Bay, Windward Point, Meads Bay and Shoal Bay West during the survey periods. Occasional leatherback nests were also recorded on 5 other beaches during surveys between 1998 and 2003. TCOT staff recorded leatherback nests on Maunday's Bay and Rendezvous Bay in April and May 2004.

#### 4.5.1.3. Green turtles

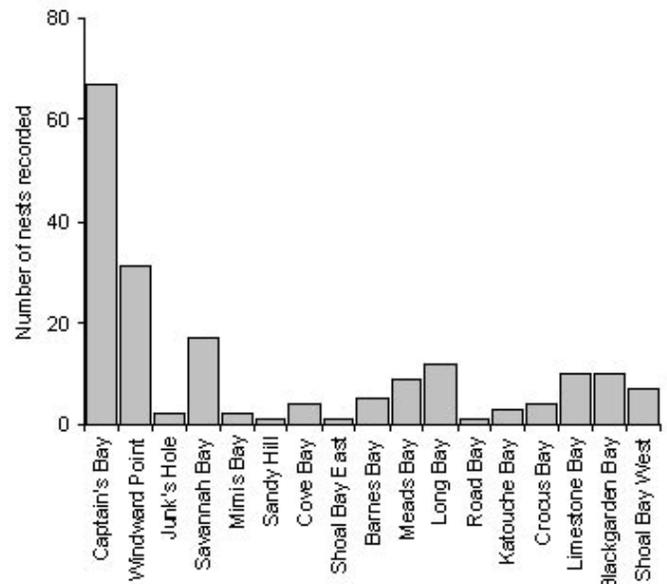
Table 4.2 suggests that there are very low numbers of green turtle nests on Anguilla. Nesting appears to be limited to August and September. These nests were laid in later stages of the regional nesting season, which occurs from about May to November, generally peaking in July and August (Hirth 1997). Figure 4.2 shows that Captain's Bay has been the most frequently used mainland beach for green turtles during the survey period, with nests occasionally reported on 4 other beaches.

#### 4.5.1.4. Mainland nesting beaches

Figure 4.4 shows the combined numbers of recorded nests on all beaches monitored during 1998, 2000, 2001 and 2003. Clearly, Captain's Bay is the most important mainland beach, with 67 nests recorded during the surveys, whereas Windward Point hosted 31 nests and Savannah Bay hosted 17 nests. Long Bay, Blackgarden Bay and Limestone Bay all hosted 10 or more nests during the surveys. It is worth noting that all of these beaches have little or no development immediately behind them.

However, Captain's Bay has a large, US-owned and well-lit (e.g. security lights and decorative lights shining onto the beach) housing development (including a floodlit tennis court) overlooking the beach to the eastern end (Photo 4.3). Windward Point is heavily mined for sand (Photo 4.4) and construction started on a locally-owned bar/disco (Photo 4.5) immediately behind Limestone Bay in late 2003, involving the removal of much beach vegetation. If this development is successful, it will undoubtedly cause some disturbance to nesting female turtles through light and noise pollution, as well as increased night-time use of the beach by the customers. Sand mining on Windward Point has effectively removed nearly all of the dry sand used by nesting turtles at the back of the beach, and has exposed the water table, thus forming saline puddles where nesting may once have occurred. Blackgarden Bay has one expatriate residence immediately adjacent to the beach and Savannah Bay is largely undeveloped, but it is known to have been used for beach driving with quad bikes and four wheel drives. This activity has the potential to destroy nests and hatchlings on the beach (Photo 4.6).

While few nests were recorded at Windward Point in 2003, 5 false crawls were recorded. In September 2002, TCOT staff recorded 1 or 2 false crawls on Windward Point, where the turtle(s) had crawled extensively over the beach, even crawling through the saline puddles at the back of the



**Figure 4.4.** Combined numbers of recorded nests for all species on all beaches monitored during 1998, 2000, 2001 and 2003. NOTE: Beaches listed clockwise from Captain's Bay in the north-east



**Photo 4.3.** Captains Bay showing recent housing development (Photo S Ranger).

beach where the sand has been mined down to the water table (Photo 4.7). Windward Point and Captain's Bay are amongst 18 beaches listed as Protected Beaches under the Beach Protection Act, (2000), which prohibits sand mining within 200 feet of the foreshore.

The Government of Anguilla Planning Department's proposed Land-Use Plan (GOA, 1996) currently designates Windward Point, Long Bay, Limestone Bay and Blackgarden Bay as 'Conservation Areas'. Savannah Bay lies within a 'Tourism Development Area' and Captain's Bay lies within a 'Resort/Residential Area'. Beachfront development has various adverse impacts on turtle nesting, including erosion, light pollution, disturbance of nesting females and increased egg/hatchling predation by domestic, feral or vermin species (Witherington 1999). Most of these potential impacts have not been investigated in Anguilla, but there is growing concern about erosion caused by uninformed beachfront development practices at various beaches around the island (Proctor & Hodge 1997). In 2003, the ANT produced a leaflet entitled *Help us grow, stop the glow* designed to inform hoteliers and other beach front property owners about the impacts of lighting on nesting turtles and



**Photo 4.5.** Limestone Bay being developed, May 2004 (Photo P. Richardson).



**Photo 4.4.** The effects of sand mining at Windward Point (Photo S. Ranger).

hatchlings (Appendix 4.1). The most undeveloped beaches on the main island are in the east. There have been some tourism development proposals for this area e.g. a golf course in the Junks Hole bay area. The whole of the eastern tip of the island is designated for development, but according to the Tourist Board, the current Tourist Board strategy for development does speak strongly to environmental considerations and EIAs for developments would have to address potential impacts on marine turtle habitat (C. Niles (Anguilla Tourist Board) pers. comm. 2002).

#### 4.5.1.5. Nesting on the cays and islands

To date there has been no systematic monitoring of any of the cays, Scrub or Dog Island, despite reports that beaches on Dog Island and Prickly Pear Cays are the most important hawksbill rookeries of Anguilla and that Scrub Island may host a nationally significant leatherback rookery (Meylan 1983; Richardson & Gumbs 1983). During the TCOT SEQ, 8 (11.1%) interviewees specifically stated that Dog Island was an important nesting site in Anguilla, with some fishers claiming that they have seen many turtle tracks there during recent summers. Marianne Fish recorded 5 possible hawksbill nests on a beach on Dog Island during a field trip



**Photo 4.6.** Car tracks on Savannah Bay (Photo P. Richardson).



**Photo 4.7.** Attempted nesting at Windward Point (Photo S. Ranger).

on the 15<sup>th</sup> August 2003 (M. Fish, (UEA) pers. comm. 2003). Seven (9.7%) of interviewees stated that turtles nest on Scrub Island, and an Island Harbour resident who regularly takes tourists to Scrub Island reported that hundreds of turtles, both green and hawksbill, nest on Scrub Island each year (J. Lake, pers. comm. 2002). Meaningful monitoring of the cays and islands was not achieved during TCOT due to logistical constraints.

TCOT staff visited Dog Island and Prickly Pear Cays in March 2002 (outside the nesting season) when no evidence of nesting activity was recorded (Photo 4.8). However, during a one-night field visit to Scrub Island in September 2002, TCOT staff recorded at least 17 tracks on Deadman's Bay. All appeared to be hawksbill nests that had been deposited in the previous week. Hatchling tracks from an older hawksbill nest were also observed. In addition there were 7 large, older body pits close to the vegetation line, thought to be nests deposited earlier in the season, possibly by green turtles due to their size and position on the beach (Photo 4.9). The approach to Deadman's Bay is almost completely blocked by an inshore fringing reef possibly ruling out leatherback nesting. On a field trip to Scrub Island in March 2002, approximately 5 large, old body pits were recorded on Deadman's Bay and on the same trip, 3 large body pits that may also have been green turtle nests were recorded on the beach adjacent to the disused airstrip.

Scrub Island and Dog Island potentially host nationally or even regionally significant rookeries for hawksbill, green and leatherback turtles. Both these islands are privately owned, and Scrub Island has been on the market for a number of years. TCOT staff interviewed the owners of both islands, who gave the impression that there is a possibility for development on the islands, but not in the immediate future. It is vital to establish the importance of any rookeries located on the outlying cays as a priority.

#### 4.5.2. Data from the TCOT SEQ

**Perceived nesting trends:** As part of the TCOT SEQ, all 72 questionnaire respondents were asked about perceived changes in nesting numbers over time (in the last 5 years and in living memory), both in general and for specific species. Thirty-eight respondents (53%) reported that they had noticed changes while 33 (46%) did not, and 1 did not answer the questions. A summary of these general perceptions of trends in turtle nesting is shown in Table 4.3.

Of the 38 respondents who reported to have noticed a change in nesting, 16 (42.1%) said they had noticed an increase in general turtle nesting in the last 5 years, while



**Photo 4.8.** Great Bay, Dog Island (Photo S. Ranger).



**Photo 4.9.** Old nest pit on Scrub Island (Photo P. Richardson).



**Photo 4.10.** Beach on Prickly Pear Cay East (Photo S. Ranger).

4 (10.5%) reported a decrease and 2 thought that levels of nesting had remained the same. The small number of respondents who had noticed species-specific changes for green, hawksbill and leatherback turtles reiterated the perception that numbers had increased in the last 5 years.

In contrast, 16 (42.1%) of the respondents who had noticed a change in nesting since they could remember said they had noticed a decrease in nesting generally, while 7 (18.4%) reported an increase, and 2 suggested that nesting had remained the same. Once again, this general perception that nesting had decreased in living memory was mirrored in the responses from the small number of people who claimed to have noticed species-specific changes for green, hawksbill and leatherback turtles. Therefore, there appears to be a general perception that turtle nesting decreased before the moratorium, and that it has increased since.

As perhaps could be expected, a much higher percentage (80%, n=16) of the 20 former egg collectors identified through the TCOT SEQ said they had noticed a change in nesting, with their perceptions matching those of the interview respondents as a whole. Arguably these individuals may have a better idea of nesting trends, given their former practices. Eight (50%) of the former egg collectors that noticed a change noticed an increase in general nesting in the last 5 years, while 2 (12.5%) reported that levels of nesting had remained the same in the last 5 years. Five (31.3%) respondents reported that they had noticed a decrease in turtle nesting in living memory, while 3 (18.8%) reported an increase in nesting during the same period and 1 said that nesting had remained the same.

One interviewee who may have noticed trends in nesting on Captain’s Bay is an Island Harbour fisherman (65 years+), who dries his nets on the beach there every day and has done so since the early 1970s. He regularly visits the beaches on the northern end of Anguilla to look out for fish and is also a former egg collector. He stopped collecting eggs in 1990 and now seems to take a great interest in turtle nesting activity from a conservation perspective. He reported an increase in hawksbill, leatherback and green turtle nests in the last 5 years, but a decrease in green and hawksbill nests since he can remember. He did not know how leatherback nesting activity had changed since the 1970s, but his observations on recent leatherback nesting increases would concur with recent increases in the shared nesting populations of BVI and USVI.

**Perceived reasons for change**

TCOT SEQ respondents were asked about reasons for perceived changes in nesting in Anguilla. Twenty-three (60.5%) of those who said they had perceived change gave

<i><b>In the last 5 years...</b></i>					
	<b>Increasing</b>	<b>Decreasing</b>	<b>Same</b>	<b>Don't know</b>	<b>NR</b>
<b>Green</b>	5	1	2	3	1
<b>Leatherback</b>	4	0	2	3	1
<b>Loggerhead</b>	0	0	0	3	1
<b>Hawksbill</b>	4	1	2	3	1
<b>General</b>	16	4	3	5	1

<i><b>Since you can remember...</b></i>					
	<b>Increasing</b>	<b>Decreasing</b>	<b>Same</b>	<b>Don't know</b>	<b>NR</b>
<b>Green</b>	1	4	1	4	1
<b>Leatherback</b>	0	3	3	3	1
<b>Loggerhead</b>	0	0	0	6	1
<b>Hawksbill</b>	1	6	1	2	1
<b>General</b>	7	16	2	3	1

**Table 4.3.** Perceptions of changing abundance of sea turtles nesting in Anguilla, in the last 5 years and since respondents can remember. (n=38 respondents who noticed some change. Note that not all respondents provided answers for every aspect of this question; NR- No response).

reasons why they believed there had been an increase in nesting either in the last 5 years or in living memory, while 26 (68.4%) gave reasons why they believed nesting had declined in the last 5 years or in living memory. Multiple responses were allowed for this question. The vast majority (78%, n=18) of those giving reasons for increase cited the moratorium as the reason for an increase in turtle nesting. Nesting females were regularly harvested on mainland Anguilla prior to the moratorium (see section 5.6.2). Though the moratorium has only been in place since 1995, it is possible that there has been a discernable increase in nesting during this period as, by all reports, it has brought about a much greater survival of nesting females and new recruits to the nesting population are no longer harvested. Other reasons cited included turtles becoming tamer, the cessation of harvest of nesting females and eggs, regional conservation initiatives and a research presence.

Of the 26 respondents that gave reasons for a perceived decline, 18 (69.2%) identified various kinds of harvest as the reason for this decline (See Table 4.4). This overarching harvest category includes turtle fishing (n=11), harvest of nesting females (n=3), harvest of eggs (n=3) and smuggling (n=1). The harvest of turtles and eggs will be discussed in greater detail in section 4.6.2 and 4.6.3. The second significant reason for decline identified by respondents was development and associated threats, cited by 15 (58%) respondents. This category includes development in general (n=7), habitat destruction (n=1), beach use (n=3), beach lighting (n=3) and boat traffic (n=1).

In Anguilla, the most significant factor affecting human populations in the last few decades has been a phenomenally rapid increase in tourism (Gell & Watson 2000). The scale of development on the island is also likely to have impacted Anguilla's turtles. In 1983, Meylan stated that the slow rate of development of the tourism industry had been a positive factor in the continued survival of Anguilla's turtle population. However, Anguilla's tourist industry flourished during the 1980s and early 1990s, when visitor numbers increased from 17,561 in 1982 to 125,780 in 1995 (Gell & Watson 2000). In 2003 a total of 109,282 visitors came to

Anguilla. Of these, 46,915 were stay-over tourists, while the remainder were excursionists or day visitors from neighbouring islands ([www.gov.ai/statistics](http://www.gov.ai/statistics)). There was a period of rapid construction and development that has slowed somewhat in recent years ([www.anguillahomepage.ai](http://www.anguillahomepage.ai)). As mentioned above, increased development on nesting beaches has a number of adverse impacts on nesting turtles, and the TCOT SEQ indicates that awareness in Anguilla of these impacts is high. It is worth noting that the most frequently used nesting beaches on mainland Anguilla are largely undeveloped, and that nesting is reported to be high on the uninhabited Dog and Scrub Islands.

#### 4.5.3. Genetics of nesting populations

No nesting green turtles or hatchlings were sampled in Anguilla during TCOT and only 2 hawksbill hatchlings were sampled, from recently emerged nests (Photo 4.11). Haplotypes described in the 2 samples that generated data during TCOT genetic analysis have also been described in **foraging** populations in Anguilla, BVI and TCI (via TCOT), Cuba, Mexico and Puerto Rico. TCOT genetic analysis has also revealed a previously undescribed haplotype, provisionally entitled TCOT3. During TCOT genetic analyses, TCOT3 was also discovered in **foraging** hawksbill populations in TCI, BVI and Montserrat, as well as in **nesting** hawksbill populations in TCI and Montserrat (see section 10.4.4).

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 during 2005 and more definitive answers will be available once this has been done. However, further sampling of Anguilla's nesting populations is required to fully understand and establish their genetic identity.

Samples were also collected from 5 hatchlings from recently emerged leatherback nests and one nesting female. Analysis of all 6 leatherback samples is pending.

Reasons cited for increase in turtle nesting (n= 23)								
<i>Moratorium</i> (18)	<i>No take of eggs and females</i> (4)		<i>Increased awareness</i> (2)	<i>Research presence on beaches</i> (2)	<i>Regional conservation initiatives</i> (1)			
Reasons cited for decrease in turtle nesting (n= 26)								
Harvest (18)				Development & related issues (15)				
<i>Fishing</i> (11)	<i>Nesting females</i> (3)	<i>Eggs</i> (3)	<i>Smuggling</i> (1)	<i>Development general</i> (7)	<i>Beach use</i> (3)	<i>Beach lighting</i> (3)	<i>Boat traffic</i> (1)	<i>Habitat destruction</i> (1)

**Table 4.4.** Summary of perceived reasons for the changes in turtle nesting in Anguilla.

## Recommendations

### 4.1.2.1.b. Amend the Fisheries Protection Regulations

- i) Ensure permanent and complete prohibition of the harvest of nesting female turtles and turtle eggs.
- ii) Ensure a closed season that protects breeding turtles in Anguillian waters from the 1<sup>st</sup> of April to the 30<sup>th</sup> of November inclusive, to be reviewed every 5 years (in order to react to possible shifts in nesting seasons due to climate change).
- iii) 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 also yield an equivalent maximum curved carapace length that should be stipulated in any amended legislation.

### 4.1.2.3. Amend Planning Policy and Beach Protection Act

- a) Revise the Planning Department's proposed Land Use Plan (1996) so that Captain's Bay and Savannah Bay and all land at least 100m landward of the high tide marks of these Bays are protected from the adverse impacts of development. e.g by being re-designated as Conservation Areas.
- b) Introduce planning regulations to mitigate the adverse impacts of development, including, for example, light pollution, disturbance of nesting females and erosion on all other nesting beaches.
- c) Ensure that all developments that impact on marine turtle nesting or foraging habitat are required to undertake an environmental assessment that includes an evaluation of impacts and measures to mitigate negative impacts.
- d) Amend the Beach Protection Act (2000) in order to prohibit all sand mining at Windward Point (and any other turtle nesting beach), thereby allowing natural sand accretion and beach rehabilitation for marine turtle nesting.
- e) Under the guidance of the advisory committee (see 4.1.1.2), develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings and distribute recently produced National Trust advisory leaflet to all hotels to advise on mitigating against light pollution.

### 4.1.3.1 Establish systematic monitoring efforts at mainland index nesting beaches, as well as Dog and Scrub Islands

- a) Establish a sustainable programme of weekly morning nesting beach monitoring at index beaches on mainland Anguilla (e.g. Blackgarden Bay, Captain's Bay, Savannah Bay) and at least monthly

monitoring on Dog and Scrub Islands to determine nesting abundance and to facilitate genetic analysis of the nesting population through nest excavation and sampling.

**NB.** This programme should preferably engage local interest groups and residents and could eventually be developed, under the guidance of the advisory committee, into seasonal, revenue-generating turtle walks for tourists in order to raise funds to contribute to marine turtle management efforts.

### 4.1.4.1. 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. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to observe hatchling emergences.
- b) Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure DFMR has the capacity to collect, necropsy and document all strandings.
- c) Raise awareness through a dedicated campaign to sensitise Anguillians to the importance of protecting the nests of such small nesting populations and to encourage reporting of any illegal take of eggs or of nesting females.
- d) Develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings and distribute the recently produced National Trust advisory leaflet to all hotels to advise on mitigating against light pollution.
- e) Ensure school participation in rookery monitoring programmes to sensitise children to importance of rookery protection.



**Photo 4.11.** James Gumbs, (DFMR) excavating a hawksbill turtle nest at Captain's Bay (Photo P. Richardson/MCS).

#### 4.6. Status of Foraging Marine Turtles in Anguilla

In 1983 Meylan reported that marine turtles were more abundant in Anguilla than at most of the other Leeward islands and attributed this to the extensive available habitat and slow growth of the tourism industry. Over the intervening 2 decades there have been some significant changes in Anguilla. The last habitat surveys were completed in 1995 and reports coincided with Hurricane Luis, which is said to have caused massive habitat destruction (Gumbs 2003). Tourist development and residential construction have gone through a boom since Meylan's report and are causing environmental problems (Proctor & Fleming 1999; Proctor & Hodge 1997). There are however still foraging populations of green, hawksbill and occasional loggerhead turtles in Anguillian waters (Proctor & Fleming 1999; Weidner et al. 2001).

Anguilla's Marine Parks Ordinance of 1982 empowered the Governor to designate Marine Protected Areas and acquire private land. The legislation was amended in 1992 to restrict damaging activities and impose fines or imprisonment as penalties. Five marine parks were established in 1993. Four of these, Sandy Island, Prickly Pear Cays - including the Seal Island Reef System, Island Harbour and Dog Island- were designed to protect reef systems and are managed by the Department of Fisheries (Gell & Watson 2000). A Marine Park Management Plan is still in the pipeline despite the fact that the marine parks have been in existence for some time. This document currently exists in draft. Anguilla has recently been successful in securing funding to progress work on coastal resource management and monitoring with the aim of enhancing long-term marine resource management from the Overseas Territories Environment Programme.

**Green turtles:** Juvenile green turtles are year round residents in Anguillian waters (Meylan 1983) and are relatively abundant at some localities around the island including Island Harbour, Sandy Ground, Little Bay and the Forest, and also around some of the outlying cays including Fish Hole Pond on Scrub Island. One fisher reported that he regularly has 12 to 15 small green turtles around his boat off Sandy Ground. Fifty-nine (81.9%) of the TCOT SEQ respondents reported that green turtles occur in Anguilla's waters, and recognition of this species is generally excellent. Green turtles captured during TCOT in-water sampling ranged from 23.5cm curved carapace length (CCL) and 80.6cm CCL (mean  $\pm$  SD, 45.7cm  $\pm$  12.3, n=48). Thirty-five of these turtles were caught in Island Harbour and the remaining 13 in Fish Hole Pond, Scrub Island (Scrub Island: mean  $\pm$  SD, 44.8cm  $\pm$  8.7, n=13). A green turtle weighing 48 pounds, which was tagged as a yearling at Merritt Island National Wildlife Refuge, Florida in 1975, was caught at Sandy Island in 1980 (Richardson & Gumbs 1983).

**Hawksbill turtles:** Foraging hawksbill turtles are present in Anguillian waters year round, especially in the extensive reef to the north of the island and around the offshore cays

(Meylan 1983; Proctor & Fleming 1999). From fisher reports and observations it appears there is extensive suitable foraging habitat for hawksbills in areas including Shoal Bay, Junks Hole and Savannah Bay, off the cliffs near North Hill Village (Katouche Bay), off the cliffs at Lower South Hill, Long Bay, Mead's Bay, between Shoal Bay and Blowing Rock, Sandy Hill Bay, Crocus Bay, Little Bay, Forest Bay, Limestone Bay and Scilly Cay. According to Meylan (1983), Anguilla was one of the few places in the region where hawksbills could still be routinely seen in shallow inshore habitat. More than 20 years later, TCOT staff observed that this is still the case in some areas. Sixty (83.3%) of TCOT SEQ respondents confidently identified the hawksbill turtle and reported that this species is present in Anguilla's waters - the highest percentage for all species. Hawksbills captured during TCOT in-water sampling ranged from 22.7cm to 37.3cm (mean  $\pm$  SD, 27.7  $\pm$  3.78, n=25). With the exception of one animal that was caught off Junk's Hole, all hawksbills sampled were caught on the reefs between Katouche Bay and Flatcap Point (Little Bay). Larger hawksbills have been reported from Sombrero Island (Meylan 1983). A TCOT SEQ respondent reported seeing large hawksbills off Captain's Bay as well as seeing mating hawksbills between the main island and Scrub. He reported that he usually sees larger turtles later in the year.



**Photo 4.12.** Green turtles captured during TCOT sampling in Island Harbour (Photo P. Richardson).

**Loggerhead turtles:** Not much is known about loggerheads in Anguillian waters, except that they occur infrequently. Meylan saw a subadult that had been caught off Scilly Cay in April 1980 that weighed about 54.5kg (Meylan 1983).

In February 2004, the DFMR was called to the same site as fishers had found an injured loggerhead in the bay (Photo 4.14). This animal had a curved carapace length of 70.5cm. It appeared to have been attacked by a shark and attracted a fair amount of media attention when it was released in Crocus Bay. Meylan suggests that identification of loggerheads by most Anguillians is unreliable because of the scarcity of this species (Meylan 1983). During the TCOT SEQ, only 35% (n=25) of respondents reported that this species occurs in the waters around Anguilla. Loggerheads are reported off Scrub, Dog and Sandy Islands (Meylan 1983). One fisher interviewed for the TCOT SEQ reported seeing a large loggerhead from the ferry between Anguilla and St Martin in May 2004.

#### 4.6.1. Monitoring efforts

Data on the abundance of marine turtles in Anguillian waters were gathered via voluntary participation in Caribbean Turtlewatch and by in-water sampling using net based and hand capture methods.

##### 4.6.1.1. Caribbean Turtlewatch- Anguilla

*Caribbean Turtlewatch* is a voluntary scheme designed to engage recreational divers in marine turtle monitoring. This method of information gathering was not particularly successful in Anguilla and produced limited results. Materials were distributed to all dive operators in Anguilla (n=3), but only Anguillian Divers completed any of the forms. A copy of the form and information sheet are given in Appendix 2.2-2.4. More detailed methodology is given in Section 2 of this report.

*Caribbean Turtlewatch* surveys were conducted in Anguilla between February and August 2003. During the period, 18 *Caribbean Turtlewatch* forms were completed, detailing

dives and turtle sightings. On all of these 18 occasions turtles were observed. Two reports were made by an independent snorkeller, the remainder by scuba divers. All dive reports were made by clients of Anguillian Divers. See Table 4.5 for summary of results.

The *Caribbean Turtlewatch* surveys that were completed have illustrated that green and hawksbill turtles are found in the waters of Anguilla. The latter is the most common species observed by divers. The majority of all turtles observed by divers were of juvenile/sub-adult size although a few of both species were of the size of breeding individuals.

When asked the question: *Did the chance of seeing a turtle influence your decision to choose this particular dive?* Of the 13 individuals that responded, 1 answered yes, 11 answered no and one was unsure. When asked the questions: *How important was your turtle sighting to the enjoyment of the dive?* 7 individuals responded that the experience was very important, 6 responded that it was important. These limited data suggest that while divers may not specifically choose to dive because they want to see turtles, a sighting is seen as important or very important and could therefore be said to significantly enhance the dive.

##### 4.6.1.2. In-water sampling

Both hand capture and net-based sampling have been carried out in Anguilla (See Table 4.6).

#### Sampling methods

**Net-based sampling (*Chelonia mydas*):** In the absence of dedicated turtle nets, a variety of locally available nets have been employed in net-based sampling. These have ranged from large mesh set nets to Jack Seine nets. All sets have taken place in 2 locations, namely Fish Hole Pond (Scrub Island) and Island Harbour. Staff from the DFMR carried out all net sets with assistance from TCOT staff (when in country) and local fishers. Only one net set was carried out in Island Harbour, in the absence of TCOT staff. In 2002,



**Photo 4.13.** DFMR Marine Biologist, James Gumbs, and Fisheries Officer, Carlos Sasso, with hawksbill turtles captured by hand during TCOT sampling off the North Cliffs (Photo P Richardson).



**Photo 4.14.** The loggerhead turtle found in Island Harbour in February 2004 (Photo courtesy of DFMR).

Species	<25cm	26-50cm	51-75cm	>76	Unknown size	Total	Site
Green	0	1	2	3	1	7	2, 4, 5, 6
Hawksbill	0	2	3	2	2	9	1, 2, 3
Loggerhead	0	0	0	0	0	0	
Leatherback	0	0	0	0	0	0	
Unidentified	0	2	0	0	0	2	7

**Table 4.5.** Summary of species and size class of individual turtles observed by divers in Anguilla Feb-Aug 2003. Key to locations: <sup>1</sup>Anguillita, <sup>2</sup>Osterdiep Wreck, <sup>3</sup>Sandy Deep, <sup>4</sup>Ooster Reef, <sup>5</sup>Cathley House, <sup>6</sup>Ida Maria, <sup>7</sup>Junk Hole Bay.

the DFMR received funding from the British Chelonia Group (BCG) to construct 3 turtle nets for use in this project. These nets have been successfully used, but require adjustments in order to improve their performance. Once the nets have been perfected, a standardised replicable sampling method should be adopted. The DFMR currently follows procedures learned on the Bermuda In-water Course as closely as local conditions will allow. Tagging and data collection take place on the shore or on a DFMR boat, and turtles are returned to the water as early as possible, usually within an hour.

**Hand capture:** Hawksbill turtles have been captured either by snorkelling or using the Man-on-tow method to locate the turtles. Once a turtle has been located, personnel free dive to capture it. Tagging and data collection occurs on the shore or on a DFMR boat, and turtles are returned to the water as early as possible, usually within an hour.

**Morphometric data:** Straight carapace length, width and plastron length measurements are recorded for turtles on capture and following each recapture.

**Genetic Sampling:** Skin biopsies are obtained from a rear flipper with a sterile 4-millimetre biopsy punch or scalpel and preserved in a buffer solution of 20% dimethyl sulfoxide (DMSO) saturated with Sodium Chloride (NaCl) (Dutton 1996).

**Tagging:** All captured turtles are tagged according to standard protocols to prevent collection of duplicate genetic samples and to elucidate demographic parameters. Metal Inconel tags are applied to the posterior edge of each front flipper and Passive Integrated Transponder (PIT) tags are injected into the left shoulder muscle (Balazs 1999).

#### 4.6.2. Data from the TCOT Socio-economic Questionnaire (SEQ)

##### Perceived trends in turtles in Anguilla's waters

As part of the TCOT SEQ, all 72 questionnaire respondents were asked about changes in the number of turtles seen in Anguilla's water over time (in the last 5 years and in living memory), both in general and for specific species. Fifty-three respondents (73.6%) reported that they had noticed changes while 18 (25%) did not, and 1 did not answer the questions. A summary of these general perceptions of trends in the number of turtles in Anguilla's waters is shown below (Table 4.7).

Of those answering these questions for turtles in general, 26 (49%) respondents reported an increase in the number of turtles around Anguilla in the last 5 years, while 3 (5.6%) reported a decrease. None of the respondents who noticed species-specific changes for green, hawksbill and leatherback turtles reported a decrease.

Species	Captures to date	Location	Method	TOTAL/SPP.
Green	13	Fish Hole Pond, Scrub Island	net	48
	35	Island Harbour	net	
Hawksbill	8	Crocus Bay	hand capture	24
	5	Little Bay	hand capture	
	9	North Hill Cliffs	hand capture	
	1	Junks Hole Bay	hand capture	
	1	Shoal Bay	hand capture	
<b>TOTAL CAPTURE FOR ALL SPECIES: 72</b>				

**Table 4.6** Summary of marine turtle captures in Anguilla.

Sixteen (30.1%) respondents answering for turtles in general reported a decrease in the numbers of turtles in Anguilla's waters generally since they could remember, while 9 (16.9%) reported an increase and 1 respondent suggested that the number of turtles in Anguillian waters had remained the same. Respondents who said they had noticed species-specific changes for green, hawksbill and leatherback turtles also indicated this perception of a decrease in the number of turtles in Anguilla's waters in living memory.

Based on their regular observations of turtles at sea during the course of their work and their particular interest in turtles, one might expect that former turtle fishers would be particularly well placed to detect changes in the abundance of turtles at sea. A high percentage of former turtle fishers (89.2%, n=25) reported that there had been a change in the last 5 years, while only 2 (7.1%) reported no change in the same period. All of the former turtle fishers who reported a change in the population of green turtles in Anguilla's waters in the last 5 years said there had been an increase. The same is true for hawksbills.

**Perceived reasons for change:** TCOT SEQ interviewees were asked about reasons for perceived changes in the abundance of turtles in Anguilla's waters. Forty-seven (88.6%, n=53) of those who said they had perceived a change gave reasons why they believed there had been an increase in the number of turtles either in the last 5 years or in living memory, while 40 (75.4%, n=26) gave reasons why they believed numbers had declined in the last 5 years or in living memory. Multiple responses were allowed for this question. The vast majority (89.3%, n=42) of those giving reasons for an increase cited the moratorium. The remaining respondents cited the fact that turtles are tamer in

Anguilla (n=7), that there has been a cultural change away from turtle use (n=3), that there is increased awareness of conservation issues (n=2), the fact that there had not been any hurricanes recently (n=1) and regional conservation initiatives (n=3) as reasons for the perceived increase. It is interesting to note that 3 of these respondents noted that, although there were more turtles now, there used to be larger turtles in the past.

Of the 40 respondents that gave reasons for a perceived decrease in the number of turtles in Anguillian waters, 39 (97.5%) identified fishing as the cause. Nineteen of these specifically indicated that they felt the resource was overexploited. Other reasons cited included hurricanes (n=1), habitat destruction (n=1) and smuggling (n=1).

#### 4.6.3. Genetics of foraging populations

TCOT genetic analyses have shown that the haplotypes of foraging turtles in Anguilla have also been described in a number of other nesting and foraging sites (see 10.4.4).

#### Foraging green turtles in Anguilla

Samples were taken from 51 foraging green turtles in Anguilla. Sixteen of these samples have been analysed to date. Haplotypes described in the 16 samples that generated data during TCOT genetic analysis have also been described in **foraging** populations in TCI, Montserrat and BVI (via TCOT), Bahamas, Barbados, Florida, Nicaragua and West Africa. Some of these haplotypes have also been described in **nesting** populations in Ascension Island, Aves Island, Brazil, Costa Rica, Florida, Mexico, and Suriname, as well as Bioko, Guinea Bissau, Sao Tome and Principe on the West coast of Africa. Analysis also identified one haplotype, provisionally entitled TCOT1, that has not been described from any other population.

<i>In the last 5 years...</i>					
	Increasing	Decreasing	Same	Don't know	NR
<b>Green</b>	24	0	0	0	1
<b>Leatherback</b>	2	0	3	14	1
<b>Loggerhead</b>	1	0	1	13	1
<b>Hawksbill</b>	22	0	1	0	1
<b>General</b>	26	3	0	1	1

<i>Since you can remember...</i>					
	Increasing	Decreasing	Same	Don't know	NR
<b>Green</b>	10	11	0	2	1
<b>Leatherback</b>	0	1	1	16	1
<b>Loggerhead</b>	0	0	1	13	1
<b>Hawksbill</b>	9	10	0	4	1
<b>General</b>	9	16	1	4	1

**Table 4.7.** General Perceptions of changing abundance of sea turtles in Anguillian waters, in the last 5 years and since respondents can remember (n=53 respondents who noticed change; NR- No response).

<b>Reasons cited for increase in the number of turtles in Anguillian waters (n=47)</b>					
Moratorium (42)	Turtles tamer (7)	Cultural change (3)	Regional conservation initiatives (3)	Increased awareness (2)	No recent hurricanes (1)
<b>Reasons cited for decrease in the number of turtles in Anguillian waters (n=40)</b>					
Fishing (39)		Hurricanes (1)	Habitat destruction (1)	Smuggling (1)	

**Table 4.8** Summary of perceived reasons for the changes in the number of turtles in Anguillian waters.

### **Foraging hawksbill turtles in Anguilla**

Samples were taken from 22 foraging hawksbill turtles in Anguilla. Five of these samples have been analysed to date. Haplotypes described in the 4 samples that generated data during TCOT genetic analysis (1 sample failed) have also been described in **foraging** populations in TCI, BVI, CI and Montserrat (via TCOT), Cuba, Mexico and Puerto Rico. Some of these haplotypes have also been described in **nesting** populations in Antigua, Barbados, Brazil, Cuba, Mexico, Montserrat (via TCOT), Puerto Rico and the US Virgin Islands. One of the haplotypes had not been described prior to TCOT and has now only been described from **foraging** turtles in Anguilla, BVI, Montserrat and TCI and **nesting** turtles in Anguilla, Montserrat and TCI.

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 during 2005 and more definitive answers will be available next year. At this point, however, it can be clearly highlighted that the turtles foraging in Anguillian waters will undoubtedly include those originating from a number of nesting colonies across the Caribbean region. Detailed information will be disseminated as part of the cross-territory FCO Overseas Territories Environment Programme (OTEP) funded project, which will focus on Turtle Conservation and the Environment Charter and Multilateral Environment Agreements. However, further sampling of Anguilla's foraging turtle populations is required to fully understand and establish their genetic identity.

### **Recommendations**

#### **4.1.2.2. Amend the Marine Parks Act**

a) Ensure that all five 'designated' marine parks are fully described in Schedule 1 of the Marine Parks Regulations.

b) Ensure that marine turtles have permanent and complete protection within Anguilla's Marine Parks. This should include no take zones as well as policies to curb potential negative tourism impacts e.g. through SCUBA diving and snorkelling.

#### **4.1.3.1. Establish systematic monitoring efforts at mainland index nesting beaches, as well as Dog and Scrub Islands**

b) Establish sustainable, regular and frequent (monthly), constant-effort monitoring programmes at Island Harbour and other identified green turtle foraging sites (nets & CPUE), and on the stretch of coast from Little Bay to Sandy Ground and other identified and accessible hawksbill turtle foraging sites (snorkel surveys) to determine abundance trends.

c) Establish a regular and frequent (quarterly) genetic sampling regime at Island Harbour (nets), Scrub Island (nets), Shoal Bay (hand capture) and Little Bay/ Sandy Ground (hand capture) to increase understanding of genetic stock composition of green and hawksbill turtle populations.

**NB.** Steps should be taken to encourage the involvement of interested local fishermen in all monitoring programmes (e.g. CPUE monitoring in Island Harbour and elsewhere), and financial incentives should be considered.

#### **4.1.4.2. Implement general awareness programmes regarding marine turtle conservation in Anguilla**

a) Develop the Anguilla National Trust turtle specific educational materials, and expand them to include further curriculum linked, multi-media materials where appropriate.

b) Raise awareness among Anguillians of the presence of distinct foraging and nesting turtle populations through informational materials and media outputs.

c) Establish a programme of awareness raising presentations and workshops in fishing communities, schools and other public fora.

d) 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.

e) Establish a programme of awareness raising presentations and workshops to sensitise the tourism industry to the potential impacts of tourism and possible mitigation measures.

## 4.7. Direct Use of Marine Turtles in Anguilla

### 4.7.1. Overview

Connor and Connor (1998) interviewed several fishers ranging in age from 50 to 92 years old who recount lifetime anecdotes of turtle capture, egg harvest and utilisation. Fishers would capture green turtles at sea with trammel nets and hawksbills by hand, as well as taking occasional turtle bycatch in fishing lines. Older fishers and their families say that they are able to see where turtles will nest by looking for “tracks in the sky” (a herringbone cloud formation resembling turtle tracks) and in days gone by people would follow these tracks to the nesting beach. Nesting females were turned and harvested and nests were excavated for eggs, which some men considered to have aphrodisiac properties (Connor & Connor 1998; R Hodge (DFMR) pers. comm. 2003). Eggs of all species were taken whenever they were encountered (Meylan 1983).

Turtle meat was either sold locally to households, hotels and restaurants, or exported to neighbouring islands, particularly St Martin, where the larger tourism industry provided a steady demand (Meylan 1983). There was also a trade in turtle shells, with dedicated traders from Puerto Rico, St Lucia and St Thomas buying from Anguillians at US\$20 per kg, and by the early 1980s, the scale of this export was a cause for concern (Connor & Connor 1998; Meylan 1983; Richardson & Gumbs 1983; R Hodge (DFMR) pers. comm. 2003). At the same time, spearfishers, realising the value of tortoiseshell, started targeting hawksbills of all size classes and the island’s total catch of turtles was reported to have increased to unprecedented levels (Meylan 1983). Some fishers continued to use nets and in Little Bay a catch of between 3 and 5 turtles a day, or “enough to call the butcher”, was reported as not uncommon prior to the current moratorium on turtle fishing (Rogers, pers. comm. 2002). In response to concern from NGOs and the general public about a perceived decline in local turtle populations, harvesting of turtles and their eggs was completely prohibited in Anguilla by the Fisheries Protection (Amendment) Regulations, 1995 (Connor & Connor 1998). Interestingly, there were no data to validate these concerns, but the legislation was passed regardless, possibly as a result of NGO and Government consultation with representatives from WIDECAST (R Hodge (DFMR) pers. comm. 2003). Though no consistent monitoring of Anguilla’s turtle populations was carried out between 1995 and 2000, the moratorium was extended for a further 5 years from the 15<sup>th</sup> December 2000.

The key domestic legislation with regard to marine turtle exploitation in Anguilla is the Fisheries Protection Regulations (2000) outlined in Table 3.1. These Regulations extend the moratorium on take of turtles and their eggs for 5 years from the 15<sup>th</sup> December 2000. The Government of Anguilla will review this element of the Act and decide the future of the moratorium by December 2005. The moratorium was originally introduced by The Fisheries Protection (Amendment) Regulations, 1995. However, prior to this amendment, the Fisheries Protection Regulations, 1988 permitted the regulated take and sale of turtle eggs

and meat between the 1<sup>st</sup> of October and the 31<sup>st</sup> May in any year and the minimum size limit for harvested turtles was 20lb (9.07kg). Anyone contravening these regulations was liable to a fine of EC\$5,000 and/or imprisonment for 12 months. Under the Fisheries Protection Regulations (2000) anyone found in contravention of the moratorium is liable to a fine of up to EC\$50,000 or up to one year imprisonment, or a fine of EC\$250,000 and imprisonment for 2 years for a second or subsequent offence, or to both such fine and imprisonment.

It is suggested that marine turtle stocks in Anguilla are depleted (Connor & Connor 1998; Meylan 1983), but it is impossible to confirm this as no long-term monitoring programmes have been implemented. The current moratorium on turtle fishing was expected to give responsible agencies and stakeholders an opportunity to reassess marine turtle management in Anguilla. However, this has not been achieved and the lack of information regarding the current status of turtles is recognised as a significant problem by the Government of Anguilla (K. Hodge (Government of Anguilla) pers. comm. 2004).

The case for maintaining the moratorium is considerably weakened so long as the Government of Anguilla fails to implement monitoring programmes to ascertain trends in local turtle populations. TCOT staff carried out informal interviews during early field trips with some fishers who were most active in the turtle fishery prior to the moratorium and who have so far complied with this legislation. They indicated that they would see a future unexplained extension of the moratorium as an infringement of their basic human rights, and have threatened to flout the law and fish for turtles again if the moratorium is extended for a third time without scientific justification.

There have already been numerous representations by fishers to the Government of Anguilla in favour of dropping the moratorium when the current legislation expires in December 2005 (R Rey (Government of Anguilla) pers. comm. 2002). The turtle moratorium not only brought an end to turtle fishing, but also the use of gill nets. In some quarters, it is thought that turtle fishing has never been a major source of income, but that the net ban is perhaps more controversial as this affects the take of other species and could have more significant economic impacts. The Executive Council has made it clear that the necessary information must be made available to ensure that they are able to take an informed decision on this issue by the end of 2005 (R Rey (Government of Anguilla) pers. comm. 2002).

Table 4.9 presents turtle fishers’ attitudes to fishery conservation options. Most fishers agreed that there should be regulations for the type of fishing gear that can be used to catch turtles, that there should be size limits for turtles caught and that there should be open and closed seasons for turtle fishing. There was less support for quotas, but many fishers qualified this by saying that there was no point suggesting this management method as it would be unenforceable in Anguilla. This does not necessarily suggest

that they disagree with quotas in principle. Many felt that open and closed areas for turtle fishing were impractical because turtles move freely through Anguilla's waters and they did not feel that closed areas would afford the turtles any protection. Forty-six % (n=13) of the 28 fishers who responded to this section thought that there should be some controls on which species of turtles are caught. Among the reasons for supporting this measure were that it would allow fishers to target the most plentiful species (5), that it would protect hawksbills, as they are too easy to catch (6), and that it would allow people to target their preferred species, the green turtle (4).

The option with the highest level of consensus amongst the turtle fishers was the size limit option, where 82% agreed. The majority specified that they would support a *minimum* size limit, with suggested lower limits ranging from 25lbs – 55lbs. Five fishers suggested that there should be upper and lower limits and specifically indicated that it was important to protect the larger, breeding turtles. Where respondents did not mention an upper size limit and were asked about their opinions on this issue, they were often not convinced that this would be a useful conservation measure and there were indications that there may be some resistance to the establishment of upper size limits.

## Recommendations

### 4.1.2.1. Amend the Fisheries Protection Regulations

*TCOT recommends replacing the moratorium on turtle fishing in Anguilla with a 3 year active and participatory research programme. For the duration of this research programme there should be no harvest of marine turtles in Anguillian waters. The programme should assess the viability of establishing a highly regulated experimental turtle fishery by 2009 and should be characterised by active involvement of fishers and open dialogue between all stakeholders. Capacity building to ensure that the DFMR will be equipped to effectively manage a turtle fishery, should it be established, should begin immediately.*

#### a) Short to medium term

- i) *The Advisory Committee described in 4.1.1 should immediately start to seek funding for a participatory marine turtle research programme and solicit the participation of interested fishermen in the in-water and nesting beach monitoring and sampling regimes described below.*

<b>a There should be regulations for which species of turtle can be caught</b>					
	yes	no opinion	no	na	no answer
n	13	4	6	4	1
%	46	14	21	14	4
<b>b There should be regulations for the type of fishing gear and methods that can be used to catch turtles</b>					
	yes	no opinion	no	na	no answer
n	19	2	2	4	1
%	54	6	30	14	4
<b>c There should be regulations for the number of turtles that can be caught</b>					
	yes	no opinion	no	na	no answer
n	8	1	10	8	1
%	29	4	36	29	4
<b>d There should be size limits for turtles caught</b>					
	yes	no opinion	no	na	no answer
n	23	0	0	4	1
%	82	0	0	14	4
<b>e Open and closed zones should be set for turtle fishing</b>					
	yes	no opinion	no	na	no answer
n	9	3	9	6	1
%	32	11	32	21	4
<b>f Open and closed seasons should be set for turtle fishing</b>					
	yes	no opinion	no	na	no answer
n	20	1	0	6	1
%	71	4	0	21	4

**Table 4.9.** Views of turtle fishers on options for managing the turtle fishery.

## **b) Long term**

Once abundance trends of green and hawksbill turtles have been established through the programmes described below, and if they are deemed favourable to reopen a turtle harvest, amend the Fisheries Protection Regulations as follows:

- i) Ensure permanent and complete prohibition of the harvest of nesting female turtles and turtle eggs
- ii) Ensure a closed season that protects breeding turtles in Anguillian waters from the 1<sup>st</sup> of April to the 30<sup>th</sup> of November inclusive, to be reviewed every 5 years (in order to react to possible shifts in nesting seasons due to climate change)
- iii) 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 also yield an equivalent maximum curved carapace length for turtles that should be stipulated in any amended legislation.
- iv) Consider a continued minimum size limit, as most fishermen already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for turtles that should also be stipulated in any amended legislation.
- v) Establish a limited licensing scheme for turtle fishing whereby turtle fishing is restricted to licensed individual fishermen who are required to abide by strict regulations regarding fishing practice. Harvest quotas should be adaptive and based, *inter alia*, on the number of licensed turtle fishers and stock assessments established through the monitoring regimes\*.
- vi) Establish regulations with regard to the type of gear that can be used to capture turtles. Possible regulations could ensure permanent and complete prohibition of all turtle capture methods excluding hand capture and use of turtle nets, with strict specifications for legal net structure and use.
- vii) Ensure prohibition of the harvest of loggerhead and leatherback turtles in Anguillian waters. The Government of Anguilla have also expressed that they would recommend prohibition of any future take of hawksbill turtles.

**NB.** Any future turtle fishery must be accompanied by systematic monitoring regimes as described below, along with a programme to monitor Catch per Unit Effort of licensed fishermen, and biometrics of turtle catch, which should also be implemented by the DFMR. In the event of the reopening of Anguilla's turtle fishery, the Fisheries Protection Act must be further revised to provide statutory powers to react to the ongoing results of the abundance trend monitoring programmes. In the event of declining abundance trends or declining Catch per Unit Effort below pre-established thresholds, the DFMR must have the power to temporarily or permanently close the turtle fishery.

The TCOT SEQ revealed that the moratorium on turtle fishing is a subject of significant local interest. When asked if they could describe any laws regarding turtles in Anguillian waters, 95.8% (n=69) of respondents answered in the affirmative. All 69 respondents who said they were aware of the law explained that it is illegal to fish for turtles in Anguilla. Most mentioned the ban or moratorium specifically. However, only 12 of those who said they could describe the law referred to the fact that there are penalties in place and none were aware of what these are. It appears that, though the vast majority of people are aware of the law, very few are aware of what penalties might be incurred if the law is broken. In a separate survey, when informed of the existing penalties, several TCOT SEQ interviewees said that a fine of up to EC\$250,000 was wholly inappropriate and some suggested that the severity of the penalty may also result in Fisheries Officers being reluctant to prosecute. It is worth noting that there have been no successful prosecutions in Anguilla to date despite a handful of instances where the authorities have apprehended individuals who were in contravention of the moratorium. The most recent incident took place on the 19th of March 2002. Three individuals in a boat took a juvenile hawksbill turtle in Crocus Bay and transported it by boat to Island Harbour where they were met by the regular police (as the special marine police could not be contacted) and Department of Fisheries officers. A decision was taken not to prosecute on this occasion due to the particular circumstances of the individuals involved, and instead a very public warning was issued, which all involved felt was a more appropriate course of action (Vanterpool (DFMR) pers. comm. 2002).

## **Recommendation**

### **4.1.2.1. a.**

- ii) Change the current penalty for contravening the moratorium under the Fisheries Protection regulations, to a more appropriate penalty in line with other offences under the Act (e.g. Fine of EC\$5,000 and/or imprisonment for up to 12 months).

## **The Survey audience**

Data on use of marine turtles were gathered using the TCOT SEQ. In Anguilla 72 questionnaires were completed and a breakdown of information gathered on marine turtle exploitation is given in the Table 4.9.

### **4.7.2. Harvest of adults on the nesting beach**

We have not sourced any historical accounts of the level of exploitation of nesting female turtles in Anguilla, though anecdotal reports suggest that females were routinely turned on the nesting beach (Connor & Connor 1998). WIDECAS report that before the 1970s, nesting female green, hawksbill and leatherback turtles were regularly taken from Anguilla's beaches and that the capture of 2 turtles in one night would be considered a 'big catch' (WIDECAS in prep). One of the older TCOT SEQ respondents recalled that competition for

nesting females and their eggs reached a level where some fishers would set nets across the approach to the nesting beach, if they expected a female to come ashore to nest, so that they could be assured of capturing the turtle and getting her unlaidd eggs. Eight (29%) of the respondents who fished for turtle reported that they had, in the past, turned turtles on the nesting beach. None of them reported that they were still taking turtles from the nesting beach and, by all accounts, the practice has disappeared.

One of the 8 fishers who used to take females on the nesting beach reported taking green turtles. He estimated that the largest green turtle he ever caught weighed 136.1kg (300lbs). Five fishers reported taking hawksbill turtles from the nesting beach. Estimates for the size of the largest hawksbills they ever caught ranged from 56.7kg (125lbs) to 226kg (500lbs). Marquez (1990) suggests that the first maturity of female hawksbill turtles should be reached at between 68 and 80cm (straight carapace length) and at body weights of 40-56kg, depending on the locality. Two fishers did not distinguish which species they took from the nesting beach, but answered for turtles in general. They estimated the size of the largest turtles they had ever caught at 90kg and 204.1kg. Because all 8 respondents who took females on the nesting beach also fished for turtles using other methods, it is not possible to discern from the TCOT SEQ how often or in what numbers nesting females were taken by these 8 respondents. When asked about their reasons for no longer harvesting turtles, 50% (n=4) of this group reported that they had stopped using turtles because of the moratorium. Two stopped when they retired. One believed that turtles were getting scarce and decided to stop and for one fisher a reason was not recorded.



**Photo 4.15.** Island Harbour fishers with a juvenile green turtle captured during in-water sampling carried out in Island Harbour with fisher assistance (Photo P. Richardson).

#### 4.7.3. Harvest of eggs

Connor and Connor (1998) report that there was a local demand for turtle eggs and it has been suggested that eggs were collected whenever they were encountered (Meylan 1983). During the TCOT SEQ, 20 former egg collectors were interviewed, all of whom reported that they no longer collected turtle eggs. However, during surveys of Anguilla's mainland nesting beaches in 2001, an Anguilla National Trust Volunteer recorded illegal take of nests on Long Bay (leatherback), Mead's Bay (leatherback), Katouche Bay (leatherback), Captain's Bay (leatherback and hawksbill) and Windward Point (leatherback). Furthermore, Marianne Fish (University of East Anglia) recorded possible take of nests on Captain's Bay (hawksbill), Savannah Bay (hawksbill) and Prickly Pear Cays (species unknown) in 2003 (K. Hodge (Government of Anguilla) pers. comm. 2003; M Fish (UEA) pers. comm. 2003). Members of the TCOT staff have also received reports of egg collection on Prickly Pear Cays since the introduction of the moratorium.

There has been legislation in place to prohibit the taking of turtle eggs either seasonally or completely since 1947, when egg collection and sale was prohibited between 1 June and 30 September, under the Turtle Ordinance. However, only 20% of former egg collectors indicated that the law influenced them to stop collecting eggs. When asked when they had stopped collecting eggs, 75% of former collectors reported that they had stopped by the 1980s with only 15% continuing to collect in the 1990s. For 40% of former collectors, conservation was the motivation behind stopping, due to a perceived decrease in the number of nesting females, and a realisation that if egg collection continued the nesting population could disappear. Other reasons for stopping included a lack of interest (n=1), a lack of time (n=1), not having the skill the old fishers had to find eggs (n=1) and not actually liking the taste of eggs (n=3).

From information provided by 10 of the former egg collectors, it appears that egg collection peaked in June, July and August when 70 - 80% of former collectors who answered this question reported being active (see Figure 4.5). These are the months during which egg collection has been illegal since 1947, suggesting that legislation has not been a key factor controlling egg collection practices in Anguilla.

In terms of the frequency of egg collection, 20% (n=4) of respondents reported to have only collected eggs once or twice in their lifetime, 35% (n=7) reported collecting eggs yearly, 15% (n=3) monthly and 10% (n=2) weekly during the season. Sixty-five % (n=13) reported that the most significant factor influencing when they took eggs was opportunity. This reinforces the belief expressed by Meylan (1983) that eggs were taken whenever they were encountered, but suggests that, for most people, egg collection was only an occasional occupation.

Half the respondents in this group (n=10) said that they did not distinguish between species when collecting eggs, while 7 (35%) said they collected hawksbill eggs and 3 (15%) said they collected green turtle eggs. The majority

Measures of direct exploitation	Past	Present	Never	No response or not applicable
<b>By life stage</b>				
Females on beaches	8	0	20	44
Eggs from beach	20	0	51	1
Turtles in water (intentional)	27	1	-	44
Turtles in water (incidental)	20	?	-	-
<b>By product</b>				
<b>Meat</b>				
Fishers who sell meat	28	0	-	-
Meat vendors	9	0	-	-
Meat consumers	62	1	8	1
<b>Eggs</b>				
Collectors who sell eggs	0	0	-	-
Egg vendors consumers	0	0	-	-
Egg consumers	33	0	37	2
<b>Non-edible</b>				
Fishers who sell shells	11( <i>whole shells</i> ) 11( <i>scutes</i> )	0	-	-
Shell vendors	3( <i>whole shells</i> ) 1( <i>scutes</i> )	0	-	-
Shell consumers	34( <i>whole shells</i> ) 17( <i>scutes</i> )	0	35( <i>whole shells</i> ) 51( <i>scutes</i> )	-
<b>Measures of indirect exploitation</b>				
Turtles indirectly used in business	6 advertising	12 attraction	9 feature of professional activities	
<b>Total interviews</b>	<b>72</b>			

**Table 4.10.** Numbers of TCOT SEQ respondents involved in exploitation, by exploitation category

said they did not have a preference for the eggs of one species over another with only 2 individuals reporting a preference for green turtle eggs and 2 for hawksbill eggs because these species are good eating, culturally familiar and should produce good eggs.

One of the former egg collectors, who stopped collecting in the early 1970s, reported that he used to sell the eggs from less than 20 nests per year. He would determine the price and the eggs would be sold to people at their homes. This individual reports that the price of eggs rarely changed, but he could not remember what eggs would sell for.

All 72 respondents to the SEQ were asked whether they had ever consumed turtle eggs and 33 (45.8%) reported that they had. None said that they were currently eating turtle eggs. The frequency at which people reported consuming turtle eggs mirrors the picture of egg collection above. Twenty-three egg consumers reported how often they used to eat eggs and 91.3% (21) reported that they did so less than once a year. Only 1 egg consumer said they would eat

eggs yearly (i.e. at least once a year) and 1 that he would eat eggs weekly during the season.

Four consumers said that they would actually purchase the eggs and all would buy them directly from the collector's home. All others would either collect eggs themselves or receive them as a gift. One person remembered paying US\$11.19 for 40 eggs on one occasion (US\$0.28/egg). Nine consumers reported giving eggs to friends, family or neighbours as a gift, but most said they would keep eggs for consumption in their own household. Though the use of turtle eggs as an aphrodisiac has been widely reported, only 3 respondents in this case suggested that turtle eggs enhanced virility. Consumers reported a decrease in the availability of eggs to purchase both in the last 5 years as well as in living memory.

From data gathered during the SEQ, it appears that turtle eggs were a rare and highly prized treat. For the most part they were not a cash commodity, but were collected and shared among neighbours, family and friends. It is possible

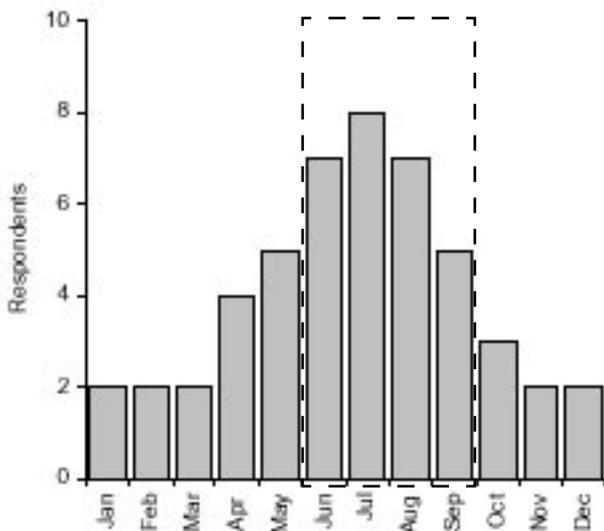
that the use of turtle eggs decreased in line with the decline of the nesting population rather than as a result of legislation, but egg consumption continued into the 1990s.

#### 4.7.4. Harvest at sea

Information about the historical harvest of marine turtles in Anguilla is fragmentary. Richardson & Gumbs (1983) reported that between 5 and 10 fishers were harvesting turtles in Anguilla in the early 1980s and that none were entirely dependent on this harvest for their livelihood. It was reported that hawksbill, green and loggerhead turtles, caught by spear fishing or turtle nets, were landed at Sandy Ground, Island Harbour, Crocus Bay and Rendezvous Bay. Meylan (1983) reports that leatherback meat is also eaten in Anguilla. WIDECAST estimated that approximately 20 full and part-time fishers were harvesting turtles prior to 1995 (WIDECAST in prep.)

It appears that not all turtles harvested in Anguilla were used in Anguilla. Meylan (1983) reported that fishers took turtles to St Martin where there was a steady demand from the many hotel restaurants. There are also reports of foreign divers, equipped with spear guns, coming to Anguilla for fish, lobsters and turtle, particularly in the region of Dog Island and though there are no clear estimates of this harvest, it is thought to be “significant” (Richardson & Gumbs 1983). Meylan (1983) suggested that the depleted status of local turtle stocks in St Martin meant that the demand for souvenirs made from turtles and turtle meat had to be met by divers travelling to neighbouring islands including Anguilla, St Martin’s nearest neighbour.

The TCOT SEQ represents an attempt to improve the understanding of the nature and extent of the historical marine turtle fishery in Anguilla, while shedding a little light on the ongoing limited illegal take of turtles for subsistence use. Weidner *et al.* (2001) reported that local environmental groups, fishers and other interested parties are becoming increasingly troubled by illegal harvesting, but during TCOT staff visits, most stakeholders, from environmental groups



**Figure 4.5.** Indication of the seasonality of former turtle egg collection. The dashed line represents the historical closed season in Anguilla.

to government representatives and the fishers themselves, expressed the belief that there was now only a very limited covert take of turtles in Anguilla.

The TCOT SEQ identified 51 people who reported that they fish for cash, subsistence or pleasure. Of these, 27 (52.9%) reported that they used to fish for turtles. Green and hawksbill turtles were the species most commonly harvested and there was a limited take of loggerhead and leatherback turtles. The most recent estimates put the number of fishers in Anguilla at around 400 (Gell & Watson 2000; R.Hodge (DFMR) pers.comm. 2002). The SEQ sample does not provide insight into the percentage of all fishers who may have been involved in the turtle fishery, but it seems likely that the opportunistic and intentional take of turtles was not uncommon among Anguillian fishers up until 1995 when the moratorium was introduced.

One fisher reported that he still takes turtles despite the current moratorium. This fisher’s current harvest is limited to the occasional turtle, taken opportunistically, for personal consumption. All respondents to the SEQ were asked whether they were aware of any activities that contravened the moratorium. Nearly half (47.2%) said they believed that there was still some use of turtles in Anguilla and 2 of these people said that they would take a turtle if they had the chance. All who said they were aware of an illegal turtle harvest characterised it as occasional take. In addition, 4 people said that they did not know of any take of turtles, but suspected that it did go on. The fact that nearly half the interview audience were aware of infringements does not necessarily mean there is a lot of illegal turtle fishing going on. There have been one or two well-publicised cases and Anguilla is a small island. It is likely that respondents were referring to the same incidents. It was not possible to build up an accurate idea of how many people were referring to the same incidents as many people were uncomfortable with this question and did not want to discuss details they felt would incriminate others.

Whereas some fishers would intentionally set nets or go out spearfishing to capture turtles, others would capture them opportunistically while targeting other species like lobster. A summary of information about intentional and opportunistic catch (see Figure 4.6) suggests that most green turtles were caught intentionally while slightly more hawksbills were captured opportunistically. Most turtle fishers (82%) reported that they preferred green turtles because of their superior meat. Fifty-four % (n=15) selected hawksbills as their second choice.

Twenty-two fishers provided estimates of numbers for green turtles caught, and 18 fishers provided estimates for hawksbill turtles. For green turtles, numbers caught ranged from a minimum of 1 to a maximum of 2,000 per year (median (IQ range) = 25(8-190)). Fishers reported catching green turtles of varying sizes, with the minimum size reported being 4.5kg and the maximum being 136.1kg. The reported ‘average’ sized catch ranged from 9.1-117.9kg. For hawksbill turtles, the number of turtles caught ranged



**Photo 4.16.** Fishing craft in Island Harbour (Photo: P. Richardson).

from a minimum of 1 to a maximum of 100 (median (IQ range) =13(5-43)) per year. It was reported that hawksbills from 4.5kg – 226.8kg were captured. The reported average size ranged from 9.1-124.7kg.

There was little difference reported in the frequency of fishing across species. If fishers reported catching more than one species, they would generally do so for the same amount of time for each species caught. This is with the exception of 2 fishers who reported fishing more frequently for green turtles and less frequently for hawksbills. Of the remaining 26 turtle fishers interviewed, 12 reported fishing weekly, 6 fished for turtles monthly, 4 yearly and 4 daily.

All but one of the turtle fishers interviewed (n=27) provided information on what factors would influence when they fish for turtles. Amongst the most important motivations reported for turtle fishing were opportunity (n=7), the phases of the moon (n=7), the season (n=6) and the weather (n=6). Other factors motivating fishers to take turtles are detailed in Table 4.11.

Turtles were most commonly captured using nets, but spear guns were frequently used and fishers also reported catching turtles at sea by hand and taking nesting females on the beach.

#### 4.7.5. Trade in turtle meat

**4.7.5.1. Sale of meat by turtle fishers:** 71.4% (n=20) of the turtle fishers interviewed reported to have sold either whole turtles or turtle meat. The total volume of meat reported to have been sold for each species is outlined in Table 4.12.

**Whole turtles:** Unbutchered turtles were sold by 9 of the turtle fishers interviewed. They reported a total annual sale of 1,801 turtles (median (IQ range) = 80 (21-150).) The data suggest that, particularly for green turtles, there were a small number of individuals with a high volume of sales while most fishers sold whole turtles at a much lower volume. Two fishers reported selling a combined total of 1,350 whole green turtles per year (i.e. 82.4% of the total

annual sale reported) while the volume sold by the other 6 ranged from 9 to 150 turtles per year. Respondents reported that the average price for turtles sold whole ranged from US\$0.75/lb to US\$1.44/lb, that it was set by the fisher and that the price rarely changed.

Whole turtles were sold at a variety of places, with most fishers (n=7) reporting that they would sell turtles from their own home or by taking it to the home of a customer. Fishers also reported selling whole turtles on the street (n=5), at the harbour (n=2), to restaurants (n=6), to hotels (n=2) and at a market (n=4). All respondents who said they took their turtles to market specified that this market was in St Martin (2 specified Marigot). The fisher who reported selling 1,000 whole turtles per year sold his whole catch to restaurants, hotels and the market in St Martin, while the fisher who sold 350 whole turtles per year also reported taking some of his catch to St Martin. This information supports Meylan's (1983) observations in the early 1980s of a flourishing trade in turtles between Anguilla and St. Martin.



**Photo 4.17.** A juvenile hawksbill turtle taken illegally in 2002 and seized by the DFMR (Photo S. Ranger).

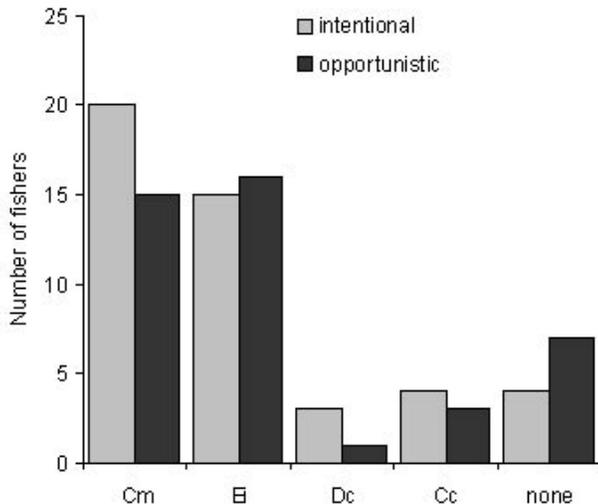
**Butchered turtles:** Twenty (71%) of the turtle fishers interviewed reported that they butchered turtles and sold the meat. They reported a total annual sale of 3,222 turtles (median (IQ range) = 24 (10.5 –202.5)). Once again, the data suggest that there were a small number of individuals with a high volume of sales while most fishers sold turtle meat at a much lower volume. For example, green turtle meat was most regularly traded and 2 of the 12 fishers who reported selling butchered green turtles reported a sale of 1,862 turtles per year (i.e. 75.8% of the total annual sale of green turtles reported), while the volume sold by the other 9 who reported how much they sold ranged from 8 to 150 turtles per year. Respondents reported that the average price for green turtle meat was around US\$2.07 and that the price was set by the fisher and rarely changed.

As with whole turtles, the majority of fishers (n=17) reported selling meat from their own home or at the home of a customer. Fishers also reported selling turtle meat on the street (n=7), to restaurants (n=7) and at the harbour (n=9). One of the older fishers said that he used to blow on a

### Factors influencing the frequency of turtle fishing

Opportunity	Phases of the moon	Season	Weather	Demand	Time	Appetite	Pleasure
7	7	6	6	3	2	1	1

**Table 4.11.** Factors influencing the frequency of turtle fishing as reported by current and former turtle fishers in (n=28).



**Figure 4.6.** Intentional and opportunistic harvest of marine turtles in Anguilla.

conch shell to let the community know he had a catch (of fish and/or turtle) and then it was first come first served. From comments made by former turtle fishers it seems that, for most of them, the trade in turtle meat was local and driven by word of mouth. Fishers would bring turtles home to butcher them and customers would usually come to them. One fisher reported that there used to be a daily gathering in South Hill where people could buy turtle. Three of the respondents specifically stated that there was always enough demand on Anguilla and that they had never felt the need to look for a market elsewhere. However, some fishers did report selling to hotels (n=3), and at a market (n=2). Once again, the market referred to was in St Martin and the fisher who reported that he sold 1,000 butchered turtles each year sold his whole catch there or to restaurants in St Martin.

#### 4.7.5.2. Sale of turtle meat by direct vendors

The TCOT SEQ identified 8 vendors who used to sell turtle meat including 5 restaurants, a supermarket and 2 hotels. Seven of these vendors reported starting to sell turtle products in the 1980s and 90s, corresponding with the tourism boom in Anguilla, and all reported stopping when the ban was introduced (1995). On average these businesses sold turtle products for 10 years. Fifty % of vendors cited the ban on use of turtle products as a reason they stopped selling turtle. Two vendors reported that they stopped selling turtle because they didn't like the idea of selling turtle and personally found the animals interesting. Another 2 said they believed turtle was something that tourists, particularly Americans, did not want to see on the menu. The supermarket owner owned his own turtle nets and his short-lived experiment in selling turtle meat outside the supermarket came to an end when his nets were destroyed by sharks – he had only been in business for one year and had only sold 7-8 turtles.

Vendors only reported selling green and hawksbill meat. One vendor reported selling turtle daily, while 2 sold turtle meat on a monthly basis and 2 only sold turtle a few times a year. Two vendors did not answer the question about how often they sold turtle meat. Four vendors (50%) had their meat delivered directly to them, 1 bought meat at the harbour and 1 from a fisher's home. Two of the vendors did not answer the question about where they bought turtle meat. Five of the 8 meat vendors reported that the fisher who sells the meat sets the price.

Seven vendors reported that they had noticed a change in the availability of turtle products for them to sell, the majority of these reporting that availability had decreased in the last 5 years and had either decreased or remained the same since they could remember. The main reason cited for the decrease in availability was the moratorium, but one vendor

	Number of fishers selling	Total annual sale reported	Green	Hawksbill	General (unspecified species)
<b>Whole turtles</b>	9	1,801 turtles	1,637	36	128
<b>Butchered turtles</b>	20	3,222 turtles	2,456	297	469

**Table 4.12.** Numbers of turtles of different species sold by fishermen in Anguilla.

said that there wasn't really a market anymore and one said that the supply of turtle meat has disappeared. None of the vendors reported any seasonal variation in sales volume, but 2 vendors indicated increased sales during carnival month (August) when people from other Caribbean islands, who are accustomed to turtle steak and stew, visit Anguilla and are keen to eat turtle meat. Anguillians who live abroad and return home for Carnival are also reported to want to eat turtle as it is a special dish.

Three factors were reported to influence how much was charged for turtle on the vendor's menus: purchase price, profit margins and current price trends. The average price charged for a serving of turtle was US\$13.12 (max US\$18, minUS\$7.46). One vendor reported that the sale of turtle was very important to his business, 5 that it was of little importance and 2 did not answer this question. When asked about changes in demand for turtle, 3 vendors said that the change had been in availability, not demand and that there was still a market for turtle meat in Anguilla. One vendor reported that people still ask for it and he tells them that it is banned and cannot be served. According to this respondent, in recent years more local people have asked about turtle meat, whereas in the past it was tourists, particularly from Europe, who were interested. Five vendors reported that local people were the main purchasers of turtle meat, while 2 said that more men bought it and 2 indicated that it was a favourite among European tourists. With the exception of 1 vendor who reported that residents in Anguilla disagreed with the sale of turtle products and 2 who reported that tourists disagreed, the general perception was that all customer groups (i.e. local people, naturalised residents, residents and tourists) either agreed with the sale of turtle products or had no opinion on the matter.

#### 4.7.5.3. Consumption of turtle meat

The vast majority of respondents to the TCOT SEQ (n=62, 86.1%) said that they had eaten turtle meat in the past. Respondents enthusiastically shared recipes and pointed out herbs that used to be used to flavour turtle stew (Photo 4.18). One person said that he was still consuming turtle meat and a minority of the survey audience (n=8, 11.1%) reported that they had never consumed turtle meat. The reasons given for never consuming turtle products included conservation, personal choice and a lack of availability. Thirty-five (56.5%) respondents who used to consume meat and other products, but no longer did, gave the moratorium as the reason for stopping. In keeping with this, a majority of respondents (35) reported that they had stopped consuming turtle products in the 1990s.

Other reasons for stopping included religion (2), no longer fishing for turtle (2), conservation (15), turtle products being unavailable (8), dislike of turtle products (9) and no interest (1). Seven respondents said that they had only used turtle products "long ago" and 1 did not answer the question.

Forty-six of the consumers interviewed reported using turtle more than once a year (yearly, 14; monthly, 21; weekly, 10 and daily,1). Green turtle was clearly the preferred meat



**Photo 4.18.** "Stingin' Thyme", a favourite herb used to flavour turtle stew (Photo P. Richardson).

species with 31 (64%, n=46) of respondents citing this preference. Twelve respondents said they did not distinguish between species, 5 preferred hawksbill meat and 2 said they preferred loggerhead meat.

Only 19 of those who consumed meat on a regular basis reported purchasing the product. It was more common (27) for people who used turtle meat to either fish for it themselves or receive meat as a gift. Of those who did purchase meat, most (12) said that it was available all year round. The average price of turtle meat was reported to be US\$2.80/lb, with a maximum of US\$11.00 paid for a turtle dish in a restaurant, and a minimum price per lb reported to be US\$0.65. Twenty-three consumers also reported giving turtle meat away as a gift to friends, neighbours and family (green, 18; hawksbill,13; no preference, 4). Of the 46 regular turtle consumers, only 4 made reference to the fact that turtle meat is a "strong" meat, believed to enhance virility and 1 said that it had medicinal properties.

Based on a calculation of how many times turtle was consumed in a year and how much constituted a meal, the 46 regular consumers interviewed reported that they used a total of about 759kg of turtle meat per year. Average consumption was around 23.7kg per household per year, the maximum reported was 141kg and the minimum 0.4kg. Respondents reported using between 2lbs and 6lbs of turtle meat per meal depending largely on the number of people in the household. While for many turtle meat was an occasional variation in the diet, it appears to have constituted a very important source of protein for some families.

#### 4.7.6. Trade in shells and shell products

Little has been written about the volume of local trade in turtle shells and shell products in Anguilla. Meylan (1983) reported that carapaces of green and hawksbill turtles were dried and sold locally though there was no local handicraft in tortoiseshell. She observed the shells of 15 juvenile hawksbills and 1 sub-adult green turtle on sale at various places in Anguilla. In 1983, polished juvenile turtle carapaces were for sale at a shop in Sandy Ground, at the

airport and at a restaurant in Island Harbour (Richardson & Gumbs 1983). According to Meylan (1983) traders from St. Thomas (US Virgin Islands) and Puerto Rico are said to have periodically visited Anguilla to buy turtle shell. The price in 1980 was reported to be US\$20/kg. Furthermore, Anguillian fishers were reported to be selling hawksbill scutes and whole turtle shells to traders on St Martin where, in 1980, there was a dealer exporting shell from the Northern Leeward Islands to Holland. Despite offering US\$100/kg, he was only able to purchase half the amount of shell he had been able to in previous years (Meylan 1983). Years ago there are reports that some individuals from Japan came to Anguilla looking for shells (R. Hodge (DFMR) pers. comm. 2002). There have been no instances of prosecution due to international trade infringements.

#### 4.7.6.1. Sale of shells and shell products by turtle fishers

##### Whole shells

Sixty-two % (13) of turtle fishers who sold turtle meat or shells, sold whole turtle shells. Three of these said that they only ever sold green turtle shells, while 3 sold green and hawksbill shells, and 7 answered for turtles in general and did not specify which species the shells they sold came from. The 6 fishers who sold whole green turtle shells reported a total annual sale of 2,717 shells. One fisher accounted for most of this annual sale, and reported having sold 2,000 whole green turtle shells to traders in Anguilla and in St Martin each year prior to the moratorium. Whole green turtle shells sold as decorative items for between US\$20 and US\$100 with an average price of US\$39.52. One fisher reported that whole green turtle shells were sold for the same price as meat (US\$2.24/lb), as people would cook up the shells along with the flesh for soups and stews.

Though whole hawksbill turtle shells were reported to be worth slightly more than green turtle shells (US\$20-US\$150), only 3 fishers said that they sold hawksbill shells. The reported annual sale of whole hawksbill shells was 105 shells. This is consistent with reports of a lower catch of hawksbill turtles in Anguilla compared to green turtles, but does not support reports that some fishers were specifically targeting hawksbills to fuel the trade in shells (Meylan 1983). The reported annual sale of whole hawksbill shells was 105 shells.

Of the 7 fishers who did not specify which species the shells they sold came from, none reported that they sold more than 20 shells per year. They reported a total annual sale of 52 shells that sold for an average price of US\$20.21. The price of whole shells was said to be constantly changing as prices were discussed between the buyer and seller and were influenced by the size, quality and species of turtle.

Eight fishers reported selling whole shells at points of sale consistent with a local market (on the street, at the harbour, at people's homes) and 8 reported selling them at places consistent with a tourist market (market in St Martin, restaurants, retail outlets, hotels), with most fishers catering

to both markets. All those who reported to be selling to retail outlets were selling to a well-known trader in North Hill Village. This trader was interviewed for the TCOT SEQ and details of his interview are discussed in 4.6.6.2 below.

##### Shell pieces (scutes)

Eleven fishers reported to have sold shell pieces, but only 9 provided any detail about this sale. Of these, 8 reported to have sold hawksbill scutes while 1 fisher said he sold the scutes from 75 green turtles each year for US\$2.99/lb, and 1 said he sold the scutes from 1 or 2 turtles of unspecified species each year for US\$3.73/lb. The annual reported sale of hawksbill scutes amounted to scutes from 207 turtles. Two fishers reported selling just a few pounds of scutes each year. Information about the price of hawksbill scutes is fragmentary. One fisher only sold scutes many years ago and reported receiving 2-3 shillings per pound. Prices reported from more recent years ranged from US\$0.65 to US\$15 per pound. One fisher reported selling worked items like bracelets and pendants that he would occasionally make out of hawksbill shells discarded by his father. He reported getting about US\$7.50 per item. Some scutes were sold locally, but the majority of sales were to traders from other Caribbean islands (St. Lucia, St. Kitts and Antigua), the local trader in North Hill Village or to a retail outlet known as "The Factory" in the Valley.

#### 4.7.6.2. Sale of shells and shell products by direct vendors

The TCOT SEQ identified 9 direct vendors who used to sell turtle products, and only 1 of these regularly sold shells or shell products. From TCOT SEQ interviews, he appears to have been the only person dealing in any amount of shells and scutes. This respondent acted as a broker for shells



Photo 4.19. Whole green and hawksbill turtle shells on display in a restaurant (Photo P. Richardson).

and scutes that he would purchase directly from fishers. He purchased hawksbill scutes and whole green turtle shells on a monthly basis. Traders came to him from the Dominican Republic and bought whatever scutes he had accumulated from fishers since their last visit, and sold him items that had been made from scutes (e.g. pendants, bracelets and earrings) as well as a wide range of other souvenirs. During the 1980s, he said that he began to notice that tourists were no longer buying tortoiseshell items. He believed this was because it was no longer legal for them to take these products into their own countries. As a result of this decline in the market, he stopped buying from the Dominicans. The vendor reported that the Dominicans stopped coming to Anguilla altogether in the 80s when the government started taxing them. He has since closed his gift shop and no longer trades in any souvenirs or turtle shells, though he showed TCOT staff a few pieces of stock that were left over from his days in the souvenir business.

#### 4.7.6.3. Consumption of turtle shell and shell products

All 72 respondents to the TCOT SEQ were asked if they had ever used shell or shell products. Forty-seven % of respondents (n=34) said that they had used whole shells and 23% (n=17) said that they had used worked shell or shell products. Though quite a large number of people owned or used whole shells, this does not appear to represent a flourishing local market as most shells and shell products seem to have been given rather than sold.

#### Whole shells

According to respondents, both green and hawksbill shells were used whole. Most whole shells were used decoratively in people's homes and were given or received as gifts. One respondent recalled that turtle shells were used as receptacles for feeding pigs. From the TCOT SEQ it appears that the local trade in whole shells was negligible. Only four people reported ever purchasing a whole turtle shell and only 2 of these could remember what they paid for the shells: one US\$70 and the other US\$22.50. Shells were purchased directly from fishers. Sixteen people said that they had given whole shells as gifts to others, mostly to friends and family (n=12), but also to tourists (n=4). The number of shells used was expressed either as a total or as a number used annually. Fifteen respondents reported the number of shells they had owned in a lifetime, which amounted to 50 shells. Four respondents said that they would use whole shells each year and this amounted to an annual number of 120 shells.

In general, people reported a decrease in the availability of shells in the past 5 years due to the moratorium. Slightly more people had noticed an increase immediately prior to the moratorium than those who reported to have noticed a decrease in the same period.

#### Shell products

Meylan (1983) reported that there was no real local handicraft in tortoiseshell in Anguilla and this is borne out by the findings of the TCOT. It appears that local use of shell products on Anguilla was limited to owning a home-made



**Photo 4.20.** A bucket of hawksbill scutes left in a fisher's backyard from a time when he used to sell to traders (Photo P. Richardson).

guitar pick, hair slide, ornament, or piece of jewellery that had been fashioned elsewhere. Whatever shell products were produced were derived from hawksbill turtles. Once again, only 4 people reported ever having purchased something made of turtle shell and only one of these remembered that he had paid US\$25 for a bracelet. Whereas whole shells seem to have been quite frequently gifted to others, only four people reported giving shell products to friends and family (n=3) or tourists (n=1) as gifts. In general, people reported a decrease in the availability of shell products in the past 5 years due to the moratorium. Slightly more people had noticed an increase immediately prior to the moratorium than those who reported to have noticed a decrease in the same period.

#### **Recommendation**

#### **4.1.2.4. Recommendations regarding Multilateral Agreements**

*Gazette legislation to transpose CITES to domestic law.*

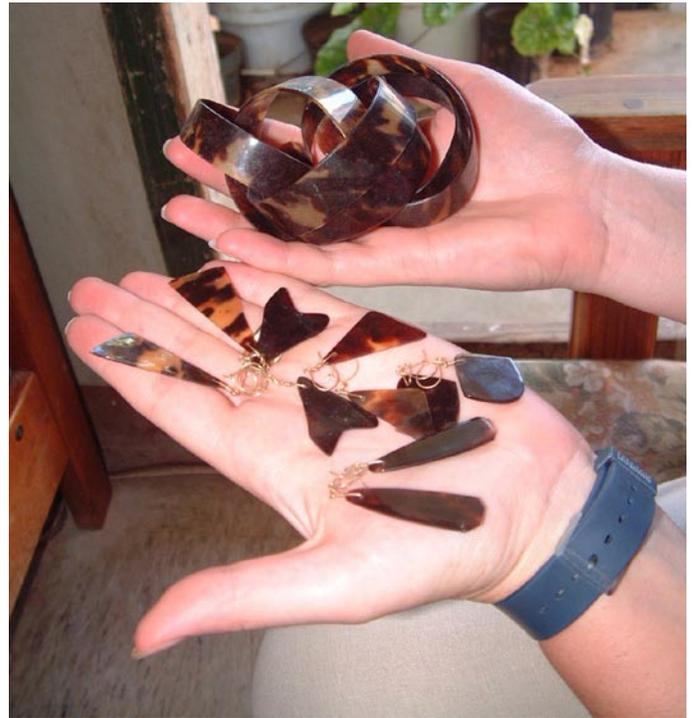
#### 4.7.7. Incidental catch in marine fisheries

One of the regulations introduced by Anguilla to limit by-catch, and linked to the moratorium on turtle fishing, is a ban on gill-net fishing. Currently, only beach seine nets are allowed on the island and fishers are only allowed to deploy nets when they see fish. In addition, nets can only be kept in the water for a limited time. Since most fishers are now working set gear such as lobster traps, it is believed that there is little accidental entanglement (R. Hodge (DFMR) pers. comm. 2002).

Prior to TCOT, reported incidences of accidental capture of turtles were limited. One of the fishers interviewed by Connor and Connor (1998) reported accidentally catching a turtle off Sombrero with a rod and line. On 2 occasions in 1998-1999, an experimental long line fishery project entangled leatherback turtles, which were released alive (MacAlister Elliot & Partners Ltd 2003; Weidner *et al.* 2001). Anguillan authorities have seized Taiwanese vessels that have illegally set long-lines in Anguilla's territorial waters, but there are no data available on turtle by catch incurred (O. Vanterpool (DFMR) pers. comm. (2002); Weidner *et al.* 2001).

Information from the TCOT SEQ generally seems to support the reports of limited incidental catch, however, there are a few issues that are worthy of note. Of the 39 fishers interviewed, 20 said that they had accidentally captured turtles while targeting other species. For the most part this was reported to happen only occasionally, however, 2 fishers reported frequently catching turtles in gear set for other species.

One was a fisher who used set nets to capture sharks and rays. The nets deployed for these species are virtually identical to turtle nets. He reported catching 3-4 green turtles in each net set – amounting to an accidental catch of hundreds of turtles each year. Most of these turtles were alive when captured and were released because of the moratorium. These nets have been illegal in Anguilla since the moratorium was first introduced in 1995, but it seems that this fisher at least has continued to use them. He said that he believed others also captured turtles accidentally, but did not wish to discuss this. The other fisher who reported a higher than average by-catch was using the legal beach seine nets used to catch jack. These are deep, small mesh nets that are set to encircle a school of fish and, according to this fisher, regularly capture turtles. Once again an accidental catch of hundreds of turtles each year was reported, and the fisher said that most turtles are captured alive and that they are released because of the moratorium. Both green and hawksbill turtles are caught in these nets. This fisher indicated that there used to only be a small number of people who could afford to fish for jack because of the high cost of beach seine nets. However, since other nets have been banned, more people have begun to use these nets and anyone using beach seine nets would catch turtles, which leads him to believe that turtle by-catch is on the increase in Anguilla.



**Photo 4.21.** Tortoiseshell pieces bought from foreign traders and left over from a time when a vendor sold these items in a shop in Sandy Ground (Photo P. Richardson).

TCOT staff witnessed Anguillan fishers legally setting a seine net in Little Bay (see Photo 4.23), a designated marine park (see section 3 for details of legislation governing fishing in marine parks). This area has been identified as an important foraging site for green and hawksbill turtles. Though TCOT staff did not see the net being hauled, the fisher later reported to them that 2 green turtles and one hawksbill were caught and released on that occasion. In addition to incidental capture in seine and set nets described above, the 18 fishers who reported occasional incidental catch reported turtles being caught or entangled in a variety of gear. Eight fishers reported turtles becoming entangled in the buoy ropes attached to their fish or lobster pots. Except for 1 hawksbill, all of these were leatherback turtles. Though leatherback meat is known to have been used in Anguilla, fishers would generally not take these animals either because of the moratorium, because they did not want the meat or because the animals were simply too big to handle. Five fishers reported small turtles, most often hawksbills, getting inside their fish traps and drowning as they were not able to escape. Two fishers reported catching turtles on a hook and line and one described accidentally spearing a turtle that was sheltering in a hole as he thought it was something else. In general it was reported that turtles were released if they were alive and used or sold if they were dead, but fresh. Turtles caught in fish traps would usually be inedible as traps are not checked daily, and would therefore be discarded. Some fishers specified that they would not use any turtle captured incidentally since the moratorium had been introduced, but timescale was not asked and it is therefore impossible to say whether the moratorium has impacted on the course of action fishers would choose.

#### 4.8. Indirect Use

Indirect use of turtles in Anguilla has not developed in the same way as it has in some of the other OTs. Turtles appear on the currency (East Caribbean Dollar) and on T-shirts sold in souvenir shops, but do not have the ubiquitous presence they do in the Cayman Islands for example.

The Anguilla National Trust (ANT) has expressed an interest in developing a tourism component like turtle watching, partly to see whether non-consumptive practices might curb egg collecting. To date the Trust has had only limited contact with the tourism industry through the sale of Turtle T-Shirts. This venture met with some success and there was a feeling that turtles could act as a good flagship species to attract tourists' attention to the marine environment and

bring much-needed funds into the Trust (Christian (ANT) pers. comm. 2002). Early on in the TCOT process, the Trust also expressed an interest in developing a volunteer driven turtle research programme in Anguilla (K.Hodge (Government of Anguilla) pers. comm. 2002). There have however been substantial staff changes since these issues were discussed and the ANT perspective on future use of turtles would need to be re-evaluated. There is however always significant public interest when people are aware of a nesting event (see Photo 4.28). The Anguilla Tourist Board (ATB) indicated that there is a move towards developing more tourism ventures with an environmental slant on the island, including things like turtle watching (Niles (Anguilla Tourist Board) pers. comm. 2002).

#### Information from the TCOT SEQ

We interviewed 17 indirect users of turtles and their use of turtles varied widely. Three primary areas of indirect turtle use were identified: using turtles as an advertising feature, using turtles as an attraction and having turtles as a feature of your professional activities. Multiple answers were allowed.

The most frequently cited reason for using turtles was because they are attractive to customers and this is a reflection of the fact that turtles are most often indirectly used as an attraction for foreign tourists. Tourists were said to be more likely to ask about turtles than local people and, on average, the majority of indirect users' customers are tourists. Information gathered from visitor exit surveys by the Anguilla Tourist Board in April 2004 indicates that only 2% of visitors engaged in SCUBA diving, while 13% went snorkelling while in Anguilla ([www.gov.ai/statistics](http://www.gov.ai/statistics)). The



**Photo 4.22.** Fishers setting a beach seine net in Crocus Bay (Photo S. Ranger).



**Photo 4.23.** Fishers bringing in a beach seine net in Crocus Bay (Photo P. Richardson).



**Photo 4.24.** Seine netting in Little Bay Marine Park (Photo S. Ranger).

Once in a lifetime	<10 in a lifetime	Rarely	2-4/year	Frequently
9	2	5	2	2

**Table 4.13.** Reasons given for no longer consuming turtle products.

TCOT SEQ indicates that there was a general perception that interest in turtles among foreign tourists was increasing. While an increase in interest among local people was recorded, one respondent indicated that whereas local people used to be interested in turtles from the viewpoint of eating them, they are now interested in conservation, highlighting that it is perhaps not the level of interest that has changed, but the focus of interest. The most frequently cited reason for a change in the level of interest in turtles was an increase in conservation awareness. Other reasons mentioned included the moratorium, the media, a desire to resume fishing and the perceived increase in the number of turtles. Two respondents gave the fact that people are no longer allowed to use turtles as the reason for a decrease in local interest in turtles.

Though indirect users involved in the tourist industry said that they used turtles to advertise their business and/or attract customers, only 3 believed that use of their services would decline if turtles were no longer found in Anguilla. However, nearly half the indirect users (47%, n=8) said that turtles were very important to their business and a further 5 (29.4%) said they were somewhat important. Ninety-four % of indirect users said that they believe turtles are economically important in Anguilla and 100% agreed that that some income from tourism should contribute to marine turtle conservation.

**4.9. Attitudes to conservation**

The 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'. While full details of responses to these questions are being analysed further, 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 (95.8%)

- As turtles are migratory, they should be managed in cooperation with neighbouring states (91.7%)
- The government needs to actively work to protect sea turtles (84.7%)
- Turtles play an important ecological role in our natural environment (84.7%)
- Turtles should be protected, regardless of their use to humans (79.2%)
- Turtles are culturally valuable in this OT (76.4%)
- Turtles are economically valuable in Anguilla (73.6%)
- Some income from tourism should be used to support sea turtle conservation efforts (72.2%)
- Turtle fishing should be stopped until more is known about the size and health of the turtle populations (65.3%)



**Photo 4.25.** Anguillian currency, East Caribbean dollars, featuring a marine turtle.

<b>Advertising</b>	<b>Attraction</b>	<b>Professional</b>
<i>Turtles are used as a way of promoting goods or a service</i>	<i>Guests are told that they have a chance of seeing live turtles</i>	<i>Involvement in marine turtle research, conservation and education</i>
2 Boat operators	4 Boat Operators	3 Government employees
2 Dive Operators	3 Dive Operators	1 NGO
2 Gift Shops	2 Gift Shops	1 Teacher
	2 Restaurants*	
	*Tourists able to view live turtles at sea from the restaurant	
6 (35%)	11 (64.7%)	5 (29%)

**Table 4.14.** Summary of indirect use of turtles in Anguilla



**Photo 4.26.** Anguillian stamps featuring marine turtles.

- Existing laws protecting marine turtles are effectively enforced (63.9%)
- Government needs to do more to ensure that existing laws regarding marine turtles are effectively enforced (55.6%)
- Local people should be allowed to purchase sea turtle meat (55.6%)
- Local people should be allowed to catch and eat sea turtles, provided it does not harm the regional population (54.2%)
- Turtles should be used both as tourist attractions and as a source of food (51%)
- Turtles should be used as a tourist attraction rather than as a source of food (50%)
- Tourists should be allowed to purchase sea turtle meat (50%)



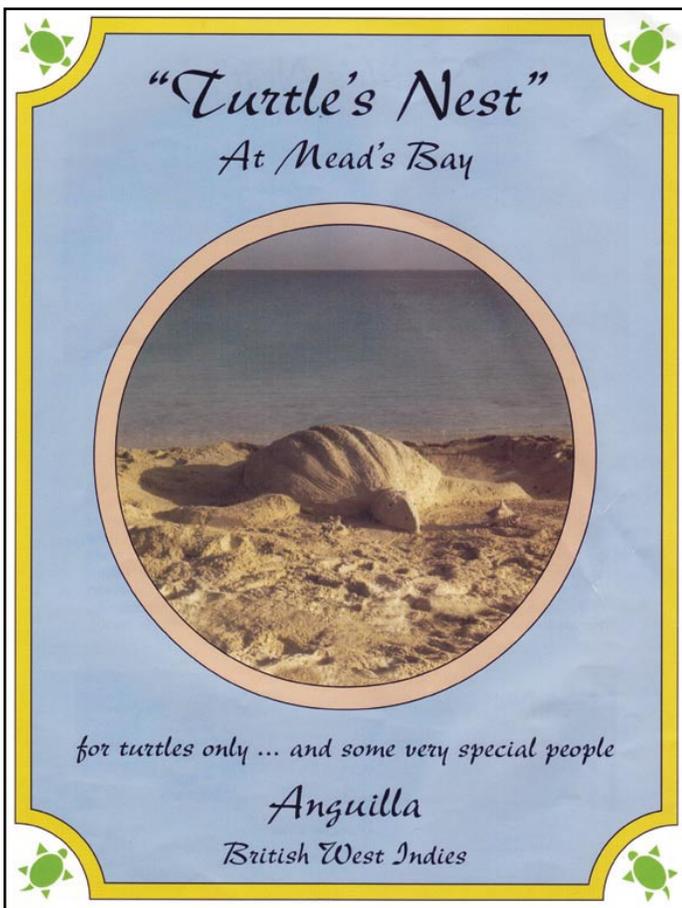
**Photo 4.28.** Staff at Cap Juluca, an exclusive hotel, enjoy the spectacle of a nesting leatherback turtle, May 2004 (Photo P. Richardson).



Most respondents disagreed with the following statements:

- Turtle fishing should be unregulated (68.1%)
- Turtle fishing should be stopped completely (54.2%)
- Tourists should be allowed to purchase sea turtle shell and take it home with them (51.4%)

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 a regional conservation approach. The local capture, consumption and sale of sea turtle meat is widely supported, but it is important to note that respondents frequently qualified their responses by saying that they agreed with certain statements, e.g. Local people should be allowed to purchase sea turtle meat, on the understanding that it was LEGAL to consume turtles. The support for consumptive exploitation should not be interpreted as defiance of the existing moratorium. Respondents agree that government has a critical role to play in turtle conservation and generally feel that they should be actively involved in turtle conservation. While many feel that the laws are effectively enforced in Anguilla, there was also a strong feeling expressed that the government could do more to ensure effective enforcement. This appears contradictory, but could reflect people's belief that Anguillians are generally compliant, but that there are still those who will break the law given the chance. While there is support for the continuation of a turtle fishery, this



**Photo 4.27.** Brochure for beachfront accommodation called "Turtle's Nest" at Mead's Bay, Anguilla.

is coupled with strong support for regulation of the fishery. Views on whether or not tourists should be able to consume and/or buy turtle products vary depending on the product. Though there is general agreement that tourists should be allowed to purchase meat, people disagree with tourists taking shells home with them. Turtle fishers showed strong support for turtle fishing and for the rights of others to use turtle products. Fishers also showed opposition to indirect use of turtles as a tourist attraction taking precedence over consumptive use.

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 Anguillian population.

#### **4.10. Capacity Building and Outreach Activities During TCOT**

##### **4.10.1. Capacity building**

In September 2002, James Gumbs attended the TCOT training workshop in the Cayman Islands, having attended the Bermuda Turtle Project In-water course earlier that year.

With support from the Foreign and Commonwealth Office, Carlos Sasso was able to attend the Bermuda course in 2003. In addition, DFMR staff have been closely involved in all fieldwork carried out by TCOT staff. Therefore, the capacity of the DFMR staff to carry out marine turtle monitoring has been significantly improved through the TCOT project. TCOT staff were also instrumental in securing a grant from the British Chelonia Group for the construction of turtle nets.

At every opportunity, local fishers were involved in research activities and it is important to note that this area of local capacity building and local involvement proved very successful in Anguilla.

##### **4.10.2. Outreach activities**

Anguilla has been part of the generic dissemination outputs of the TCOT project (see section 12), and in collaboration with project partners TCOT was particularly successful in attaining a number of media outputs. TCOT staff have regularly appeared on Anguillian radio and in the local press and DFMR staff have also been featured following their participation in TCOT training initiatives.



**Photo 4.29.** TCOT and DFMR staff with fishers after successful sampling at Fish Hole Pond, Scrub Island in 2002 (Photo S.Ranger).

## Recommendations

**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.*

## 4.11. Acknowledgements

Firstly we thank the 72 individuals who gave up their time to answer the TCOT SEQ and who so generously shared their experiences and opinions. Their contribution is central to this report.

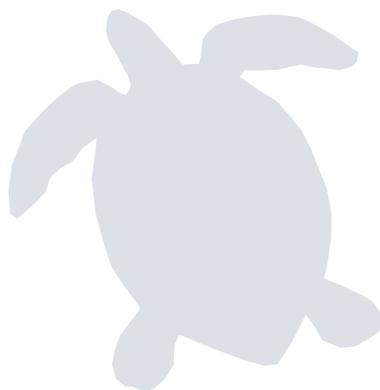
Throughout the planning and execution of this project, we have received nothing but support from everyone we have dealt with in Anguilla, but we would like to express our particular appreciation to a few people. Many thanks to the Acting Director at the Department of Fisheries and Marine Resources, Othlyn Vanterpool, for his personal interest, encouragement and willingness to make staff time available. We also thank the staff at DFMR: James, Carlos, Joslyn and Sharleen for their humour and countless hours spent beside, on or under the water in pursuit of turtles or information about turtles! Thanks also to the former Director of the DFMR, Roland Hodge, for introducing us to Anguilla, its cays and islands and its turtle fishing history and for all the time spent answering questions. We would also like to acknowledge the support the DFMR received from the British Chelonia Group to cover the cost of sampling nets. In his ever-changing guises Karim Hodge has been a constant support to the TCOT project from excavating nests to arranging CITES permits – our thanks to him for all his efforts. Thanks also to the Permanent Secretary to the Chief Minister, Mr. Rodney Rey, for his time and

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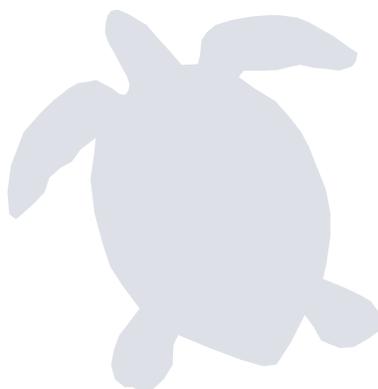


# An Assessment of the Status and Exploitation of Marine Turtles in Bermuda



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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.

## 5. Status and Exploitation of Marine Turtles in Bermuda

### Contents

	Page
<b>5.1. Summary and Recommendations</b>	<b>79-80</b>
<b>5.2. Geographic Overview</b>	<b>81</b>
<b>5.3. Historical Overview</b>	<b>81</b>
<b>5.4. Organisations Involved with Marine Turtles in Bermuda</b>	<b>81</b>
<b>5.5. Status of Nesting Marine Turtles in Bermuda</b>	<b>81-83</b>
<b>5.6. Status of Foraging Marine Turtles in Bermuda</b>	<b>83-87</b>
5.6.1. Data gathered from the TCOT socioeconomic questionnaire	83-84
5.6.2. Overview of the work of the Bermuda Turtle Project	84-87
5.6.3. Threats to marine turtles in Bermuda	88
<b>5.7. Direct Use of Marine Turtles in Bermuda</b>	<b>89-91</b>
5.7.1. Overview	89
5.7.2. Harvest of adults on the nesting beach	89
5.7.3. Harvest of eggs	89
5.7.4. Harvest at-sea	89-90
5.7.5. Trade in shells and shell products	90
5.7.6. Incidental catch in marine fisheries	90-91
<b>5.8. Indirect Use</b>	<b>91-92</b>
5.8.1. Turtle watching on beaches	91
5.8.2. Dive/snorkelling tourism	91
5.8.3. Aquaria holding captive turtles	92
5.8.4. Other marketing/cultural uses	92
<b>5.9. Attitudes to Conservation</b>	<b>92-93</b>
<b>5.10. Capacity Building and Outreach Activities During TCOT</b>	<b>94</b>
5.10.1. Capacity building	94
5.10.2. Outreach activities	94
<b>5.11. Acknowledgements</b>	<b>95</b>
<b>5.12. References</b>	<b>95</b>

## 5.1. Summary and Recommendations

### Summary

The nesting marine turtle populations that once used the beaches of Bermuda are now extinct. Currently, large numbers of juvenile green turtles are found in Bermuda's waters along with a smaller number of hawksbill turtles (see table 5.1.). Loggerheads and leatherbacks rarely visit Bermuda's waters. There are historical records of Kemp's ridleys from Bermuda, but none have been encountered in recent memory. A long-term green turtle monitoring project has been in operation in Bermuda for over 30 years and has produced valuable data on population structure, migrations, genetic identity and habitat use. Methodological variance over the three decades hinders interpretation of trend data on marine turtle abundance. Limited data regarding the perceptions of fishers and others subject to the TCOT socioeconomic questionnaire suggest that, although most species are generally perceived to have decreased in the long term, in the last 5 years the green turtle populations are generally perceived to have increased. Although formerly the site of a marine turtle fishery, turtles are no longer subject to direct harvest in Bermuda, although boat strikes, fatalities due to marine debris, incidental capture in marine fisheries and loss of sea grass habitat are considered threats to Bermuda's sea turtles worthy of further investigation.

### Summary of Recommendations

TCOT recommends that the Government of Bermuda continue to take all necessary steps to ensure the sustained existence of populations of marine turtles in Bermuda and facilitate their recovery. Bermuda appears to have lost its nesting populations, but still hosts significant foraging aggregations of juvenile turtles, especially green turtles. Although quantitative trend data are lacking, the general abundance and perceptions thereof by fishers and others in Bermuda seem to suggest that current management is resulting in a population increase of the green turtle. We make a number of specific recommendations under the following general headings:

#### 5.1.1. Systematic monitoring of marine turtle populations to determine trends in abundance

5.1.1.1. Additional effort is expended on orienting in-water capture work of the BTP towards yield of CPUE data for green turtles.

5.1.1.2. Monitoring efforts on hawksbill turtles should be expanded.

5.1.1.3. Continued monitoring should be carried out at main potential nesting sites to ensure possible positive results of the past headstarting experiment do not go unnoticed.

5.1.1.4. Extend monitoring of possible impacts of bycatch and marine debris.

#### 5.1.2. Increase capacity for marine turtle management

5.1.2.1. Ensure the Department of Environmental Protection has the long-term capacity, staff and resources to carry out all enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis.

5.1.2.2. Continue and increase the regional capacity building role of the BTP training course.

**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

Species	Nesting	Foraging	Harvest
<b>Green Turtle</b> ( <i>Chelonia mydas</i> )	None since 1937	Juveniles present. Large numbers in some areas	Thought to be eliminated
<b>Hawksbill Turtle</b> ( <i>Eretmochelys imbricata</i> )	None	Juveniles present Small numbers	Thought to be eliminated
<b>Leatherback Turtle</b> ( <i>Dermochelys coriacea</i> )	None	Rarely encountered	None
<b>Loggerhead Turtle</b> ( <i>Caretta caretta</i> )	One nest in 1990	Rarely encountered	None

**Table 5.1.** Marine turtle species present and summary of harvests in Bermuda.

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

### 5.1.1. Systematic monitoring of marine turtle populations to determine trends in abundance

#### 5.1.1.1. Additional effort is expended on orienting in-water capture work of the BTP towards yield of CPUE data for green turtles.

In recent years, more effort has been focused on generating data that can be used to assess temporal changes in marine turtle abundance in Bermuda's waters. These efforts have not yet been able to generate sufficient trend data to show whether the current management regime in Bermuda is successful. Recent changes in sampling strategy should be examined critically to ensure that these efforts will generate data of sufficient power to detect trends. An integral part of this work should be the continued monitoring and linkage to the health and distribution of seagrass beds.

#### 5.1.1.2. Monitoring efforts on hawksbill turtles should be expanded.

Bermuda hosts a small population of hawksbill turtles. Data on size distribution, genetic identity, maturity status and spatial distribution have been collected by the BTP and BAMZ through incidental captures and through strandings. Hawksbills are rarely caught in the net used to capture green turtles. Since 2000, the BTP has dedicated annual sampling effort to swimming transects of suitable habitat with teams of snorkelers, capturing hawksbills by hand. This has proven to be a successful technique, but apparent low density of this species in Bermuda precludes large sample size for study, and has hindered evaluation of population trends.

#### 5.1.1.3. Continued monitoring should be carried out at main potential nesting sites to ensure possible positive results of the past headstarting experiment do not go unnoticed.

It is still possible that individuals translocated to Bermuda could return to nest. It is important that at least some monitoring is carried out around likely candidate beaches to ensure this does not go unrecorded. Given that green turtles leave substantial tracks and pits and they typically nest at least three times over 1-2 months in a season, it is unlikely that nesting would go unnoticed if beaches were checked at intervals of 1-2 weeks in June-August (the likely peak nesting months).

#### 5.1.1.4. Extend monitoring of possible impacts of bycatch and marine debris.

Other than boat strike, the main threats to marine turtles in Bermuda's waters appear to be bycatch in marine fisheries, including both local fishers and those on international vessels operating on the high seas, and fatalities due to encounters with non-degradable marine debris (ingestion

of plastics, entanglement in flotsam). These factors warrant further investigation.

### 5.1.2. Increase capacity for marine turtle management

#### 5.1.2.1. Ensure the Department of Environmental Protection has the long-term capacity, staff and resources to carry out all enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis.

The staff of the Department of Environmental Protection carrying out the fieldwork of the Bermuda Turtle Project are well skilled in the field and data collection techniques needed for ongoing monitoring and research. However, although this initiative is relatively well resourced in comparison to many OTs, the BTP is reliant on outside donor and specialist scientific support. It is important for a long-term legacy of marine turtle monitoring and research that local ownership and co-management of data sets gathered with outside researchers are further developed to facilitate the enhancement of institutional memory and capability. This will insure against changes in capability of external workers to participate in the future.

#### 5.1.2.2. Continue and Increase the Regional Capacity Building Role of the BTP Training Course.

The importance of this initiative in regional capacity building cannot be underestimated. It has been well utilised to date by TCOT partners (see section 11). Given the wide genetic origins of marine turtles in Bermudan waters, it is possible that positive benefits of Bermuda-based capacity building efforts could be detected in Bermuda in the future. Given the excellent track record of this initiative, additional external funding would be well deserved and is highly likely.



Figure 5.1. Map of Bermuda.

## 5.2. Geographic Overview

Bermuda (32°20'N, 64°45'W; Figure 5.1) is made up of approximately 180 limestone and coral islands and islets, 20 of which are inhabited. The eight largest islands - St George's Island, St David's Island, Bermuda Island, Somerset Island, Watford Island, Boaz Island, Ireland Island North, Ireland Island South - are connected by causeways and bridges. Total land area is 58.8 km<sup>2</sup> and the coastline is 150 km. The population is 64,900 (July 2004 est.), and per capita GDP is \$36,000 (2003 est.), the highest of the OTs. Tourism and international business are the main sectors of the economy. Over 500,000 tourists visit Bermuda each year, more than 80% of whom are from the USA.



**Photo 5.1.** Green turtle under X-ray at the Bermuda Aquarium Museum and Zoo Wildlife Rehabilitation Centre (Photo. J. Gray).

## 5.3. Historical Overview

Bermuda once had an assemblage of nesting as well as foraging green turtles. Murray (1991) gives the account of William Strachey, shipwrecked with other survivors in Bermuda in 1609:

*“The tortoyse is a reasonable toothsam (some say) wholesome meat. I am sure our company liked the meate of them veerie well, and one Tortoyse would goe further amongst them, then three hogs. One Turtle (for so we called them) feated well a dozen Messes, appointing sixe to every Messe. It is such a kind of meat, as a man can neither absolutely call Fish nor Flesh, keeping most what in the water, and feeding upon Sea-grasse like a Heifer,*

*in the bottome of the Coves and Bayes, and laying their Egges (of which wee would find five hundred at a time in the opening of a shee turtle) in the Sand by the shoare side, and so covering them close leave them to the hatching of the Sunne, like the Manati at Saint Dominique, which made the Spanish Friars (at their first arrival) make some scruple to eate them on a Friday, because in colour and taste the flesh is like morsells of Veale.”*

However, despite seminal protective legislation adopted in 1620, by the end of the 1800s the green turtle nesting population was significantly reduced and Bermudian turtle boats are reported to have fished as far afield as the Bahamas or even Ascension Island (Parsons 1962). The law failed to halt the destruction of the breeding colony and there has been no recorded wild nesting of green turtles in Bermuda since the 1930s. By 1937 there was no laying at all on the main islands although it was felt there may still be some laying on outlying islets (Babcock 1938). The construction of the International Airport in the 1940's led to widespread destruction of the islets in Castle Harbour, which is thought to have further worsened the situation.

## 5.4. Organisations Involved with Marine Turtles in Bermuda

Green turtles have been the focus of a tagging study initiated in 1968 by Dr. H. C. Frick II, a trustee of the Caribbean Conservation Corporation (CCC) in collaboration with the Bermuda Government Department of Agriculture and Fisheries. One of the first scientific investigations of green turtles on their foraging grounds, The Bermuda Turtle Project (BTP) continues today as a joint effort of the Bermuda Aquarium, Museum and Zoo (BAMZ) and the CCC. Drs. Anne and Peter Meylan, research associates of the CCC and the Bermuda Aquarium, serve as scientific directors of the project, and Jennifer Gray of the Aquarium serves as Project Coordinator. The team is assisted by other staff members of Bermuda's Department of Conservation Services, in addition to local and international students and volunteers from the community. For a fuller overview of the BTP see Section 5.6.2.

The Bermuda Aquarium Museum and Zoo collects important data on sea turtle health and mortality through information gathered in their Wildlife Rehabilitation Centre (WRC) and the Bermuda Sea Turtle Stranding Network. Stranding statistics gathered in Bermuda are shared with the Sea Turtle Stranding and Salvage Network (STSSN) coordinated by the National Marine Fisheries Service in the USA.

## 5.5. Status of Nesting Marine Turtles in Bermuda

Between 1967 and 1977, an attempt to re-establish a nesting population in Bermuda saw over 25,000 green turtle eggs flown in from Costa Rica and Surinam and buried on local beaches. The majority were buried on Nonsuch Island and at Howard's Bay on Castle Point. 18,000 hatchlings emerged from these nests. Although, other headstarting

***In the last 5 years...***

	Increasing	Decreasing	Same	Don't know	NR
<b>Green</b>	10	2	3	2	2
<b>Leatherback</b>	0	2	3	11	3
<b>Loggerhead</b>	1	6	1	9	2
<b>Hawksbill</b>	0	8	1	8	2

***Since you can remember...***

	Increasing	Decreasing	Same	Don't know	NR
<b>Green</b>	5	10	1	1	2
<b>Leatherback</b>	0	6	2	8	3
<b>Loggerhead</b>	0	10	0	7	2
<b>Hawksbill</b>	0	10	0	7	2

**Table 5.2.** Fisher perceptions of change in abundance of sea turtles in Bermuda waters over time (n=19 of 25 fishers who noticed changes).

projects around the world have received some level of success (see Mrosovsky in press for review), it may be that hatchlings deployed were either insufficient in number, had inappropriate sex ratios, or did not receive the behavioural cues that would allow re-establishment of a viable breeding population. It remains to be seen if the nesting population has been re-seeded.

In 1990, a loggerhead turtle nest with eggs was discovered on Clearwater Beach and was exposed by beach erosion. The clutch produced three healthy hatchlings. This was the first confirmed nesting of this species in Bermuda (Gray 1990a; 1990b). Given there has been no recorded nesting other than this one nest for over 5 decades, it is likely that all nesting populations of turtles that once used Bermuda are extirpated.

As in all TCOT countries, as part of the TCOT Socioeconomic Questionnaire (SEQ) respondents were asked about changes in numbers of nesting turtles over time. All respondents but one were aware that turtles do not nest in Bermuda. Some respondents were unsure whether or not there may have been nesters within their lifetimes, but all but one knew that there had been none in the last five years. Thus, awareness of the lack of marine turtle nesting activity among respondents was high.



**Photo 5.2.** Sport Diver Ron Porter captures a hawksbill turtle for the Bermuda Turtle Project (Photo: J. Gray).



**Photo 5.3.** Pelagic phase hawksbill turtles are encountered in Bermuda's waters (Photo: J. Gray).

## Recommendation

### 5.1.1.3. Continued monitoring should be carried out at main potential nesting sites to ensure possible positive results of the past headstarting experiment do not go unnoticed.

*It is still possible that individuals translocated to Bermuda could return to nest. It is important that at least some monitoring is carried out around likely candidate beaches to ensure this does not go unrecorded. Given that green turtles leave substantial tracks and pits and they typically nest at least three times over 1-2 months in a season, it is unlikely that nesting would go unnoticed if beaches were checked at intervals of 2 weeks in June-August (the likely peak nesting months).*

of turtles had decreased since they started fishing. One believed turtles had increased in the last 5 years, and two responded that they didn't know (both had retired from fishing for almost 10 years). While these fishers were hesitant to comment on recent trends, their explanations for change suggest they view things positively. Reasons cited for changes in abundance were better management and laws protecting turtles. One fisher suggested overpopulation in Bermuda contributed to declines.

All questionnaire respondents were also asked about changes in numbers of turtles seen in territorial waters over time (in the last five years and since they can remember), both in general and for specific species (Q104). Results are presented for fishers in general, and then for the surveyed population as a whole. Of the 25 fishers interviewed, 19 commented on their perception of the patterns of turtle abundance over time. Their perceptions of change of individual species are shown in Table 5.2.

## 5.6. Status of Foraging Marine Turtles in Bermuda

### 5.6.1. Data gathered from the TCOT Socioeconomic Questionnaire (TCOT SEQ)

In-water turtle work was well developed in Bermuda before the instigation of TCOT and TCOT staff merely visited as guests of the Bermuda Turtle Project. BTP has been working extensively on foraging marine turtles for several decades (see below). BTP volunteer Jennifer Constable executed the TCOT SEQ in Bermuda and much useful information was gathered from fishers.

Fisher opinions on trends in turtle numbers were solicited in two separate questions on the TCOT SEQ. Q24 asked fishers about changes in abundance for all species they fish, in the last five years and since they started fishing. Five fishers were former turtle fishers, although one fished in Australia and one in Jamaica, so the responses of these two individuals regarding trends were excluded. All three who fished turtles in Bermuda believed that the number

The fishers gave little indication as to what they thought with regard to turtles in general, and rather commented on individual species. Of 15 who provided an opinion on green turtle abundance, 10 felt that green turtles had increased over the past five years, with 2 citing a decrease and 3 suggesting no change (2 fishers did not know and 2 did not respond for green turtles). In contrast, when comparing trends for as long as they could remember, 10 of 16 who provided an opinion felt that green turtles had decreased. Only one fisher contended that greens had decreased both in the short and long term. For leatherbacks, most fishers who commented felt that they had decreased in the long term, and decreased or stayed the same in the short term. The majority of fishers felt that loggerheads and hawksbills had decreased in the short and long term.

For the surveyed population as a whole, 37 respondents (52%) noticed a change in general, while 34 (48%) did not.

#### *In the last 5 years...*

	Increasing	Decreasing	Same	Don't know	NR
Green	21	5	3	3	39
Leatherback	0	2	6	19	44
Loggerhead	1	8	5	16	41
Hawksbill	1	12	5	12	41

#### *Since you can remember...*

	Increasing	Decreasing	Same	Don't know	NR
Green	10	17	3	2	39
Leatherback	0	6	5	16	44
Loggerhead	0	12	4	14	41
Hawksbill	0	14	5	11	41

**Table 5.3.** Perceptions of change in abundance of sea turtle in Bermuda waters over time (n=71 respondents)



**Photo 5.4.** Collection ofturtle net (Photo: J.Gray).

Views of all respondents for specific species and in general are shown in table 5.3. In general, respondents who saw a change believed that turtles had increased over the past 5 years, but decreased since they could remember. However, perceived trends were different for some specific species. Leatherback, loggerhead and hawksbill turtles were believed to have decreased in the last 5 years and since respondents could remember. For green turtles, however, most respondents believed them to have increased in the last 5 year (n=21) rather than decreased (n=5). Over the longer time frame (since you can remember), most people believed green turtles had decreased (n=17), but many also believed they had increased (n=10).

Respondents were asked about reasons for the perceived increase or decrease in the number of turtles found in OT waters. Responses varied, but protection was the reason (n=8) cited most often as supporting increases with the only other reason cited being decreased fishing effort. Reasons for decreased numbers included: changing habitat, pollution, overpopulation, environmental pressure, hunting elsewhere, over-harvest, and increased consumption.



**Photo 5.5.** Capture of juvenile green turtle (Photo: J. Gray).



**Photo 5.6.** Loading of turtles onto research vessel (Photo: J. Gray).



**Photo 5.7.** Bermuda Turtle Project captures lined up in their beds on board the research vessel awaiting data collection (Photo: J. Gray).

### 5.6.1. Overviewing the work of the Bermuda Turtle Project

**Peter Meylan, Anne Meylan and Jennifer Gray write:**

Today, only immature green turtles and hawksbills inhabit the island's extensive shallow-water habitats. Greens and hawksbills arrive in Bermuda waters after having spent several years as post-hatchlings in the open ocean. They stay in Bermuda until they move on to an adult foraging ground where they will mature. Greens, leatherbacks, hawksbills, and loggerheads are sighted in the offshore Bermuda habitat. Here we outline the work of the BTP:

#### 5.6.2.1. Project mission/description

The project's mission is to further the understanding of the biology of highly migratory, endangered marine turtles in order to promote their conservation in Bermuda and worldwide. The project provides what is arguably the best window on the post-pelagic, near-shore developmental stage of green turtles anywhere in the world. Turtles on Bermuda's extensive sea grass pastures are captured for study using a modification of the turtle fishing method that was historically employed in the Bermuda turtle fishery. A 2000-ft. entrapment net is set at study sites around the Bermuda Platform, and entangled turtles are removed by

teams of snorkelers and taken aboard a research vessel for study. Between 1992 and 2003, 448 sets were made with the net at 40 sites representing the various suitable marine habitats around Bermuda.

Sampling efforts between 1968 and 1991 were reported on a daily basis rather than by individual set numbers. As of December 2003, the Bermuda Turtle Project has collected data from 2,262 green turtles, approximately 100 hawksbills, and 43 loggerheads. Most of the green turtles were captured in the entrapment net, whereas the majority of hawksbills and loggerheads were obtained from recreational divers or as live or dead strandings. These records provide data on population structure and trends, genetic identity, sex ratios, growth rates, site fidelity, and migratory patterns. The project has made approximately 729 recaptures of its tagged green turtles in Bermudian waters, providing a large and robust data set on growth rates and movements of free-ranging, immature green turtles. Only two hawksbill recaptures have been made in Bermuda waters.

All turtles captured by the Bermuda Turtle Project are studied using a standardized protocol (Meylan *et al.* 1992; 1994; 1999; 2003). All are measured, weighed, and tagged. Each tag bears a unique number, a reward message and the return address of a tag clearing house at the University of Florida in Gainesville, Florida. Since 2001, turtles smaller than 35 cm in carapace length have also been tagged with an internal PIT tag. Blood samples are taken from each turtle for hormone assays that reveal the sex of the turtle by measuring the amount of testosterone in the blood. A separate blood sample or skin biopsy is preserved for DNA sequencing. Captured turtles are released at their initial capture site within an hour or two.

#### 5.6.2.2. Population structure.

Green turtles captured by the Bermuda Turtle Project have varied in minimum straight carapace length at first observation from 22.3 to 81.0 cm (mean±SD; 48.79±12.61, n=1924) and in weight from 1.0 to 86.2 kg (20.27±14.79, n =1927). Although a small number of the green turtles captured are larger than the minimum size at sexual maturity, laparoscopy of a sample of more than 100 individuals suggests that none are mature.

#### 5.6.2.3. Population trends.

The capture method used by the Bermuda Turtle Project involves the setting of an entrapment net on sea grass beds at sites around Bermuda where green turtles are known to feed. Approximately 40 sites have been sampled over the course of the project, including a core group of sites representing various habitat types that has been routinely sampled throughout the 36-year project. From 1992 through 2003, this amounted to 448 sets, averaging 37 sets per year. Since 1992, the same net has been used for every set and the total number of turtles captured per set has been recorded providing a potential data set for catch-per-unit-effort (CPUE) analysis. However, there is a large amount of variance associated with the data. Some of it can be reduced by restricting the sample to data for the most

frequently sampled month (August, n=182 samples) and only the most frequently sampled sites. But other important sources of variation in the capture data remain, such as ambient conditions (time of day, sea state, current, turbidity, water temperature) and learning behaviour on the part of turtles (i.e., turtles that have been captured before may be more successful at evading the net). Unfortunately, we have little control over these variables.

Other variance is likely to be introduced by parameters associated with our netting protocol, such as the stealth used in approaching and initiating the set, exact placement of the net on the grass bed, the speed at which the net is deployed, degree and speed of closure of each set, and whether the lead line of the net remains on the bottom throughout the set. We are addressing these procedural sources of variation in several ways, including making



Photo 5.8. Blood sampling (Photo BTP).



Photo 5.9. Release of tagged turtle (Photo. J. Gray).

some uniform “blind” sets during each sampling session at net site locations that have enough “landmarks” that we can encompass approximately the same area of the sea grass bed each time. Although we currently employ a high-quality GPS unit, it is difficult to use it to set the net exactly in the same place each time. Another directive of the netting protocol for trend evaluation is that the net site is approached directly (not crossed) and the net is deployed upon arrival at a designated starting spot regardless of whether turtles are seen in the area. This is not always the case in other sets because we sometimes reconnoitre an area and delay setting until turtles are sighted, attempting to maximize the number of turtles captured (i.e., to get new tags put on, to recapture turtles for growth and movement studies) or targeting large animals for deployment of satellite transmitters. The specific methodology we have adopted for sets designed to yield trend data should begin to remove at least some of the causes of variation and provide a robust measure of trends in green turtle abundance in Bermuda.

#### 5.6.2.4. Genetics.

For information on genetics of turtles in Bermuda waters see section 10.5

#### 5.6.2.5. Developmental migration

*Tag returns:* Upon reaching a shell length of approximately 65-70 cm, green turtles depart from Bermuda and migrate to distant foraging grounds where they will complete their development and become sexually mature. External tags allow researchers to determine the locations of these distant foraging grounds. To date, 71 green turtles and one hawksbill tagged by the project in Bermuda have been recaptured in other countries in the western Atlantic, including Nicaragua, Panama, Colombia, Venezuela, Cuba, the Dominican Republic, Grenada, St. Lucia, and the United States. Over two-thirds of the green turtle recaptures have been made in Nicaragua, reflecting travel of approximately 2500 km in straight-line distance. We believe that the turtles take up residence on the extensive shallow grass beds off the coast of this country. This region is the primary source of mature adult green turtles in the western Caribbean. From this area, mature turtles undertake reproductive migrations to the nesting beach where they were born, completing a long and complex life cycle.

#### 5.6.2.6. Satellite telemetry

The exact routes of migratory travel and other aspects of migratory and residential behaviour are studied using satellite telemetry. Small transmitters mounted on the backs of the turtles communicate with ARGOS satellites to provide BTP researchers with geographic coordinates, temperature, and diving behaviour. Five satellite transmitters have been deployed in Bermuda through 2003, four of which indicated only local movements around Bermuda. In the fifth experiment, a female green turtle given the name “Bermudiana,” travelled from Bermuda to the Dominican Republic and Haiti, and then on to the eastern tip of Cuba, where she was captured by fishers.



Photo 5.10. Release of turtle for satellite tracking (Photo: J. Gray).

#### 5.6.2.7. Outputs

Publications resulting from the Bermuda Turtle Project, as well as publications about marine turtles in Bermuda, are listed in Appendix 11.5 as an integrated part of the TCOT Bibliography. Results of research conducted on marine turtles in Bermuda as part of the Bermuda Turtle Project are regularly presented at international symposia and at various regional meetings, including the International Symposia on Sea Turtle Biology and Conservation, the USFWS/NMFS Hawksbill Protocol Meeting in Miami, annual WIDECAS meetings, the CITES Wider Caribbean Hawksbill Turtle Dialogue Meetings, and the meeting on Population Models for the West Atlantic Green Turtle (Cayman Islands). Data from the Bermuda Turtle Project contributed to Bermuda's most recent State of the Environment Report, and they have been used to help make coastal and management decisions. Manuscripts on the importance of the Bermuda green turtle and hawksbill aggregations to the understanding of near-shore (neritic) developmental habitats and on the genetic composition of the Bermuda green turtle aggregation are close to submission.

#### 5.6.2.8. Data management

Data generated by the Bermuda Turtle Project are maintained in a SAS 8.02 database on a server that is backed up daily with files stored at a remote location. The server is extensively guarded against viruses. Each individual turtle is assigned a Primary Tag Number under which all records are stored and accessed. Different types of records are coded according to observation type, including first observation, recapture, foreign recapture and stranding. All tags ever placed on an individual turtle are associated with the Primary Tag Number, including PIT tags. Spatial data are maintained in an ARCVIEW Geographic Information System to allow mapping and analysis. Data on all biological



**Photo 5.11.** The 2002 course attendees.

samples (blood, serum, tissues) are managed in Excel, as are foreign recapture records and set information. We hope to merge all current databases into a single Access database with several relational databases. This will avoid annual license fees associated with SAS and will make the data more accessible. Stranding data are maintained at the Bermuda Aquarium and are linked by Primary Tag Numbers in all cases where the turtles receive a tag and are released.

#### 5.6.2.9. Conservation role

One of the most significant conservation contributions of the Bermuda Turtle Project is the International Course on the Biology and Conservation of Sea Turtles that is taught each year in conjunction with the summer sampling session. Over the eight years this course has been offered, it has served 87 students from countries bordering the Caribbean Sea and western Atlantic Ocean. These have included Anguilla, Belize, Bermuda, Bonaire, the British Virgin Islands, Canada, the Cayman Islands, Costa Rica, Cuba, Grenada, India, Jamaica, the Netherlands, Nicaragua, St. Lucia, the Turks and Caicos Islands, UK, USA and Venezuela. The course consists of lectures, discussions of assigned readings, two weeks of field experience capturing turtles and collecting data, and a hands-on anatomy session in which dead, stranded turtles recovered by the Aquarium through their stranding programme are examined. The course prepares students to establish or expand upon sea turtle monitoring and research programs in their home countries. Many of them return home and serve in decision-making positions in their governments where they are able to apply their conservation training. Most of the students in the 2003 course were funded by a grant from the U.K. Foreign and Commonwealth Office Environment Fund for the Overseas Territories.

The Bermuda Turtle Project plays a prominent role in Bermuda as a flagship programme of the Bermuda Aquarium. It is frequently featured in island magazines, newspapers, and film documentaries. The project's website <<http://www.cccturtle.org/bermuda/>>, hosted by CCC, received 69,727 page visits during 2003. Project Coordinator Jennifer Gray is a frequent speaker at schools around the island, as well as conservation and civic groups. An Educator's Guide about



**Photo 5.12.** Class in session (Photo P. Richardson).



**Photo 5.13.** Stomach contents of a juvenile hawksbill turtle that died from ingestion of plastic debris. BAMZ Sea Turtle Stranding and Salvage Network (Photo J. Gray).

Bermuda sea turtles was produced in collaboration with the CCC and distributed to Bermuda schools. Environmental education goals of the Bermuda Turtle Project are furthered by the involvement of volunteers in the programme. In 2003, 47 volunteers donated a total of 1962 hours of their time, and learned much about these endangered animals. The volunteers included international students, Friends of the Bermuda Aquarium interns, Bermuda Aquarium Museum and Zoo registered volunteers, and a number of professionals including lawyers, doctors, nurses and policemen from around the island.

Bermuda has a long history of commerce and population exchange with the countries of the Atlantic Basin. The sea turtles of Bermuda are a living symbol of this interconnection among peoples and cultures. In fact, the very survival of these endangered animals depends on international cooperation and stewardship.

**End section by Meylan, Meylan and Gray**

### 5.6.3. Threats to marine turtles in Bermuda waters

The main threats to marine turtles in Bermuda include incidental catch in fisheries, interaction with marine debris, boat strikes (see Section 5.7.6 below), and habitat loss (J. Gray (BAMZ) pers. comm. 2004).

#### Recommendations

##### 5.1.1.1. Additional effort is expended on orienting in-water capture work of the BTP towards yield of CPUE data for green turtles.

In recent years, more effort has been focused on generating data that can be used to assess temporal changes in marine turtle abundance in Bermuda. These efforts have not yet been able to generate sufficient trend data to show whether the current management regime in Bermuda is successful. Recent changes in sampling strategy should be examined critically to ensure that these efforts will generate data of sufficient power to detect trends. An integral part of this work should be the continued monitoring of the health of seagrass beds.

##### 5.1.1.2. Monitoring efforts on hawksbill turtles should be expanded.

Bermuda hosts a small population of hawksbill turtles. Data on size distribution, genetic identity maturity status and spatial distribution have been collected by the BTP and BAMZ through incidental captures and through strandings. Hawksbills are rarely caught in the net used to capture green turtles. Since 2000, the BTP has dedicated annual sampling effort to swimming transects of suitable habitat with teams of snorkelers, capturing hawksbills by hand. This has proven to be a successful technique, but apparent low density of this species in Bermuda precludes large sample size for study, and has hindered evaluation of population trends.

##### 5.1.1.3. Extend monitoring of possible impacts of bycatch and marine debris.

Other than boat strike, the main threats to marine turtles in Bermuda's waters appear to be bycatch in marine fisheries, including both local fishers and those on international vessels operating on the high seas, and fatalities due to encounters with non-degradable marine debris (ingestion of plastics, entanglement in flotsam). These factors warrant further investigation.

Measures of direct exploitation	Past	Present	Never
<b>By life stage</b>			
Females on beaches	0	0	0
Eggs from beach	0	0	0
Turtles in water (intentional)	3 <sup>1</sup>	0	0
Turtles in water (incidental)	15		0
<b>By product</b>			
<b>Meat</b>			
Fishers who sell meat	0	0	0
Meat vendors	0	0	0
Meat consumers	20	0	0
<b>Eggs***</b>			
Collectors who sell eggs	0	0	0
Egg vendors consumers	0	0	0
Egg consumers	2 <sup>2</sup>	0	0
<b>Non-edible</b>			
Fishers who sell shells	0	0	0
Shell vendors	0	0	0
Shell consumers	6	1	0
<b>Measures of indirect exploitation</b>			
Turtles indirectly used in business	1		
<b>Total interviews</b>	<b>71</b>		

**Table 5.4.** Numbers of exploiters per category, in the past and present. Notes: (1) A total of 5 fishers identified themselves as former turtle fishers. However, 2 of these fished turtles while resident in other countries, 1 in Australia and 1 in Jamaica. Therefore, they are excluded from this overview. (2) Two respondents identified themselves as former turtle egg collectors. However, 1 collected eggs while resident in the Philippines, and the other while in Australia. Thus, they are excluded from this overview.



**Photo 5.14.** Green turtle entangled in cargo netting, BAMZ Sea Turtle Stranding and Salvage Network (Photo J. Gray).

## 5.7. Direct Use of Marine Turtles in Bermuda

### 5.7.1. Overview

The degree of protective legislation afforded turtles in Bermuda has been progressive. The earliest known legislation protecting marine turtles was passed by the First Bermuda Assembly in 1620 and prohibited the taking of young turtles. The act protected all turtles of less than 18" breadth or diameter in any bay, harbour, sound or at sea to a distance of five leagues around the island. The penalty was 15lb of tobacco – half went to government and half to the informer. In 1937 there was a prohibition on taking turtles under 20lb. The Board of Trade (Fisheries) regulations (1947) enforced a restriction on the take of turtles during the month of June in any year. The Fisheries Regulations (1963) enforced a restriction on the take of any turtle of a weight smaller than 40lb. An order made under the Fisheries Act (1972) implemented a moratorium on the take of all turtles for a five year period. This moratorium was never lifted, but replaced with the Fisheries Protected Species order of 1978. To this end sea turtles in Bermuda have enjoyed complete protection from direct take since the act commenced on April 1, 1973.

Data on use of marine turtles in Bermuda were gathered by integrating published information, project partners, and using the TCOT Socioeconomic Questionnaire or SEQ (see Section 2; Appendix 2.1). In Bermuda, 71 questionnaires were completed and a breakdown of the number of interviewees and categories of exploitation gathered is digested in table 5.4, with a full digest of actual data gathered circulated to donors and local partners.

### 5.7.2. Harvest of nesting adults

Given the nesting population was extinct or a remnant by the 1930s, it is not surprising that no evidence of recent adult female exploitation was unearthed.

### 5.7.3. Harvest of eggs

Although no egg collection was recorded by any of the TCOT interviewees, 9 respondents reported egg harvesting by their parents and grandparents as continuing until the 1920s. Eggs were collected at various places around the Island.

### 5.7.4. Harvests of turtles at sea

In 1902 there were 8 boats commercially fishing turtles, but this had reduced to 2 boats by 1937 (Babcock 1938). By 1970, there were only a handful of part-time turtle fishers with a total recorded catch of 26 turtles, all green turtles (Rebel 1974). Legal turtle harvests in Bermuda continued until 1972 and former turtle fishers have been targeted as part of the TCOT SEQ to gain their insights. We interviewed three past turtle fishers, all over 65 years of age, and all retired, because of legislative change (n=2) and/or ill health (n=2). All three fishers preferred green turtles. Nets were used by all fishers, to catch both green and hawksbill turtles. No other methods were reported. The sizes of turtles reported captured are consistent with the small to medium sized juveniles found in Bermuda waters (around 50 lbs each), with low numbers (<30 per fisher) being captured per season. Turtle fishing, as suggested in the literature (Rebel 1974), appears not to have been a very important part of the economic activity in recent decades.

Although no fishers admitted to taking marine turtles in recent times, some interviewed as part of the TCOT SEQ suggested that turtles were still taken illegally, although through incidental rather than intentional capture (see section 5.7.6. below). Of 13 fishers who believed that other fishers catch turtles incidentally, 8 thought that some green turtles were kept. There have been no recent prosecutions for infringements of the laws governing turtle harvest, and members of the Bermuda Turtle Project were sceptical about these findings. They believe that if such illegal take occurs, it undoubtedly involves a very few turtles per year (J. Gray (BAMZ) pers. comm. 2004).

Awareness regarding Bermuda's Reef Preserves and Protected Areas is promoted in an attractive FCO funded leaflet (Appendix 5.1) that shows locations of protected areas and stipulates that line fishing, spear-fishing and lobster diving are prohibited. Contravening these laws carries a fine of up to \$5000 and/or imprisonment. Awareness of laws protecting turtles appears to be low. Fifty-three



**Photo 5.15.** Green turtle strangled by monofilament fishing line (Photo J. Gray).

respondents to the TCOT SEQ stated they were aware of laws regarding turtle fishing, and 23 said they were aware of laws regarding the purchase and sale of turtle products. However, only 6 and 4 individuals could provide examples of laws for fishing and purchase/sale respectively. Lack of awareness of specifics of the laws is likely a reflection of their lack of impact on individuals; as there is little to no demand for marine turtle products (see next paragraph), there is little incentive for people to know the specifics of laws restricting consumption.

Although there were no reports of current turtle product consumption, 20 respondents to the TCOT SEQ reported that they formerly consumed meat products. However, 14 of these had eaten turtle somewhere else, on holiday, infrequently (or only once), and one ate it more regularly while living in Indonesia. Five of the respondents consumed turtle meat in Bermuda, 4 regularly and one on holiday occasions, before it became illegal.



**Photo 5.16.** Turtle Warning Sign (Photo J. Constable).



**Photo 5.17.** Green turtle carapace repair following boat strike, BAMZ Wildlife Rehabilitation Centre (Photo J. Gray).

### 5.7.5. Trade in shells and shell products

None of the fishers in the survey recorded selling whole shells or worked shell and no respondents reported current usage of such items in Bermuda. Three respondents reported using the whole shells, but only one of these while in Bermuda (an 86 year old man who stopped when it became illegal). Five respondents reported using worked shell; again, 3 of these used shell while outside of Bermuda, one used it in Bermuda (and is now opposed to such use), and the final respondent inherited tortoise shell items from her grandmother.

### 5.7.6. Incidental take

#### i) Incidental catch in marine fisheries

Ministry of Environment (2000) statistics suggest that in 1999, there were 213 registered commercial fishing vessels and 23 licensed charter-fishing vessels. These numbers appear to be relatively similar in recent years (J. Gray (BAMZ) pers. comm. 2004). The level of turtle by-catch by these fisheries has not been assessed, but is thought to be insignificant (J. Gray (BAMZ) pers. comm. 2004). A necropsy of a stranded loggerhead turtle in 2000 by the Bermuda Aquarium revealed a long-line hook embedded in the animal's oesophagus (J. Gray (BAMZ) pers. comm. 2004; Weidner *et al.* 2001). Presently there are only two local long-liners in active use. One fisher reports that they never incidentally caught a sea turtle, as they set at night with well weighted, fast sinking lines (J. Constable (BTP) pers. comm. 2004) It is thought that foreign registered long-liners operate in Bermuda's territorial waters, but as the local government lacks an enforcement vessel, pirate fishing can carry on with impunity.

In the TCOT SEQ, 15 (of 26) fishers recorded incidental take as part of marine fishing activities. The methodologies involved were net fishing for bait fish (n=8), using other nets (n=4), and using rod and hand lines (n=3). Most fishers indicated that these were unusual occurrences, once (n=12), twice (n=2) or three times per year (n=1). Most said turtles were alive when caught and that they were released. Under existing laws, these turtles should be reported to local Fisheries Authorities or the Bermuda Turtle Project, but there are few records of fishers doing this (J. Gray (BAMZ) pers. comm. 2004). The species most often captured were green turtles although loggerheads and hawksbills were also captured.

Year	Total Stranded	Entanglement	Ingestion of plastic	Boat Strike
1999	30	3	2	6
2000	30	1	1	2
2001	33	4	3	7
2002	23	2	3	1
2003	17	3	0	1

**Table 5.5.** Numbers of stranded turtles for each year 1999-2003 and the number where entanglement, ingestion of plastic and boat strike were thought to be primary cause of mortality. Data are provided courtesy of Jennifer Gray, Bermuda Turtle Project.

## ii) Boat Strike

A more prevalent issue in Bermuda has been boat injury and death of turtles due to boat collisions in recent years. As of August 2004, there were 4,243 pleasure boats registered in Bermuda with 6,583 on file. This is an increase of 100 vessels since 2003. There are 5,170 registered moorings, which also represents an increase of 100 since 2003 (J. Gray (BAMZ) pers. comm. 2004). This has led to production of a "Turtle Alert" leaflet (Appendix 5.2) and the provision of sea turtle warning signs at 33 (22 installed 2004) known trouble spots. This is thought to have been beneficial in raising awareness and there may be modest signs that increased awareness is having the desired effect. There are many cases where cause of death cannot be confirmed even though boat collisions are suspected (e.g. boat collision can inflict damage on a floating corpse after the animal has died of other causes), and this must be borne in mind when interpreting the data in table 5.5. The incidence of boat strike is worth bearing in mind when considering the other OTs, where stranding networks do not operate. All of the OTs are highly dependent on tourism, much of it water based. As tourism continues to grow in the region, Bermuda's experience with its education program may inform education activities in other OTs.

## iii) Entanglement and ingestion of marine debris

While boat strikes have been a threat and concern for more than a decade in these islands data suggest that entanglement in and ingestion of marine debris is increasing. Most entanglements involve monofilament fishing line left in the environment by local shoreline fishers. Ingestion of debris most often involves the consumption of small bits of weathered and broken plastic pieces and styrene pellets and occasionally involves ingestion of monofilament. The Marine Environmental Committee of the Bermuda National Trust has implemented a monofilament recycling programme and has installed receptacles at popular fishing spots around the island to encourage Bermudians to keep discarded fishing line out of the environment.

### **Recommendation**

#### **5.1.1.4. Extend monitoring of possible impacts of bycatch and marine debris.**

*Other than boat strike, the main threats to marine turtles in Bermuda's waters appear to be bycatch in marine fisheries, including both local fishers and those on international vessels operating on the high seas, and fatalities due to encounters with non-degradable marine debris (ingestion of plastics, entanglement in flotsam). These factors warrant further investigation.*



**Photo 5.18.** Green turtle "Dick" on exhibit in the North Rock Exhibit at the BAMZ (Photo J. Gray).

## 5.8 Indirect Use

### 5.8.1. Turtle watching on beaches

Not applicable.

### 5.8.2. Dive tourism/snorkel tours

The dive tourism sector in Bermuda is significant, with some 6 dive operators and an estimated 15-20 000 dives per year. In informal discussions operators reported seeing them (hawksbills at the western breakers area and very rarely a leatherback) infrequently while diving. However, turtles were sighted regularly from the dive boat going to and from dive sites (M. Burke (Blue Water Divers) pers. comm. 2004). Dive operators approached by TCOT were interested in participating in Caribbean Turtlewatch, however, they pointed out that they rarely saw turtles on their dives. None were surveyed as part of the SEQ.

There are approx 25 boat cruise operators in Bermuda, but none of these highlight turtles in their advertising or in logos. Indeed turtles in Bermuda are very wary and it would be difficult if not impossible for a snorkel tour to get close enough to see them with any satisfaction.

Despite the fact that turtles are not advertised in tours, a large number of tour operators take visitors to turtle foraging grounds to enjoy sea turtles. One Helmet Diving operator visits such a site at the end of their dive to spend twenty minutes counting surfacing turtles with clients. The areas known as "Vixen" and "Fort St. Catherine" are visited daily, in season, by numerous tour operators who are specifically sharing the sea turtle experience with clients. One tour operator has a vessel named "*Chelonia*". Thus, while boat operators were not included in the TCOT SEQ sample, it is apparent that the sea turtles of Bermuda are highlighted in such tours. (J. Gray (BAMZ) pers. comm. 2004).

### 5.8.3. Aquaria Holding Captive Turtles

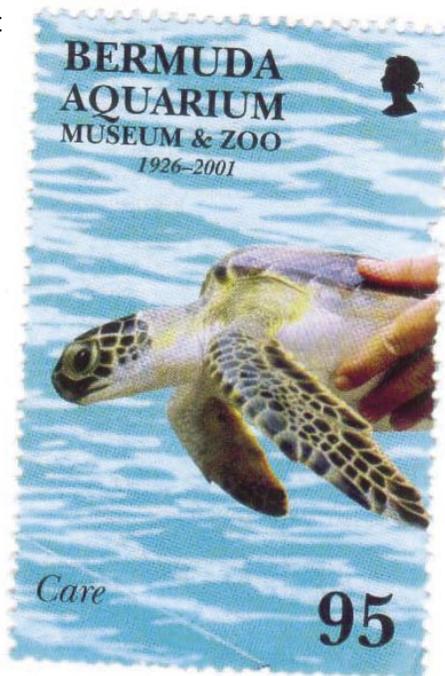
There are three places in Bermuda where green turtles are held in captivity.

1. BAMZ has eight accessioned green turtles in addition to a variable number of rehabilitating animals. Three of the accessioned turtles came from eggs laid by a Devil's Hole Aquarium female, which were translocated and hatched at BAMZ in 1988. One (MB534) was hatched on Nonsuch Island in 1972 after egg translocation from Costa Rica. Another (BP3577) was donated to BAMZ in 1987 and had been kept in a private pond for thirty years prior. The remaining three turtles are of unknown origin and have been captive at BAMZ in excess of four decades (Gray 1989). BAMZ has a large number of visitors (105,413 in 2001; (J. Gray (BAMZ) pers. comm. 2004).

2. Devil's Hole Aquarium is a smaller aquarium run in conjunction with a real estate firm, which shows 6 turtles. It is one of the oldest tourist attractions in Bermuda situated in a limestone sinkhole drowned by the post-glacial rise in sea level. The water is 35 feet deep and there are extensive underwater recesses and tidal connections to Harrington Sound. Ever since the 1880s it has been stocked with a variety of fish and turtles. In 1970 and again in 1971, there was mating and laying by the green turtles held, but, as there was no beach, the turtles laid in the water where the eggs sank to the bottom. In 1974-1975 an artificial beach was created (Wingate 1975). In 1976 there was a successful laying in Devil's Hole and the eggs were transferred to Nonsuch Island (Wingate 1976, 1977). No hatchlings resulted (Wingate 1977). Another clutch was laid on August 4, 1988, and the eggs were transferred to an artificial beach in the turtle enclosure at BAMZ. The eggs hatched on September 28<sup>th</sup> (60 days incubation). There were 58 hatchlings; 7 of these hatchlings were retained at the Aquarium. The remaining hatchlings were released at Church Bay, Southampton on September 29, 1988. Of the retained 7 turtles, 4 were returned to Devil's Hole Aquarium and 3 were retained at BAMZ. Presently, 1 hawksbill and 5 green turtles are on view at Devil's Hole. Devil's Hole suffered significant structural damage during Hurricane Fabian in September 2003. It is not known what its annual visitor numbers are, but they are undoubtedly considerably less than BAMZ.

3. Tom Moore's National Park has one large male green turtle and a second not yet identified smaller turtle in an inland saltwater pond known as Walsingham Pond. The origin of these animals is unclear. It was noted in 2003, by an employee of Tom Moore's Tavern, that the animals

were transferred from the restaurant's lobster holding crawl to the pond some seventeen years ago when the restaurant was renovated and the crawl removed. After Hurricane Fabian, there were no sightings of the turtles for 4 months and they were feared dead. However the large male was discovered in a cave in January 2004 – it was weighed and had not lost any weight. It has been returned to Walsingham Pond the second smaller turtle was sighted in July 2004 (J. Gray (BAMZ) pers. comm. 2004).



### 5.8.4. Other marketing/cultural uses

Weidner *et al.* (2001) state that 'there is considerable interest in turtles on Bermuda by the public and the environmental community'. Perhaps surprisingly, despite the large foraging populations of marine turtles in Bermudan waters and its well-developed tourist industry, there are no companies that use turtles as a logo (See 5.8.2). Turtles have appeared on Bermuda postage stamps, and there is the one tour boat named 'Chelonia'. Turtle orientated items are available in the gift shop of Bermuda Aquarium and Zoo, but are no more prevalent than at any other zoo or aquarium. In the

TCOT SEQ, nobody recorded using turtles to promote their business in Bermuda. As discussed in section 5.9 below, few TCOT SEQ respondents felt that turtles were culturally or economically valuable in Bermuda.

### 5.9. Attitudes to Conservation

The TCOT SEQ sought to assess overall attitudes towards conservation of marine turtles, and options for marine turtle management which could be compared to opinions in other OT's. Respondents could agree, disagree, or have no opinion. In some cases, they could choose 'not applicable'. While full details of responses to these questions will be circulated to donors and local partners, 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 future (94%)
- Turtles should be protected, regardless of their use to humans (85%)
- Turtles play an important ecological role in our natural environment (75%)
- As turtles are migratory, they should be managed in cooperation with neighbouring states (75%)
- The government needs to actively work to protect turtles (70%)
- Existing marine turtle laws are effectively enforced (66%)



**Photo 5.19.** Jennifer Gray (BTP/BAMZ) gives Bermuda Report at TCOT Workshop (Photo: S.Ranger).



**Photo 5.20.** Participants of the BTP International Field Course 2003 joined by Minister of the Environment; The Hon. Neletha D. Butterfield JP, MP (back row 5th from left) (Photo BTP).



**Photo 5.21.** Publicity for BTP in Cayman

Most people disagreed with the following statements:

- Turtle are economically valuable in this OT (94%)
- Turtles are culturally valuable in this OT (92%)
- The government needs to do more to ensure that existing laws protecting marine turtles are effectively enforced (48% disagreed, 25% agreed, and 27% had no opinion)

Opinions of respondents were almost equally split regarding the following statement:

- Some income from tourism should be used to support marine turtle conservation efforts (41% yes, 39% no)

As turtle fishing and consumption is illegal in Bermuda, most people deemed the following questions irrelevant (dominant agreement or disagree also shown in brackets):

- Turtle fishing should be unregulated (69% NA, and a further 31% disagreed with the statement)
- Turtle fishing should be stopped until more information is known on the size and health of the populations (68% NA, but 5 people agreed with the statement, perhaps indicating their unfamiliarity with existing laws)
- Local people should be allowed to catch and eat sea turtle, provided it doesn't threaten the regional population (68% NA, but 14% agreed with this statement)
- Tourists should be allowed to purchase sea turtle shell and take it home with them (65% NA, and a further 28% disagreed with the statement)
- Turtles should be used as both a tourist attraction and a source of food (65% NA, and a further 23% disagreed with the statement)
- Turtles should be used as a tourist attraction rather than as a source of food (63% NA, and a further 23% agreed with this statement)
- Local people should be allowed to purchase sea turtle meat (62% NA, and 21% disagreed with this statement)

The results indicate broad support for existing turtle conservation laws among respondents. There is satisfaction with existing law enforcement. Reflecting the lack of use of marine turtles in Bermuda (both direct and indirect), turtles were considered neither economically nor culturally valuable, by most respondents.

Cursory analysis of results by stakeholder group indicate that, while there are some areas of disagreement amongst stakeholders, these are few. For example, fishers as a group generally agree with the responses of the surveyed population as a whole. There is only one question for which the majority of fishers feel differently:

- Some income from tourism should be used to support sea turtle conservation (while surveyed population as a whole was split on this, most fishers disagreed with it).

## 5.10. Capacity Building and Outreach Activities During TCOT

### 5.10.1. Capacity building

There was little capacity building needed in Bermuda. Involvement of the BTP in the project did facilitate regional networking within the UK OT's as part of the TCOT Workshop in Grand Cayman and the BTP team were involved in the collaborative writing of a successful grant bid to HMG, which may increase chances of future success.

### 5.10.2. Outreach activities

Levels of awareness regarding the presence and status of turtles in Bermuda were high and there were no TCOT public awareness raising events as part of the 2 short visits to Bermuda by TCOT staff. The receipt of the FCO grant to fund the training of TCOT representatives from other OT's stimulated some press interest in Bermuda and abroad, leading to several media outputs which served to raise the local and international profile of the BTP.

#### **Recommendations**

**5.1.2.1. Ensure the Department of Conservation Services has the long-term capacity, staff and resources to carry out all enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis.**

*The staff of Conservation Services carrying out the fieldwork of the Bermuda Turtle Project are well skilled in the field and data collection techniques needed for ongoing monitoring and research. However, although this initiative is relatively well resourced in comparison to many OT's, the BTP is reliant on outside donor and specialist scientific support. It is important for a long-term legacy of marine turtle monitoring and research that local ownership and co-management of data sets gathered with outside researchers are further developed to facilitate the enhancement of institutional memory and capability. This will insure against changes in capability of external workers to participate in the future.*

**5.2.1.2. Continue and Increase the Regional Capacity Building Role of the BTP Training Course.**

*The importance of this initiative in regional capacity building cannot be underestimated. It has been well utilised to date by TCOT partners (see section 11). Given the wide genetic origins of marine turtles in Bermudan waters, it is possible that positive benefits of Bermuda-based capacity building efforts could be detected in Bermuda in the future. Given the excellent track record of this initiative, additional external funding would be well deserved and is highly likely.*

**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. 5.22.** Emblematic of Bermuda's commitment to sea turtle conservation is the involvement of Minister of the Environment, The Hon. Neletha D. Butterfield, JP, MP. (Photo BTP).



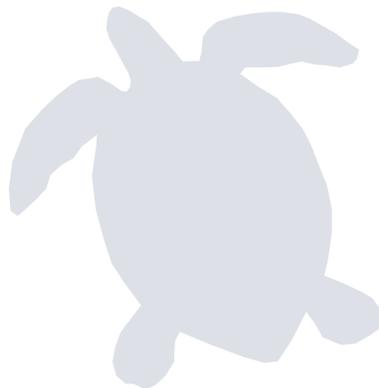
**Photo 5.23.** Community involvement in conservation is encouraged by the Bermuda Turtle Project. Rehabilitated hawksbill turtle “Sophie” with finder Sophie Farrow prior to release of the animal (Photo J. Gray).

### 5.11. Acknowledgements

The TCOT SEQ could not have been carried out without the commitment and hard work of volunteer, Jennifer Constable who also reviewed drafts of this chapter. The TCOT team would like to gratefully acknowledge the generous collaboration of Jennifer Gray, Anne Meylan, Peter Meylan and Jack Ward in the compilation and review of this chapter. We would like to additionally thank Jennifer Gray for her generosity in sharing her images. Brendan Godley would like to thank the Draycott family for their hospitality during his stay. Additional constructive review was offered by Nick Pilcher (IUCN-MTSG), James Abbott, Liz English Andrew Kesteloot, Zoe Meletis, and Jennifer Silver all assisted with TCOT SEQ under the supervision of Lisa Campbell.

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# 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

<b>Contents</b>	<b>Page</b>
<b>6.1. Summary and Recommendations</b>	<b>96-100</b>
<b>6.2. Geographic Overview</b>	<b>101</b>
<b>6.3. Historical Overview</b>	<b>101</b>
<b>6.4. Organisations Involved with Marine Turtles in the BVI</b>	<b>101-102</b>
<b>6.5. Status of Nesting Marine Turtles in the British Virgin Islands</b>	<b>102-106</b>
6.5.1. Data from beach monitoring	102-103
6.5.2. Data from TCOT socio-economic questionnaire	103-104
6.5.3. Genetics	104-105
6.5.4. Threats	105-106
<b>6.6. Status of Foraging Marine Turtles in the British Virgin Islands</b>	<b>106-111</b>
6.6.1. In-water sampling around Tortola and nearby islands	106
6.6.2. In-water sampling at Anegada	107
6.6.3. Data gathered through Caribbean Turtlewatch	107-108
6.6.4. Information gathered from sailing community	108
6.6.5. Trends in abundance gathered from the TCOT SEQ	109-110
6.6.6. Genetics	110
6.6.7. Threats	110-111
<b>6.7. Direct Use of Marine Turtles in the British Virgin Islands</b>	<b>112-118</b>
6.7.1. Overview	112
6.7.2. Harvest of adults on the nesting beach	112-113
6.7.3. Harvest of eggs	113
6.7.4. Harvest at sea	113-116
6.7.5. Views of turtle fishers on regulation of the fishery	117
6.7.6. Trade in shells and shell products	117
6.7.7. Incidental catch in marine fisheries	117-118
<b>6.8. Indirect Use of Marine Turtles in the British Virgin Islands</b>	<b>118-119</b>
6.8.1. Turtle watching on beaches	118
6.8.2. Dive/snorkelling tourism	118-119
6.8.3. Aquaria holding captive turtles	119
6.8.4. Other marketing uses	119
6.8.5. Data from the TCOT socio-economic questionnaire	119
<b>6.9. Attitudes to Conservation</b>	<b>119-121</b>
<b>6.10. Capacity Building and Outreach Activities During TCOT</b>	<b>121-122</b>
6.10.1. Capacity building	121
6.10.2. Outreach activities	121-122
<b>6.11. Acknowledgements</b>	<b>122-123</b>
<b>6.12. References</b>	<b>123</b>

## 6.1. Summary and Recommendations

### 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

6.1.2.1. Revision of harvest legislation.

6.1.2.2. Strengthening BVI's marine protected areas system.

6.1.2.3. Planning policy and beach management.

6.1.2.4. Revision of MEA legislation.

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

6.1.3.1. Establish systematic monitoring efforts of nesting beaches.

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

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

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 process.

##### 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
<b>Green Turtle</b> ( <i>Chelonia mydas</i> )	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
<b>Hawksbill Turtle</b> ( <i>Eretmochelys imbricata</i> )	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
<b>Leatherback Turtle</b> ( <i>Dermochelys coriacea</i> )	Small numbers Possibly increasing	Rarely encountered at sea	Almost eliminated  Possibly very occasional egg harvest
<b>Loggerhead Turtle</b> ( <i>Caretta caretta</i> )	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 Aneгада, 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 Aneгада.
- 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 significantly 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 infringements to a more punitive 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**

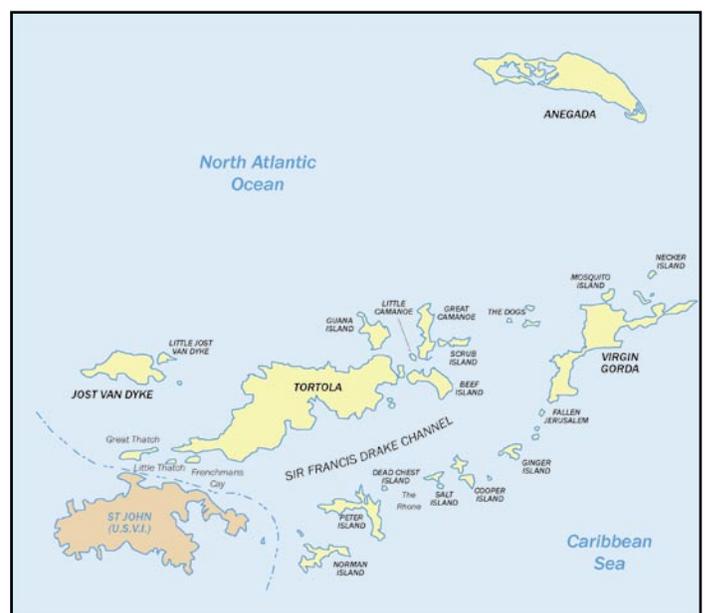
- a) Develop a network of hoteliers, beach residents and other beach users to ensure swift reporting of nests not on index beaches, so that they can be marked, protected and monitored. A toll-free hotline may be of utility. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergencies.
- 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<sup>2</sup> 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](http://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, comprising 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 led 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 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.

**6.1.4.1. 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 emergencies.
- 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
<b>TOTAL</b>	<b>10</b>	<b>34</b>

**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: <sup>1</sup>Mountain Point - VG, <sup>2</sup>Kellys Cove, <sup>3</sup>Mellon Wall- Guana Island, <sup>4</sup>National Parks, <sup>5</sup>Wreck Alley - Cooper, <sup>6</sup>Coral Gardens, <sup>7</sup>Bronco Billy, <sup>8</sup>Brewers Bay, <sup>9</sup>Cooper Island, <sup>10</sup>Norman Island, <sup>11</sup>Angelfish Reef- Norman <sup>12</sup>The Rhone - Salt Isl., <sup>13</sup>Alice in Wonderland, <sup>14</sup> Spyglass Wall – Peter, <sup>15</sup>Diamond Reef, <sup>16</sup>Blue Chromis-Cooper, <sup>17</sup>Cistern Rock, <sup>18</sup>Trellis Bay, <sup>19</sup> Thumb Rock – Cooper, <sup>20</sup>Maryground – Guana <sup>21</sup>Pelican Island, <sup>22</sup>Privateers Bay Norman Isl., <sup>23</sup>The Chimney’s, <sup>24</sup>Scrub Island, <sup>25</sup>Vanishing Rock, <sup>26</sup>Playgorund – JostVanDyke, <sup>27</sup>The Baths, <sup>28</sup>Salt Island, <sup>29</sup>Sir Francis Drake Channel, <sup>30</sup>Carvel Rock, <sup>31</sup>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.

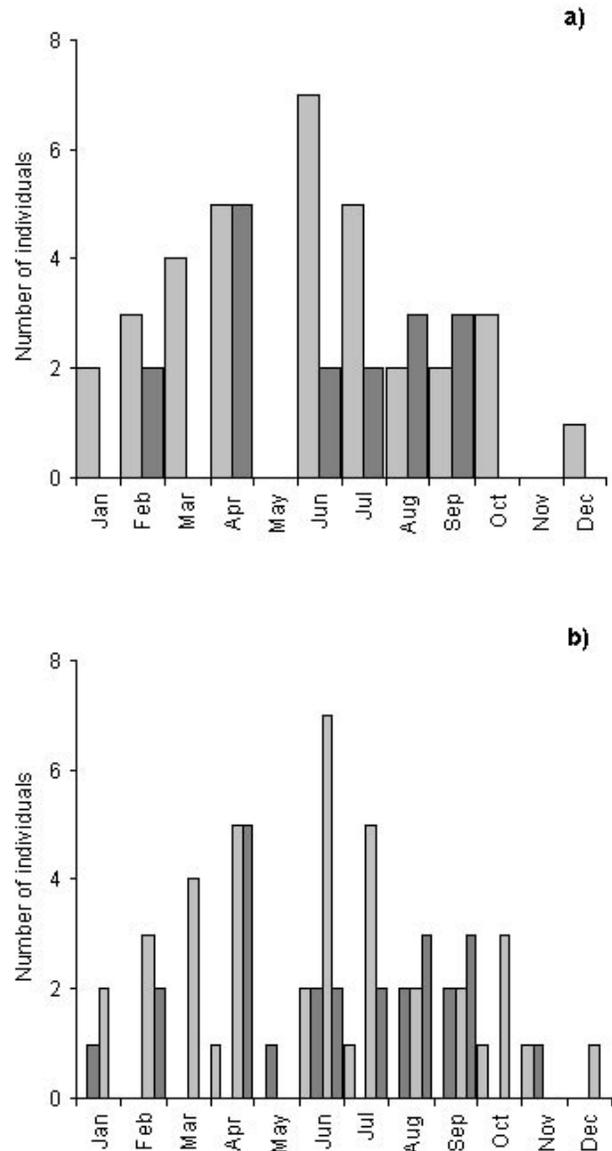
### 6.6.3. Data gathered through Caribbean Turtlewatch

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	
<b>Jan</b>	0	0	0	0	0	0	0	0	0	7	7
<b>Feb</b>	0	0	0	0	0	0	0	1	0	0	1
<b>Mar</b>	0	0	0	0	0	0	0	0	0	0	0
<b>Apr</b>	0	0	6	3	0	0	0	0	0	0	9
<b>May</b>	0	4	10	4	0	0	0	0	2	0	20
<b>Jun</b>	4	2	8	2	0	0	0	0	0	0	16
<b>Jul</b>	2	1	4	3	3	2	0	1	0	0	16
<b>Aug</b>	0	1	5	2	0	0	0	1	0	1	9
<b>Sep</b>	0	0	2	2	0	0	0	0	0	0	4
<b>Oct</b>	0	0	2	0	0	0	0	0	0	0	2
<b>Nov</b>	0	0	0	0	0	1	0	0	0	0	1
<b>Dec</b>	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.

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 Hotspots*, 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).



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

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
<b>By life stage</b>				
Females on beaches	1	0	-	-
Eggs from beach	4	0	-	-
Turtles in water (intentional)	8	8	-	-
Turtles in water (incidental)	-	-	-	-
<b>By product</b>				
<b>Meat</b>				
Fishers who sell meat	5	6	-	-
Meat vendors	1	3	15	-
Meat consumers	15	18	22	-
<b>Eggs</b>				
Collectors who sell eggs	0	0	-	-
Egg vendors consumers	0	0	-	-
Egg consumers	11	18	-	-
<b>Non-edible</b>				
Fishers who sell shells	2	1	-	-
Shell vendors	0	1	-	-
Shell consumers	5	6	-	-
<b>Measures of indirect exploitation</b>				
Turtles indirectly used in business	18	-	-	-
<b>Total interviews</b>	<b>55</b>			

**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 Schmidt (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 20<sup>th</sup> 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).

<b>a There should be regulations for which species of turtle can be caught</b>				
	Yes	no opinion	no	na
n	11	1	3	2
%	65	6	18	12
<b>b There should be regulations for the type of fishing gear and methods that can be used to catch turtles</b>				
	yes	no opinion	no	na
n	11	3	1	2
%	65	18	6	12
<b>c There should be regulations for the number of turtles that can be caught</b>				
	yes	no opinion	no	na
n	9	2	4	2
%	53	12	24	12
<b>d There should be size limits for turtles caught</b>				
	yes	no opinion	no	na
n	13	2	0	2
%	76	12	0	12
<b>e Open and closed zones should be set for turtle fishing</b>				
	yes	no opinion	no	na
n	6	3	6	2
%	35	18	35	12
<b>f Open and closed seasons should be set for turtle fishing</b>				
	yes	no opinion	no	na
n	13	2	0	2
%	76	12	0	12
<b>g Who should be involved in setting regulations?</b>				
	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 dead.

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 infringements to a more punitive 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

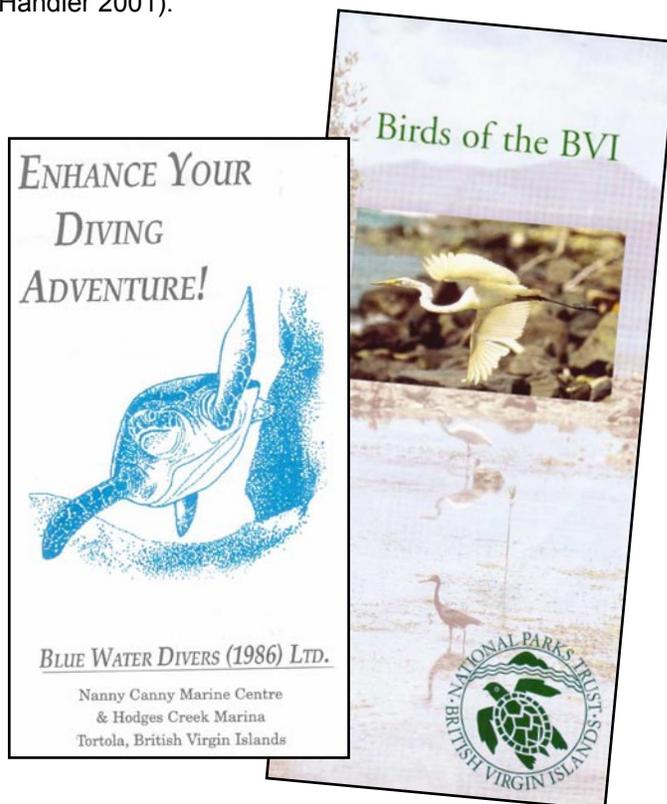
### 6.8.1. Turtle watching on beaches

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 moratoriums, 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 our 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 or 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 thereof) 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 turtle-related 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)

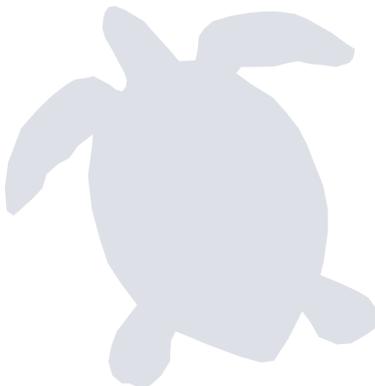
**6.11. Acknowledgements**

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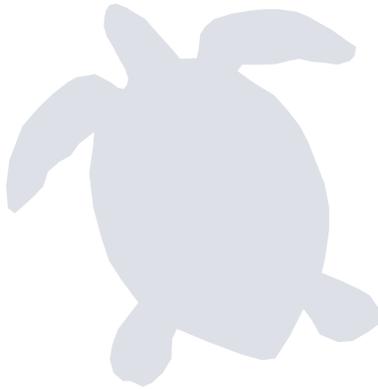


# An Assessment of the Status and Exploitation of Marine Turtles in the Cayman Islands



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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.

# 7. Status and Exploitation of Marine Turtles in the Cayman Islands

<b>Contents</b>	<b>Page</b>
<b>7.1. Summary and Recommendations</b>	<b>125-128</b>
<b>7.2. Geographic Overview</b>	<b>129</b>
<b>7.3. Historical Overview</b>	<b>129</b>
<b>7.4. Organisations Involved with Marine Turtles in the Cayman Islands</b>	<b>129-130</b>
<b>7.5. Status of Nesting Marine Turtles in the Cayman Islands</b>	<b>130-133</b>
7.5.1. Data from nesting beach monitoring	130
7.5.2. Data from TCOT socioeconomic questionnaire	130-131
7.5.3. Threats	131-132
7.5.4. Genetics of nesting turtles	132
7.5.5. Nesting overview	132-133
<b>7.6. Status of Foraging Marine Turtles in the Cayman Islands</b>	<b>133-139</b>
7.6.1. Monitoring efforts	133-136
7.6.2. Overview of species present	136
7.6.3. Spatial patterns in relative abundance	137
7.6.4. Trends in abundance	137
7.6.5. Threats	138
7.6.6. Genetics of foraging populations	138-139
7.6.7. Foraging overview	139
<b>7.7. Direct Use of Marine Turtles in the Cayman Islands</b>	<b>139-148</b>
7.7.1. Overview	139-140
7.7.2. Harvest of adults on the nesting beach	140
7.7.3. Harvest of eggs	140-141
7.7.4. Harvest at sea	141-143
7.7.5. Trade in shells and shell products	143
7.7.6. Incidental catch in marine fisheries	143
7.7.7. The Cayman Turtle Farm	144-148
<b>7.8. Indirect Use</b>	<b>148-150</b>
7.8.1. Turtle watching on beaches	148
7.8.2. Dive/snorkelling tourism	148-149
7.8.3. Aquaria holding captive turtles	149
7.8.4. Other marketing/cultural uses	149-150
<b>7.9. Attitudes to Conservation</b>	<b>150-151</b>
<b>7.10. Capacity Building and Outreach Activities During TCOT</b>	<b>151-152</b>
7.10.1. Capacity building and outreach activities	151
7.10.2. Outreach activities	152
<b>7.11. Acknowledgements</b>	<b>153</b>
<b>7.12. References</b>	<b>153-154</b>

## 7.1. Summary and Recommendations

### Summary

At least two species of marine turtle (green and loggerhead turtles) nest in the Cayman Islands but in critically low numbers (see table 7.1). Much needs to be done to ensure the continued existence of marine turtles nesting in the CI and facilitate their recovery. Foraging marine turtles (green and hawksbill turtles) are widespread in CI coastal waters and 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 much reduced levels but targets large individuals, a significant proportion of which are likely to be part of the breeding population. Local authorities have advised that this fishery should be discontinued as turtle meat which is so important in Caymanian culture is available from cultured stocks from the Cayman Turtle Farm (CTF). Indirect exploitation of turtles and their image is higher in the Cayman Islands than in any of the other OTs.

### Summary of Recommendations

TCOT recommends that the Government of Cayman Islands takes all necessary steps to ensure the sustained existence of nesting and foraging populations of marine turtles in Cayman Islands and facilitate their recovery. This will require actions under the following general headings:

#### 7.1.1. Increase capacity for marine turtle management

7.1.1.1. Increase the capacity of the Cayman Islands Department of Environment (CIDoE).

7.1.1.2. Establish a multi-stakeholder marine turtle management process.

#### 7.1.2. Amend legislation and policy to facilitate marine turtle population recovery

7.1.2.1. Revise harvest legislation.

7.1.2.2. Increase the network of Protected Areas in the Cayman Islands.

7.1.2.3. Enact Endangered Species Trade and Transport Law.

#### 7.1.3. Continue and enhance systematic monitoring of marine turtle populations to determine trends in abundance

7.1.3.1. Continue systematic monitoring efforts at nesting beaches throughout the three Islands.

7.1.3.2. Establish sustainable, regular and frequent (monthly), constant-effort monitoring programmes at a range of in-water study sites for both green and hawksbill turtles around the Cayman Islands.

7.1.3.3. Undertake limited night time beach monitoring for identification and genetic sampling adult nesting green turtle females.

7.1.3.4. Consideration be given to acting as a regional training centre.

Species	Nesting	Foraging	Harvest
<b>Green Turtle</b> ( <i>Chelonia mydas</i> )	Small numbers possibly increasing	Adults and juveniles present.  Large numbers of juveniles in some areas	Licensed turtle fishery present at reduced levels targeting large juveniles and adults  Low level of illegal take on the nesting beach and at sea.  Low levels of illegal egg take
<b>Hawksbill Turtle</b> ( <i>Eretmochelys imbricata</i> )	Very small numbers possibly extirpated	Adults and juveniles present  Large numbers of juveniles in some areas	Still present at reduced levels targeting large juveniles and adults  Low level of illegal take at sea  Egg take unlikely
<b>Leatherback Turtle</b> ( <i>Dermochelys coriacea</i> )	Occasional nest	Rarely encountered	Unlikely
<b>Loggerhead Turtle</b> ( <i>Caretta caretta</i> )	Small numbers	Rarely encountered	Licensed turtle fishery present at reduced levels targeting large juveniles and adults  Low level of illegal take on the nesting beach and at sea  Low levels of illegal egg take

**Table 7.1.** Marine turtle species present and summary of exploitation in the Cayman Islands.

#### **7.1.4. Maximise the role of the Cayman Turtle Farm in marine turtle conservation**

#### **7.1.5. Establish further conservation and awareness programmes to sensitise those living in and visiting Cayman Islands to marine turtle conservation requirements**

7.1.5.1. Encourage and implement sensitive practices at existing nesting beaches.

7.1.5.2. Implement general awareness programmes regarding marine turtle conservation in the Cayman Islands.

#### **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**

##### **7.1.1. Increase capacity for marine turtle management in Cayman Islands**

TCOT has significantly contributed to the skills and technical knowledge of the CIDoE officers. Although CIDoE are relatively well resourced in OT terms, additional resources would further improve the magnitude and quality of the work currently being undertaken. It is essential that the CIDoE receives adequate resources to effectively carry out their custodianship of Cayman Islands' highly valuable marine and coastal resources, on which the country's economy so heavily depends.

###### **7.1.1.1. Increase the capacity of the CIDoE**

It is vital to ensure CIDoE has the capacity, staff and resources to carry out research, monitoring and enforcement duties relevant to marine turtle management, including data collection and analysis for turtle monitoring programmes. CIDoE staff are well trained and highly motivated, but have

a limited research budget which constrains current efforts. It is recommended that national and international funding is sourced to support ongoing research and monitoring efforts as the work being carried out in the Cayman Islands is potentially of profound regional importance and CIDoE has the capacity to match support.

##### **a) Increased presence in Cayman Brac/Little Cayman**

Given the importance of Little Cayman as a foraging and nesting site, and that Cayman Brac has recently been discovered to host nesting and foraging populations of unknown magnitude, but has long been a centre of turtle exploitation, it is recommended that CIDoE have a more significant presence on these sister islands. Although CIDoE have one enforcement officer for each of the two Islands, it would seem that, at minimum, a sister islands field base and sufficient operating resources are warranted to facilitate more extensive research, monitoring and community outreach by DoE scientific staff.

##### **7.1.1.2. Establish a multi-stakeholder marine turtle management process**

To date there have been 5 years of dedicated marine turtle research on wild marine turtles in the Cayman Islands and marine turtle conservation and management in the Cayman Islands is now of significant public interest. It is essential that public compliance with marine turtle management measures continues and, to facilitate such compliance, it is necessary that stakeholders feel they have meaningful input into the decision-making progress.

It is therefore recommended that the CIDoE coordinate a Marine Turtle Working Group to include representatives of relevant stakeholders (e.g. government agencies and departments such as CIDoE, CTF, Planning and Tourism; NGOs such as CI National Trust; hoteliers; dive operators etc.). The working group should meet regularly to discuss marine turtle management issues and to provide input to government's management and regulatory processes. The group would also function as a public education resource, promoting marine turtle conservation and informing their respective stakeholder groups on marine turtle management issues.

##### **7.1.2. Amend legislation and policy to facilitate marine turtle population recovery**

It is felt by CIDoE that data from their ongoing inwater monitoring provide convincing evidence that the fishery should be closed and they have made such a recommendation to the Marine Conservation Board (G. Ebanks-Petrie (CIDoE) pers. comm. 2004). Available data suggest the fishery, although small, as currently structured is likely to be affecting nesting population recovery. TCOT recognises that cessation of all turtle fishing would significantly contribute to the recovery of depleted marine turtle populations in the Cayman Islands. TCOT also recognises that turtle meat is a component of the traditional Caymanian diet, but that in the Cayman Islands, turtle meat can be obtained from farmed stocks. Complete closure of the traditional turtle fishery may, however, be deemed politically and socially unacceptable.

At minimum, it is recommended regulations governing the traditional harvest be altered.

In addition, the Cayman Islands' turtles face a host of threats imposed by the growing human population (2.71%, 2004 est.), and the regulation of utilisation alone will not serve the sustainable management of these turtle populations. TCOT therefore also makes recommendations regarding legislation and policy changes to facilitate protection of critical marine turtle habitat in the Cayman Islands.

#### **7.1.2.1. Harvest legislation recommendations:**

While the Cayman Islands have relatively sophisticated regulations to monitor marine turtle harvest, this harvest must be accompanied by meaningful, long-term and systematic monitoring programmes to ascertain trends in turtle abundance. TCOT makes the following recommendations:

- a) Prohibit the capture of all adult marine turtles in Cayman waters. Ensure permanent and complete prohibition of the harvest of reproductively active turtles by extending the closed season to include the 1<sup>st</sup> of April to the 30<sup>th</sup> of November inclusive.
- b) 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 also yield an equivalent maximum curved carapace length that should be stipulated in any amended legislation.
- c) Consider a continued minimum size limit, as most fishers already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length stipulated in any amended legislation.
- d) Ensure prohibition of the harvest of loggerhead and leatherback turtles. The CIDoE have also expressed that they would recommend prohibition of any future take of hawksbill turtles.

#### **7.1.2.2. Increase the network of Protected Areas in the Cayman Islands**

##### **a) Key nesting sites should be given protected status**

At present, none of the key nesting beaches in the Cayman Islands is afforded protected status. It is recommended that key nesting sites for marine turtles are given a high level of protection from the deleterious effects of inappropriate coastal development. While there is currently no legislation to implement this recommendation, the Draft National Conservation Law would provide the necessary legal framework. Therefore, TCOT recommends the immediate enactment of this law.

##### **b) Key foraging sites should be given protected status**

Based on the ongoing and recommended expanded inwater monitoring programme, key foraging sites not already protected should be given protected status to ameliorate the effects of coastal development and recreational use. In so

doing, it is likely that key coral reef and seagrass habitats will be preserved. The Draft National Conservation Law would provide a comprehensive framework for management of protected areas and species.

#### **7.1.2.3. Endangered Species Trade and Transport Law**

TCOT recommends that the CIDoE be adequately resourced to implement the provisions of the recently enacted Endangered Species Trade and Transport Law, and that the necessary commencement orders be issued by Cabinet as soon as possible. When this legislation comes into effect, it will fully transpose CITES to domestic law.

#### **7.1.3. Continue and enhance systematic monitoring of marine turtle populations to determine trends in abundance**

Cayman Islands hosts nesting populations of green, loggerhead and hawksbill turtles and foraging populations of greens and hawksbills. The Cayman Islands' nesting turtle populations are remnant and at critically low levels; indeed the hawksbill nesting population may be extirpated. 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 the continuation and expansion of the following monitoring programmes, under the guidance of the CIDoE, as a matter of priority:

##### **7.1.3.1. Continue systematic monitoring efforts at nesting beaches throughout the three Islands**

The CIDoE currently runs an exemplary monitoring program that has been in operation for 6 years in Grand and Little Cayman. Given the recent discovery of nesting on Cayman Brac, survey efforts have been expanded to Cayman Brac. The main aims of such monitoring in all three islands would be to determine nesting abundance trends, monitor hatching success, describe threats and facilitate genetic analysis of nesting populations through nest excavation and sampling.

##### **7.1.3.2. Establish sustainable, regular and frequent (monthly), constant-effort monitoring programmes at a range of in-water study sites for both green and hawksbill turtles around the Cayman Islands**

Enhancing ongoing work, this would be carried out around all three of the Cayman Islands to allow the detection of temporal patterns of abundance, and to facilitate genetic sampling to further determine trends in genetic stock composition of green and hawksbill turtle populations. Surveillance for fibropapillomatosis should continue to be incorporated.

##### **7.1.3.3. Undertake limited night time beach monitoring for identification and genetic sampling of adult nesting green turtle females**

Given the large financial investment previously made in the CTF headstarting operation, it is highly recommended that CTF support the CIDoE's nocturnal monitoring to

allow a fuller appreciation of the impact of the headstarting experiment to be ascertained.

#### **7.1.3.4. Consideration be given to acting as a regional training centre**

The combined inwater and nesting monitoring programme of the CIDoE would be an excellent training platform for a range of interns, including fisheries officers, from throughout the wider Caribbean region.

#### **7.1.4. Maximise the role of the Cayman Turtle Farm in marine turtle conservation**

The Cayman Turtle Farm (CTF) is ideally and uniquely suited to promoting the conservation of marine turtles in the Cayman Islands. One key area is in the maximization of the proportion of production that is sold to local people. Since recent production cuts at the CTF, there has been a relative scarcity of turtle meat relative to demand. This has an intrinsic potential to drive the trade in both legal and illegally captured turtle meat from the wild. It is strongly advised that, where possible, production is increased and/or re-routed towards the local market, whether it be through supermarkets or restaurants catering largely to local people, in preference to those most frequented by island visitors. It is recommended that the sale of farmed turtle products be controlled under the Trade and Transport Law to prevent illegal trade in wild turtle products through commercial establishments.

#### **7.1.5. Establish further conservation and awareness programmes to sensitise those living in and visiting Cayman Islands to marine turtle conservation requirements**

Increased awareness of turtles and their conservation requirements in the Cayman Islands 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 CIDoE, to facilitate public contribution to marine turtle conservation:

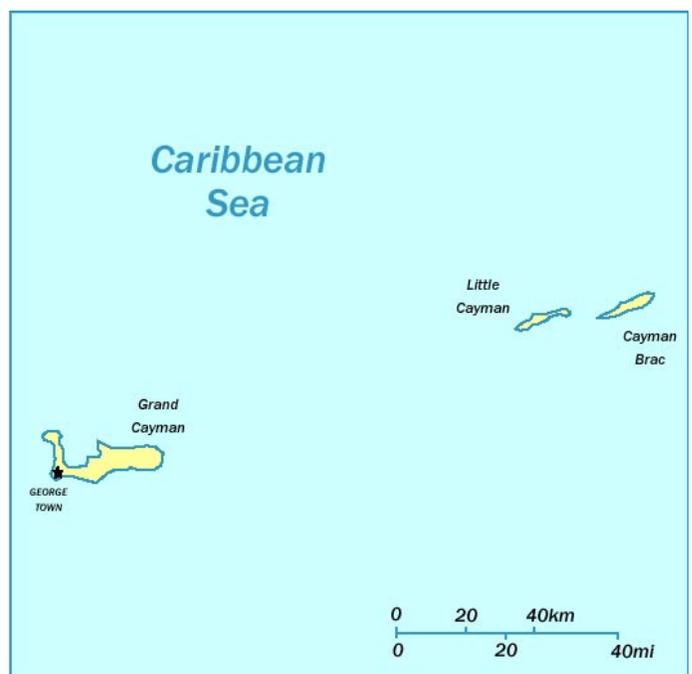
##### **7.1.5.1. Encourage and implement sensitive practices at existing nesting beaches**

- a) Continue coordinating the established network of hoteliers, beach residents and other beach users to ensure swift reporting of nests so that they can be marked, protected and monitored. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergences. Key issues to be addressed are lighting, vehicular traffic, and the use of heavy beach cleaning equipment.
- b) Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure CIDoE has the capacity to collect, necropsy and document all strandings. This network could be supported by a toll-free hotline.

- c) Raise awareness through the continuation and expansion of the campaign to sensitise Caymanians 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) Update and expand distribution of guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.
- e) Ensure continued enhanced school participation in relevant marine turtle conservation programmes to sensitise children to the importance of rookery protection.

#### **7.1.5.2. Implement general awareness programmes regarding marine turtle conservation in the Cayman Islands**

- a) Raise awareness among Caymanians of the presence of distinct foraging and nesting turtle populations through informational materials 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) Enhance existing CIDoE programme of awareness raising presentations and workshops in local 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 Cayman Islands specific turtle-related educational materials, and expand them to include further curriculum linked, multi-media educational materials where appropriate.



**Figure 7.1.** Map of Cayman Islands.

## 7.2. Geographic Overview

The Cayman Islands (Fig 7.1.) are a group of three islands: Grand Cayman, Little Cayman and Cayman Brac. They have a land area of 259 km<sup>2</sup>, 207 km of coastline, and a population of 43,103 growing at 2.71% (2004 est.). The economy is second only to Bermuda among the 6 OT's involved in TCOT, with a GDP per capita of US\$35,000 (2002 est., statistics from CIA World Fact Book <http://www.cia.gov/>). With no direct taxation, the islands are a thriving offshore financial centre. Tourism is also a mainstay, with over 2.1 million visitors in 2003.

## 7.3. Historical Overview

Historically, nesting marine turtles were abundant in the Cayman Islands (Williams 1995), with a large migrant population of green turtles reproducing between May and October on both Grand Cayman and Little Cayman (Lewis 1940; Parsons 1984). When Christopher Columbus discovered the islands in 1503, he named them "Las Tortugas" (Spanish: the turtles). His expedition recounted that the islands were:

*"full of tortoises, as was all the sea about, insomuch as that they looked like little rocks."*

Murray (1991) reports that, while stopping off at Tortugas en route to Florida in 1564, the English slave-trader Sir John Hawkins recorded:

*"These Islands beare the name of Tortoises, because of the number of them, which there do breed, whose nature is to live both in the water and upon land also, but breed onely upon the shore; in making a great pit wherein they lay egges, to the number of three or foure hundred, and covering thm with sand, they are hatched by the heat of the Sunne; and by this meanes commeth the great increase. Of these we tooke very great ones, which have both backe and belly all of bone, of the thicknes of an inch; the fish whereof we proved, eating much like veale; and finding a number of egges in them, tasted also of them, but they did eat very sweetly."*

The population was so large that authors have suggested that the Cayman Islands may have been the largest rookery for the green turtle in the Caribbean (Groombridge & Luxmoore 1989; King 1982; Jackson 1997).

Turtle fishing later came to form the basis of the economy and culture of the Islands, providing a rich food source and means of livelihood for several centuries. Indeed, this easily attainable resource was what originally attracted people to the islands, which were first colonised in the mid 1600's, with turtle fishing becoming the main local industry. By 1688, 40 sloops from Jamaica were engaged full time, with sources suggesting shipments of 13,000 turtles a year (King 1982). The level of take was undoubtedly unsustainable and by the late 1700s nesting turtles of the Cayman Islands were no longer a significant commercial resource. The population

was thought to have been completely extirpated by the 20<sup>th</sup> Century, but it appears that a remnant population has persisted (see Aiken *et al.* 2001a; 2001b, Bell & Austin 2002 and references therein).

By the early 1800s, Caymanian turtle fishers were sailing to Cuba, then to the Miskito Cays, Nicaragua to catch turtles (Lewis 1940; Parsons 1984). The Caymanian turtle fleet operated in this manner, largely sustaining the local economy, until tourism overtook as the major industry in the 1970s. Parsons (1962; 1984) suggests that the inhabitants of Cayman Brac were traditionally hawksbill fishers using "trap nets" while those in Grand Cayman focussed largely on the green turtle. Presumably, the green turtle take involved targeting nesting turtles on beaches as well as using "set nets" that were subsequently used in the Miskito Keys (Parsons 1984).

## 7.4. Organisations Involved with Marine Turtles in the Cayman Islands

There are two main organisations concerned with marine turtles in the Cayman Islands.

### 7.4.1. Cayman Islands Department of Environment

The responsibilities of the Cayman Islands Department of Environment (CIDoE) are broad, encompassing research, monitoring, advisory, enforcement, and education. There is a staff complement of 31: Director; 2 Assistant Directors (Operations; Research & Assessment); Research Manager; Senior Research Officer (Aquaculture & Fisheries); Environmental Assessment Officer; 5 Research Officers; 2 Special Projects Officers; Marine Parks Maintenance Supervisor; 2 Marine Parks Maintenance Officers; 2 Technical Assistants; Marine Technician; Chief Marine Enforcement Officer; Marine Enforcement Supervisor; 9 Marine Enforcement Officers; Executive Officer; Administrative Officer. The overall operating budget estimate for 2004-2005 was CI\$2,848,469 (T. Austin (CIDoE) pers. comm. 2004). The CIDoE currently operates 13 vessels and 11 road vehicles in support of Research, Marine Enforcement, and Marine Parks Operations in Grand Cayman, Little Cayman, and Cayman Brac.

The CIDoE has played a pivotal role in research, conservation, and management of wild marine turtles in the Cayman Islands since 1998, when the Marine Turtle Research Project was initiated with support of a grant from the UK Foreign and Commonwealth Office. Currently, research is carried out using the extensive field experience of the CIDoE and the collaborative academic expertise of the Marine Turtle Research Group at the University of Exeter in Cornwall. Through TCOT support, the CIDoE greatly expanded the range and scope of existing initiatives. As the agency responsible for research, public education, and management of the natural environment in the Cayman Islands, the CIDoE will ensure that TCOT recommendations and results are presented to the public and considered in the relevant policy decisions.

	Grand Cayman					Little Cayman					Cayman Brac
	1999	2000	2001	2002	2003	1998	2000	2001	2002	2003	2003
<b>Green</b>	1	18	2	43	18	9	9	3	8	4	0
<b>Loggerhead</b>	18	25	27	12	31	0	0	5	1	4	12
<b>Hawksbill</b>	2	0	0	0	0	2	0	0	0	0	0
<b>Unidentified</b>	2	2	1	9	1	4	2	0	2	0	0
<b>Total</b>	<b>23</b>	<b>45</b>	<b>30</b>	<b>64</b>	<b>50</b>	<b>15</b>	<b>11</b>	<b>8</b>	<b>11</b>	<b>8</b>	<b>12</b>

**Table 7.2.** Overall magnitude of nesting in the Cayman Islands since monitoring began in 1998 in Little Cayman and 1999 in Grand Cayman Islands.

#### 7.4.2. Cayman Turtle Farm

As a key part of the exploitation of turtle products in the Cayman Islands, a detailed profile of the Cayman Turtle Farm is given in Section 7.7.7.

### 7.5. Status of Nesting Marine Turtles in the Cayman Islands

#### 7.5.1. Data from nesting beach monitoring

The following information is distilled from a paper in preparation by Catherine Bell (CIDoE) *et al.*:

A total of 27 beaches covering 37 km of Grand Cayman's 129km of coastline have been identified as suitable for marine turtle nesting based on beach morphology and composition, and information from historical records and anecdotal reports. The Grand Cayman coastline has been monitored during the reproductive season from 1999 – 2004 (Photo 7.1). In Little Cayman the survey has been carried out in 1998, and every year commencing 2000. Sixteen beaches covering 18km of coastline were identified as suitable for marine turtle nesting habitat. In Cayman Brac, sporadic and reactive monitoring of its limited nesting

habitat began in 2003 in response to reports of marine turtle activity in these areas. Table 7.2 summarises nesting data gathered to date. There has been no recorded hawksbill nesting in the Cayman Islands since 1999 and it is possible that the hawksbill nesting population on the Cayman Islands may have been extirpated. Although nesting in every year, green (Photo 7.2) and loggerhead (Photo 7.3) nesting are at critically low levels and continued monitoring will give insights into trends in nesting numbers. Individual nests are followed through to hatching or failure and excavated to assess success (Photo 7.4).

#### 7.5.2. Data from TCOT socioeconomic questionnaire

Although systematic nesting beach monitoring by the CIDoE was only instigated in 1998, some insight can be obtained from past egg collectors. As part of the TCOT SEQ, 2 former egg collectors expressed their views that, in general, marine populations had declined. However, one thought that nesting turtles, especially loggerheads, had increased in the last 5 years. This same observer also felt that hawksbill nesting had continued to decline in the last 5 years.

All questionnaire respondents were also asked about perceptions of change in nesting numbers over time (in the last 5 years and since they can remember), both



**Photo 7.1.** Relatively undeveloped beaches persist in the Cayman Islands (Photo P. Richardson).



**Photo 7.2.** Green turtle nesting (Photo M. Orr).



**Photo 7.3.** Raking over loggerhead turtle track (Photo P. Richardson).



**Photo 7.4.** Nest excavation (Photo B. Godley).

in general and for specific species (Q105a-b). Twenty respondents noticed changes, 78 did not, and 12 did not answer the questions. For those who did notice change, for each species and in general, more people believed turtle nesting was decreasing versus increasing, in the past 5 years and since they can remember. For example, for turtles in general, 4 people believed nesting numbers had increased in the last 5 years, as opposed to 10 who believed they had decreased. Three believed they had increased since they could remember, and 10 believed they had decreased. Perceptions of species decline and increases are summarised in Table 7.3 below.

Respondents were asked about reasons for the perceived increase or decrease, both in the number of turtles nesting and found in OT waters (reasons were not distinguished by habitat). Responses (offered by 29 respondents) varied, with no single explanation dominating. Reasons cited for decreases included: over-fishing or inappropriate fishing methods, increased demand, environmental pressure, overpopulation, cultural traditions, over-consumption and storm damage. Reasons for increases included: conservation efforts, law and the turtle farm.

### 7.5.3. Threats

The following anthropogenic threats to adult turtles, their eggs and hatchlings have been documented by the CDoE and reviewed by Solomon (1998):

1. Fisheries capture (via legal turtle licenses; see Section 7.7.4)
2. Illegal fishing of adults (via hand capture and illegal set nets).
3. Illegal collection of eggs
4. Egg predation by domestic dogs

<b>In the last 5 years...</b>					
	<b>Increasing</b>	<b>Decreasing</b>	<b>Same</b>	<b>Don't know</b>	<b>NR</b>
<b>Green</b>	2	9	0	4	5
<b>Leatherback</b>	1	4	1	8	6
<b>Loggerhead</b>	3	6	0	7	4
<b>Hawksbill</b>	1	6	1	8	4
<b>General</b>	4	10	1	6	0

<b>Since you can remember...</b>					
	<b>Increasing</b>	<b>Decreasing</b>	<b>Same</b>	<b>Don't know</b>	<b>NR</b>
<b>Green</b>	2	8	0	4	4
<b>Leatherback</b>	0	5	1	7	7
<b>Loggerhead</b>	1	8	0	6	5
<b>Hawksbill</b>	0	8	1	6	5
<b>General</b>	3	10	1	7	0

**Table 7.3.** Perceptions of changing abundance of sea turtles nesting in Cayman Islands, in the last 5 years and since respondents can remember (n=20 respondents who noticed change).

5. Hatchling misorientation due to inappropriate beach lighting (Photos 7.5 and 7.6)
6. Nests being placed at risk by heavy beach cleaning equipment
7. Beach erosion
8. Coastal armoring and other physical obstacles on beaches
9. Loss of native vegetation

The CIDoE has a substantial enforcement capacity and does bring prosecutions for illegal activities (Section 7.7.4). It has an extensive liaison with property owners, media and community groups, including schools, to help ameliorate other threats (J Solomon (CIDoE) pers. comm. 2004).

#### 7.5.4. Genetics of nesting turtles

TCOT genetic analyses has shown that the haplotypes of nesting samples collected in the Cayman Islands have also been described in a number of other nesting sites and foraging areas (see section 10.4.4).

**For farmed green turtles**, haplotypes described in the Cayman Turtle Farm have also been found in the



**Photo 7.5.** Green turtles misorientated by lights and then killed by road vehicles (Photo CIDoE).



**Photo 7.6.** Nests in highly developed sites are caged to protect against misorientation and damage (Photo CIDoE).

**foraging** areas of Anguilla, Bahamas, Barbados, BVI, Montserrat, Nicaragua, TCI, USA and West Africa. These same haplotypes have also been described from **nesting** aggregations in Costa Rica, Mexico, USA and Venezuela.

**For wild green turtles**, haplotypes described in nesting turtles/hatchlings from the Cayman Islands have been described from **foraging** grounds in Bahamas, Barbados, Nicaragua and USA. These same haplotypes have also been described from **nesting** aggregations in Costa Rica, Mexico, USA and Venezuela.

**For hawksbill turtles** no genetics vouchers were collected.

**For loggerhead turtles**, haplotypes described in nesting turtles/hatchlings from the Cayman Islands have been described from **foraging** grounds in Panama and the Eastern Atlantic, but have also been described at **nesting** colonies in Greece, Mexico, and the USA.

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 Cayman Islands and the limited sampling to date, previously undescribed haplotypes were described for both green and loggerhead turtles. This highlights the likelihood that Cayman Islands may host its own discrete nesting populations with limited immigration/emigration, underlining the importance for protection. Data will be disseminated as part of the recently funded cross-territory Overseas Territories (OTEP) project which will focus on Turtles and the Environment Charter and Multilateral Environment Agreements.

#### 7.5.5. Nesting overview

Although once large, the populations of turtles nesting in the Cayman Islands may be genetically unique and are critically small. Indeed, the hawksbill turtle nesting population may be extirpated. Anthropogenic threats faced include direct and indirect capture and a range of factors related to coastal development.

#### **Recommendations**

##### **7.1.2.2. Increase the network of Protected Areas in the Cayman Islands**

##### **a) Key nesting sites should be given protected status**

*At present, none of the key nesting beaches in the Cayman Islands is afforded protected status. It is recommended that key nesting sites for marine turtles are given a high level of protection from the deleterious effects of inappropriate coastal development. While there is currently no legislation to implement this recommendation, the Draft National Conservation Law would provide the necessary legal framework. Therefore, TCOT recommends the immediate enactment of this law.*

#### **7.1.3.1. Continue systematic monitoring efforts at nesting beaches throughout the three Islands**

*The CDoE currently runs an exemplary monitoring program that has been in operation for 6 years in Grand and Little Cayman. Given the recent discovery of nesting on Cayman Brac, survey efforts have been expanded to Cayman Brac. The main aims of such monitoring in all three islands would be to determine nesting abundance trends, monitor hatching success, describe threats and facilitate genetic analysis of nesting populations through nest excavation and sampling.*

#### **7.1.3.3. Undertake limited night time beach monitoring for identification and genetic sampling adult nesting green turtle females**

*Given the large financial investment previously made in the CTF headstarting operation, it is highly recommended that CTF support the CDoE's nocturnal monitoring to allow a fuller appreciation of the impact of the headstarting experiment to be ascertained.*

#### **7.1.5.1. Encourage and implement sensitive practices at existing nesting beaches**

- a) *Continue coordinating the established network of hoteliers, beach residents and other beach users to ensure swift reporting of nests so that they can be marked, protected and monitored. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergences. Key issues to be addressed are lighting, vehicular traffic, and the use of heavy beach cleaning equipment.*
- b) *Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure CDoE has the capacity to collect, necropsy and document all strandings. This network could be supported by a toll-free hotline.*
- c) *Raise awareness through the continuation of the campaign to sensitise Caymanians 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) *Update and expand distribution of guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.*
- e) *Ensure continued and enhanced school participation in relevant marine turtle conservation programmes to sensitise children to the importance of rookery protection.*

## **7.6. Status of Foraging Marine Turtles in the Cayman Islands**

### **7.6.1. Monitoring efforts**

CDoE co-ordinated in-water survey work, with remote guidance offered by MTRG before and during the TCOT project. **Janice Blumenthal and Catherine Bell of CDoE write:**

The Cayman Islands Department of Environment has been carrying out an in-water monitoring project since 2000. Sampling was undertaken from May 2000 to August 2002 and bi-monthly following initiation of the TCOT project. To date, over 160 juvenile hawksbill turtles and 35 juvenile green turtles have been captured on foraging grounds in Grand Cayman and Little Cayman. During each capture occasion, data are collected on location, capture depth and habitat type, Catch Per Unit Effort, turtle morphometrics, size frequencies, recaptures (for capture-mark-recapture modeling), and incidence of lesions suggestive of fibropapillomatosis. Turtles are sampled for blood (serum and red blood cells – RBC's), tissue, and epibionts.

Many aspects of sea turtle population dynamics remain unevaluated, hampering conservation efforts. Basic demographic parameters such as sex ratio, growth rate, habitat utilisation, and foraging behaviour must be elucidated in order to model population dynamics and evaluate risks to threatened populations. Initial monitoring efforts have uncovered great geographic variability, necessitating the study of regional index populations. As identified at the West Atlantic Green Turtle Population Modelling Workshop (Bolten & Chaloupka 2004), the Cayman Islands are ideally situated to provide a robust reference point for marine turtle population biology in the Western Caribbean.

The following techniques are being used:

#### **i) Modified Mark and Recapture using Snorkel Tow**

Hawksbills, and to a lesser extent green turtles, are hand-captured in foraging habitat by snorkellers towed approximately 30 feet behind a small boat (Photo 7.7). Capture depth, weather and sea conditions, capture habitat, turtle activity on sighting, Catch Per Unit Effort (CPUE), and other parameters are evaluated during each capture occasion. This methodology was demonstrated to participants during the TCOT workshop (2002), and has now been adopted in other Overseas Territories. Captures in CI to date include:

Hawksbills: 82 foraging hawksbills have been captured in Grand Cayman and 79 in Little Cayman (Total: 161);  
Green turtles: 32 foraging green turtles have been captured in Grand Cayman and 3 in Little Cayman (Total: 35).

All captured turtles are tagged according to standard protocols to prevent collection of duplicate genetic samples and to elucidate demographic parameters. Metal Inconel tags are applied to the posterior edge of each front flipper and Passive Integrated Transponder (PIT) tags are injected into the shoulder muscle (Balazs 1999). Weight, straight



**Photo 7.7.** Catching a juvenile hawksbill turtle (Photo P. Richardson).

carapace length, width, depth, plastron length, and tail measurements are recorded for turtles on capture and following each recapture. Scales and calipers are calibrated prior to all capture days. Morphometric data are collected for all foraging turtles. Skin biopsies are obtained from a rear flipper with a sterile 4-millimetre biopsy punch and preserved in a buffer solution of 20% dimethyl sulfoxide (DMSO) saturated with Sodium Chloride (NaCl) (Dutton 1996). Samples are collected from all captured turtles.

To collect blood for sex determination, turtles are restrained head-down while 5-10 ml samples are collected from a dorsal cervical sinus (Owens *et al.* 1980) using a 21-gauge needle and an evacuated blood-collecting tube (Dutton 1996). Blood samples for sex determination are collected in Sodium Heparin vials (to prevent coagulation of the blood) and are centrifuged upon return from field to separate serum from red blood cells (RBCs). Serum is stored at  $-70^{\circ}\text{C}$  pending analysis by Radioimmunoassay (Diez & van Dam 2003), and RBCs are archived for stable isotope analysis.

Samples collected to date include: Hawksbills: 47 serum samples have been collected from foraging hawksbills in

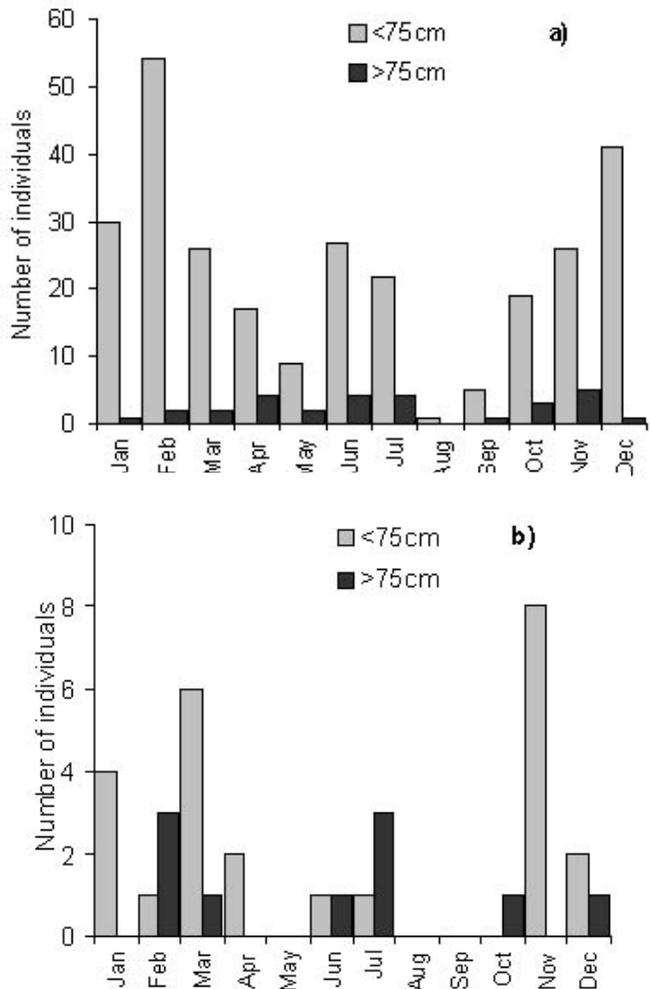
Grand Cayman, and 35 in Little Cayman; Green turtles: 6 serum samples have been collected from foraging green turtles in Grand Cayman and 2 in Little Cayman.

### ii) Transect Surveys

Transect surveys have been conducted in lagoonal and reef habitats. Capture-Mark-Recapture and transect surveys are performed in order to collect data on foraging population abundance and distribution. Transect methodology has been adapted from reviews in Bjorndal and Bolten (2000) and habitat classification methodology from Kendall *et al.* (2001). Distribution and habitat information will be incorporated into GIS mapping of benthic habitat. Habitat and marine turtle abundance data are collected for 66 transect lines.

### iii) Aerial Surveys

Aerial surveys are in progress to facilitate an evaluation of habitat use and trends. To date, 4 trial/training flights have been conducted in order to standardize survey methodology, sightings, and recording. Following finalisation of technique, bi-monthly flights will be conducted.



**Figure 7.2.** Temporal distribution of sighting of a) hawksbill and b) green turtles in the Cayman Islands. Pale bars represent individuals of <75cm in carapace length estimated by observers. Dark bars represent those >75cm, considered adults.

Species	<25	26-50	51-75	>76	Unknown	Total	Site
Green	1	20	4	10	3	38	2,14,18,32,39,50,63,69,70,71,83,85,86,97,106,112,118,127,144
Hawksbill	47	177	53	29	13	319	2,4,5,6,8,10,12-17,20,23-25,29-31,33,35,37-40,42,45,47-49,52-61,63-65,69-71,74-76,78,79,81-83,85,87,89-95,98,104,106,109,110,112-120,122,125,127,128,131-134,136,137,141v
Loggerhead	0	0	1	0	0	1	31
Unidentified	0	13	7	3	5	28	2,22,29,36,42,69,85,106,127,132,141

**Table 7.4.** Summary of species and size class of individuals turtles observed by divers in the Cayman Islands 1 September 2002 – 26 November 2003. Key to locations: 14 Trees <sup>1</sup>, Anchor Point <sup>2</sup>, Andes Wall <sup>3</sup>, Aquarium <sup>4</sup>, Armchair Reef <sup>5</sup>, Babylon <sup>6</sup>, Balboa <sup>7</sup>, Barracuda bight <sup>8</sup>, Bears Paw <sup>9</sup>, Big Dipper <sup>10</sup>, Big house <sup>11</sup>, Big Sister <sup>12</sup>, Big Tunnel <sup>13</sup>, Black Forest <sup>14</sup>, Black Hole <sup>15</sup>, Black Rock <sup>16</sup>, Black Rock Shallow <sup>17</sup>, Blackie's Hole <sup>18</sup>, Blue Peter <sup>19</sup>, Bonnie's Arch <sup>20</sup>, Breakers Cut <sup>21</sup>, Bus Stop <sup>22</sup>, Caribbean Sand Chute <sup>23</sup>, Chain Reef <sup>24</sup>, Charlie's <sup>25</sup>, Cheeseburger reef <sup>26</sup>, Chinese Garden <sup>27</sup>, Christina's Wall <sup>28</sup>, Chubb Hole <sup>29</sup>, Cinderella's Castle <sup>30</sup>, Coconut Wall <sup>31</sup>, Crushers Wall <sup>32</sup>, Cumbers Cove <sup>33</sup>, Delilah's Delight <sup>34</sup>, Doc Polson <sup>35</sup>, Donna's Delight <sup>36</sup>, Dreamweaver <sup>37</sup>, Eagle Ray Pass <sup>38</sup>, Eagle Ray Round Up <sup>39</sup>, Eagle's Nest <sup>40</sup>, Eden Rock <sup>41</sup>, Fish Tank <sup>42</sup>, Gail's Mountain <sup>43</sup>, Gails Reef <sup>44</sup>, Ghost Mountain <sup>45</sup>, Governor's Reef <sup>46</sup>, Great House Wall <sup>47</sup>, Great Wall <sup>48</sup>, Great Wall East <sup>49</sup>, Great Wall West <sup>50</sup>, Grouper Grotto <sup>51</sup>, Grundy's Gardens <sup>52</sup>, Hammerhead Hill <sup>53</sup>, Harbour Heights <sup>54</sup>, Hepp's Wall <sup>55</sup>, High Rock <sup>56</sup>, Hole in the Wall <sup>57</sup>, Hyatt Drop Off <sup>58</sup>, Ironshore Garden <sup>59</sup>, Jack McKinney's <sup>60</sup>, Jackson Wall and Reef <sup>61</sup>, Japanese Garden <sup>62</sup>, Joy's Joy <sup>63</sup>, Julie's Wall <sup>64</sup>, Kangaroo Gorge <sup>65</sup>, Kelly's Cavern <sup>66</sup>, Keno <sup>67</sup>, Kent's Caves <sup>68</sup>, La Mesa <sup>69</sup>, Lea Leas Lookout <sup>70</sup>, Lemon Reef <sup>71</sup>, Leslie's Curl <sup>72</sup>, Lighthouse Wall <sup>73</sup>, Little Bluff Reef <sup>74</sup>, Little House on the Prairie <sup>75</sup>, Little Tunnel <sup>76</sup>, Long Point Seven Mile Beach (N) <sup>77</sup>, Lost Valley <sup>78</sup>, Maggie's Maze <sup>79</sup>, Main Street <sup>80</sup>, Marilyn's Cut <sup>81</sup>, Meadows <sup>82</sup>, Middle Sister <sup>83</sup>, Mitch Millers Reef <sup>84</sup>, Mixing Bowl <sup>85</sup>, Mountain <sup>86</sup>, Nancy's Cup of Tea <sup>87</sup>, Ned's Tunnel <sup>88</sup>, No Name Wall <sup>89</sup>, Northern Lights <sup>90</sup>, NW Point Drop Off <sup>91</sup>, Old Wreck Head <sup>92</sup>, Omega Reef <sup>93</sup>, Orange Canyon <sup>94</sup>, Ore Verde <sup>95</sup>, Paradise Reef <sup>96</sup>, Paradise Wall <sup>97</sup>, Pat's Wall <sup>98</sup>, Peppermint Reef <sup>99</sup>, Pirate's Caves <sup>100</sup>, Playing Fields <sup>101</sup>, Princess Penny's Pin <sup>102</sup>, Public Beach <sup>103</sup>, Public Beach North between 3 Tree and Bolters <sup>104</sup>, Queens Throne <sup>105</sup>, Randy's Gazebo <sup>106</sup>, Red Bay Caves <sup>107</sup>, Red Bay Caves W <sup>108</sup>, Ridgefield reef <sup>109</sup>, Ringer Wall <sup>110</sup>, Rivers of Sands <sup>111</sup>, Robert's Wall <sup>112</sup>, Round Rock <sup>113</sup>, Royal Palm's Ledge <sup>114</sup>, Sand Chute W <sup>115</sup>, Sarah's Set <sup>116</sup>, Scuba Bowl <sup>117</sup>, Seaview Reef <sup>118</sup>, Sheer Wall East <sup>119</sup>, Silver Sands <sup>120</sup>, Smith's Cover <sup>121</sup>, Snapper Hole <sup>122</sup>, Soto's Reef <sup>123</sup>, Splash House <sup>124</sup>, Split Rock <sup>125</sup>, Stingray Alley <sup>126</sup>, Sunset Reef <sup>127</sup>, Tarpon Alley <sup>128</sup>, Tarpon Alley (E) <sup>129</sup>, The Edge <sup>130</sup>, The Maze <sup>131</sup>, The Pinnacles <sup>132</sup>, The Wharf <sup>133</sup>, Three B's <sup>134</sup>, Three Trees <sup>135</sup>, Tolero <sup>136</sup>, Trinity Caves <sup>137</sup>, Turtle Farm <sup>138</sup>, Turtle Pass <sup>139</sup>, Turtle Reef <sup>140</sup>, Valley of the Dolls <sup>141</sup>, Whitestoke <sup>142</sup>, Wildlife Reef <sup>143</sup>, Jackson's Bay <sup>144</sup>.

#### iv) Net-based Surveys

Initial attempts at in-water capture of green turtles employed several unmonitored set nets and a 500-foot entrapment net deployed from the stern of a small outboard boat. Initial efforts resulted in 17 green turtle captures, and beginning in summer 2004, an intensive capture effort will be initiated using monitored set nets, with the aim of collecting 50-100 samples from foraging green turtles in the Cayman Islands.

#### v) Use of Caribbean Turtlewatch

Caribbean Turtlewatch surveys were conducted in the Cayman Islands between September 1, 2002, and November 26, 2003. Seven dive operators on Grand Cayman (including the CIDoE) and 3 dive operators on Little Cayman took part in the survey. During this time 521 check forms were completed, detailing 521 check dives over 144 dive sites around the two islands. On 244 dives, no turtles were seen and on the other 277 dives, 386 turtle sightings were recorded. A total of 319 hawksbill, 38 green, 1 loggerhead and 28 unidentified turtle sightings were logged. On 196 occasions only 1 turtle was seen, on 54 occasions 2 turtles were seen, and on 5 occasions 4 turtles were seen. See table 7.4 for a summary of species and size class of individuals observed.

The most frequently sighted turtle in the Cayman Islands is the hawksbill turtle (83% of total sightings). Green turtles were also observed on occasion (10% of total sightings). Only 1 loggerhead sighting was recorded, and no leatherback turtles were sighted in Cayman waters. Green and hawksbill turtles commonly reside on Cayman's reefs and seagrass beds, and it is therefore more likely that they would be sighted by divers.

The months during which individuals were observed are given in table 7.5. In addition, data on the temporal distribution of hawksbill and green turtle sightings are presented in figure 7.2.

Divers completing Caribbean Turtle Watch forms were asked the question: *Did the chance of seeing a turtle influence your decision to choose this particular dive?* Of 310 responses to this question, 110 were positive, 185 responses were negative and 12 were unsure.

When asked the question: *How important was your turtle sighting to the enjoyment of the dive?* 205 felt it was very important, 90 felt it was important and 11 replied that the sighting of a turtle did not influence their enjoyment of the dive.

Month	Green		Hawksbill		Loggerhead		Unidentified		Total
	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	
Jan	4	0	30	1	0	0	0	0	35
Feb	1	3	54	2	0	0	0	0	60
Mar	6	1	26	2	0	0	0	0	35
Apr	2	0	17	4	0	0	1	0	24
May	0	0	9	2	0	0	2	0	13
Jun	1	1	27	4	0	0	0	0	33
Jul	1	3	22	4	0	0	0	0	30
Aug	0	0	1	0	0	0	0	0	1
Sep	0	0	5	1	0	0	1	0	7
Oct	0	1	19	3	0	0	0	0	23
Nov	8	0	26	5	1	0	1	0	41
Dec	2	1	41	1	0	0	0	0	45

**Table 7.5.** Temporal distribution of observations of all species in the Cayman Islands. Juveniles are classed as those <75cm in carapace length and possible adults those >75cm.

These answers show that, although the majority of divers are not selecting dive sites in the hope of seeing a turtle (possibly a reflection of the low numbers of turtles in Cayman waters and the consequent difficulty in being able to guarantee a sighting at any site), once sighted, turtles are highly appreciated by most divers. Data presented should be considered preliminary and will be given a full and detailed analysis by Catherine Bell (CIDoE) who will explore the utility of this approach whilst discussing many of the potential sources of bias.

### 7.6.2. Overview of species present

The Cayman Islands host relatively large foraging aggregations of immature hawksbill and green turtles. CIDoE in-water capture surveys, *Caribbean Turtlewatch*,

and formal and informal interviews during the course of TCOT Socioeconomic Questionnaire (SEQ) suggest that Grand Cayman, Little Cayman, and Cayman Brac provide developmental habitat for juvenile hawksbill and green turtles, while mature turtles are observed exclusively during the summer breeding and nesting season. Hawksbills captured during CIDoE in-water surveys ranged from 22.7 - 61.9 cm Straight Carapace Length (n=161), while green turtles ranged from 24.5 - 53.0 cm (n=37). These size classes are indicative of post-pelagic juveniles and sub-adults, confirming the role of the Cayman Islands as a developmental habitat. Loggerhead turtles are rarely observed in Caymanian waters, despite the Islands hosting a small nesting population. Undoubtedly these adults are only seasonal migrants.

#### In the last 5 years...

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

#### Since you can remember...

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

**Table 7.6.** Fishermen's perceptions of changing abundance of sea turtles found in OT waters, in the last 5 years and since they can remember (n=8 fishermen who noticed change).

**In the last 5 years...**

	Increasing	Decreasing	Same	Don't know	NR
Green	12	14	1	9	0
Leatherback	0	10	1	17	7
Loggerhead	3	16	0	13	2
Hawksbill	7	15	1	10	1
General	4	15	1	11	4

**Since you can remember...**

	Increasing	Decreasing	Same	Don't know	NR
Green	7	17	1	8	2
Leatherback	0	9	1	16	9
Loggerhead	1	15	1	12	6
Hawksbill	3	15	3	9	5
General	3	16	1	10	5

**Table 7.7.** Perceptions of changing abundance of sea turtles found in OT waters, in the last 5 years and since respondents can remember (n=35 respondents who noticed change).

**7.6.3. Spatial patterns in relative abundance**

The Cayman Islands support an extensive system of back-reef lagoons, providing habitat for foraging juvenile green turtles. Seagrass beds within the lagoons are primarily composed of turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*) and shoal grass (*Halodule wrightii*), along with several genera of green algae, including *Halimeda*, *Penicillus* and *Rhizochephalus* (Roberts 1994). Surveys to date indicate that the southerly South Sound and the eastern edges of the North Sound lagoon provide key seagrass habitats for green turtles. Additionally, green turtles have been documented on exposed western algal foraging grounds. Hawksbill turtles have been documented in colonised hard-bottom areas, patch reef, and the vertical reef wall, with key habitat occurring in Bloody Bay, Little Cayman, and Western Grand Cayman. These areas have been designated index sites for intensive monitoring and abundance estimation via Capture-Mark-Recapture (CMR) modelling.

**7.6.4. Trends in abundance**

Trends in abundance on index sites (key foraging areas) will be evaluated via CMR modelling, which allows estimation of absolute abundance. The CJS (Cormack-Jolly-Seber) modelling approach is a multiple sequential modelling technique used for derivation of apparent survival ( $\phi$  – probability of surviving and remaining in the study area) and temporal recapture probabilities ( $p$ ) of marked individuals in an open population. Preliminary CJS population estimates for foraging grounds in Little Cayman and Grand Cayman have been conducted via the program MARK (White & Burnham 1999) to establish the viability of the approach, and precision and reliability of estimates can be confirmed when sample size has increased.

**End of section by Blumenthal and Bell.**

Answers provided by fishers as part of the SEQ suggest that turtle populations have decreased over time. Four turtle fishers provided their views on the temporal patterns of marine turtle abundance in Cayman waters. Three turtle fishers felt there has been a general decrease in marine turtle numbers in both the short (5 years) and long term (since they started fishing). One believed turtle numbers had increased in the past 5 years. All respondents were asked their opinions on changes in abundance of turtles overall and for each species, in the short and long term (section 9, Q104a-c). Views of fishers, 8 of whom noticed change while 3 did not, are isolated in table 7.6, while views of all respondents are shown in table 7.7.

Of 106 respondents to TCOT SEQ, 35 perceived a change, while 59 did not, and 12 did not respond. As with nesting turtles, the number of people perceiving a decline in numbers exceeded the number of people perceiving an increase, for all species, and for both time periods. For example, over the last 5 years for turtles in general, 4 respondents perceived an increase in the number of turtles in water, while 15 perceived a decrease. Since they can remember, 3 respondents perceived an increase and 16 perceived a decrease. Results for individual species and turtles in general are shown in table 7.7.

Respondents were asked about reasons for the perceived change, both in the number of turtles nesting and in water. Responses (offered by 29 respondents) varied, with no single explanation dominating. Reasons cited for decreases included: over-fishing or inappropriate fishing methods, increased demand, environmental pressure, overpopulation, cultural traditions, over-consumption and storm damage. Reasons for increases included: conservation efforts, law and the turtle farm.

<i>Measures of direct exploitation</i>	<i>Past</i>	<i>Present</i>	<i>Never</i>	<i>NR or NA</i>
<b>By life stage</b>				
Females on beaches	0	0	-	-
Eggs from beach	3	0	-	-
Turtles in water (intentional)	4	4	-	-
Turtles in water (incidental)	6	-	-	-
<b>By product</b>				
<b>Meat</b>				
Fishers who sell meat	1	2	-	-
Meat vendors	2	9	-	-
Meat consumers	24	42	40	-
<b>Eggs</b>				
Collectors who sell eggs	0	0	-	-
Egg vendors consumers	0	0	-	-
Egg consumers	3	7	96	-
<b>Non-edible</b>				
Fishers who sell shells	1	1	-	-
Shell vendors	1	1	-	-
Shell consumers	22	4	80	-
<b>Measures of indirect exploitation</b>				
Turtles indirectly used in business	21			
<b>Total interviews</b>	<b>106</b>			

**Table 7.8.** Numbers of TCOT SEQ respondents involved in exploitation, by exploitation category. Key NR- No Response, NA - Not Applicable.

### 7.6.5. Threats

The following anthropogenic sources of mortality or injury have been documented by the Cayman Islands Department of Environment:

1. Fisheries capture (via legal turtle licenses)
2. Illegal fishing (via hand capture and illegal set nets)
3. Boat strike (fatal propeller wounds to carapace and limbs)
4. Entanglement in monofilament fishing line (leading to fatal tissue necrosis; Photo 7.8)
5. Ingestion of fishhooks and helium balloons

Pollution and nutrient enrichment are also of concern in the Cayman Islands, as incidence of fibropapillomatosis disease may be correlated with poor water quality. Additionally, coral bleaching, anchor damage, sedimentation, and dredging have the potential to compromise marine turtle habitat in the Cayman Islands. On a broader scale, preliminary genetic studies (TCOT genetics section) indicate that juvenile hawksbills in the Cayman Islands originate from a range of Caribbean jurisdictions. Therefore, exploitation on nesting beaches and adult foraging grounds in other areas could significantly impact foraging aggregations in the Cayman Islands.

### 7.6.6. Genetics of foraging populations

TCOT genetic analyses have shown that the haplotypes of foraging turtles in the Cayman Islands have also been described in a number of other nesting and foraging sites (see section 10.4.4).



**Photo 7.8.** Hawksbill killed as a result of entanglement (Photo CIDoE).

**For wild green turtles** sampling is now underway by DoE. **For hawksbill turtles** haplotypes described in **foraging** turtles in the Cayman Islands have been described from **foraging** grounds in Anguilla, BVI, Cuba, Mexico, Montserrat, Puerto Rico, and TCI. These haplotypes have also been described from **nesting** aggregations in Antigua, Barbados, Belize, Brazil, Mexico, Cuba, Puerto Rico, 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 Caymanian waters will undoubtedly include those originating from a number of nesting colonies across the Caribbean region. Detailed information will be disseminated as part of the recently funded cross-territory Overseas Territories (OTEP) project that will focus on Turtles and the Environment Charter and Multilateral Environment Agreements.

#### **7.6.7. Foraging overview**

It is likely that only green and hawksbill turtles forage in Cayman waters where there are pockets of abundance of both species.

#### **Recommendations**

##### **7.1.2.2. Increase the network of Protected Areas in the Cayman Islands**

##### **b) Key foraging sites should be given protected status**

*Based on the ongoing and recommended expanded inwater monitoring programme, key foraging sites not already protected should be given protected status to ameliorate the effects of coastal development and recreational use. In so doing, it is likely that key coral reef and seagrass habitats will be preserved. The Draft National Conservation Law would provide a comprehensive framework for management of protected areas and species.*

##### **7.1.3.2. Establish sustainable, regular and frequent (monthly), constant-effort monitoring programmes at a range of in-water study sites for both green and hawksbill turtles around the Cayman Islands**

*Enhancing ongoing work, this would be carried out around all three of the Cayman Islands to allow the detection of temporal patterns of abundance, and to facilitate genetic sampling to further determine trends in genetic stock composition of green and hawksbill turtle populations. Surveillance for fibropapillomatosis should continue to be incorporated.*

## **7.7. Direct Use of Marine Turtles in the Cayman Islands**

### **7.7.1. Overview**

The main domestic legislation that covers turtle use is the Marine Conservation (Turtle Protection) Regulations (1996 Revision), which is fully reviewed in Section 3. In summary, the laws of the Cayman Islands protect eggs and nesting females and maintain turtle harvests at sea to a limited licensed traditional take within a geographically restricted open season. The CIDoE have 10 enforcement officers working throughout the 3 islands, and enforcement is considered effective, but not absolute. Through informants, enforcement officers are aware of infringements of laws that occur despite possible penalties of fines of up to CI\$500,000 or 1 year imprisonment. Although there are few records or accounts of prosecutions for turtle related offences, in August 2004 an individual was fined CI\$1,000 for slaughtering a wild green turtle, which included \$500 for possession and \$500 for slaughter without inspection by a Fisheries Officer (T. Austin (CIDoE) pers. comm. 2004). A second case is pending trial in Cayman Brac. Marine Park Regulations and Marine Conservation Laws are publicised in an attractive pamphlet (Appendix 7.1) that outlines the location and rules for limited use areas, as well as summarising the regulations in easily accessible language. The TCOT SEQ revealed reasonably high awareness of laws regulating marine turtle fishing; over 50% of respondents reported their awareness of laws, and most of these could provide specific examples of restrictions.

Data on use of marine turtles were gathered by combining published information, that provided by project partners and the data gathered using the TCOT Socioeconomic Questionnaire or SEQ (See Section 2). In Cayman, 106 questionnaires were completed and a breakdown of how much information gathered on marine turtle exploitation is digested in the Table 7.8.

### **Methods**

The TCOT SEQ was administered in Cayman Islands by community college students. Preparation involved training of teaching staff in week 1, and student training in week 2, which included a briefing and practice administration. In week 3, teaching staff carried out an overview and problem-solving session in advance of student administration in week 4. It appears, however, this was not sufficient to allow all of the students to negotiate some of the more difficult parts of the questionnaire. While some questionnaires were completed correctly, it is evident that administration protocol was not followed rigorously in many instances. One problem in particular is pertinent to the following exploitation report, and is described here. The TCOT team had made the decision to allow pleasure fishers to 'opt out' of section 3 (for fishers), with pleasure fishing defined in contrast to fishing undertaken as a means of supporting oneself (for food or cash). While we imagined that some pleasure fishers might incidentally hook a sea turtle now and again, we felt having them complete a long section of the survey, most of which would not be relevant to them, was undesirable. We also imagined that there would be few 'pleasure' turtle fishers.

However, 4 people who identified themselves as pleasure fishers went on to complete section 4 of the survey, designed for turtle fishers. There are two possible explanations for this. First, the first question of section 4 asks respondents if they catch turtles intentionally, opportunistically, or both, and all 4 people responded 'opportunistically'. These pleasure fishers may have misunderstood opportunistically to mean incidentally (and college students may have been unable to explain that the section was not relevant to them). Second, it may be that some pleasure fishers do opportunistically catch sea turtles, though this would at first seem unlikely given the illegal nature of the activity and the fact that there may be some difficulty in hiding sea turtles at public landing site. We have included these 4 fishers in the discussion below.

### 7.7.2. Harvest of adults on the nesting beach

In the Cayman Islands, it is strictly illegal to take nesting females during the nesting season as:

1. turtles taken as part of the legal fishery must be captured outside the reef crest and;
2. the closed season encompasses the recorded nesting season of both green and loggerhead turtles and is likely to encompass the majority of hawksbill turtle nesting, although there are very few nests from this species.

Some illegal take of nesting females is thought to still occur (G. Ebanks-Petrie (CIDoE) pers. comm. 2004), possibly at a low level. Indeed, one such attempt was thought to have recently been foiled where a nesting green turtle was discovered turned and tied to a tree by CIDoE staff during beach monitoring. The turtle was released under police supervision (Photo 7.9). It transpires that the turtle had been captured under the misunderstanding that a temporary lifting of the protective legislation, which had been instigated to allow recapture of the escaped Cayman Turtle Farm stock in the wake of Hurricane Michelle, had still been in place. CTF paid the turtler who had previously been paid for recoveries of escaped farm stock (J. Parsons (CTF) pers. comm. 2004). None of the interviewees in the TCOT SEQ reported catching nesting turtles at any time.



**Photo 7.9.** Green turtle released under police supervision (Photo CIDoE).



**Photo 7.10.** Tags and license for use in turtle fishery (Photo CIDoE).

### 7.7.3. Harvest of eggs

Despite being illegal, taking of eggs still occurs. CIDoE staff have 9 reliable records of clutches of eggs having been taken since 2000 (n=1 green turtle nest), 2002 (n= 3 green turtle nests; n =2 unknown species) and 2003 (n=3 nest of unknown species). It is felt that this is undoubtedly an underestimate as surveillance is less intense on Little Cayman and Cayman Brac, and nest poachers are thought to camouflage their own tracks and those of the turtle laying the clutch to minimise the chance of detection.

Nesting levels in the Cayman Islands are very low (Aiken *et al.* 2001a; 2001b; Bell & Parsons 2002) and it is thought that only a minority are subject to egg poaching, thus the total number of eggs involved is not large. The mechanism and prices involved in any sale of eggs is not yet assessed, but suffice to say that the take and sale of sea turtle eggs is not a significant economic activity. If information provided by past egg collectors holds true today, it is most likely that eggs collected are used for personal consumption.

In the TCOT SEQ, no interviewees reported current egg collecting although we received data from 3 former egg collectors (2 from Cayman Brac and 1 from Grand Cayman). Two of these ceased egg collection approximately 25 years ago when they became aware it was illegal and another reported stopping in 1990 following an incident when he was nearly caught by Police. It appears from the testimony of these 3 interviewees that the eggs of all three hardshell species were collected. Two interviewees expressed a preference: hawksbill turtle eggs (n=1; more eggs per nest) and green turtle eggs (n=1; better tasting). Two of the three interviewees offered opinions as to the pattern in abundance of nesting turtles, and their views are isolated from the general population of respondents. One responded that nesting numbers in general had decreased over the past 5 years and since he could remember. The other responded in general, and for specific species. In general, he believed nesting numbers had increased in the past 5 years, but decreased since he could remember. He described the same trend for loggerhead turtles specifically.

Year	Month	Spp	Mass (lbs)	Mass (kg)	sex	Capture method
1999	Apr	L	154	70.0	U	U
2000	Nov	G	U	U	U	U
	Dec	G	U	U	U	U
	Dec	G	155	70.5	U	trap net
	Dec	U	U	U	U	U
	Apr	L	350	159.1	U	U
	Apr	H	98	44.5	U	U
2001	Jan	G	240	109.1	U	U
	Apr	G	180	81.8	M	U
	Apr	G	300	136.4	M	trap net
	Apr	H	110	50.0	U	trap net
2002	Feb	G	130	59.1	F	trap net
	Feb	H	105	47.7	U	trap net
2003	Mar	G	>100	>45.5	U	U
	Nov	H	120	54.5	U	U
	Apr	G	225	102.3	M	trap net
	Apr	H	110	50.0	F	trap net
	Apr	H	110	50.0	M	trap net
	Mar	H	85	38.6	U	set net
	Apr	H	82.5	37.5	U	set net
	Nov	H	90	40.9	F	set net
	Nov	G	264	120.0	M	trap net
2004	Apr	H	85	38.5	F	trap net
	Apr	G	200	91	M	U
	Apr	G	>200	>91	M	trap net
	Apr	L	>200	>91	M	trap net
	Apr	G	280	127	M	trap net
	Apr	G	>200	>91	M	trap net

**Table 7.9.** Data on legally captured marine turtles in the Cayman Islands 1999-2004. Data Courtesy of CI DoE (Key G: Green turtle; H: Hawksbill turtle; L: Loggerhead turtle; U: Unknown species, sex or fishing method of capture; M: Male; F: Female).

However, he believed that hawksbill turtles had decreased during both time periods. The lack of a significant economy in turtle eggs is somewhat supported by the fact that none of the three former egg collectors reported ever having sold eggs. Of 7 former egg consumers, only 2 had opinions as to temporal trends in availability; both considered that egg availability had decreased in the short and the long term. Three respondents reported they were current consumers of sea turtle eggs, but no further information was proffered.

#### 7.7.4. Harvest at-sea

A traditional marine turtle fishery still exists in the Cayman Islands, which has been a license-only fishery since 1978. The open season is 1<sup>st</sup> November-30<sup>th</sup> April. There are 20 individuals with the right to apply for a marine turtle fishing license; 14 of these are current and 8 have taken turtles since 1998 (5 in Cayman Brac and 3 in Grand Cayman; C. Bell (CIDoE) pers. comm. 2004). The other eligible fishers do not have licenses at this time and therefore cannot fish for turtles. Eligible licensees are individuals from families which have a long tradition of turtling. Licenses are non transferable and under the current legislation, the fishery will die with the last of the 20 traditional turtle fishers.

Under this system, each fisher is allowed to take no more than 6 turtles per season and each turtle must be greater than 120lbs (54.5kg) if a green turtle, or greater than 80lbs (36.4kg) if a loggerhead or hawksbill turtle. Turtles must be taken outside the reef crest using traditional methods only (set net, trap net). Harpoons or spear-guns are specifically prohibited. Upon capture, licensed fishers are required to place an individually numbered tag that is issued with license (Photo 7.10) on a captured turtle and report it to a fisheries officer before slaughter. Fisheries officers are not limited to CIDoE officers and are appointed by the Marine Conservation Board. The fisheries officer checks and records the details of the license under which the turtle has been taken, the weight and sex of the turtle, the area and date of the capture, and the number of tags the license holder has remaining. Where possible, genetic vouchers are obtained.

Formal data recording has only been instigated in recent years, but the data in Table 7.9. show that green (at least 50%), loggerhead (at least 11%) and hawksbill turtles (at least 36%) are all taken. Estimates made by marine enforcement officers and marine turtle fishers suggest that since 1986 approximately 10 large turtles are taken legally per year. In addition, however, more than 10 are thought to be taken

illegally per year by licensed turtle fishers, by those who would be eligible for, but do not possess a current license, and by others (Aiken *et al.* 2001a; C. Bell (CIDoE) pers. comm. 2004). This illegal take includes nesting females, undersized turtles, turtles taken outwith the season, or captured in prohibited areas. Illicit harvest still occurs despite legally available turtle meat from the Cayman Turtle Farm, demonstrating the magnitude of desire for turtle meat in the Cayman Islands.

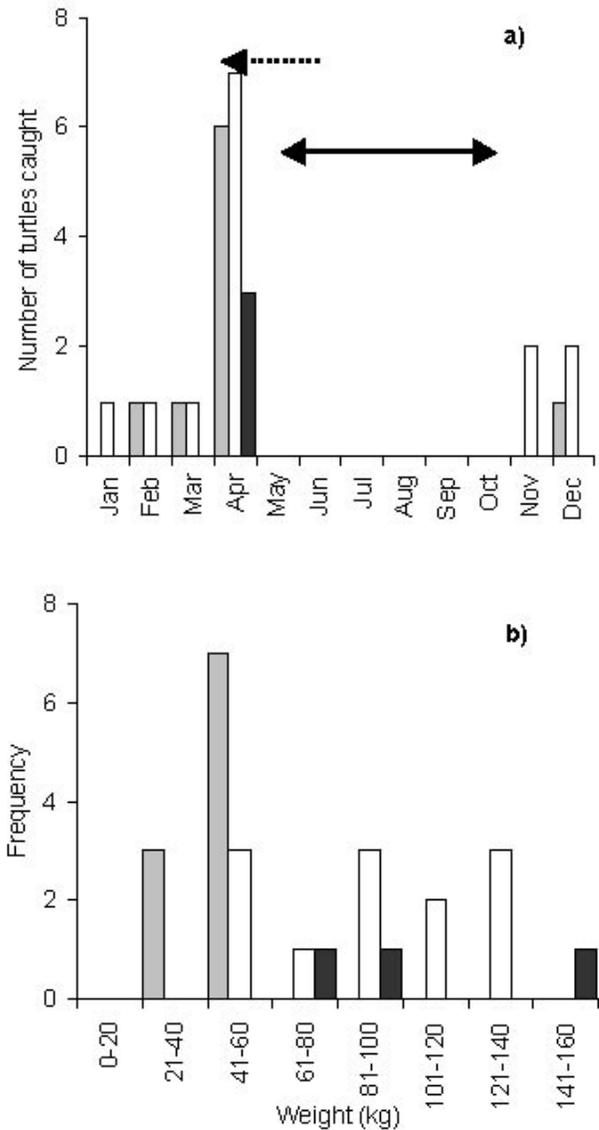
As can be seen in Figure 7.3., 16 of the 22 reported captures occurred in April. This is the time of the year when many breeding adults in the Caribbean are undertaking their breeding migrations and individuals of the Caymanian nesting populations will be moving into the waters for mating. There is thought to be a delay of the order of 1 month between mating and the first egg-laying of the season, with marine turtle nesting in the Cayman Islands beginning in May. Given the closed season is currently designed to protect adults, extending the closure to include April would better accomplish its aim of protecting the Caymanian breeding turtle population.

Since events at the CTF following Hurricane Michelle, at least 3 relatively freshly butchered green turtle carapaces have been found in secluded areas around the island by CIDoE staff. Although these could be resultant from illegal take at sea, they could also be turtles stolen from CTF during the Hurricane and from Jackson's Pond. The latter is used as a temporary holding facility for a large number of farm turtles since the Hurricane and until construction on the new facility is complete (anticipated end 2005).

A total of 14 fishers in the TCOT SEQ reported catching marine turtles in the past or present. Of these, 8 have intentionally captured turtles whilst 6 report catching them accidentally as part of other fishing activities (see section 7.7.5). Of the 8 turtles fishers, 4 had since stopped fishing for turtles; 2 gave reasons: 1) Changes in the law and poor health; 2) Concerns for the environment. Of the 4 current turtle fishers, 2 identified themselves as intentional fishers, 1 as both intentional and opportunistic and the fourth as only opportunistic. Methodologies used included capture by hand (n=1) and nets (n=2). Four of the 8 fishers (2 fishing in the past and 2 in the present) also identified themselves as pleasure fishers only (see methods note, section 7.7.1.1).

Information on number and size of turtles caught was limited, as only 1 current fisher provided estimates. He reported capturing 2000 green turtles per year, but not all from Cayman Islands. The survey administrator failed to have the fisher distinguish between local and other fishing. No fishers provided data for any other species.

The meat from the legal harvest is widely thought to be kept for personal use on family occasions or gifted and is considered of great cultural importance, with license holders having fished for turtles all their lives as did their forefathers (C. Bell (CIDoE) pers. comm. 2004). However, of the 4 present turtle fishers who responded to the TCOT SEQ, 2



**Figure 7.3.** All reported capture data from the Cayman Islands legal fishery April 1999-April 2004. **a)** Temporal distribution of all reported captures. Dashed line indicates the likely start of the mating season (one month prior to the first nesting) and consequent entrance of adults into Cayman waters. Solid line describes the extent of the Cayman Island nesting season. **b)** Weight distribution (kgs) of all reported captures. Most weight records were taken as an estimate at the time of capture. Where a range was presented by a fisherman or enforcer, the lowest estimate was used. Key: *E. imbricata*: grey boxes, *C. mydas*: white boxes, *C. caretta* black boxes.

(1 from Grand Cayman and 1 from Cayman Brac) reported selling the meat). One suggested the going price was CI\$6 per turtle (although we suspect this is a translation error for a per lb price), and 1 suggested he received CI\$6 per lb (the latter of these is 1 of those who identified himself as a pleasure fisher). That he sells meat and filled out all parts of section 3 and 4 suggest that in this case, it was the initial categorization as a pleasure fisher that was incorrect.

While price was reported by only 2 current fishers, the reported price for marine turtle meat from wild turtles is comparable with that of Cayman Turtle Farm stew and

Menavelins (see section 7.7.7. below). Both fishers stated that the price rarely changed, with 1 respondent suggesting the price was set by fishers and another suggesting it was defined by local consumers.

The economic importance of turtle fishing varies across respondents. For past turtle fishers (n=4), 2 rated turtle fishing their most important catch before they stopped, while 2 did not respond to the question. For current fishers, only 1 ranks turtle fishing as his most important economic activity. Two others rank it 3<sup>rd</sup> and 4<sup>th</sup>, while 1 current fisher did not answer the question. Given the small number of fishers legally licensed, and the suspected small number of illegal fishers, the harvest probably does not play a significant role in the economy of the Cayman Islands. Indeed, this can be said for the whole commercial fishing sector. There are currently only 2 vessels that could be considered part of the commercial fishery. These fish the offshore banks (Misteriosa, Rosalind, Serranna, 60 mile) and supply fish to local restaurants. They contribute to the majority of the livelihood of only 4 fishers (P. Bush (CIDoE) pers. comm. 2004).

#### 7.7.5. Trade in shells and shell products

Trade in shell and related products is not a major enterprise in the Cayman Islands other than when operated by the Cayman Turtle Farm (see section 7.7.7. below). Only 2 fishers identified themselves as selling shells as by-products of capture for meat; 1 in the past and 1 in the present. Other than the Cayman Turtle Farm, no current vendors were identified.

#### 7.7.6. Incidental catch in marine fisheries

Although there are few commercial fishers in the Cayman Islands, fishing is important and guide-fishing for tourists targeting bone fish and tarpon is prevalent. The majority of these operations are believed to be 'catch-and-release' and are considered as 'sport fishing' in that the catch in no way supplements household incomes although guiding fees will contribute significantly to some. Of these, there are 10-20 based in Grand Cayman and 1 based in Little Cayman. Additionally the recreational fishing sector is large, numbering up to 400 unlicensed boats. Although this does not constitute the major part of the earnings of any individuals, catch supplements the income of many.

Incidental catch is considered as minimal within Caymanian waters. The commercial fishing industry is very small and no records of interactions with the game fishing industry have been recorded by CIDoE. Anecdotal evidence, however, suggests that occasionally turtles (usually reported to be juvenile green turtles but including occasional hawksbills) are hooked accidentally whilst fishers line fish. There have been two recent incidences of this in the North Sound, and on each occasion it was reported that more than 1 turtle was taken (C. Bell (CIDoE) pers. comm. 2004).

Data from the TCOT SEQ suggest that bycatch may be more prevalent than previously thought. Six of 12 fishers who contributed to the TCOT SEQ reported catching turtles

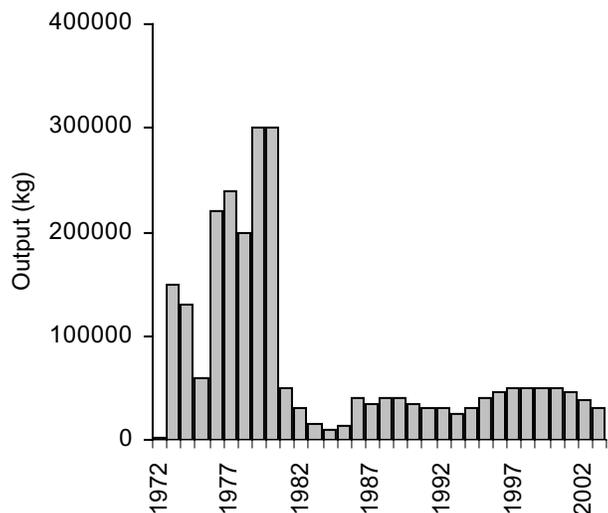


Photo 7.11. CTF yearling turtles (Photo B. Godley).



Photo 7.12. Feeding turtles in growing tanks (Photo B. Godley).

accidentally as part of other fishing activities; with estimates ranging between 1 and 2 turtles per year per fisher. When asked which turtles they catch most often, 3 fishers identified greens, 2 identified loggerheads, and 1 identified hawksbills. Fishers were also asked what other turtles they caught incidentally, and an equal number identified greens, loggerhead, and hawksbills. Data suggest that turtles captured are usually alive. Methodologies likely to interact with turtles were line based methods (n=6) and net fishing (n=1). All six fishers said that they release turtles when captured with 4 giving reasons: legality (n=3); dislike of taste (n=1). When asked about other fishers, 4 of the 6 respondents thought that other fishers kept accidentally caught turtles and only 1 thought that in general fishers release them. Given the number of fishers suggesting they catch turtles accidentally using line and hook, and the number of pleasure fishers who suggested they captured turtles 'opportunistically' (and may have met accidentally), the incidence of accidental catch of turtles by pleasure fishers could be high and warrants further investigation.



**Fig 7.4.** Output (kg) of edible product from the Cayman Turtle Farm 1972-December 2003 (Data courtesy of Cayman Turtle Farm).

### 7.7.7. The Cayman Turtle Farm

#### i. Introduction

The Cayman Turtle Farm has been in operation since 1968 as a commercial venture to raise green turtles. To form the herd, eggs, adults and sub-adult turtles were collected from the wild. A minimum of 477,644 eggs were collected from Ascension Island, Costa Rica, Guyana, and Suriname between 1968 and 1978. Additionally, 60 adults were collected from Ascension Island, Costa Rica, Guyana, and Suriname, between 1968 and 1973. A further 117 adults and sub-adults were obtained from Mexico between 1976-1977, and 31 individuals of adult size (24 females and 7 males) were purchased from Caymanian fishing boats fishing the Miskito Keys of Nicaragua between 1970 and 1971 (Cayman Turtle Farm 2002).

Breeding adults are held in a large breeding pond next to an artificial nesting beach. Eggs from each clutch laid on the beach are incubated in a hatchery (Critchley *et al.* 1983; Wood & Wood 1979) and hatchlings are reared in groups (Photos 7.11 and 7.12). Animals selected for release are in excess of what is required for local use and future breeding stock, and have in the past equated to ca.10-15% of annual production (Cayman Turtle Farm 2000). The stock level has varied over the years, and by 2001 the breeding herd stood at 355 (94 males, 261 females) and mean annual production of hatchlings from 1980-2001 was 10,500. In November 2001, Hurricane Michelle caused severe damage to the Farm and 78% of the breeding stock was washed out to sea. Since then, a new facility has been built further inland. The Cayman Turtle Farm continues to provide meat for local consumption and remains one of the major tourist attractions on Grand Cayman.

#### ii. Product Utilisation and Distribution

Animals are reared to slaughter typically at 4-5 years of age when they weigh 27-36kg (60-80lb). As a way of maintaining the product output with less turtles since Hurricane Michelle, slaughter animals have typically been older and heavier: 7 years old and of the order of 45kg (100lb) in weight.

Typically, animals are slaughtered and butchered on site 4 days per week. In general, 60% of the edible product is sold wholesale to 2 outlets: Farmers Market and Foster's Supermarket. The additional 40% is sold retail to 8 restaurants, CTF, staff and a small number of individuals, and some is donated as charitable gifts to the local retirement home, a special-needs day care centre, sports and service clubs, religious fundraisers and other charitable events.

Carcasses are processed into:

1. Steaks: Eight ounce pieces of filleted meat.
2. Stew: Packaged mixture containing large pieces of meat, fat, liver, lung, calipee (pre-boiled and boned) and can include portions of tail, neck, and flippers minus larger bony elements.
3. Menavelins: Packaged mixture of small cuts of meat, fat, skin, heart, kidney and spleen.
4. Waste: All guts, the carapace and major bony elements of larger turtles are now dumped.

In 2001 CTF applied to register under CITES as a captive breeding operation. The purpose of this registration proposal, concerning carapaces only, was to allow tourists that visit the Cayman Turtle Farm to export carapaces as personal effects. Each carapace processed for sale would have borne a permanently fixed metallic label with the Farm's logo, the ISO country code for the Cayman Islands, a unique number, and year of production. It would also have been accompanied by a CITES permit with a digital photograph of the carapace bearing the unique serial number. At the CITES CoP, Santiago, Chile, November 2002, this proposal failed to reach the required two-thirds majority with a vote of 38 in favour, 24 against and 48 abstentions. Prior to this proposal, a small number of carapaces were prepared for local sale and this practice was discontinued in 2002. However, in 2004 CTF resumed local sale of marine turtle carapaces.

#### iii. Pattern of Production

The output of edible product from the farm has varied greatly over the years, rising from the start of production in 1972 to a peak of nearly 305 metric tonnes in 1980. With the loss of international markets in the early 1980's, as a result of decisions taken at CITES meetings and the instigating of strict import measures of some importing states, production was reeduced (see figure 7.4.). The long-term average 1983-2000 was 34.8 metric tonnes of product per annum, which corresponds to the slaughter of 1500-3000 animals per year with live body weight of the order of 30kg.

There appears to be no marked seasonal variation in demand for turtle meat in the Cayman Islands other than a slightly elevated demand driven by local people towards the end of the year (J. Parsons (CTF) pers. comm. 2004). This is coincidental with the occurrence of the local Pirates Week festival in October and the Christmas/New Year celebrations. Following the damage caused by Hurricane Michelle in November 2001, CTF management

realised that they would need to reduce meat production while management re-assessed its capacity for future productivity. This management measure was instigated in January 2002 (see fig 7.5), with slaughtering of fewer animals per slaughter day, and on only 3 days per week. Additionally, CTF largely ceased retail operations, limiting trade to wholesale partners and the gifts to care institutions and other donations. This production has, however, been incrementally increased since January 2003.

Although greatly reduced from its peak, consumption of turtle food products is prolific. Although our sampling strategy for the TCOT SEQ was not random, the fact that of 106 people interviewed, 42 were current consumers of turtle meat and an additional 24 were past consumers is illustrative of the presence of turtle meat eating in the Cayman Islands. Undoubtedly, the vast majority of turtle consumption occurring in the Cayman Islands is that of farmed product. Of 42 current consumers of turtle meat, 15 purchased at the supermarket, 12 at restaurants, 7 at the Cayman Turtle Farm and 1 “at the harbour”. With regard to this latter case, it is not known if this means purchase of wild meat from a fisher or from a restaurant near the harbour.

**iv. Pricing and Patterns of Distribution**

Although CTF staff informed us that preferential wholesale rates are given to Fosters Supermarket/Farmers market, the system is geared so that the retail price would be broadly consistent whether the product is purchased from CTF or either retailer.

The prices as of 1<sup>st</sup> February 2004 for retail from CTF (J Parsons (CTF), pers. comm. 2004) were as follows:

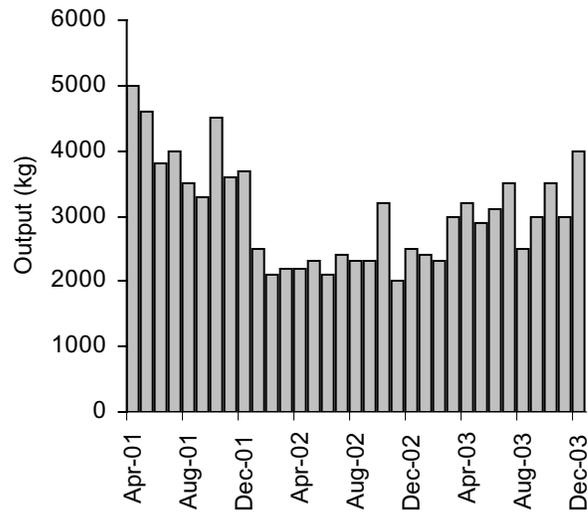
<b>Steak</b>	CI\$9.00 per lb retail
<b>Menavelins</b>	CI\$4.00 per lb retail
<b>Stew</b>	CI\$5.40 per lb retail

**Foster’s Food Fair Supermarket**

On 10 February 2004, a member of CIDoE staff visited Foster’s Food Fair Supermarket in Georgetown. There was



**Photo 7.13.** Staff prepare to distribute turtle meat (Photo CIDoE).



**Fig 7.5.** Output (kg) of edible product from Cayman Turtle Farm April 2001-December 2003 (Data courtesy of Cayman Turtle Farm).

no turtle meat for sale, but she was informed that Foster’s buy 200lbs per week, which it sells at its Republic store (West Bay). In the past, steaks had been sold at a second store at the Strand, West Bay Road (Seven Mile Beach), but this had been discontinued. The third Foster’s Supermarket near the airport is close to Farmer’s Market and does not retail turtle meat. She was informed that the meat arrives on a Wednesday morning and that, since the post-Hurricane production cuts, it is typically sold out immediately, with people waiting at the door when the store opens. Prior to Hurricane Michelle, Foster’s would buy considerably more and it would sell more gradually throughout the week.

On 11 February 2004, a CIDoE staff visited the Foster’s Store (Republic - West Bay) and waited in a queue of 8 other people for the opening of store and turtle meat retail. One senior citizen in the queue informed CIDoE that this was the smallest queue she had ever seen and that it usually numbered 20 or more people. About 30 minutes after the store opened the assistants from the meat department wheeled out a trolley full of boxes, and handed these out 1 per person to ensure equity of distribution (Photo 7.13). Staff at the store informed us that this competition for turtle meat had not been an issue before Hurricane Michelle. All meat was sold out within the hour and did not even reach the point of merchandising.

Foster’s prices of the 2 turtle products they sell are as follows:

<b>Stew</b>	CI \$27 per 5lb box
<b>Menavelin</b>	CI \$18 per 5lb box.

These prices are very similar to those given by CTF.

**Farmer’s Market**

On 10<sup>th</sup> February 2004, a member of CIDoE staff visited Farmer’s Market in Georgetown and was informed that they sell turtle to the public on Thursday and Saturday mornings. It was pointed out that they only sell what is left

after they fill their orders (of steak/stew and menavalin) for the restaurants, which vary from week to week. They too reported an undersupply versus demand in recent times, with little left for retail to the public and whatever was available in high demand.

**Restaurant Sector**

A selection of restaurants were contacted to confirm what dishes were sold and the prices per portion of turtle product. These are summarised below:

Liberties	Stew	CI\$10.75	Thursdays only
	Steak	CI\$18.95	Daily to order
Wellies Cool Spot	Stew	CI\$11.00	Fridays only
Vivine’s Kitchen	Stew	CI\$16.00	Wednesday
	(part of buffet)		
Bus Side	Stew	CI\$10.00	Friday only
Champion House	Stew	CI\$8.00	Tuesdays only
	Steak	CI\$15.00	Daily to order

In the TCOT SEQ, 9 interviewees identified themselves vendors of turtle meat. Of these, 7 owned or managed restaurants that sold turtle meat. Of these, 5 stated that turtles were important to their business. All 7 have noted a decrease in meat availability over time.

**iv. Demand**

Our preliminary description of the retail network surrounding edible marine turtle products has shown that there is currently an underproduction versus demand. Overall, of the 42 respondents who currently consume turtle meat, 29 of them answered questions regarding change in availability of products in general (Q101a-c). For meat specifically, 19 respondents commented on trends over the last 5 years, with 15 respondents noticing a decrease and 1 noticing an increase. Eighteen respondents commented on availability since they can remember; 13 perceived a decrease and 1 perceived an increase. CTF recognises that demand has outstripped production during the step down in production since Hurricane Michelle. Production is still on the increase and it is expected that pre-Michelle levels will be reached within the next year.

**Did the CTF’s pre-Michelle production level satisfy local demand?** CTF thinks this is the case (J. Parsons (CTF) pers. comm. 2004). CTF had the potential of markedly increasing production in the years before Michelle should the demand have necessitated. This was not the case and since the mid 1980’s production has been relatively constant. Turtle consumption has been integral to the Caymanian culture for centuries and was prevalent before the start-up of the Farm. Indeed CTF purchased a number of animals from the Cayman based fishery catch to bolster its stock of adults in the early 1970s. As the international fishery closed down, CTF production was available to fill the gap and the culture of eating turtle products persisted at a high level.

**Does CTF production stimulate a demand which needs to be satiated by a wild harvest?** Given the suspected total wild take makes up such a small fraction of Caymanian

turtle consumption, it is felt that in general terms this is unlikely. Our reported observations suggest that since Hurricane Michelle the demand of local consumers is not being fully met. Although monitoring of covert illegal actions is difficult, CIDoE have not reported any marked increase in legal or illegal turtle fishing activities as a result of the reduction in CTF production. A matter of concern, however, would be the likely consequence of long-term reduced production, i.e. whether this would stimulate illegal take from the wild.

Additional points worthy of note include:

1. The retail cost of turtle food products is highly subsidised by the Farm’s tourist revenue.
2. The price has varied little in the last decade, thus in real terms this subsidy has been increasing across time.
3. Despite a marked reduction of production and relative scarcity ensuing from Hurricane Michelle, no market forces driven price increase was instituted.
4. Theft of turtles has been recorded from the Cayman Turtle Farm, especially during Hurricane Michelle (K. Hydes (CTF) pers. comm. 2004). Ongoing illegal take from the wild may simply be financially driven by individual misfortune rather than the dynamics of the demand of wild versus cultured turtle meat.

**v. Benefits of the Cayman Turtle Farm**

Cayman Islands Authorities consider the primary conservation benefit of the Farm to be that making available farmed green turtle meat has proven to be an effective means of filling local demand for turtle meat, and accordingly limiting the impact on wild turtle populations (Cayman Turtle Farm 2002; G. Ebanks-Petrie (CIDoE) pers. comm. 2004). As part of this mission of turtle meat production for cultural preservation, the CTF has become a major employer in Grand Cayman (30 employees) and a significant tourist attraction (340,000 visitors in 2001), and has an extremely high profile in tourist related publications (Photo 7.14). The revenue generated from gate receipts and retail outlets at the CTF significantly subsidises the price of turtle derived food products.

Other than this, how does marine turtle conservation in the Cayman Islands and internationally benefit from the income generated by the CTF?



**Photo 7.14.** Cayman Turtle Farm promotion in tourist publication.

### **Locally**

**Beach Monitoring:** Prior to the CIDoE becoming the lead agency responsible for monitoring wild turtle population, CTF responded to reported nesting and was involved with hatchery incubation of eggs considered “doomed”.

**Rescue and rehabilitation:** The Farm acts as a facility for the rehabilitation of sick and injured wild turtles.

**Support to Training Initiatives:** CTF has financially supported participation of CIDoE staff in International Sea Turtle Symposia and the Bermuda Turtle Project Annual Training Course. In addition, CTF provided support to the TCOT training workshop held in 2002.

**Headstarting:** In 1980, CTF initiated a program of releasing juvenile turtles produced and raised on the Farm into the territorial waters of the Cayman Islands; a process often termed “headstarting”. This release programme was set up to determine whether headstarted turtles were capable of surviving in the wild and recruiting to breeding populations. It was also hoped that data could be provided concerning age at sexual maturity, and that returns would provide geographical insights into migration and the selection of nesting and foraging grounds (J. Wood (ex-CTF) pers. comm. 2003). The results of this 22 year study have been analysed with the support of MTRG staff as part of the TCOT initiative, and have been submitted for publication (Bell *et al.* submitted). The abstract of this manuscript follows:

*“Headstarting is a management technique employed to enhance recruitment of turtles into diminished or extirpated marine turtle populations. Between 1980 and 2001, 16,422 hatchlings and 14,347 “yearling” green sea turtles were released from the Cayman Turtle Farm. Approximately 80% of all turtles released were subject to some form of tagging, including living tags. A total of 392 tagged animals have been recaptured at intervals of up to 19 years. Of this total, 160 individuals were captured in the Cayman Islands and 232 from other locations within the Wider Caribbean and south-eastern USA. There was significant variation in the release-recapture intervals at the three countries with most returns (Cayman, Cuba and Nicaragua). A positive relationship exists between time at large and size at recapture, and data suggest growth rates comparable to those of wild green turtles in the region. There have been at least 6 living tag returns, four released as yearlings and two as hatchlings, demonstrating an age at maturity which may be as short as 15-19 years. These results show that some headstarted turtles are moving around the Caribbean, surviving for long periods of time and contributing to the local breeding population.”*

Thus, at least some of the turtles nesting in the Cayman Islands are the result of this headstarting effort. Further monitoring and/or genetic analyses may allow the assessment of the relative importance of this contribution to be assessed.

### **Internationally**

**Repatriation:** Between 1970-1983, in accordance with the collecting agreements with government authorities of the countries from which eggs were obtained, almost 2,500 turtles of more than 10 months of age were marked using a notching technique and returned to the nesting beaches of origin (Cayman Turtle Farm 2002).

**Supporting Research:** Since it commenced operation, CTF has been responsible for, or sponsored, a considerable volume of research, both pure and applied, on both green and Kemp’s ridley turtles. This work has resulted in numerous scientific papers many of which are listed in the TCOT bibliography (Appendix 11.1). More recently CTF commissioned a preliminary stochastic simulation model of green turtle dynamics in the West Atlantic, which was discussed and developed during a supporting workshop also funded by CTF: West Atlantic Green Turtle Population Modelling Workshop (22 – 24 October 2003). This workshop included the following international participating specialists: Alberto Abreu, George Balazs, Catherine Bell, Karen Bjørndal, Janice Blumenthal, Alan Bolten, Milani Chaloupka, Gina Ebanks-Petrie, Scott Eckert, Vin Fleming, Jack Frazier, Brendan Godley, Julia Horrocks, Ken Hydes, Cynthia Lagueux, Brian Lusty, Neca Marcovaldi, Anne Meylan, Felix Moncada, Nicholas Mrosovsky, Joe Parsons, Henri Reichart, Sebastian Troëng, Vincent Vera, and Melania Yanez.

**Education:** The Farm provides one of the few locations in the world where visitors are able to view 4 different species of marine turtles and learn about their conservation. Visitor numbers, the vast majority international, are increasing annually. Guided tours and information boards explain the purpose and operation of the Farm, and highlight the threats marine turtles face. The re-development plans for CTF include enhanced educational facilities.

**Kemp’s Ridley Insurance Population:** CTF was the location of a highly successful captive breeding program for a small population of Kemp’s ridley turtles until it became apparent that the Rancho Nuevo population showed signs of recovery, and the vast majority of animals were repatriated. A few exhibit animals remain at the CTF.

**Partnership in TCOT:** The farm has been a partner in TCOT since the current project bid was submitted. The role of CTF was to:

1. Contribute to training as part of the TCOT workshop.
2. Participate in genetics analysis of the CTF herd.
3. Support assessment of the CTF’s activities with free access to all relevant data.

CTF has completely fulfilled its commitments in all these regards.

**Supporting International Sea Turtle Conservation Community:** CTF has been a donor to three of the organisations central to the co-ordination of marine turtle conservation efforts internationally: International Sea Turtle Society, Marine Turtle Newsletter and SEATURTLE.ORG.

## Recommendations

### 7.1.2.1. Harvest legislation recommendations

While the Cayman Islands have relatively sophisticated regulations to monitor marine turtle harvest, this harvest must be accompanied by meaningful, long-term and systematic monitoring programmes to ascertain trends in turtle abundance. TCOT makes the following recommendations:

- a. Prohibit the capture of all adult marine turtles in Cayman waters. Ensure permanent and complete prohibition of the harvest of reproductively active turtles by extending the closed season to include the 1<sup>st</sup> of April to the 30<sup>th</sup> of November inclusive.
- b. 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 also yield an equivalent maximum curved carapace length that should be stipulated in any amended legislation.
- c. Consider a continued minimum size limit, as most fishers already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length stipulated in any amended legislation.
- d. Ensure prohibition of the harvest of loggerhead and leatherback turtles. The DoE have also expressed that they would recommend prohibition of any future take of hawksbill turtles.

### 7.1.2.3. Endangered Species Trade and Transport Law

TCOT recommends that the CIDoE be adequately resourced to implement the provisions of the recently enacted Endangered Species Trade and Transport Law, and that the necessary commencement orders be issued by Cabinet as soon as possible. When this legislation comes into effect, it will fully transpose CITES to domestic law.

### 7.1.4. Maximise the role of the Cayman Turtle Farm in marine turtle conservation

The CTF is ideally and uniquely suited to promoting the conservation of marine turtles in the CI. One key area is in the maximization of the proportion of production that is sold to local people. Since recent production cuts at the CTF, there has been a relative scarcity of turtle meat relative to demand. This has an intrinsic potential to drive the trade in both legal and illegally captured turtle meat from the wild. It is strongly advised that, where possible, production is increased and/or re-routed towards the local market, whether it be through supermarkets or restaurants catering largely to local people, in preference to those most frequented by island visitors. It is recommended that the sale of farmed turtle products be controlled under the Trade and Transport Law to prevent illegal trade in wild turtle products through commercial establishments.

## 7.8. Indirect Use

### 7.8.1. Turtle watching on beaches

Although CIDoE occasionally carries out intensive nocturnal monitoring of nesting beaches (e.g. 2002 efforts to confirm the identity of live tagged individuals or 2003 and 2004 efforts to locate study animals as part of a satellite tagging project), nesting numbers are so small as to make the chances of seeing a turtle very low. Nesting turtle numbers would need to increase 5 to 10-fold before any valid turtle watching enterprises could be considered. At this point, given the highly developed tourism in the Islands, any turtle watching enterprise would need to be carefully regulated.

### 7.8.2. Dive/snorkelling tourism

To put the Cayman dive industry in context, the CI Watersports Association estimate that there are ca. 30 companies, directly employing approximately 500 people in the Cayman Islands, that have diving at the core of their business. In addition, the Land and Sea Co-op offers snorkelling trips to the Cruise Industry and has 25 individual boat owners/companies employing ca. 60 people. It should be noted that these are the direct jobs associated with the industry, and the impact is far more significant once service and support industries are taken into consideration.

Dive tourism undoubtedly plays a huge role in the Caymanian economy. CI Dept Tourism figures show that, in 2000, international tourist arrivals into the Cayman Islands totaled

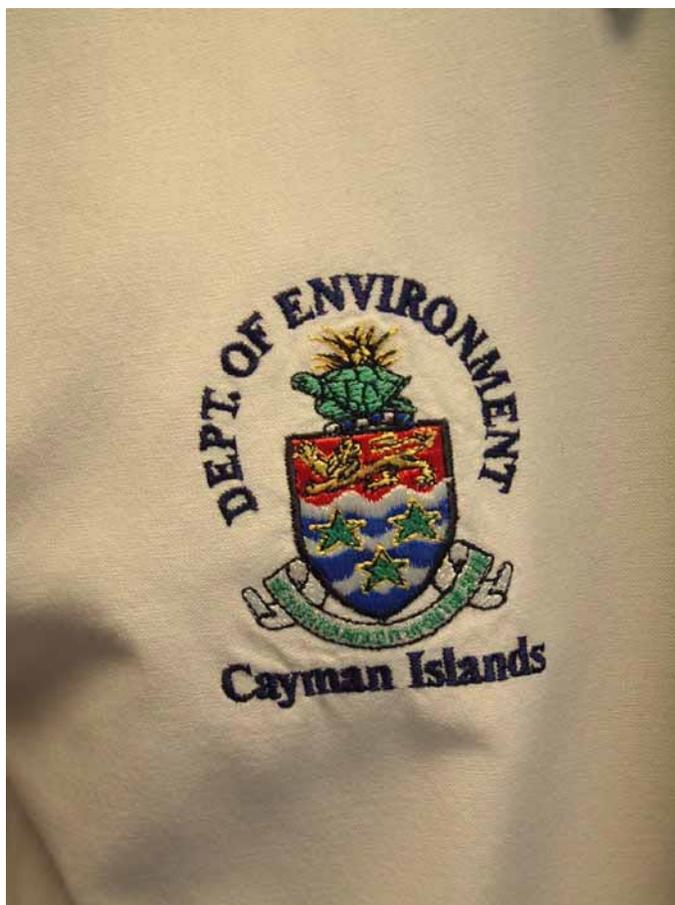


Photo 7.15. CIDoE logo incorporating Cayman Islands coat of arms (Photo S. Ranger).

1,437,477 (406,620 air arrivals; 1,030,857 cruise ship arrivals) largely from North America and Europe. A more recent survey (June- Nov 2003) has suggested that 54% of cruise ship arrivals (survey sample 132) go snorkeling and 10.6% go diving, whereas of the air arrivals (survey sample 459), 74% go snorkeling and 49% go diving. These very basic figures allow us to estimate that, each year, over 1 million different people snorkel and over 300,000 people dive in the marine environment of the Cayman Islands (source: CI Department of Tourism). These numbers concur with estimates given in Tratalos and Austin (2001). TCOT staff found that there was good take-up of Caribbean Turtlewatch and the four dive operators surveyed in TCOT SEQ identified turtles as 'somewhat important' to their business.

In recent years, a turtle feeding station has evolved at the northern end of Seven Mile Beach. Green turtles have been hand fed from shore at this site for up to 10 years, according to anecdotal reports. They are being fed a wide variety of foodstuffs ranging from cinnamon bagels to mincemeat and squid. Based on size estimates, it is likely that all the turtles seen today are not the same turtles that were being fed ten years ago and that new turtles are recruiting to these 'feeding stations'. Anecdotal evidence also suggests that, after November 2001 and Hurricane Michelle (which was responsible for the loss of turtles at CTF), numbers of green turtles being fed at these locations increased from less than 5 to as many as 10, although the number of turtles appearing on a daily basis fluctuates. Three of these turtles have been tagged by the DoE. One of the most obvious problems being caused by feeding is the alteration of natural behaviour. Recently turtles have been reported to be biting people and becoming aggressive in an attempt to get more food. CIDoE has advised that feeding be discontinued.

### 7.8.3. Aquaria holding captive turtles

Other than CTF, there are no other public aquaria displaying captive marine turtles, although CIDoE have confiscated and released a small number of green turtles kept in a private aquarium.

### 7.8.4. Other marketing/cultural uses

The level of use of turtles as insignia and logos in the Cayman Islands is without parallel in the Caribbean Overseas Territories. Sea turtles have a central place in the history, economy and culture of the Cayman Islands and this importance is apparent in the prominence of the sea turtle image in the Coat of Arms (Photo 7.15), National Flag, 10-cent coin, and watermark for all currency notes.

The economic importance of turtles continues to this day, as turtles are used as a marketing tool and attraction throughout the islands. This includes the logos of the National Airline (Sir Turtle), the national power company (Sparky the Turtle; Photo 7.16), and the Cayman Islands Tourism Association, as well as names or logos for dozens of hotels, inns, condominiums, water sports operations, and other businesses, ranging from building supply to travel agencies. A few examples: Turtle Nest Inn, Turtle Beach



Photo 7.16. Sparky the turtle (Photo S. Ranger).

Villas, Turtle Walk, Sea Turtle Villa, Turtle Reef Divers, and Tortuga Rum (a major exporter).

Tourism is a mainstay of the Cayman economy, with SCUBA diving and other water sports providing a primary attraction. Within the tourism industry, images of turtles are common in advertisements, posters, and leaflets promoting diving and snorkelling, submersible and semi-submersible tours, cruises, and other activities. Cayman sea turtles are often featured in Dive, Travel, Airline, and Tourism magazines, and are one of the primary examples of the charismatic megafauna that attract divers, snorkelers, and boaters.

Webpages devoted to the sighting of a sea turtle on a Cayman holiday are common, and websearches for "Cayman Turtle" produce thousands of hits. Jewellery, ornaments, figurines, T-shirts, photos, paintings, and other souvenirs featuring turtles are ubiquitous in local craft-shops and art galleries.

Sea turtle images are utilised by a cross-section of the community, catering to both a local and a tourism market. This prominence illustrates the continuing importance of these species to the culture, economy, and sense of identity of the Cayman Islands.

Of 106 respondents to the TCOT SEQ, 21 suggested that they used turtles indirectly in their business. Fourteen used turtles for advertising, 11 as an attraction and 13 in a professional manner (NB respondents could answer multiple

times). Their sectors included: scuba, tourism, marketing, conservation, hospitality, taxidermy, education, turtle farm, fishing, and retail. Of these, 18 felt they could assess how important this use was to their business: very important (n=3), somewhat important (n=13) and unimportant (n=2). Interestingly, 2 of the 3 businesses that identify their use of turtles (in advertising and as an attraction) as 'very important' also retail turtle meat.

## 7.9. 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'. While full details of responses to these questions have been circulated to local partners, basic results are summarized here. The most common response is cited. In general, most respondents agreed that:

- The government needs to actively work to protect sea turtles (92%)
- Turtles should be protected, regardless of their use to humans (92%)
- It is important that sea turtles exist in the wild in the future (90%)
- Turtles are culturally valuable in this OT (90%)
- Some income from tourism should be used to support sea turtle conservation (87%)
- Turtles play an important ecological role in our natural environment (86%)
- Turtles are an economically valuable resource in CI (84%)
- As turtles are migratory, they should be managed in cooperation with neighbouring states (77%)
- The government needs to do more to ensure that existing laws regarding marine turtles are effectively enforced (75%)
- Turtles should be used both as a tourist attraction and as a source of food (54%)
- Local people should be allowed to purchase sea turtle meat (55%)
- Turtle fishing should be stopped until more information is known on the size and health of the populations (53%)
- Turtles should be used as a tourist attraction rather than as a source of food (44%)
- Existing laws protecting marine turtles are effectively enforced (44%)
- Local people should be allowed to catch and eat sea turtles, provided it doesn't threaten the regional population (44%)
- Tourists should be allowed to purchase sea turtle meat (42%)

Approximately equal numbers of people agreed and disagreed that:

- Turtle fishing should be stopped completely (36% yes, 34% no)

A majority of respondents disagreed that:

- Turtle fishing should be unregulated (66%)
- Tourists should be allowed to purchase sea turtle shell and take it home with them (45%)



**Photo 7.17.** Catherine Bell gives Cayman country report at TCOT workshop (Photo S. Ranger).

These results suggest that there is wide support for the idea of sea turtle conservation in Cayman Islands. There is particularly high support for general 'feel good' statements (e.g. it is important that sea turtles exist in the wild in the future), and wide acceptance of the role of government in turtle conservation. More contentious are statements related to how conservation might be achieved, and specifically the roles of consumption and tourism in conservation programmes. In these instances, opinions are more divided, and the majorities in favour of responses are always slight.

Initial and cursory analysis of responses to these questions by stakeholder group suggests that, while there are some areas of disagreement amongst stakeholders, these are few. For example, turtle fishers as a group generally agree with the responses of the surveyed population as a whole. There are only 4 questions for which the majority of fishers feel differently:

- Turtles should be used as a tourist attraction rather than as a source of food (50% of turtle fishers had no opinion)
- Turtle fishing should be stopped until more information is known on the size and health of the populations (50% of turtle fishers had no opinion)
- Turtle fishing should be stopped completely (50% of turtle fishers disagreed with this statement)
- Tourists should be allowed to purchase sea turtle meat (turtle fishers were divided, with 38% for and against this statement)

The instances in which turtle fishers had no opinion should be treated with caution, as expressing 'no opinion' about an issue that clearly affects the respondent may reflect the respondents discomfort with the question. 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 Cayman population. In particular, due to the seemingly high number of young adults surveyed by a friend or family member enrolled in an environmental college course, it is likely that this segment of the population is over-represented, and that older long time consumers are under-represented.

## 7.10. Capacity Building and Outreach Activities During TCOT

### 7.10.1. Capacity building

At the start of TCOT, capacity was already high within CIDoE, but this has been built upon both as part of the TCOT Training Workshop in Cayman (all staff involved with turtles attended and supported; Photo 7.17), Bermuda Training Course (Catherine Bell 2002; Joni Solomon 2003; Photo 7.18), the ongoing MTRG supervision of Janice Blumenthal and Catherine Bell in graduate studies, and grant raising. This has also included support in the inception of the Cayman Island's Sea Turtle Satellite Tracking Programme.



**Photo 7.18.** Joni Solomon takes part in Bermuda training course (Photo J. Gray).

### Recommendations

#### 7.1.1. Increase capacity for marine turtle management in Cayman Islands

*TCOT has significantly contributed to the skills and technical knowledge of the CIDoE officers. Although CIDoE are relatively well resourced in OT terms, additional resources would further improve the magnitude and quality of the work currently being undertaken. It is essential that the CIDoE receives adequate resources to effectively carry out their custodianship of Cayman Islands' highly valuable marine and coastal resources, on which the country's economy so heavily depends.*

##### 7.1.1.1. Increase the capacity of the CIDoE

*It is vital to ensure CIDoE has the capacity, staff and resources to carry out research, monitoring and enforcement duties relevant to marine turtle management, including data collection and analysis for turtle monitoring programmes. CIDoE staff are well trained and highly motivated, but have a limited research budget which constrains current efforts. It is recommended that national and international funding is sourced to support ongoing research and monitoring efforts as the work being carried out in the Cayman Islands is potentially of profound regional importance and CIDoE has capacity to match support.*

**a) Increased presence in Cayman Brac/Little Cayman.** *Given the importance of Little Cayman as a foraging and nesting site, and that Cayman Brac has recently been discovered to host nesting and foraging*

*populations of unknown magnitude, but has long been a centre of turtle exploitation, it is recommended that CIDoE have a more significant presence on these sister islands. Although CIDoE have one enforcement officer for each of the two Islands, it would seem that, at minimum, a sister islands field base and sufficient operating resources are warranted to facilitate more extensive research, monitoring and community outreach by DoE scientific staff.*

#### 7.1.1.2. Establish a multi-stakeholder marine turtle management process

*To date there have been 5 years of dedicated marine turtle research on wild marine turtles in the Cayman Islands and marine turtle conservation and management in the Cayman Islands is now of significant public interest. It is essential that public compliance with marine turtle management measures continues and, to facilitate such compliance, it is necessary that stakeholders feel they have meaningful input into the decision-making progress.*

*It is therefore recommended that the CIDoE coordinate a Marine Turtle Working Group to include representatives of relevant stakeholders (e.g. government agencies and departments such as CIDoE, Cayman Turtle Farm, Planning and Tourism; NGOs such as CI National Trust; hoteliers; dive operators etc.). The working group should meet regularly to discuss marine turtle management issues and to provide input to government's management and regulatory processes. The group would also function as a public education resource, promoting marine turtle conservation and informing their respective stakeholder groups on marine turtle management issues.*

#### 7.1.3.4. Consideration be given to acting as a regional training centre

*The combined inwater and nesting monitoring programme of the CIDoE would be an excellent training platform for a range of interns, including fisheries officers, from throughout the wider Caribbean region.*

### 7.10.2. Outreach activities

CIDoE have been very proactive in this regard with a range of activities carried out independent of TCOT. These have focussed on the local community, especially school children (Photo 7.19). A central part of these efforts was the satellite tracking of 3 turtles in 2003 and 5 in 2004 (Photo 7.20). Additional support has been given by TCOT staff in the drafting and distribution of press releases resulting in a wide range of media outputs.

#### Recommendations

##### 7.1.5.1. Encourage and implement sensitive practices at existing nesting beaches

- a) Continue coordinating the established network of hoteliers, beach residents and other beach users to ensure swift reporting of nests so that they can be marked, protected and monitored. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergences. Key issues to be addressed are lighting, vehicular traffic, and the use of heavy beach cleaning equipment.
- b) Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure CIDoE has the capacity to collect, necropsy and document all strandings. This network could be supported by a toll-free hotline.
- c) Raise awareness through the continuation and expansion of the campaign to sensitise Caymanians 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) Update and expand distribution of guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings.
- e) Ensure continued and enhanced school participation in relevant marine turtle conservation programmes to sensitise children to the importance of rookery protection.

##### 7.1.5.2. Implement general awareness programmes regarding marine turtle conservation in the Cayman Islands

- a) Raise awareness among Caymanians of the presence of distinct foraging and nesting turtle populations through informational materials 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) Enhance existing CIDoE programme of awareness raising presentations and workshops in local 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 Cayman Islands specific turtle-related 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 7.19. School children partake in fieldwork (Photo CIDoE).



**Photo 7.20.** Samia the loggerhead heads to sea with satellite transmitter (Photo CIDoE).

### 7.11. Acknowledgements

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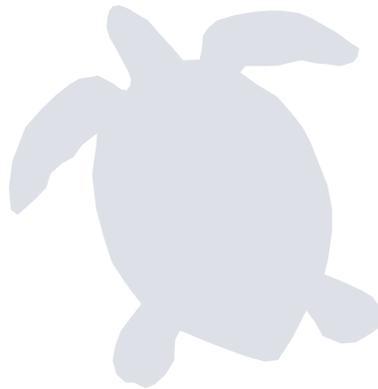
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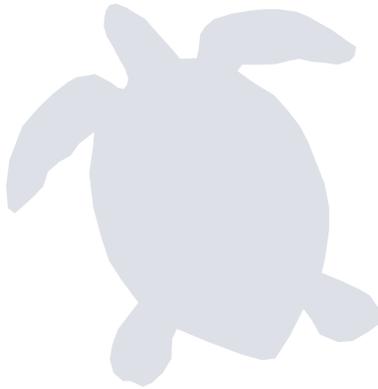


# An Assessment of the Status and Exploitation of Marine Turtles in Montserrat



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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.

# 8. Status and Exploitation of Marine Turtles in Montserrat

## Contents

	Page
<b>8.1. Summary and Recommendations</b>	<b>156-159</b>
<b>8.2. Geographic Overview</b>	<b>160</b>
<b>8.3. Historical Overview</b>	<b>160</b>
<b>8.4. Organisations Involved with Marine Turtles in Montserrat</b>	<b>160</b>
<b>8.5. Status of Nesting Marine Turtles in Montserrat</b>	<b>160-166</b>
8.5.1. Data from nesting beach monitoring	160-164
8.5.2. Data from the TCOT socioeconomic questionnaire	164
8.5.3. Threats to nesting marine turtles	164-165
8.5.4. Genetics of nesting turtles	165
8.5.5. Nesting overview	165-166
<b>8.6. Status of Foraging Marine Turtles in Montserrat</b>	<b>166-170</b>
8.6.1. Information gathered from literature/fishery records	166
8.6.2. Information gathered from Caribbean Turtlewatch	167
8.6.3. Data from in-water monitoring	167
8.6.4. Data derived from the TCOT socioeconomic questionnaire	167-168
8.6.5. Status of marine turtle habitats and in-water threats to marine turtles	168
8.6.6. Genetics	168-169
8.6.7. Summary	169-170
<b>8.7. Direct Use of Marine Turtles in Montserrat</b>	<b>170-173</b>
8.7.1. Overview	170
8.7.2. Harvest of adults on the nesting beach	170
8.7.3. Harvest of eggs	170-171
8.7.4. Harvest of turtles at sea	171-172
8.7.5. Trade in shells and shell products	172
8.7.6. Incidental catch in marine fisheries	172-173
8.7.7. Summary	173-174
<b>8.8. Indirect Use of Marine Turtles in Montserrat</b>	<b>174</b>
8.8.1. Turtle watching on beaches	174
8.8.2. Dive/snorkelling tourism	174
8.8.3. Aquaria holding captive turtles	174
8.8.4. Other marketing uses	174
<b>8.9. Attitudes to Conservation</b>	<b>174-176</b>
<b>8.10. Capacity Building and Outreach Activities During TCOT</b>	<b>176</b>
8.10.1. Capacity building	176
8.10.2. Outreach activities	176-177
<b>8.11. Acknowledgements</b>	<b>178</b>
<b>8.12. References</b>	<b>178-179</b>

## 8.1. Summary and Recommendations

### 8.1.1. Summary

Montserrat hosts critically small but regionally important nesting populations of green and hawksbill turtles. (see table 8.1) Occasional nesting activities of loggerhead and leatherback turtles have also been recorded. Although there is a local perception that numbers may be increasing, numbers of nesting turtles in Montserrat are at critically low levels and likely to be remnant of once larger populations. Little is known regarding the status of marine turtles resident in the waters of Montserrat. Green and hawksbill turtles are the most numerous species, but are of unknown magnitude, and smaller numbers of loggerheads are also likely to be present. Based on the data gathered, direct extraction of eggs and adults from the nesting beaches appears to be minimal, and undertaken mostly for personal consumption rather than sale. Levels of extraction at sea are also low, although most former turtle fishers did sell their products, they estimated the value of this to their overall activities as somewhat or not important. Current commerce in marine turtle meat exists, but we only interviewed one current fisher who reported selling it. Turtle meat is the only product consumed and consumers have noticed a decrease in availability over time.

### Summary of Recommendations

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

This will require actions under the following general headings:

### 8.1.1. Increase capacity for marine turtle management

- 8.1.1.1. Increase the capacity of the Government of Montserrat.
- 8.1.1.2. Increase the capacity of the Montserrat National Trust.
- 8.1.1.3. Establish a multi-stakeholder biodiversity management process.

### 8.1.2. Amend legislation and policy to facilitate marine turtle population recovery

- 8.1.2.1. Revise Turtle Ordinance Cap 112 1951.
- 8.1.2.2. Establish Marine Protected Areas.
- 8.1.2.3. Consider Marine Turtles as part of Planning Policy and Beach Management.
- 8.1.2.4. MEA legislation recommendations.

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

- 8.1.3.1. Establish systematic monitoring efforts at index nesting beaches.
- 8.1.3.2. Establish a systematic in-water monitoring programme.

### 8.1.4. Establish further conservation and awareness programmes to sensitise those living in and visiting Montserrat to marine turtle conservation requirements

- 8.1.4.1. Encourage and implement sensitive practices at existing nesting beaches.
- 8.1.4.2. Implement general awareness programmes regarding marine turtle conservation in Montserrat.

Species	Nesting	Foraging	Harvest
<b>Green Turtle</b> ( <i>Chelonia mydas</i> )	Small numbers	Juveniles present In very small numbers	Still present at reduced levels targeting large juveniles and adults. Legal and possibly illegal  Low levels of egg take-illegal and possibly legal
<b>Hawksbill Turtle</b> ( <i>Eretmochelys imbricata</i> )	Small numbers	Juveniles and possibly some adults present in small numbers	Still present at reduced levels targeting large juveniles and adults  Low levels of egg take
<b>Leatherback Turtle</b> ( <i>Dermochelys coriacea</i> )	Occasional nest	Rarely encountered	Unlikely
<b>Loggerhead Turtle</b> ( <i>Caretta caretta</i> )	Small numbers	Rarely encountered	Unlikely

**Table 8.1.** Marine turtle species present and summary of exploitation in Montserrat.

**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**

**8.1.1. Increase capacity for marine turtle management in Montserrat**

TCOT has contributed to the skills and technical knowledge of the Government of Montserrat Fisheries Department and contributed to Montserrat National Trust events. However, the enforcement patrol, research and monitoring capacity of the Government of Montserrat (GoM) is currently compromised due to an extreme shortage of staff, equipment and a very limited budget. It is essential that GoM apportion adequate resources to effectively carry out their custodianship of Montserrat's highly valuable marine and coastal resources on which the country's future so heavily depends. In addition, Montserrat National Trust would be the ideal organisation to deal with awareness raising programmes and support marine turtle research, but at present is also significantly below capacity for this role, with no current project officer for biodiversity conservation.

**8.1.1.1. Increase the capacity of the Government of Montserrat**

- a) Ensure GoM has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis for turtle monitoring programmes.
- b) Ensure that key staff in GoM have the skills to apply for external funding to support biodiversity related projects.
- c) Ensure that all new Fisheries Officers are adequately trained in marine turtle biology, as well as research and conservation techniques.

- d) Ensure that adequate expertise is in place to allow for the process of legislative review.

**8.1.1.2. Increase the capacity of the Montserrat National Trust**

As part of a general increase in staffing and resources of the Montserrat National Trust, one of the urgent needs is for a project officer who can lead outreach campaigns, and support/ liaise with the many international organisations currently involved in biodiversity work in Montserrat. This officer's duties should include coordinating these various efforts, whether they involve provision of funds, staff, equipment, training or advice.

**8.1.1.3. Establish a multi-stakeholder biodiversity management process**

Identify and establish a Biodiversity Working Group to include representatives of all interest groups and stakeholders (e.g. government agencies and departments including Planning and Tourism; NGO's; hoteliers; dive operators; construction industry representatives, fishers, schools and specially-interested members of the public). The working group should meet regularly to discuss, decide and advise government on biodiversity management issues working to implement Montserrat's Environment Charter, marine turtles being one key subject area. With regard to marine turtles, particular attention should be paid to direct and indirect fishery interactions, habitat protection, exploring possibilities for sourcing funding, further research/population monitoring, as well as investigating potential economic benefits of marine turtle conservation, and external advice should be sought from appropriate experts. There may be a need to provide support for participation by some sectors (i.e. cover travel costs to meetings). In other OTs, it has been recommended that a specific group be assembled for marine turtles, but it is felt that at this stage a single focus group is more likely to succeed and make significant inroads, given limited resources on Montserrat.

**8.1.2. Amend legislation and policy to facilitate marine turtle population recovery**

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

TCOT recognises that cessation of all turtle fishing would significantly contribute to the recovery of depleted turtle populations. TCOT also recognises that turtle meat is a component of the traditional Montserratian diet and a moratorium is unlikely to receive enough support from the fishing community, especially given the current economic situation in Montserrat. However, we make a suite of recommendations to allow future harvest of turtles to be carried out in a highly regulated and controlled manner, minimising its impact on the local nesting populations. We suggest programmes to monitor stock abundance and mechanisms to reduce or close the fishery in response to measured future decreases in turtle stock. The fishing community should be involved in this process, and their

interest in doing so was expressed as part of the TCOT SEQ results (see section 8.9). Furthermore, given that GoM will be responsible for the management of a future turtle fishery, it is vital that they have the skills, as well as the human, technical and financial resources to effectively monitor the fishery.

Regulation of use alone will not serve the sustainable management of these turtle populations. TCOT therefore also makes recommendations to facilitate protection of critical marine turtle habitat in Montserrat.

#### **8.1.2.1. Revise Turtle Ordinance Cap 112 1951**

We recommend the following based on the draft revisions drawn up by the GoM as “the Turtle Act 2002” (not yet gazetted). It should be noted however, that additional amendments to the “Turtle Act 2002” are needed:

- i) Ensure permanent and complete prohibition of the harvest of nesting female turtles and turtle eggs.
- ii) Ensure a closed season from the 1<sup>st</sup> of March to the 30<sup>th</sup> of November inclusive, to be reviewed every five years (to facilitate legislative adaptation to possible nesting season shift caused by climate change).
- iii) Ensure permanent and complete prohibition of harvest of any large, reproductively valuable turtles by instigating a maximum size limit. A suggested maximum would be 50lbs (22.7kg) or less, but should be based on additional research on the fishery and turtle stocks. This research should also yield an equivalent maximum curved carapace length that should be stipulated in any amended legislation.
- iv) Consider a continued minimum size limit, as most fishers already accept this as an established 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.
- v) 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 Government of Montserrat 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.
- vi) Ensure permanent and complete prohibition of all turtle capture methods except hand capture and use of turtle nets, with strict specifications for legal net structure and use.
- vii) Ensure prohibition of the harvest of loggerhead and leatherback turtles.

**NB.** Any continuing turtle fishery must be accompanied with systematic monitoring regimes as described below, along with a programme to monitor Catch per Unit Effort of licensed fishers,

and biometrics of turtle catch, which should also be implemented by the GoM. Fisheries regulations should be revised to provide statutory powers to react to the ongoing results of the abundance trend monitoring programmes. In the event of declining abundance trends or declining Catch per Unit Effort below pre-established thresholds, the GoM must have the power to temporarily or permanently close the turtle fishery.

#### **8.1.2.2. Establish Marine Protected Areas**

Montserrat does not currently have any marine protected areas. It is advised that, based on holistic assessment of the marine biodiversity of Montserrat, key areas be set aside for protection.

#### **8.1.2.3. Consider Marine Turtles as part of Planning Policy and Beach Management**

Montserrat's nesting marine turtles probably represent remnants of depleted populations and are at critically low levels (see section 8.5). However, the adverse impacts of increased beachfront development on the nesting populations using Montserrat's mainland beaches 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 Montserrat, and therefore TCOT recommends the following policies:

- a) Ensure all development, other than non-permanent structures designed for daytime beach use, is 100m landward of the high tide mark.
- b) Introduce planning regulations to mitigate the adverse impacts of development on marine turtles, including, for example light pollution, nesting female disturbance and erosion.
- c) Ensure marine turtles are considered in the current beach sediment extraction projects being carried out in support of Montserrat's reconstruction. Extraction from major nesting beaches should be permanently discontinued.

#### **8.1.2.4. MEA legislation recommendations**

The Endangered Animals and Plants Ordinance, 1976, should be amended to prohibit commercial import and export of turtles and all turtle products of all wild marine turtle species, so that this legislation fully transposes CITES to domestic law.

#### **8.1.3. Establish systematic monitoring of marine turtle populations to determine trends in abundance**

Montserrat hosts nesting populations of green and hawksbill turtles, and occasional nesting by loggerhead and leatherback turtles is likely. In addition, coastal waters host foraging populations of green and hawksbill turtles of unknown magnitude, with occasional loggerhead turtles also reported. Montserrat's nesting turtle populations are probably remnant and at critically low levels (see section 8.6). 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 proposed Biodiversity Working Group, as a matter of priority:

#### **8.1.3.1. Establish systematic monitoring efforts at index nesting beaches**

Establish a sustained programme of morning nesting beach monitoring at index beaches to determine nesting abundance trends and to facilitate genetic analysis of nesting populations, through nest excavation and sampling. Ideally, monitored beaches should be visited at minimum three times per week to ensure species identification, and surveying should be carried out across the duration of the known nesting season and with constant effort.

**NB.** This programme should preferably engage local interest groups and residents and could eventually be developed, under the guidance of the proposed Biodiversity Working Group, into seasonal, revenue-generating tourist turtle walks in order to raise funds to sustain marine turtle management efforts.

#### **8.1.3.2. Establish a systematic in-water monitoring programme.**

In the first instance this would assess species composition and distribution, highlighting key areas of abundance. Building upon this, effort related surveying should be carried out to allow trends in abundance to be assessed, and sampling for genetic profiling should be undertaken.

**NB.** Under the guidance of the proposed Biodiversity Working Group, steps should be taken to encourage the involvement of interested local fishers in all monitoring programmes (e.g. CPUE monitoring), and financial incentives should be considered so long as they fit within the remit of a sustainable programme.

#### **8.1.4. Establish further conservation and awareness programmes to sensitise those living in and visiting Montserrat to marine turtle conservation requirements**

Increased awareness of turtles and their conservation requirements in Montserrat 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 Biodiversity Working Group, to facilitate public contribution to marine turtle conservation:

##### **8.1.4.1. Encourage and implement sensitive practices at existing nesting beaches**

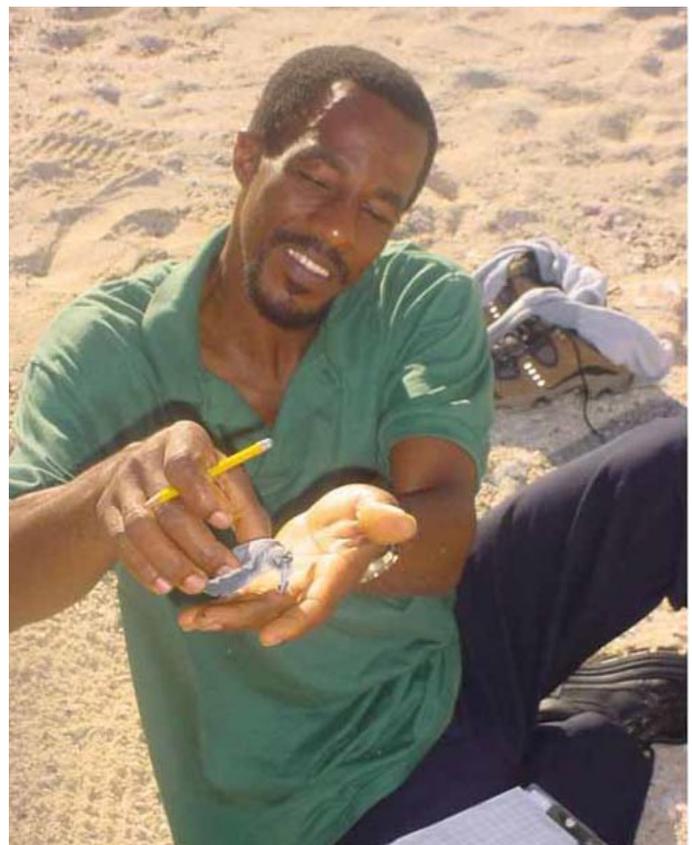
- a) Develop a network of hoteliers, residents and other beach users to ensure reporting of nests not on index beaches, so that they can be marked, protected and monitored.
- b) Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure GoM has the capacity to collect, necropsy and document all strandings.
- c) Raise awareness through a dedicated campaign to sensitise Montserratians to the importance of protecting the nests of such small nesting populations and to

encourage reporting of any illegal take of eggs or of nesting females.

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

##### **8.1.4.2. Implement general awareness programmes regarding marine turtle conservation in Montserrat**

- a) Raise awareness among Montserratians of the presence of distinct foraging and nesting turtle populations through informational materials 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 Montserrat specific turtle educational materials, and expand them to include further curriculum linked, multi-media educational materials where appropriate.



**Photo 8.1.** John Jeffers with a green turtle hatchling (Photo B. Godley).

## 8.2. Geographic Overview

Montserrat (16°45'N, 62° 12' W) is a small volcanic island situated in the Leeward Antilles (See Fig 8.1). Montserrat has suffered a series of natural disasters in recent years, including hurricanes and volcanic eruptions. Although reducing at the time of writing, some areas of the island have at times been no-go areas as a result of the eruptions. It has a total land area is 104 km<sup>2</sup> with a coastline of 40km. The population is much reduced following an estimated 8,000 refugees leaving the island following the volcanic activity in 1995 and 1996/1997. Some have returned. The population prior to 1995 was estimated at 12,000. Montserrat has a GDP per capita of US\$3,400 (2002 est.), the lowest of all the OTs. Natural disasters of recent years have affected the island economy based upon tourism, rum production, textiles and electronics. Prior to the eruption, 30,000 tourists visited Montserrat annually accounting for 25% of the GNP. In the year 2000, only 15,000 visited.

## 8.3. Historical Overview

Montserrat was subject to human habitation from pre-historic times and colonised by Europeans in the early 17<sup>th</sup> century. Steadman *et al.* (1984) have unearthed evidence of hawksbill turtle (presumed adult) exploitation by the Saladoid culture, a people who colonized the Lesser Antilles *ca.* 2000 years ago. Other than this reference, we have not uncovered any information regarding turtle exploitation before the 1940s. However, it is likely that it has been ongoing since settlement.

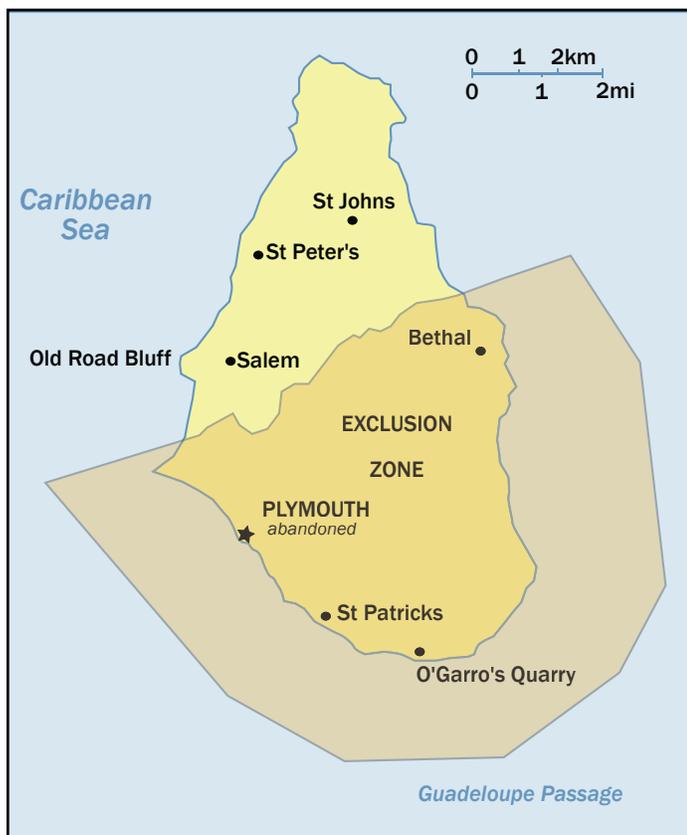


Figure 8.1. The island of Montserrat.



Photo 8.2. Fox's Bay, Montserrat (Photo B. Godley).



Photo 8.3. Rendezvous Bay, Montserrat (Photo B. Godley).

## 8.4. Organisations Involved with Marine Turtle Monitoring and Conservation in Montserrat

**The Department of Fisheries** has a staff of 4, has access to government pool road vehicles, but no marine vessel. A Police launch is used occasionally for surveillance. The department is responsible for all aspects of marine fisheries, including marine turtles, and the Fisheries Assistant, Mr. John Jeffers (J.J.), has assumed the mantle for marine turtle monitoring for a number of years (Photo 8.1).

**The Montserrat National Trust** employs a staff of 5; including a Director, a museum curator, a secretary and 2 botanical gardens assistant. Marine turtles have featured in awareness raising materials, but there are no staff actively involved with marine turtle fieldwork.

## 8.5. Status of Nesting Marine Turtles in Montserrat

### 8.5.1. Data from nesting beach monitoring

Four species of sea turtles have been reported nesting in Montserrat. Seminal studies suggested that green and hawksbill turtles nested in small numbers, whilst loggerhead and leatherback turtle nests were only occasionally encountered (Groombridge & Luxmoore 1989; John 1984;

Meylan 1983). Meylan (1983) reported that nesting levels were low, presumably because of constant human activity on the island's beaches (that were widely used for boat storage and recreational purposes). Whether nesting levels were reduced at this time is a matter from conjecture, but given direct exploitation has occurred for some 2000 years, it is likely that numbers were reduced by the 1980's.

The island is of volcanic origin, and all but one of its sandy beaches consists of black volcanic sand (Photo 8.2); white calcareous sand dominates at Rendezvous Beach (Photo 8.3) near the northern tip of the island (Anonymous 1993). Apart from Trant's and Farm beaches (east coast), all of Montserrat's sandy beaches are located on the western side of the island (Figure 8.1.). Since the recent volcanic activity, a great deal of sediment run-off means that some beaches are growing (e.g. Isles Bay) and much of the south coast has become a sandy coastline.

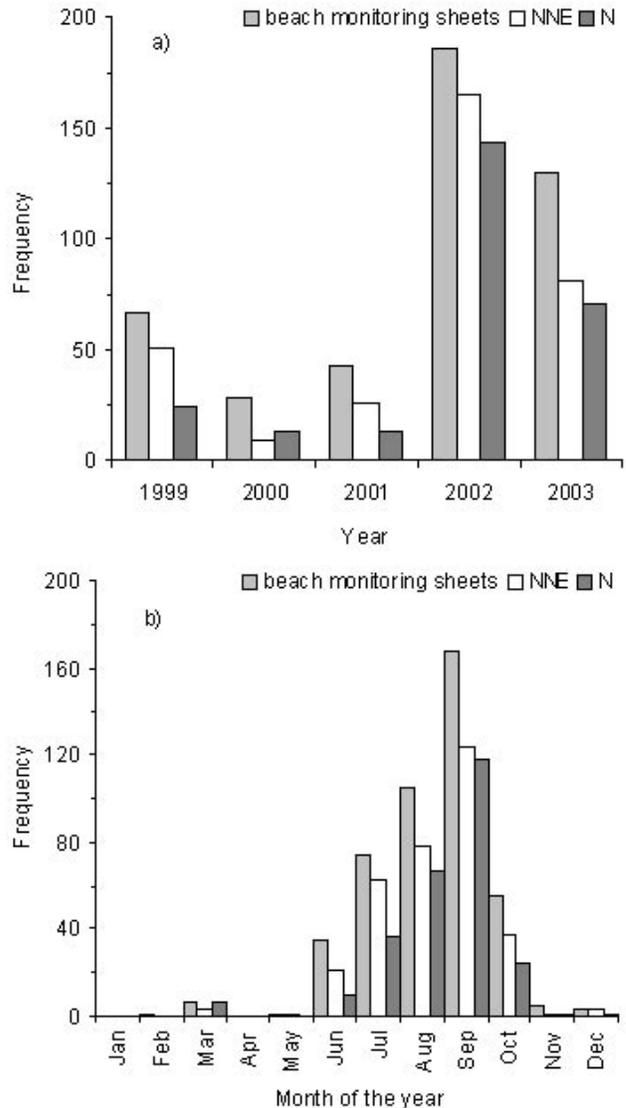
Although marine turtle monitoring had been ongoing since studies in the 1980s (John 1984; Meylan 1983), almost all relevant data were lost along with many government records in the volcanic activity that engulfed Plymouth in 1997.

#### Daytime monitoring of marine turtle nesting

The Fisheries Department of Montserrat's Agriculture Ministry has been coordinating monitoring of the island's beaches for turtle activities since 1999. Although, ad-hoc, day-time beach monitoring has been carried out by dedicated island residents, with these individuals regularly checking their local beach for turtle emergences and nests, the bulk of the monitoring effort has been carried out by the Fisheries Department (J.J.). Monitoring frequency of nesting beaches has been uneven and especially patchy on the beaches located in the exclusion zone (Figure 8.1.). Safe, accessible beaches were walked and checked for turtle tracks and nests. Sites subject to volcanic risk were checked from an offshore boat with binoculars. Beach monitoring sheets were filled by staff (J.J.) each time a beach was visited, and by other island residents only when they had detected nesting activities on their local beach. Nests (N), i.e. adult emergences resulting in clutch deposition, were individually



Photo 8.4. Track of hawksbill turtle (Photo C. Martin).

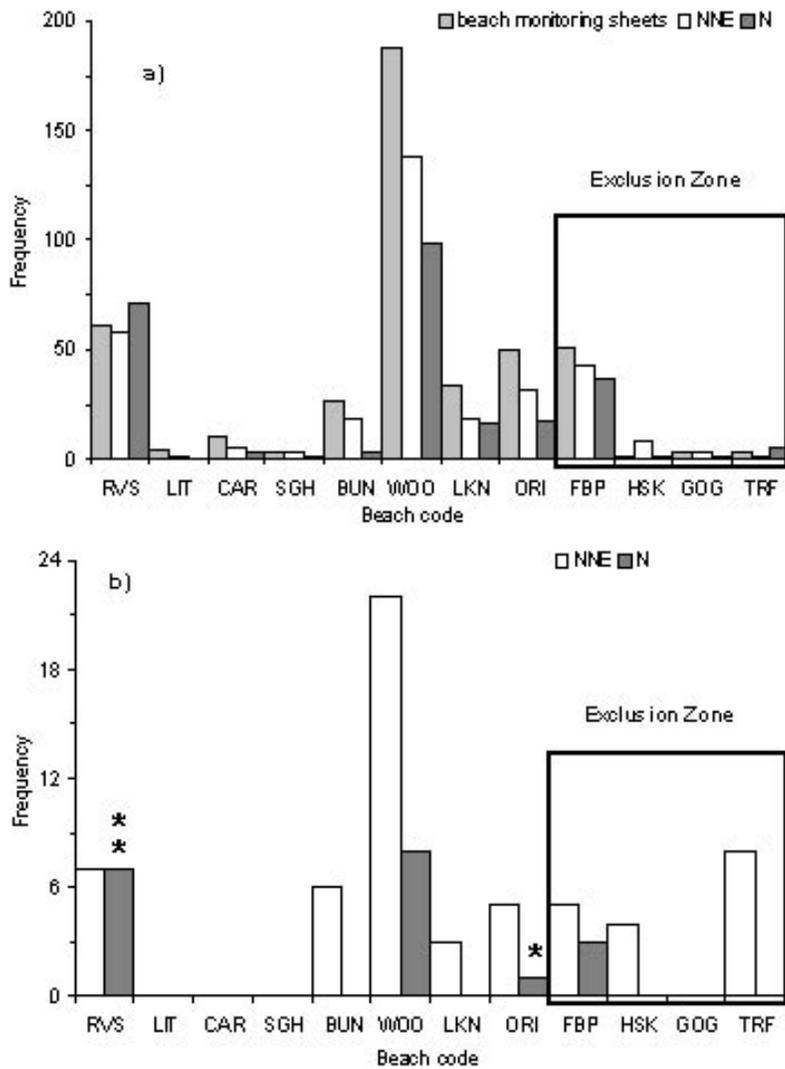


**Figure 8.2. a)** The total numbers of completed beach monitoring sheets, records of non-nesting emergence (NNE) and nests (N), for the period 1999 to 2003. **b)** The total numbers of completed beach monitoring sheets, records of non-nesting emergences (NNE) and nests (N), by calendar month (1999 to 2003).

counted. Non-nesting emergences (NNE) were not counted individually, but instead their presence or absence on any given survey day was recorded. No distinction was made among species based on track morphology.

In 2003, all beaches were monitored a minimum of once per week for one month (mid-August/mid-September). Beaches were either walked or checked from a distance with binoculars (e.g. from a helicopter or boat). Special permission was granted from the authorities to access and walk some of the beaches of the exclusion zone (Trant's, Farm, Fox's, Bransby Point, Hot Water Pond). In these surveys, individual non-nesting emergences and nests were counted and species identification from tracks morphology was undertaken where possible (following Pritchard & Mortimer 1999; Photo 8.4).

Data originating from a total of 453 beach monitoring forms were analysed (Table 8.2). The mean annual total of nests



**Figure 8.3. a)** The numbers of completed beach monitoring sheets, records of non-nesting emergences (NNE) and nests (N), per beach (1999 to 2003). For beach codes see Table 8.2. **b)** Individual non-nesting emergences (NNE) and nests (N), per beach (mid-August/mid-September 2003) (\* and \*\* indicate one and two hawksbill turtle nests, respectively).

recorded for the period 1999 to 2003 was 53 ( $\pm 24.9$  SD, range: 13–143). Annual numbers of non-nesting emergences and nests are highly correlated with associated monitoring frequency when one considers annual totals (Figure 8.2.a) or the combined monthly totals of nesting activity (Figure 8.2.b). During the monitoring period, Woodlands beach demonstrated the greatest nesting intensity of all beaches, but was also the most monitored beach of the island (Figure 8.3.a). The three other key nesting beaches appeared to be Rendezvous, Fox’s Beach/Bransby Point and Old Road/Illes Bay beaches (Figure 8.3.a). Nesting activities followed a strong seasonal pattern, with 97% of turtle activities (non-nesting emergences and nests) being recorded between June and October, clearly peaking in September (Figure 8.2.b). The seasonality of nesting activities closely followed the pattern of the monitoring intensity.

For mid-August/mid-September 2003, there were a total of 60 nesting emergences and 19 nests recorded (Table

8.3). There were 21 non-nesting emergences and six nests of green turtles, and 17 non-nesting emergences and three nests of hawksbill turtles. Because of their relatively large widths, four asymmetrical tracks observed on Trant’s beach were attributed to loggerhead turtle(s), despite no nest being observed. The spatial distributions of non-nesting emergences and nests for mid-August/mid-September 2003 (Figure 8.3.b) showed patterns similar to those shown when all data are pooled from the five year long dataset (Figure 8.3.a). Moreover, the numbers of non-nesting emergences for mid-August/mid-September 2003 were highly correlated with the total numbers of recorded non-nesting emergences for the period 1999 to 2002 (Spearman’s rank correlation  $R_s = 0.84$ ,  $P < 0.01$ ). Such a relationship was also detected between the numbers of nests for mid-August/mid-September 2003 and the total number of nests for the period 1999 to 2002 ( $R_s = 0.57$ ,  $P < 0.05$ ).

### Night-time beach monitoring

In 2002 and 2003, logistics permitting, beaches were monitored at night for the presence of nesting adult turtles. When possible, nesting turtles were measured (Curved Carapace Length, CCL) and tagged with Passive Integrated Transponders (PIT’s). In 2002 and 2003, a total of 28 individual nesting turtles were measured: 16 green turtles (12 in 2002 and 4 in 2003; mean CCL (cm) =  $106.9 \pm 6.3$ SD, range: 103–118) and 11 hawksbill turtles (9 in 2002 and 2 in 2003; mean CCL (cm) =  $87.8 \pm 6.8$ SD, range: 79–103). A total of 9 hawksbill (8 in 2002, 1 in 2003) and 13 green turtles (11 in 2002, 2 in 2003) were PIT tagged. All were tagged on Woodlands beach, with the exception

of 3 hawksbill turtles that were tagged on Carr’s beach (2 in 2002, 1 in 2003). In 2002, 2 green turtles (Photo 8.5) were re-sighted on Woodlands beach after having been PIT tagged on that beach earlier in the season, 11 and 12 days earlier respectively. These data were supplemented by 1 sighting (by a member of the public) of a loggerhead turtle nesting on Woodlands beach in August 2002, and hatchling leatherback turtles being discovered on the same beach in the mid 1990’s (Jeffers unpublished data). In addition, since the advent of TCOT, project efforts are made to record the hatching of nests and undertake excavation to monitor hatching success and gather genetics vouchers.

### Status of nesting populations

When monitoring efforts are intermittent and uneven we should show caution before making any wide ranging recommendation regarding status. There are, however, a few key points that can be elaborated from the existing data. Green and hawksbill turtles nest in modest yet regionally important numbers in Montserrat, probably every season. Leatherback and loggerhead turtles also appear to nest, but these events are undoubtedly relatively rare. This is in concord with the wider literature that suggests that green and hawksbill turtles are the most common species of

	1999		2000		2001		2002		2003	
	NNE	N	NNE	N	NNE	N	NNE	N	NNE	N
RVS	7	6	1	3	4	3	23	25	22	34
LIT	0	0	0	0	0	0	0	0	1	0
CAR	1	0	0	0	0	0	2	3	2	0
SGH	1	1	0	0	1	0	1	0	0	0
BUN	2	0	0	0	0	0	11	2	5	0
WOO	4	4	1	0	4	4	93	70	36	21
LKN	0	0	0	0	1	0	10	16	7	0
ORI	9	4	1	4	9	3	11	7	2	0
FBP	20	5	4	5	7	3	10	15	5	10
HSK	3	4	2	1	0	0	4	5	0	0
GOG	3	0	0	0	0	0	0	0	0	0
TRF	0	0	0	0	0	0	0	0	1	5
<b>Total</b>	<b>50</b>	<b>24</b>	<b>9</b>	<b>13</b>	<b>26</b>	<b>13</b>	<b>165</b>	<b>143</b>	<b>81</b>	<b>70</b>

**Table 8.2.** Breakdown of the number of events when non-nesting emergences (NNE) were recorded and the numbers of nests (N), per beach and year. Beach codes: RVS: Rendez-vous, LIT: Little Bay, CAR: Carr's Bay, SGH: Soldier Ghaut, BUN: Bunkum Bay, WOO: Woodlands Beach, LKN: Lime Kiln Bay, ORI: Old Road/Iles Bay, FBP: Fox's Bay/Bransby Point, HSK: Hot Water Pond/Sugar/Kinsale, GOG: German's/O'Garro's, TRF: Trant's/Farm Bay).

	Green		Hawksbill		Loggerhead		Undetermined	
	NNE	N	NNE	N	NNE	N	NNE	N
RVS	0	1	0	2	0	0	7	4
LIT	0	0	0	0	0	0	0	0
CAR	0	0	0	0	0	0	0	0
SGH	0	0	0	0	0	0	0	0
BUN	1	0	3	0	0	0	2	0
WOO	14	4	5	0	0	0	3	4
LKN	0	0	3	0	0	0	0	0
ORI	0	0	4	1	0	0	1	0
FBP	2	1	0	0	0	0	3	2
HSK	2	0	2	0	0	0	0	0
GOG	0	0	0	0	0	0	0	0
TRF	2	0	0	0	4	0	2	0
<b>Total</b>	<b>21</b>	<b>6</b>	<b>17</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>18</b>	<b>10</b>

**Table 8.3.** Breakdown of the number of non-nesting emergences (NNE), and nests (N), per beach and species, for the period mid-August to mid-September (2003). For beach codes see Table 8.2.

nesting sea turtles in the Lesser Antilles, whilst leatherback and loggerhead turtles tend to nest in comparatively lower numbers (e.g. d'Auvergne & Eckert 1993; Chevalier & Lartiges 2001; Eckert & Honebrink 1992; Eckert *et al.* 1992; Fuller *et al.* 1992; Meylan 1983; Scott & Horrocks 1993; Sybesma 1992).

Magnitude of nesting data recorded was closely correlated with survey frequency in time and space. It is likely that recorders more frequently carried out surveys at times and locations when the probability of recording turtle nesting activity was higher. Although this may have resulted in some spatial and temporal biases in the data set, the seasonality of the Montserrat nesting season as described by the data set is plausible, running primarily from June to October. Although due to the nature of the data it was not possible to discriminate between the seasonality of the different

species, the temporal distribution of the data are consistent with seasonality of nesting reported for green turtles (Fuller *et al.* 1992; Hirth 1997) and hawksbill turtles (Corliss *et al.* 1989; Eckert & Honebrink 1992; Scott & Horrocks 1993) in the region. Additionally, the data collected during the period of intensive monitoring in 2003 generated a spatial distribution of nesting broadly similar with that of previously collated data.

The key nesting beaches for green and hawksbill turtles in Montserrat appeared to be Woodlands (so far unreported in the literature), Rendezvous, Fox's/Bransby Point and Old Road/Iles Beaches. Even though green turtles left tracks on many of the island's beaches, actual nesting by this species was only confirmed for Rendezvous, Woodlands and Fox's/Bransby Point beaches. Meylan (1983) reported that green turtles might also be nesting at Little and Iles beaches.



**Photo 8.5.** Dyonne Dewberry filming return to sea of a green turtle (Photo C. Martin).

Actual nesting by hawksbill turtles was solely confirmed for Rendezvous and Old Road/Iles Beaches, although Meylan (1983) also quotes Carr’s, Little and Soldier Ghaut beaches as nesting sites for this species. On Trant’s beach, tracks possibly belonging to loggerhead turtles were reported, in agreement with the belief that loggerhead turtles occasionally nest on the island (John 1984).

**8.5.2. Data from the TCOT SEQ**

All survey respondents were asked about perceived changes in abundance of nesting marine turtles by species, in the last 5 years and since they could remember (Q105a-c). Views of former and current egg collectors are considered separately, and views of all respondents are summarized in Table 8.4. Of the 6 former and 1 current egg collectors interviewed as part of the TCOT SEQ, only 1 respondent

believed there has been a change in abundance of nesting turtles (1 felt there was no change, 4 didn’t know, and 1 did not respond). He felt that turtles in the OT have increased both in the short and long term for green, loggerhead, leatherbacks and hawksbill. He also cited the increases in both time periods for turtles in general.

Only 15 of the 71 respondents to TCOT SEQ noticed a change in abundance of nesting turtles (9 noticed no change, 44 didn’t know, and 3 didn’t answer the question). As Table 8.4 shows, few respondents commented on individual species. Most respondents believed that nesting numbers for turtles had increased over both time periods, and most of the few who comment on individual species also believed there have been increases for all species in both time frames.

Respondents were asked about reasons for the perceived increase or decrease, both in the number of turtles nesting and found in OT waters (reasons were not distinguished by habitat). Responses (offered by 29 respondents) varied, with no single explanation dominating. Reasons cited for increases included: fewer people fishing, increased monitoring, no longer catching during breeding season, fewer people on island, and education. Reasons for perceived decreases included: changing habitat due to volcanic activity, and over-harvest.

**8.5.3. Threats to nesting marine turtles**

Montserrat presents a relatively narrow coastal shelf, dropping off rapidly to nearly 200 m only 650 m from the shoreline along the southern half of the island, whilst in the north, northeast and west, the shelf slopes more gently (the 200 m contour is approximately 5 km offshore; Gell & Watson 2000). The result is a high energy, erosion prone coastline, with mostly intermittent beaches (Anon 1993).

**In the last 5 years...**

	<b>Increasing</b>	<b>Decreasing</b>	<b>Same</b>	<b>Don’t know</b>	<b>NR</b>
<b>Green</b>	3	1	0	0	11
<b>Leatherback</b>	2	0	0	0	13
<b>Loggerhead</b>	2	0	0	0	13
<b>Hawksbill</b>	3	1	0	0	11
<b>General</b>	8	3	0	1	3

**Since you can remember...**

	<b>Increasing</b>	<b>Decreasing</b>	<b>Same</b>	<b>Don’t know</b>	<b>NR</b>
<b>Green</b>	3	3	0	0	11
<b>Leatherback</b>	2	0	0	0	13
<b>Loggerhead</b>	2	0	0	0	13
<b>Hawksbill</b>	3	1	0	0	11
<b>General</b>	8	3	0	1	3

**Table 8.4.** Perceptions of change in abundance of sea turtles nesting (by species and in general), in the last five years and since you can remember (n=15 respondents who perceive change)



**Photo 8.6.** Ash crust on Fox's Bay (Photo C. Martin).

The quality of Montserrat's beaches with regards to sea turtle nesting appears to be naturally poor. As a result, beach erosion may periodically prevent gravid turtles from nesting, as well as destroy incubating nests

Additional factors of concern to marine turtles linked to the volcanic eruptions include ash deposits and beach mining. Occasional ash deposits cover nesting beaches (Photos 8.6 and 8.7), render them less suitable or wholly unsuitable for nesting until they are manually cleared or cleared by heavy storms. For Montserrat's rebuilding, extraction of beach sediment deposits, largely of volcanic origin has been undertaken at Trant's (Photo 8.8) and Isle's Bay (Photo 8.9), but has now been discontinued at the latter site (C. Gerald (GoM) pers. comm. 2004). It is important that the integrity of these two beaches is maintained and that ongoing turtle monitoring, preferably daily, of these sites ensures that any clutches deposited in "at risk" locations are moved to safety.

Nest predation by feral pigs and dogs is also of concern, but has not yet been documented in detail (J. Jeffers (Montserrat Dept. Fisheries) pers. comm. 2004). It is felt that predation by feral pigs has lowered the suitability of Fox's Bay as a nesting habitat in 2004 and the Department of Agriculture has taken steps to control feral pigs there (C. Gerald (GoM) pers. comm. 2004).

#### 8.5.4. Genetics of nesting turtles

TCOT genetic analyses have shown that the haplotypes of nesting samples collected in the Montserrat have also been described in a number of other nesting sites and foraging areas (see section 10.4.4):

**For wild green turtles**, haplotypes described in nesting turtles/hatchlings from the Montserrat have not yet been described. All three degraded samples failed.

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

**For loggerhead turtles** no genetics vouchers were collected.

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. Data will be disseminated as part of the recently funded cross territory Overseas Territories Environment Programme (OTEP) project that will focus on Marine Turtle Conservation, the Environment Charter and Multilateral Environment Agreements.

#### 8.5.5. Nesting overview

Montserrat hosts nesting populations of green and hawksbill turtles with occasional nesting by loggerhead and leatherback turtles likely. Although, according to local perceptions, numbers may be increasing, Montserrat's nesting turtle numbers are at critically low levels and likely to be remnant of once larger populations.



**Photo 8.7.** Turtle tracks on ash crust (Photo C. Martin).



**Photo 8.8.** Sand extraction at Trant's Bay (Photo C. Martin).

## Recommendations

### 8.1.2.3. Consider Marine Turtles as part of Planning Policy and Beach Management

Montserrat's nesting marine turtles probably represent remnants of depleted populations and are at critically low levels (see section 8.5). However, the adverse impacts of increased beachfront development on the nesting populations using Montserrat's mainland beaches 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 Montserrat, and therefore TCOT recommends the following policies:

- a) Ensure all development, other than non-permanent structures designed for daytime beach use, is 100m landward of the high tide mark.
- b) Introduce planning regulations to mitigate the adverse impacts of development on marine turtles, including, for example light pollution, nesting female disturbance and erosion.
- c) Ensure marine turtles are considered in the current beach sediment extraction projects being carried out in support of Montserrat's reconstruction. Extraction from major nesting beaches should be permanently discontinued.

### 8.1.3.1. Establish systematic monitoring efforts at index nesting beaches

Establish a sustained programme of morning nesting beach monitoring at index beaches to determine nesting abundance trends and to facilitate genetic analysis of nesting population, through nest excavation and sampling. Ideally, monitored beaches should be visited at minimum 3 times per week to ensure species identification, and surveying should be carried out across the duration of the known nesting season and with constant effort.

**NB.** This programme should preferably engage local interest groups and residents and could eventually be developed, under the guidance of the proposed Biodiversity Working Group, into seasonal, revenue-generating tourist turtle walks in order to raise funds to sustain marine turtle management efforts.

### 8.1.4.2. Implement general awareness programmes regarding marine turtle conservation in Montserrat

- a) Raise awareness among Montserratians of the presence of distinct foraging and nesting turtle populations through informational materials 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 MEAs.

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 the Montserrat specific turtle educational materials, and expand them to include further curriculum linked, multi-media educational materials where appropriate.



Photo 8.9. Isle's Bay with disruption from extraction (Photo B. Godley).

## 8.6. Status of Foraging Marine Turtles in Montserrat

### 8.6.1. Information gathered from literature/fishery records

Adult and juvenile hawksbill and green turtles are found in Montserrat's inshore waters (John 1984; Meylan 1983). Local fishers are encouraged to report any sea turtle (along with their fish catches) to the fisheries authorities (see section 8.6.6 below). In addition, some former turtle fishers now collaborate with authorities on research initiatives (Photo 8.10). The harvest information suggests that a wide size range of green and hawksbill turtles are present year round in Montserrat's waters. Although no loggerhead turtles were officially recorded as captured, TCOT staff did see one relatively fresh carapace, which had been removed from a loggerhead turtle stranded dead in 2000. All other prepared carapaces encountered by TCOT staff were of green and hawksbill turtles. These are the most common species of sea turtles found in the waters elsewhere in the Lesser Antilles, with leatherback and loggerhead turtles tending to be present in comparatively lower numbers (e.g. d'Auvergne & Eckert 1993; Carr *et al.* 1982; Chevalier & Lartiges 2001; Eckert & Honebrink 1992; Eckert *et al.* 1992; Fuller *et al.* 1992; Meylan 1983; Scott & Horrocks 1993; Sybesma 1992).

Species	<25cm	26-50cm	51-75cm	>76	Unknown size	Total	Site
Green	0	0	0	0	1	1	1
Hawksbill	1	4	1	0	0	6	2, 3, 4, 5
Loggerhead	0	0	1	0	1	2	6, 7
Leatherback	0	0	0	0	0	0	
Unidentified	0	7	0	0	1	8	6, 2, 5

**Table 8.5.** Summary of species and size class of individual turtles observed by divers in Montserrat Jan-Sept 2003. Key to locations: 1Virgin Island, 2Little Bay, 3Porato Hill Reef, 4Rendez-vous Reef, 5Woodlands, 6Carr's Bay; 7Little Bay and Cam Bay.

### 8.6.2. Information from *Caribbean Turtlewatch*

Data on the in-water abundance of marine turtles were gathered via a series of methods. One of these was *Caribbean Turtlewatch*, a questionnaire designed to be completed by recreational divers/snorkelers. A copy of the form and information package are given in Appendices 2.2-2.4. More detailed methodology is given in the section 2.

There was only one dive operator in Montserrat during the duration of this project (Sea Wolf Diving School). During the period January-September 2003, Sea Wolf Diving School and their clients filled out 36 *Caribbean Turtlewatch* forms, detailing dives and turtle sightings. On 17 of these 36 occasions turtles were observed. One report was made by an independent snorkeler who observed a loggerhead turtle in water. See table 8.5 for summary of results.

The completed *Caribbean Turtlewatch* surveys have illustrated that green, loggerhead and hawksbill turtles (Photo 8.11) are found in the waters of Montserrat. The latter is the most common species observed by divers. The majority of all turtles observed by divers were of juvenile/sub-adult size and not thought to be breeding individuals.

Divers were asked: *Did the chance of seeing a turtle influence your decision to choose this particular dive?* Of the 16 individuals that responded, 6 said answered yes, 9 answered no and one was unsure. When asked the questions: *How important was your turtle sighting to the enjoyment of the dive?* Nine individuals responded that the experience was very important, one responded that it was of no importance. These results combined suggest that while many divers do not set out specifically to see turtles, turtles are highly appreciate when seen.



**Photo 8.10.** Recording of turtle capture with collaborating fisherman (Photo J. Jeffers).

### 8.6.3. Data from in-water monitoring

Personnel and logistical constraints mean that, at present, no in-water monitoring has been carried out in Montserrat other than the recording of marine turtle capture data (see section 8.7.4 below).

### 8.6.4. Data derived from the TCOT SEQ

All respondents were asked about perceived changes in abundance of turtles found in OT waters (Q104a-c). Responses of turtle fishers are isolated in Table 8.6 below,



**Photo 8.11.** Hawksbill turtle, Montserrat (Photo W. Krebs).

while all responses are shown in Table 8.7. Of the 12 former and 3 current turtle fishers, 12 noticed a change, 1 did not and 2 didn't know. As Table 8.6 shows, most turtle fishers commented on turtles in general, with fewer commenting on green and hawksbill numbers, and only 1 commenting on leatherbacks and loggerheads. In general, most fishers felt that turtles were increasing, in general and by species, for both time periods.

Of the 71 TCOT SEQ respondents, 32 noticed a change overall in in-water abundance, 9 did not, 27 didn't know, and 3 didn't answer the question. As Table 8.7 shows, patterns for the group that noticed changes are similar to those shown by fishers. Most people comment on turtles in general, and believe their abundance has increased. While the same holds true for trends in individual species, the numbers of respondents commenting are lower.

Respondents were asked about reasons for the perceived increase or decrease, both in the number of turtles nesting and found in OT waters (reasons were not distinguished by habitat). Responses (offered by 29 respondents) varied, with no single explanation dominating. Reasons cited for increases included: fewer people fishing, increased monitoring, no longer catching during breeding season, fewer people on island, and education. Reasons for decreases included: changing habitat due to volcanic activity, and over-harvest.

### 8.6.5. Status of marine turtle habitats and in-water threats to marine turtles

Relatively little is known of the current state of Montserrat's marine and coastal habitats with regards to suitability as marine turtle foraging areas. Its coastal shelf is relatively small (140 km<sup>2</sup>) and only generalized distributions of primary types are available (Anon 1993; Meylan 1983). Before

1995, coral communities (foraging habitats for hawksbill turtles) were found in small patches interspersed with sand and sediment on the north, south and west coasts (Gell & Watson 2000). The harmful consequences of sediments on coral reef communities and associated organisms have previously been well documented (e.g. Rogers 1990). In Montserrat, volcanic sediments are thought to have had a severe impact on reef growth, particularly in the east and southwest of the island (Gell & Watson 2000). Direct deposits of ash and waterborne sediments have led to some coral bleaching and disintegration of large sponges. Some reef areas, however, are thought to be recovering (W. Krebs. (SeaWolfe) pers. comm. 2003). In recent times, Montserrat had only 3 main sea grass beds, with the largest, 750 ha, being located at the northern tip of the island (Gell & Watson 2000), and the others on the east and west coasts. It is thought that these beds suffered considerable damage from Hurricane Hugo in 1989, although the effect on the foraging habitat for the green turtles is not known.

### 8.6.6. Genetics

TCOT genetic analyses have shown that the haplotypes of samples from foraging turtles collected in Montserrat have also been described in a number of other nesting sites and foraging areas (see section 10.4.5):

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

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

#### In the last 5 years...

	Increasing	Decreasing	Same	Don't know	NR
Green	4	1	0	0	8
Leatherback	1	0	0	0	11
Loggerhead	1	0	0	0	11
Hawksbill	4	1	0	0	8
General	6	1	0	0	5

#### Since you can remember...

	Increasing	Decreasing	Same	Don't know	NR
Green	4	1	0	0	7
Leatherback	1	0	0	0	11
Loggerhead	1	0	0	0	11
Hawksbill	4	1	0	0	7
General	5	2	0	0	5

**Table 8.6.** Perceived change in abundance of turtles in OT waters (in general and by species) in the last 5 years and since you can remember (n=12 fishers who noticed change)

**In the last 5 years...**

	Increasing	Decreasing	Same	Don't know	NR
Green	19	5	0	2	6
Leatherback	5	1	0	0	26
Loggerhead	2	0	0	0	30
Hawksbill	5	0	0	0	30
General	5	1	0	0	26

**Since you can remember...**

	Increasing	Decreasing	Same	Don't know	NR
Green	16	8	0	1	7
Leatherback	5	1	0	0	26
Loggerhead	2	0	0	0	30
Hawksbill	2	0	0	0	30
General	5	1	0	0	26

**Table 8.7.** Perceived change in abundance of turtles in OT waters (in general and by species) in the last five years and since you can remember (n=32 respondents who noticed change).

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. Data will be disseminated as part of a cross-territory FCO Overseas Territories Environment Programme (OTEP) –funded project that will focus on turtle Conservation, the Environment Charter and Multilateral Environment Agreements.

**8.6.7. Summary**

Foraging populations of green and hawksbill turtles are found in Montserrat's inshore waters, but are of unknown magnitude. Smaller numbers of loggerheads are also likely to be present.

**Recommendations**

**8.1.3.2. Establish a systematic inwater monitoring programme**

*In the first instance this would assess species composition and distribution, highlighting key areas of abundance. Building upon this, effort related surveying should be carried out to allow trends in abundance to be assessed, and sampling for genetic profiling should be undertaken.*

**NB.** *Under the guidance of the Biodiversity Working Group, steps should be taken to encourage the involvement of interested local fishers in all monitoring programmes (e.g. CPUE monitoring), and financial incentives should be considered so long as they fit within the remit of a sustainable programme.*

**8.1.2.2. Establish Marine Protected Areas**

*Montserrat does not currently have any marine protected areas. It is advised that, based on holistic assessment of the marine biodiversity of Montserrat, key areas be set aside for protection.*

**8.1.2.3. Consider Marine Turtles as part of Planning Policy and Beach Management**

*Montserrat's nesting marine turtles probably represent remnants of depleted populations and are at critically low levels (see section 8.5). However, the adverse impacts of increased beachfront development on the nesting populations using Montserrat's mainland beaches 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 Montserrat, and therefore TCOT recommends the following policies:*

- a) *Ensure all development, other than non-permanent structures designed for daytime beach use, is 100m landward of the high tide mark.*
- b) *Introduce planning regulations to mitigate the adverse impacts of development on marine turtles, including, for example light pollution, nesting female disturbance and erosion.*
- c) *Ensure marine turtles are considered in the current beach sediment extraction projects being carried out in support of Montserrat's reconstruction. Extraction from major nesting beaches should be permanently discontinued.*

#### 8.1.2.4. MEA legislation recommendations

*The Endangered Animals and Plants Ordinance, 1976, should be amended to prohibit commercial import and export of turtles and all products of wild marine turtle species, so that this legislation fully transposes CITES to domestic law.*

### 8.7. Direct Use of Marine Turtles in Montserrat

#### 8.7.1. Overview

The main domestic legislation that covers marine turtle exploitation in Montserrat is the Turtles Ordinance Cap. 112 1951 (Appendix 3.5). This states that nesting females and eggs can be harvested, possessed, bought and sold from October through to May inclusive. Although there are no quotas or species restrictions, turtles captured must weigh at least 20lbs (9.07kg). In 2002, the Government of Montserrat produced a document entitled 'Turtle Act 2002' (Appendix 3.5) that has yet to be gazetted. This Act, if passed as law, will prohibit the harvest of nesting females, the harvest, sale, purchase and possession of turtle eggs, and will restrict the open season for turtle harvest to the months of December, January and February. The Act would also increase the minimum size limit of harvested turtles to 50 lbs (22.68kg). Data on use of marine turtles were gathered by combining published information, data provided by project partners, and the data gathered using

the TCOT Socioeconomic Questionnaire or SEQ (See Section 2; Appendix 2.1). In Montserrat, 71 questionnaires were completed and a breakdown of information gathered on marine turtle exploitation is digested in Table 8.8.

#### 8.7.2. Harvests of adults on the nesting beaches

Fisheries Officers responsible for nesting beach monitoring believe that the take of turtles from nesting beaches is ongoing, although at a very low, highly opportunistic, level (1-2 turtles per year; J. Jeffers (Montserrat Dept. Fisheries) 2004). Indeed under the current legislation, such take is not illegal during periods when it might be possible to encounter them on the nesting beach, e.g. in October or May. This low level of take was confirmed by interviewees during the TCOT SEQ survey; only 1 respondent reported formerly collecting female turtles (until 15 years ago), preferring hawksbill turtles, with green turtles as second choice. The interviewee also formerly fished for turtles. His views on changes in abundance were contradictory; for one question, he stated there had been a general decline in marine turtles since he had stopped fishing in the early 1990s, as a result of over-fishing. However, on a later question, he suggested that turtle populations had increased in both the short and long term, because there are fewer fishers.

#### 8.7.3. Harvest of eggs

As with capture of adult females, egg take is not illegal at some times of the year. Egg take continues at a low level, with eggs reputed to have aphrodisiac properties, although

Measures of direct exploitation	Past	Present	Never	NR or NA
<b>By life stage</b>				
Females on beaches	1	0	-	-
Eggs from beach	6	1	-	-
Turtles in water (intentional)	12	3	-	-
Turtles in water (incidental)	11	-	-	-
<b>By product</b>				
<b>Meat</b>				
Fishers who sell meat	12	1	-	-
Meat vendors	2	0	-	25
Meat consumers	32	16	-	20
<b>Eggs</b>				
Collectors who sell eggs	0	0	-	-
Egg vendors consumers	0	0	-	-
Egg consumers	14	1	-	-
<b>Non-edible</b>				
Fishers who sell shells	10	1	-	-
Shell vendors	0	0	-	-
Shell consumers	16	0	-	-
<b>Measures of indirect exploitation</b>				
Turtles indirectly used in business	7			
<b>Total interviews</b>	<b>71</b>			

**Table 8.8.** Numbers of users of marine turtles (consumptive and non-consumptive) in the past and present. Key: NR - No Response; NA - Not Applicable.

none of the egg consumers report using eggs for this reason (most report that they fry them with spices and flour for food). Buley (2001) reported that officials estimated the take to be 5-10 nests per year, taken illegally during the peak of the season. It is widely known within the society that there are a few individuals who illegally take eggs. Of the 2 individuals suggested by other interviewees as those who regularly take eggs, 1 refused to be interviewed, but the other freely admitted to taking eggs (and specified that he did so during summer months) and granted an interview.

Six former egg collectors were interviewed for the TCOT SEQ. Reasons collectors stopped included lack of interest (2), lack of opportunity (1), and in respect of the law (1). Three of the respondents stated they stopped collecting eggs more than 20 years before the survey. Of the 6, 2 collected hawksbill eggs, 1 collected green turtle eggs, and 1 didn't distinguish between species. One respondent gave his preference as hawksbills and the other 5 did not answer. None of the 6 had previously sold their eggs. The 1 current collector noted that he has not collected eggs since 2000. He collects eggs opportunistically when he sees them, rather than searching for them. He does not distinguish between species or sell eggs taken. Contrary to existing law, the interviewee reported collecting eggs in the summer months. It appears, therefore, that egg harvest does indeed carry on at a low level, but that it is not a major economic activity.

#### 8.7.4. Harvests of turtles at sea

Rebel (1974) states that the turtle fishing industry in Montserrat is irregular, with fisheries statistics suggesting 12 nets were used in the northern district and 4 in Plymouth in 1948. A figure of 70 turtles landed at Plymouth in 1948 is given. John (1984) reported the catch of hawksbill and green turtles using spear guns and nets at Plymouth, Carr's Bay, Bunkum Bay, Sugar Bay and Farm Bay, with meat/shell/shell products being sold locally, often at Plymouth market on a Saturday.

As part of the TCOT SEQ, we interviewed 12 former turtle fishers (5 intentional, 2 opportunistic and 5 opportunistic/intentional). Greens and hawksbills were caught both intentionally and opportunistically by most fishers, and 1 fisher reported catching loggerheads. When asked what species they preferred to catch, 7 fishers preferred green turtles, 2 preferred hawksbills, 2 had no preference and 1 did not answer. None of the respondents recorded catching leatherback turtles. Methods were mostly the same for capturing greens and hawksbills, with most fishers using and spear guns (n=7) and a few using nets (n=2). One fisher reported capturing hawksbill turtles by hand.

Eleven of the 12 former fishers provided data on the magnitude of capture, either for specific species or for turtles in general. The highest number reported by any fisher was 64 (green) turtles per year, and the lowest was 1 (species unspecified). The total number of turtles caught by the 11 fishers is estimated at 224 per annum. Green turtles appear to have been the more important species,

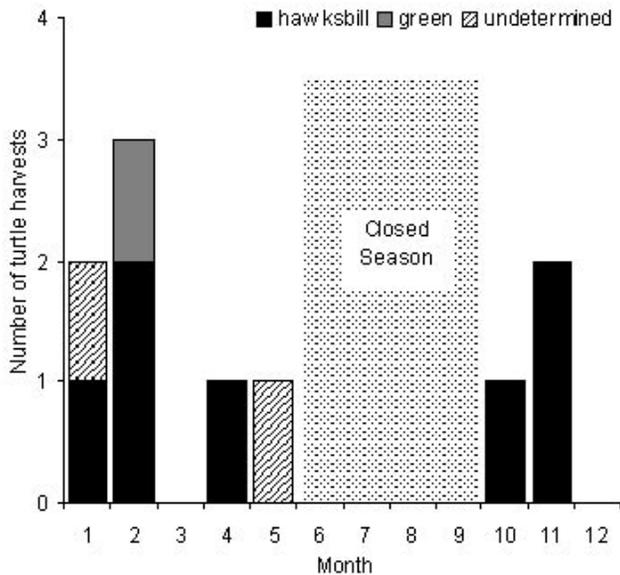
with an average of 22 turtles caught per year by 7 fishers. The average number of hawksbills caught was 3 by 4 fishers. For turtles in general, the average caught was 6 by 7 fishers. One fisher reported catching 4 loggerheads per year.

Some fishers provided average sizes for turtles caught. For green turtles, reported sizes ranged from 100 to 450 lbs. The average of size was 276 lbs. For hawksbills, reported sizes ranged from 80 to 225 lbs, and the average size was 145 lbs. The one fisher who caught loggerheads reported a minimum size of 200 lbs and a maximum size of 300 lbs. All fishers identified October – May as the season they fished turtles. All 12 of the former turtle fishers reported selling some part of their catch. Meat, whole shell, and shell pieces were items most commonly sold. Turtle products were sold to markets (n=8), sold on streets (n=4), at the fish landing site (n=4), directly to people (n=3), and to restaurants (n=2). Of these former turtle fishers, the following were cited as reasons for cessation: job change (n=3); lack of opportunity (n=3); conservation (n=2); retirement (n=2), lack of time (n=1), lack of interest (n=1).

In spite of the seemingly low overall catch rates, the economic importance of turtles to former fishers varied: 1 ranked turtles as very important, 9 as somewhat important, and 2 as not important.

We also interviewed three current turtle fishers (2 opportunistic and 1 intentional/opportunistic). Two of these stated a preference for green turtles, and all 3 use spearguns. Rates of capture are very low (1, 2.5 and 5 turtles per season) and only one fisher provided an estimate of economic importance, who ranked turtle fishing as not important (the other two didn't answer). Only one fisher sells the meat, at a price of \$5<sup>EC</sup> per lb, directly to the consumer. We suspect some fishers are selling meat to restaurants, as 1 and possibly 2 restaurants occasionally sell dishes containing turtle meat (one restaurant owner reputed to sell turtle meat refused to be interviewed). This retail seems to be on an *ad hoc*, occasional basis and very much for local consumption.

For the period 1993 to 2003, the harvest of only 10 individual turtles were declared to the Fisheries Department (Figure 8.4.), hence a mean of 0.9 harvest per year ( $\pm 1.22SD$ , range = 0–4). All captures took place during the open season (October-May). One green turtle (9.1 kg) and seven hawksbill turtles (13.6 kg, 18.1 kg, 29.5 kg, 45.4 kg, 45.4 kg, 63.1 kg, 90.9 kg; mean mass (kg) =  $43.7 \pm 26.9SD$ ) were declared to the authorities. There were two declared captures for which the species was not recorded. Using a published regression equation between mass and CCL for Hawksbill turtles ( $\text{Log}_{10}(\text{mass}) = 2.8966 \times \text{Log}_{10}(\text{CCL}) - 3.8534$ , with mass in kg and CCL in cm, Limpus *et al.* 1983), the masses of nesting hawksbill turtles that were measured in Montserrat were estimated to range from 43.9 to 94.8 kg. When compared to the masses of harvested turtles, it appeared that 4 out of the 7 harvested hawksbill turtles declared to authorities could have been adult turtles.



**Figure 8.4.** The temporal distribution of reports of turtle captures (1993-2003; N = 10 turtles). Highlighted are the closed season and the seasonal profile of nesting as recorded by the data in this study.

It is thought that the turtle fishery has declined significantly in magnitude since the extensive emigration from the island in recent years. Superimposed upon these patterns may be one of decreasing demand from some consumers (although all but 1 meat consumer interviewed as part of the TCOT survey believed that availability of turtle meat had decreased in the past 5 years and since they can remember, i.e. less turtles are being caught, butchered and sold rather than a decrease in demand). Only 10 turtles were declared to the fishing authorities for the period 1993 to 2003. Popular accounts, and the TCOT SEQ results, suggest that it is likely that this low total is the result of significant under-reporting and that clandestine harvest is carried out during the closed season. Fishers are said to avoid declaring their catch to the authorities by butchering turtle carcasses at sea, both in and outside the open season. Of great concern, as evidenced by the temporal distribution of declared turtle capture records and the fact that potential breeding adults are being captured, is that the open season for the turtle fishery overlaps significantly with the nesting season. We estimate that the total catch is likely to be 10-30 animals per year.

Of the 71 respondents surveyed, 37 formerly consumed and 16 currently consume marine turtle products. Of the former consumers, 12 stopped due to lack of availability, 7 because of conservation reasons, 5 because they had no interest, 3 because they stopped fishing, and 1 because of religion. Three didn't answer the question and 4 provided unspecific reasons, stating only that they had eaten meat 'a long time ago.' Those that stated preferences preferred green (n=5) and hawksbill meat (n=1).

Of the 16 current consumers, the only stated preference was for green turtle meat (n=4). Four current consumers purchase meat (and reported doing so during the season),

while 7 do not purchase (5 provided no answer). Those that don't purchase meat either get it as a gift or catch it themselves. The cost of purchase (provided by the 3 respondents who answered this question) was EC\$5/lb, i.e. the same price fishers report selling it. Consumption is infrequent for most current consumers; 7 respondents consume meat once a year, 5 less than once a year, 2 on a monthly basis, and 1 on a weekly basis.

#### 8.7.5. Trade in shells and shell products

Although polished turtle shells and worked items were once for sale in Montserrat (and 10 former sellers of shell/curios were interviewed), we could not find any such products for sale during TCOT field visits, although examples were shown by local people (Photo 8.12). Only 2 artisans once involved in the turtle shell industry could be traced, 1 was interviewed and another refused. Neither makes turtle shell products any longer as there is no local demand. Indeed one shell was found discarded in a garden (Photo 8.13). Others involved in this industry appear to have emigrated from Montserrat as a result of the volcanic crisis.

#### 8.7.6. Incidental catch in marine fisheries

The commercial fishery sector in Montserrat is quite small and no detailed profile has been carried out since the upheavals of the volcanic crisis. There are currently approximately 60 fishers using 33 small artisanal boats (M. O'Garro (Montserrat Dept. Fisheries) 2004). There are no legal industrialised vessels in Montserratian waters, but charges of illegal fishing in Montserrat's territorial waters have been levelled at USA long-liners, and Anguillan authorities have seized Taiwanese vessels that illegally set long-lines in nearby Anguillan waters (Weidner *et al.* 2001).

Eleven out of the 30 fishers surveyed reported accidentally catching turtles when fishing for something else. Of those, 7 told us what they did with accidentally captured turtles,



**Photo 8.12.** Johnique Fenton with decorated turtle carapace as was once produced in Montserrat (Photo C. Martin).

and most of these identified multiple actions, depending on the state of the turtle and the season. While 3 fishers would always release a turtle (1 for conservation reasons, 1 for religious reasons, and 1 with no reasons provided), the other 4 stated they would release them during closed season, but keep (to sell, use or gift) them during the open season, depending on the state of the turtle. All 11 fishers provided vague estimates of numbers of turtles caught, most of which were low. The highest number reported was 3-4 turtles per year, while the lowest was 1 in a lifetime (other responses included 'a few times in my life', 'once in a while', etc.). Methodologies likely to interact were given as gillnets (n=5), seines (n=2), fish traps (n=2), garnets (n=1). Of the 30 fishers surveyed, 21 believed that other fishers accidentally caught turtles. The fate of these turtles was described in similar terms, i.e. turtles would be released during closed season, but kept (for use, sale, and gift) during the open season (depending on the state of the turtle).

Turtle fishers were asked for their views on potential fisheries management options, and the results are shown in Table 8.9. As this table shows, there is wide support for particular types of regulations (on species caught, fishing gear, size limits and seasons). There is less support for geographic restrictions on fishing. The result re: 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 and government authorities as central to policy making.

### 8.7.7. Summary

Based on the data gathered, direct extraction of eggs and adults from the nesting beaches appears to be minimal, and undertaken mostly for consumption. Levels of extraction at sea are also low; although most former turtle fishers did sell their products, they estimated value of this to their overall activities as somewhat or not important. Current commerce in marine turtle meat exists, but we only interviewed 1 current fisher who reported selling it. Turtle meat is the only product consumed and consumers have noticed a decrease in availability over time.

### Recommendations

#### 8.1.2.2. Establish Marine Protected Areas

*Montserrat does not currently have any marine protected areas. It is advised that, based on holistic assessment of the marine biodiversity of Montserrat, key areas be set aside for protection.*

#### 8.1.2.4. MEA legislation recommendations

*The Endangered Animals and Plants Ordinance, 1976, should be amended to prohibit commercial import and export of all wild marine turtle species and their products, so that this legislation fully transposes CITES to domestic law.*

### Recommendations

#### 8.1.2.1. Revise Turtle Ordinance Cap 112 1951

*We recommend the following based on the draft revisions drawn up by the GoM as the "Turtle Act 2002" (not yet gazetted). It should be noted however, that additional ammendments to the "Turtle Act 2002" are needed:*

- i) Ensure permanent and complete prohibition of the harvest of nesting female turtles and turtle eggs.*
- ii) Ensure a closed season from the 1<sup>st</sup> of March to the 30<sup>th</sup> of November inclusive, to be reviewed every 5 years (to facilitate legislative adaptation to possible nesting season shift caused by climate change).*
- iii) Ensure permanent and complete prohibition of harvest of any large, reproductively valuable turtles by instigating a maximum size limit. A suggested maximum would be 50lbs (22.7kg) or less, but should be based on additional research on the fishery and turtle stocks. This research should also yield an equivalent maximum curved carapace length that should be stipulated in any amended legislation.*
- iv) Consider a continued minimum size limit, as most fishers already accept this as an established 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.*
- v) 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 Government of Montserrat 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.*
- vi) Ensure permanent and complete prohibition of all turtle capture methods except hand capture and use of turtle nets, with strict specifications for legal net structure and use.*
- vii) Ensure prohibition of the harvest of loggerhead and leatherback turtles.*

**NB.** *Any continuing turtle fishery must be accompanied with systematic monitoring regimes as described below, along with a programme to monitor Catch per Unit Effort of licensed fishers, and biometrics of turtle catch, which should also be implemented by the GoM. Fisheries regulations should be revised to provide statutory powers to react to the ongoing results of the abundance trend monitoring programmes. In the event of declining abundance trends or declining Catch per Unit Effort below pre-established thresholds, the GoM must have the power to temporarily or permanently close the turtle fishery.*

<b>a</b>	<b>There should be regulations for which species of turtle can be caught</b>				
	yes	no opinion	no	not app	nr
n	10	1	0	3	1
%	67	7	0	20	7
<b>b</b>	<b>There should be regulations for the type of fishing gear and methods that can be used to catch turtles</b>				
	yes	no opinion	no	not app	nr
n	9	2	1	2	1
%	60	13	7	13	7
<b>c</b>	<b>There should be regulations for the number of turtles that can be caught</b>				
	yes	no opinion	no	not app	nr
n	2	4	5	3	1
%	13	27	33	20	7
<b>d</b>	<b>There should be size limits for turtles caught</b>				
	yes	no opinion	no	not app	nr
n	8	4	1	2	0
%	53	27	7	13	0
<b>e</b>	<b>Open and closed zones should be set for turtle fishing</b>				
	yes	no opinion	no	not app	nr
n	1	6	5	2	1
%	7	40	33	13	7
<b>f</b>	<b>Open and closed seasons should be set for turtle fishing</b>				
	yes	no opinion	no	not app	nr
n	11	1	0	2	1
%	73	7	0	13	7
<b>g</b>	<b>Who should be involved in the setting regulations (multiple responses allowed)</b>				
	fishers	gov't authorities	experts	police	community
n	11	10	2	1	1
%	73	67	13	7	7

**Table 8.9.** Turtle fishers' views of turtle fisheries management options. Key nr - no response; not app - not applicable.

## 8.8. Indirect Use of Marine Turtles in Montserrat

### 8.8.1. Turtle watching on beaches

There is no organised turtle-watching, although several individuals do visit the beaches regularly in the hope of sighting turtles. Within the very small tourist sector in Montserrat, TCOT surveys revealed some awareness that, despite the relatively small local populations of foraging and nesting turtles, turtle-watching offered one more tangible attraction for the type of tourists most likely to come to post-eruption Montserrat. There was widespread interest for informational materials and the Government of Montserrat has begun the process of producing a video on the Marine Turtles of Montserrat. The main obstacle to setting up a turtle-watching initiative is that the low levels of nesting might seed high levels of disappointment during all but the peak season

Given the number of nesting turtles, and the possible restrictions on beach access, tourist participation in viewing nesting turtles is likely to proceed in an informal fashion. Information on correct behaviour around nesting turtles should nevertheless be publicized and distributed in the tourism sector, and tourists can be engaged in monitoring and reporting of sea turtle nesting activity.

### 8.8.2. Dive tourism/snorkel tours

The reefs around Montserrat are thought to be in relatively good condition (W. Krebs (SeaWolfe) pers. comm. 2004), but until recently there has been only 1 dive operator working on a part-time basis (SeaWolfe). This operator recently put the business up for sale and others on the island have expressed an interest in setting up operations. Turtles are found in Montserrat's waters at low densities, but undoubtedly contribute to the dive experience. There is 1 dive operator who will occasionally run snorkel tours if required, and turtles are occasionally sighted.

### 8.8.3. Aquaria holding captive turtles

There are no aquaria holding turtles in Montserrat.

### 8.8.4. Other marketing uses

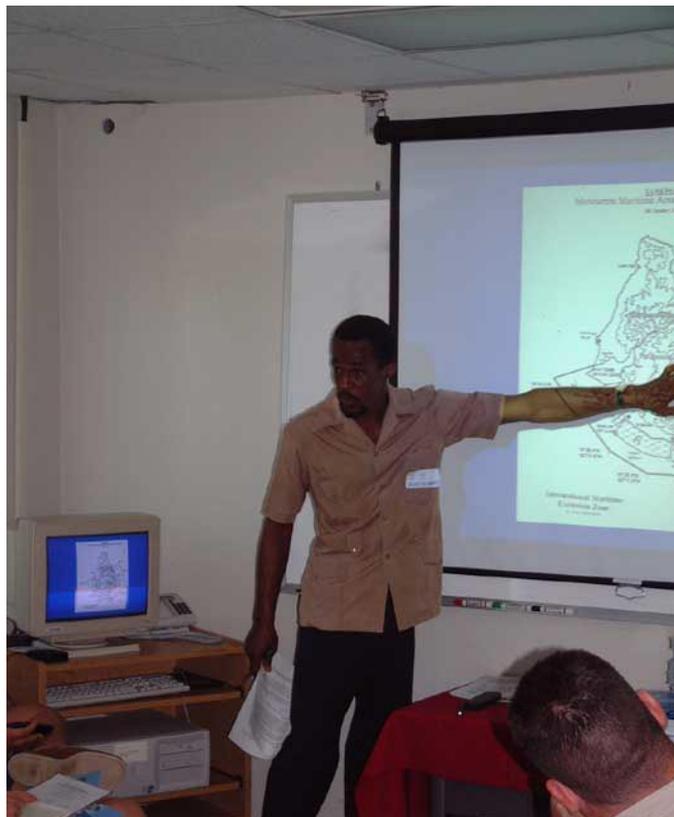
Turtle themed curios made from non-turtle materials outside Montserrat are to be found for sale in souvenir shops, but turtles do not feature prominently as a logo other than their presence on Eastern Caribbean currency notes.

## 8.9. Attitudes to Conservation

TCOT SEQ sought to assess overall attitudes towards conservation of marine turtles, and options for marine



**Photo 8.13.** Discarded turtle carapace from garden of interviewee (Photo C. Martin).



**Photo 8.14.** John Jeffers giving Montserrat presentation at TCOT workshop (Photo S. Ranger).

turtle management. Respondents could agree, disagree, or have no opinion. In some cases, they could choose 'not applicable'. While full details of responses to these questions are have been circulated to TCOT partners, 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 (87%)
- As turtles are migratory, they should be managed in cooperation with neighbouring states (82%)
- Turtles play an important ecological role in our natural environment (82%)
- The government needs to actively work to protect sea turtles (76%)
- Turtles should be protected, regardless of their use to humans (72%)
- Local people should be allowed to purchase sea turtle meat (66%)
- Local people should be allowed to catch and eat sea turtles, provided it doesn't harm the regional population (63%)
- Existing laws protecting marine turtles are effectively enforced (56%)
- Some income from tourism should be used to support sea turtle conservation efforts (55%)
- Turtles should be used both as tourist attractions and as a source of food (55%)
- Turtles are culturally valuable in this OT (54%)
- Turtles should be used as a tourist attraction rather than as a source of food (49%)
- Tourists should be allowed to purchase sea turtle meat (46%)
- Tourists should be allowed to purchase sea turtle shell and take it home with them (41%)

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

- Government needs to do more to ensure that existing laws regarding marine turtles are effectively enforced (38% agree, 32% disagree)

Most respondents disagreed with the following statements:

- Turtle fishing should be unregulated (62%)
- Turtles are economically valuable in this OT (62%)
- Turtle fishing should be stopped completely (55%)
- Turtle fishing should be stopped until more information is known on the size and health of the populations (44%)

The results above suggest that there is most agreement among respondents on general conservation statements, i.e. it is important that sea turtles exist in the wild in the future. There is also considerable support for local capture, consumption, and sale of sea turtle meat, and for regulation of the turtle fishery. There is less strong support for tourists consuming marine turtle products.

Initial and cursory analysis of responses to these questions by stakeholder group suggests that, while there are some areas of disagreement amongst stakeholders, these are few. For example, turtle fishers as a group generally agree with the responses of the surveyed population as a whole, though their support (or lack thereof) is often stronger. There are only 2 questions for which the majority of fishers feel differently:

- Some income from tourism should be used to support sea turtle conservation efforts (73% of turtle fishers had no opinion)
- Government needs to do more to ensure that existing laws regarding marine turtles are effectively enforced (40% had no opinion, 40% disagreed)

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 Montserrat population.

## **Recommendations**

### **8.1.4.2. Implement general awareness programmes regarding marine turtle conservation in Montserrat**

- a) Raise awareness among Montserratians of the presence of distinct foraging and nesting turtle populations through informational materials 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 the Montserrat specific turtle educational materials, and expand them to include further curriculum linked, multi-media educational materials where appropriate.*

## **8.10. Capacity Building and Outreach During TCOT**

### **8.10.1. Capacity building**

Mr John Jeffers (J.J.) of Department of Fisheries took part in the TCOT training workshop in Grand Cayman in August 2002 (Photos 8.14 and 8.15), but unfortunately no representative was available to attend the training course in Bermuda in August 2003 (the spare place was allocated instead to BVI). Montserrat partners were subject to all the generic TCOT assistance (see Section 11), but communications were at times difficult as local partners typically had poor online access and J.J. had no direct access to e-mail. The personnel deficit for turtle work in Montserrat was dealt with in three ways: 1. At the request of local partners, Dr. Corinne Martin spent one month on Montserrat, allowing an intensive marine turtle nesting survey to be undertaken as well as the execution of the socioeconomic questionnaire. 2. TCOT awareness raising events were used as a catalyst to mobilise volunteers from the local community. 3. A limited proportion of the TCOT travel and subsistence budget was used to pay local student volunteers to help with beach monitoring.

### **8.10.2. Outreach activities**

Montserrat has been part of the generic dissemination outputs of the TCOT project (see section 12), but in collaboration with project partners we were particularly successful in attaining media items. This was particularly true of the multi-taxon awareness raising week organised by RSPB in June 2002. As part of this week, some 30 local people who had not previously observed turtle nesting



**Photo 8.15.** Taking part in inwater monitoring session (Photo S. Ranger).



**Photo 8.16.** Biodiversity people with Montserrat schoolchildren.

participated in an interpreted turtle walk and witnessed the nesting of a hawksbill turtle. A number of community and school groups (Photo 8.16) met with a range of biodiversity professionals, local and overseas, to discuss the importance of Montserrat's biodiversity and a modest display was created, which now forms part of the exhibits in Montserrat National Trust (Photo 8.17).

### **Recommendations**

#### **8.1.1.1. Increase the capacity of the Government of Montserrat**

- a) *Ensure GoM has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis for turtle monitoring programmes.*
- b) *Ensure that key staff in GoM have the skills to apply for external funding to support biodiversity related projects.*
- c) *Ensure that all new Fisheries Officers are adequately trained in marine turtle biology, as well as research and conservation techniques.*
- d) *Ensure that adequate expertise is in place to allow for the process of legislative review.*

#### **8.1.1.2. Increase the capacity of the Montserrat National Trust**

*As part of a general increase in staffing and resources of the Montserrat National Trust, one of the urgent needs is for a project officer who can lead outreach campaigns, and support/ liaise with the many international organisations currently involved in biodiversity work in Montserrat. This officer's duties should include coordinating these various efforts, whether they involve provision of funds, staff, equipment, training or advice.*

#### **8.1.1.3. Establish a multi-stakeholder biodiversity management process**

*Identify and establish a Biodiversity Working Group to include representatives of all interest groups and stakeholders (e.g. government agencies and departments including Planning and Tourism; NGO's; hoteliers; dive operators; construction industry representatives; fishers; schools and specially-interested members of the public). The working group should meet regularly to discuss, decide and advise government on biodiversity management issues working to implement Montserrat's Environment Charter, marine turtles being one key subject areas. With regard to marine turtles, particular attention should be paid to direct and indirect fishery interactions, 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. There may be a need to provide support for participation by some sectors (i.e. cover travel costs to meetings). In other OT's it has been recommended that a specific group be assembled for marine turtles, but it is felt that, at this stage, a single focus group is more likely to succeed and make significant inroads, given limited resources on Montserrat.*

***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 8.17.** Turtle display at Montserrat National Trust (Photo B. Godley).

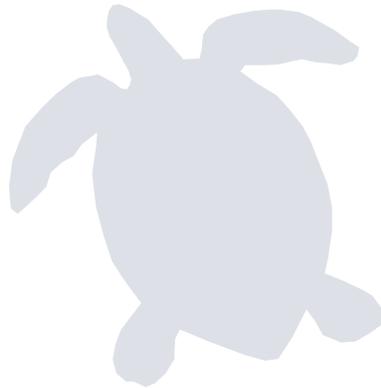
### 8.11. Acknowledgements

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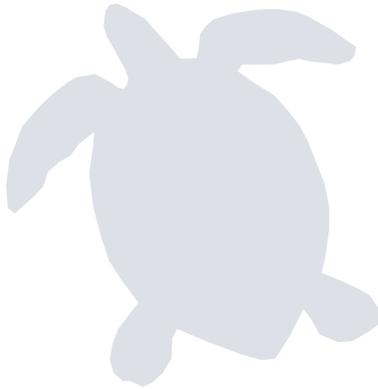


# An Assessment of the Status and Exploitation of Marine Turtles in the Turks and Caicos Islands



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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.

## 9. Status and Exploitation of Marine Turtles in the Turks and Caicos Islands (TCI)

Contents	Page
<b>9.1. Summary and Recommendations</b>	<b>181-185</b>
<b>9.2. Geographical Overview</b>	<b>186-187</b>
<b>9.3. Historical Overview</b>	<b>187</b>
<b>9.4. Organisations Involved with Marine Turtles in TCI</b>	<b>188-189</b>
<b>9.5. Status of Nesting Marine Turtles in TCI</b>	<b>189-193</b>
9.5.1. Monitoring efforts	189-191
9.5.2. Genetics of nesting populations	191
9.5.3. Data from TCOT SEQ	191
9.5.4. Threats to TCI's nesting populations	192-193
<b>9.6. Status of Foraging Marine Turtles in TCI</b>	<b>193-201</b>
9.6.1. Monitoring efforts	195-197
9.6.2. Genetics of foraging populations	198-199
9.6.3. Threats to TCI's foraging turtle populations	199-201
9.6.4. Data from TCOT SEQ	
<b>9.7. Direct Use of Marine Turtles in TCI</b>	<b>201-217</b>
9.7.1. Data form TCOT SEQ	204
9.7.2. Harvest of adults on the nesting beach	205
9.7.3. Harvest of eggs	205-206
9.7.4. Harvest at sea	206-210
9.7.5. Trade in turtle meat	210-215
9.7.5.1. Sale of meat by turtle fishers	210-211
9.7.5.2. Sale of meat by direct vendors	211-213
9.7.5.3. Consumption of turtle meat	213-215
9.7.6. Trade in shells and shell products	215
9.7.6.1. Sale of turtle shells	215
9.7.6.2. Sale of shell pieces	215
9.7.7. Incidental catch in marine fisheries	216-217
<b>9.8. Indirect Use</b>	<b>217-218</b>
9.8.1. Turtle watching on beaches	217
9.8.2. Dive/snorkelling tourism	217
9.8.3. Aquaria holding marine turtles	218
9.8.4. Gift shops	218
9.8.5. Data from the TCOT SEQ	218
<b>9.9. Attitudes to Conservation</b>	<b>218-219</b>
<b>9.10. Capacity Building and Outreach Activities During TCOT</b>	<b>220</b>
9.10.1. Capacity building	220
9.10.2. Outreach activities	220
<b>9.11. Acknowledgements</b>	<b>221</b>
<b>9.12. References</b>	<b>221-222</b>

## 9.1 Summary and Recommendations

### Summary

At least two species of marine turtle (green and hawksbill turtles) nest in the Turks and Caicos Islands (TCI; see table 9.1.) but these nesting populations appear to have decreased and nesting is now limited to remote cays. Little coordinated marine turtle research or conservation management has been undertaken in TCI and much needs to be done to ensure the continued existence of the country's nesting marine turtle populations. Foraging green and hawksbill turtles are widespread in TCI's coastal waters, and may represent regionally significant populations of both these species despite having been subject to direct exploitation for a long period of time. Direct exploitation still occurs and we estimate that between approximately 240 and 1,130 green turtles and between approximately 180 and 900 hawksbills are likely taken per year in directed fishing effort. In addition, approximately 190 turtles (green and hawksbills) may be incidentally caught on hook and line or in gill nets by TCI fishers each year, the majority of which are consumed. These populations are therefore subject to the largest legal take of marine turtles in the UK Overseas Territories in the Caribbean. Marine turtles are also used indirectly by the tourism industry, both as natural attractions and as saleable icons of the TCI.

TCOT recommends that the Government of the Turks and Caicos Islands takes all necessary steps to ensure the recovery of its nesting marine turtle populations and the sustained existence of its foraging populations. With amended legislation, increased regulation and enforcement,

and nominal investment in educational outreach, research, monitoring and fishery management, the TCI turtle fishery has the potential to be sustainable, and meet the demands of TCI tradition without threatening the existence and value of TCI's turtles as natural attractions.

This will require actions under the following headings:

#### 9.1.1. Increase capacity for marine turtle management in the Turks and Caicos Islands

9.1.1.1. Increase the capacity of the Department of Environment and Coastal Resources and the Protected Areas Department.

9.1.1.2. Establish a multi-stakeholder marine turtle management process.

#### 9.1.2. Amend legislation and policy to facilitate marine turtle population recovery

9.1.2.1. Amend harvest legislation.

9.1.2.2. Amend Planning Policy and Beach Management.

9.1.2.3. Recommendations regarding Multilateral Environmental Agreements and TCI national legislation.

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

9.1.3.1. Establish systematic monitoring efforts at index nesting beaches.

9.1.3.2. Establish systematic monitoring efforts at index foraging sites

Species	Nesting	Foraging	Harvest
<b>Green Turtle</b> ( <i>Chelonia mydas</i> )	Yes, probably in very small numbers	Adults and juveniles present  Large numbers of juveniles in some areas	Relatively high levels of legal, unmonitored harvest at sea. Some illegal take of undersized specimens  Low levels of illegal egg harvest
<b>Hawksbill Turtle</b> ( <i>Eretmochelys imbricata</i> )	Moderate numbers, the most frequently encountered species nesting in TCI	Adults and juveniles present  Large numbers of juveniles in some areas	Relatively high levels of legal, unmonitored harvest at sea. Some illegal take of undersized specimens  Low levels of illegal egg harvest
<b>Leatherback Turtle</b> ( <i>Dermochelys coriacea</i> )	No nesting in TCI	Occasionally seen offshore	No harvest
<b>Loggerhead Turtle</b> ( <i>Caretta caretta</i> )	Possibly, but probably in small numbers	Adults and juveniles occasionally encountered	Occasional legal harvest of adults

**Table 9.1.** Marine turtle species and summary of harvest in TCI.

#### **9.1.4. Establish further conservation and awareness programmes to sensitise those living in and visiting the Turks and Caicos Islands to marine turtle conservation requirements**

9.1.4.1. Encourage and implement sensitive practices at existing nesting beaches

9.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the Turks and Caicos Islands

#### **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**

##### **9.1.1. Increase capacity for marine turtle management in the Turks and Caicos Islands**

TCOT has contributed to the skills and technical knowledge of one current TCI Department of Environment and Coastal Resources (DECR) officer. However, further capacity building efforts to increase DECR and Protected Area Department staff knowledge and skills with respect to marine turtle biology, conservation and research would be greatly beneficial to TCI turtle conservation. The Department's enforcement patrol, research and monitoring capacity is currently compromised due to a shortage of staff and a limited budget. It is essential that the DECR receives adequate resources to effectively carry out their custodianship of TCI's highly valuable marine and coastal resources on which the country's economy so heavily depends.

To date there has been no long-term dedicated marine turtle research in the Turks and Caicos Islands, and no dedicated decision-making process that involves all

stakeholders in the management of TCI's turtle fishery. TCOT SEQ indicated that there was a general acceptance of the importance of marine turtle conservation in TCI. Future conservation measures in TCI will only be effective if they are accepted by the public, and to facilitate such acceptance, stakeholders must have meaningful input into a decision-making process. Such a process would be most cost-effective if established under existing and appropriate Advisory Committees (e.g. Scientific Authority and/or the Fisheries Advisory Committee). Alternatively, the conservation of marine turtles and their habitats could be considered by advisory groups established and committed to overseeing the implementation of the Environment Charter in TCI.

##### **9.1.1.1. Increase the capacity of the Department of Environment and Coastal Resources (DECR) and the Protected Areas Department (PAD)**

- a) Ensure DECR/PAD has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis for turtle monitoring programmes. Given the importance of all natural resources in the network of Protected Areas, and apparent poor compliance with the National Parks Ordinance, TCOT recommends that an increased capacity to effectively patrol the protected areas should be treated as a priority.
- b) It is recommended that national and international funding is sourced to support further capacity-building, as well as dedicated marine turtle population monitoring, turtle genetic sampling, turtle fishery monitoring and turtle conservation awareness and outreach programmes.
- c) Ensure that all new research and conservation staff are adequately trained in marine turtle biology, as well as research and conservation techniques.

##### **9.1.1.2. Establish a multi-stakeholder marine turtle management process**

- a) Identify and establish a marine turtle conservation and management advisory process under the Scientific Authority and/or the Fisheries Advisory Committee. This process should be led and co-ordinated by the DECR and should encourage input from representatives of all interest groups and stakeholders (e.g. government agencies and departments such as DECR and PAD, Department of Planning, TCI Tourist Board; NGO's such as the TCI National Trust; hoteliers; dive operators; construction industry representatives; fishers; schools and colleges and specially interested members of the public). Scientific Authority and/or Fisheries Advisory Committee meetings should discuss marine turtle management issues and advise DECR decisions, paying particular attention to the turtle fisheries, habitat protection, exploring possibilities for sourcing funding, further research/population monitoring, education and

outreach, as well as investigating potential economic benefits of marine turtle conservation. When necessary, DECR could also seek external advice from appropriate experts. It is recommended that appropriate stakeholder input is facilitated by stakeholder attendance at some meetings, with financial support being offered by the Government of TCI (e.g. support of stakeholder inter-island travel etc) when necessary.

### **9.1.2. Amend legislation and policy to facilitate marine turtle population recovery**

The turtle fishery in the Turks and Caicos Islands incurs the largest legal take of marine turtles in the UK Overseas Territories in the Caribbean. From a biological perspective, the Fisheries Protection Ordinance 1998 does not facilitate the sustained management of TCI's nesting and foraging populations of marine turtles. TCOT recognises that a cessation of all turtle fishing would significantly contribute to the recovery of depleted turtle populations. However, TCOT recognises that turtle meat is a component of the traditional TCI diet, and that a demand for turtle meat remains amongst TCI's residents and visitors. TCOT SEQ suggests that foraging turtle populations may be either stable or increasing, indicating that a ban on turtle fishing in TCI would not receive majority support and that such a ban would probably present significant enforcement problems. However, we recommend that future harvest of turtles must be carried out in a highly regulated and controlled manner, with legislation in place to permanently and strictly protect adult turtles, programmes established to monitor stock abundance, and mechanisms in place to reduce or close the fishery in response to measured decreases in turtle stock. It is important to note that the DECR must have the skills, as well as the human, technical and financial resources to effectively manage the fishery.

TCOT recommends a number of legislative changes required to increase the likelihood of sustainability of a turtle harvest in TCI. In addition, it is noted that the regulation of use alone will not serve the sustainable management of turtles in the Turks and Caicos Islands. TCOT therefore also makes recommendations regarding the promotion and publicising of the National Parks Ordinance 1998, which should protect critical marine turtle habitat (see section 9.1.4.2).

#### **9.1.2.1. Amend harvest legislation:**

TCOT recommends that the Fisheries Protection Ordinance, 1998 is amended to include the following provisions:

- 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 also yield an equivalent maximum curved carapace length for green and hawksbill turtles that should be stipulated in any amended legislation.

- b) Consider a continued minimum size limit, as most fishers already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for green and hawksbill turtles that should also be stipulated in any amended legislation.
- c) Establish a limited turtle fishing licensing scheme, whereby licensed turtle fishers are required to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including statutory monthly catch reporting by fishers to DECR (including incidental catch), and voluntary reporting of all turtles caught in advance of slaughter for biometric measurement and sampling by DECR. Quotas should be reactive and based, inter alia, on number of licensed turtle fishers and stock assessments established through the monitoring regimes. The DECR should have the statutory power to implement spot checks at fish landing sites to assess compliance and to close the fishery if stock monitoring reveals abundance declines below a pre-established and measurable level.
- d) Establish a closed season (see NB below) to be reviewed every five years (to facilitate legislative adaptation to possible nesting season shift caused by climate change) to prevent capture of adult turtles entering TCI's waters to breed.

**NB.** Estimates of composite turtle nesting seasonality for green, hawksbill and loggerhead turtles in TCI, based on regional seasonalities, suggest that while turtle nets are still used in TCI, the ideal closed season would extend from the 1<sup>st</sup> of April to the 31<sup>st</sup> of January inclusive (see section 9.5.1). However, it is important to note that no evidence of loggerhead nesting has been recorded in TCI in the last 20 years. TCOT also acknowledges that almost all turtles currently caught in TCI are caught by hand and the use of spearguns and Hawaiian slings is already prohibited. Therefore, if the suggested maximum size limits are introduced, and the use of turtle nets is prohibited as suggested below, then accidental, fatal capture of adult turtles entering TCI's waters to breed will be unlikely. Furthermore, the introduction of a 10 month closed season to the current fishery may present significant enforcement difficulties for the DECR. TCOT therefore suggests that a preliminary 6 month closed season from the 1<sup>st</sup> of July to December the 31<sup>st</sup> be considered, to encompass the majority of both the green and hawksbill turtle nesting seasons. This can be reviewed in the future when systematic rookery monitoring, as suggested below, reveals the actual composite turtle nesting season in TCI.

- e) Establish regulations with regard to the type of gear that can be used to capture turtles. Possible regulations could ensure permanent and complete prohibition of all turtle capture methods except hand capture (i.e. jumping turtles from a boat and in-water hand capture using only hands and lobster hook) as suggested by turtle fishers during TCOT SEQ.
- f) Ensure prohibition of the harvest of loggerhead and leatherback turtles given their very low numbers in TCI.

**NB.** It is important that all legislative changes are designed under the marine turtle conservation and management advisory process in consultation with the fishing community. Forty-two % of the turtle fishers surveyed said that they thought fishers should be consulted when regulations are set.

#### **9.1.2.2. Amend Planning Policy and Beach Management**

Historical records suggest that marine turtle nesting populations in TCI have been subject to prolonged harvest and therefore, while trends in abundance of nesting turtles are unknown, these populations may represent remnants of depleted populations. However, the adverse impacts of increased beachfront development on the nesting populations using TCI mainland beaches 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 TCI, and therefore TCOT recommends the following:

- a) Where possible, protected status should be extended to all nationally important nesting sites within TCI.
- b) Introduce planning regulations to mitigate the adverse impacts of development, including, for example light pollution, nesting female disturbance and erosion on all other nesting beaches.
- c) Where the extension of protected status to identified nesting beaches is not possible, TCOT recommends that TCI Government ensures, as a matter of priority, that any development occurring adjacent to important turtle rookeries is undertaken sensitively under the planning regulations mentioned above, to mitigate disturbance and destruction of habitat.
- d) Under the guidance of the marine turtle conservation and management process, develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings (e.g. property lighting regimes).

#### **9.1.2.3. Recommendations regarding Multilateral Environmental Agreements and TCI national legislation**

- a) CITES should be extended to TCI as soon as possible, and the appropriate domestic legislation drafted and gazetted, to address the possible trade of hawksbill scutes from TCI to neighbouring states.
- b) Given that Article III of CMS accommodates the needs of traditional subsistence users of marine turtles, the Government of TC should consider the role of trade in the subsistence fishery economy of TCI, and limit commercial activities regarding the sale of turtle products.

**NB.** CITES does not currently extend to TCI and TCOT SEQ corroborates previous reports that suggest there is limited trade in hawksbill turtle shell between TCI, the Dominican Republic and possibly Haiti. TCOT SEQ also suggests that turtle meat may be occasionally and illegally smuggled into the USA via Miami.

#### **9.1.3. Establish systematic monitoring of marine turtle populations to determine trends in abundance**

The Turks and Caicos Islands host nesting populations of green and hawksbill turtles, and possibly loggerhead turtles. TCI's waters host regionally significant foraging populations of green and hawksbill turtles, with occasional loggerhead turtles also reported. A lack of recent systematic surveys means that knowledge on abundance and trends in abundance of nesting and foraging populations is absent. 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 (e.g. establishment of an appropriate closed season) it is vital to work towards establishing data that will reveal any trends in their abundance, and seasonality of nesting. TCOT therefore recommends, as a matter of priority, that the following monitoring programmes be established, under the guidance of the marine turtle conservation and management advisory process:

##### **9.1.3.1. Establish systematic monitoring efforts at index nesting beaches**

- a) Seek funds for and establish a comprehensive survey of the beaches of TCI to identify key nesting sites. Ideally, this should involve aerial surveys carried out on at least a monthly basis from April to February inclusive, for three consecutive nesting seasons. These surveys should be followed up by ground truth surveys at sites that show the most nesting activity. Once these 'index' nesting sites have been identified, TCOT recommends that they are regularly monitored on foot (e.g. at least twice a month during the nesting season) to ascertain trends in nesting abundance. Surveys of index nesting sites undertaken in this way should also facilitate extensive genetic sampling to further establish the genetic identity of TCI's nesting turtle populations.

**NB.** While turtle nesting in TCI appears to be limited to remote cays, this programme should preferably engage local interest groups and residents whenever possible, to facilitate local interest in marine turtle nesting populations. Due to the remoteness of most rookeries, the future development of this programme to incorporate revenue-generating tourist turtle walks is limited, and would only ever appeal to a highly specialised market

##### **9.1.3.2. Establish systematic monitoring efforts at index foraging sites**

- a) Seek funds for and establish a systematic aerial survey of TCI's waters (perhaps in conjunction with recommendation 9.1.3.1) to understand the current distribution of turtles and identify index foraging sites. Through these surveys, index foraging sites should be identified, and frequently (e.g. once per month) and systematically monitored via boat/snorkel surveys or CPUE sampling to assess trends in abundance of TCI's foraging turtle populations.

b) Expand the sampling regime initiated under TCOT to establish the genetic 'identity' of TCI's nesting and foraging populations. This sampling could be included as part of the surveys mentioned above. The participation of turtle fishers should be encouraged where practicable. Sampling should be extensive and should include an assessment of the prevalence of fibropapilloma (FP) in the foraging, and if possible, nesting turtle populations.

**NB.** Systematic monitoring at index foraging sites will be essential to assess trends in abundance of foraging populations, and therefore generate the data necessary to responsibly manage TCI's turtle fishery. Under the guidance of the marine turtle conservation and management advisory process, steps should be taken to encourage the involvement of interested local fishers in all monitoring and sampling programmes, and financial incentives to facilitate participation should be considered so long as they fit within the remit of a sustainable programme.

c) Caribbean Turtlewatch has the potential to monitor certain regularly used dive sites for presence and absence of turtles, but requires dedicated staff time to liaise with willing dive operators, and treat data generated through the programme. TCOT recommends that if resources allow, DECR/ PAD continue and maintain Caribbean Turtlewatch with current participating dive operators in Providenciales as a relatively cheap method of monitoring turtle abundance at index foraging sites.

#### **9.1.4. Establish further conservation and awareness programmes to sensitise those living in and visiting TCI to marine turtle conservation requirements**

Increased awareness of turtles and their conservation requirements in the Turks and Caicos Islands 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 marine turtle conservation and management advisory process, to facilitate public contribution to marine turtle conservation:

##### **9.1.4.1. 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. 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 DECR 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) If nesting activity is detected on developed beaches, DECR should develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings, and distribute in the form of an accessible leaflet.

e) Where possible, ensure school participation in any rookery monitoring programmes to sensitise children to importance of rookery protection

#### **9.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the Turks and Caicos Islands**

a) Raise awareness among residents of the presence in TCI of distinct foraging and nesting turtle populations that contribute to the regional turtle populations, through informational materials 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 the TCI National Trust conservation awareness programmes to include curriculum-linked, multi-media marine turtle related educational materials, and expand these programmes to include all schools, with those located in key fishing communities in TCI, as priority.

## 9.2. Geographical Overview

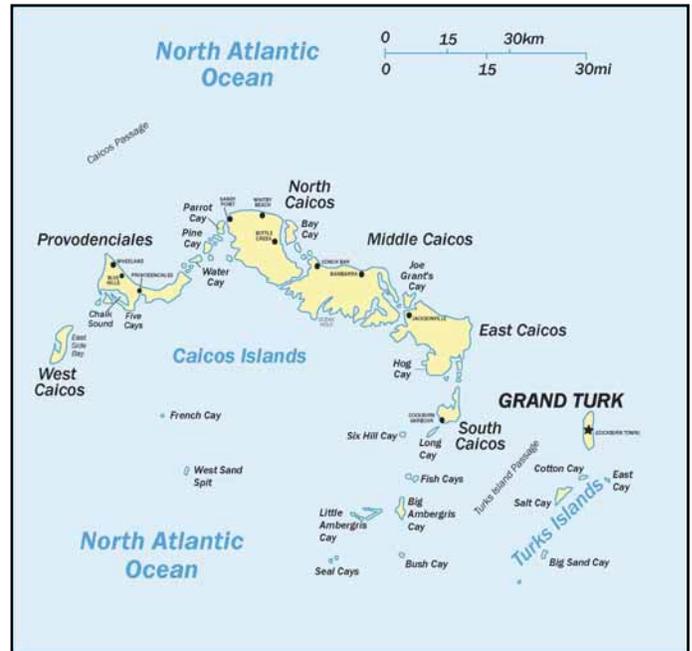
Forming the south-eastern extremity of the Bahamas chain, The Turks and Caicos Islands lie 145km north of Haiti and the Dominican Republic and 925 km south-east of Miami at approximately 21° 45N, 71° 35W (FCO 1999). There are approximately 40 low-lying islands and cays in the Territory (all <76m above sea-level), covering a total land area of about 500km<sup>2</sup> with only six of the main islands and a few of the small islands currently inhabited.



**Photo 9.1.** Grand Turk (Photo P. Richardson).



**Photo 9.2.** The extensive and largely pristine wetlands of North, Middle and East Caicos are fed by a complex of tidal creeks that provide foraging habitat for turtles (Photo P. Richardson).



**Figure 9.1.** Map of the Turks and Caicos Islands.

Over half of the land area consists of wetlands (Proctor & Fleming 1999). The Territory sits on three limestone platforms, the Caicos Bank, the Turks Bank and the Mouchoir Bank (see figure 9.1). The Caicos Bank is the largest (6,140km<sup>2</sup>), and to the north is fringed with extensive coral reefs and steep drop-offs, extending along the northern shores of the Providenciales and the Caicos Islands. The majority of Caicos Bank to the leeward of these islands is shallow and sandy, with vast sea grass beds, dominated by *Thalassia testudinum* close to the main islands and a few small cays at the southern extremity of the Bank (Carr *et al.* 1982; Gaudian & Medley 2000; Rudd 2003). The extensive and largely pristine wetlands of North, Middle and East Caicos are fed by a complex of tidal creeks, commonly vegetated by sea grass and algae, and an extensive area encompassing these wetlands, tidal creeks and inshore seagrass beds was declared a Ramsar Convention Wetland of International Importance in 1990 (Fletemeyer 1983; Proctor & Fleming 1999). Grand Turk, Salt Cay and associated cays lie on the Turks Bank (324 km<sup>2</sup>), which consists mostly of a sandy bed, with extensive coral reefs and mixed coral and algae beds, while Mouchoir Bank further east is largely coral and sand (Rudd 2003).

The main inhabited islands are Grand Turk (the capital), Providenciales (most populated), South Caicos (the main fishing settlement), Middle Caicos, North Caicos and Salt Cay. The total population in 1998 was estimated at 20,000, including approximately 10,000 foreigners, mostly from Haiti and the Dominican Republic (FCO 1999). In 2000, the GDP per capita stood at US\$9,600. Limited rainfall, poor soil and a limestone base have rendered the islands generally unsuitable for agricultural development and the TCI economy is based mainly on tourism and offshore finance. Tourism provides the highest revenue, with 110,855 tourist arrivals using about 2,500 hotel rooms in 1998 (J Skippings (formerly TCI Tourism Board) pers. comm. 2002).

After offshore finance, fishing is the third most important activity, and is the main employment sector on South Caicos (Proctor & Fleming 1999). The two most important fisheries are for lobster (*Panulirus argus*) and Conch (*Strombus gigas*). Most of the lobster and conch that is processed by TCI's fish processing plants is exported to the USA, and it is thought that at least equal, but unrecorded, amounts of conch and lobster are consumed locally (Rudd 2003; B Riggs (DECR) pers. comm. 2004). The local currency is the US Dollar.

### 9.3. Historical Overview (pre-20th Century)

The Turks and Caicos Islands' extensive reefs and seagrass beds host large foraging populations of juvenile and sub-adult green and hawksbill turtles, with some foraging loggerhead turtles also reported (Carr *et al.* 1982; Fleming 2001; Fletemeyer 1983) (see section 9.6). The numerous beaches on TCI's islands and cays host what is thought to be low-level nesting populations of green, hawksbill and possibly loggerhead turtles (Fletemeyer 1983) (see section 9.5). Leatherbacks may also be occasionally encountered in TCI's offshore waters, but do not nest there (Carr *et al.* 1982).

#### Pre-Columbian use

These turtle populations have been exploited as a food source in TCI since they were first colonised in about 700AD. Archaeological digs on Grand Turk have revealed that the early Tainos Indian settlers derived 77% of their calories from turtle. The Coralie site (GT-3) on Grand Turk is the island's oldest known human settlement, and work there has revealed the large skull of a loggerhead turtle, estimated to have weighed 1,000lbs when alive, as well as bones of at least 50 green turtles, some exhibiting spearholes. Bones were from specimens of adult, sub-adult and hatchling green turtles, with 85% of the bones coming from juvenile and sub-adult specimens, although nesting females and eggs are also thought to have been harvested (Carlson 2000; Fleming 2001). A hoe made from turtle bone was also discovered at an archaeological site in a cave on Providenciales (Sadler 1997).



**Photo 9.4.** Turtle carapace bones, showing spear holes, found at Taino archaeological sites on Grand Turk (Photo B. Carlson).



**Photo 9.3.** Lobster and conch are the TCI's most important fisheries, while finfish and turtles are also taken (Photo P. Richardson).

#### Use in post-Columbian TCI to the 19<sup>th</sup> Century

The Tainos inhabited TCI up until at least the late 15<sup>th</sup> Century, when Columbus 'discovered' Grand Turk in 1492 (Sadler 1997), and were probably dependent on turtles to some extent for as long as they inhabited the islands. After the arrival of the Europeans, Caribbean Indian tribes were decimated by the slave trade, but turtles continued to be utilised in the Turks and Caicos by visiting Europeans (Sadler 1997). Later, in the 18<sup>th</sup> Century, the TCI had been claimed as British Territory, and the British Government dispatched ships and over 1,000 men from Bermuda to the Turks and Caicos Islands to collect salt in the many lagoons. These operations often lasted 10 to 12 months in which time the workers ate locally harvested food including turtle meat and iguana (Sadler 1997).

By the late 19<sup>th</sup> Century, Britain was benefiting from a lucrative salt trade from TCI, but also exported sisal, sponge, conch and turtle shell, with £56 of shell exported in 1887, rising to £1,768 worth of shell exported in 1906 (in Sadler 1997). Records from 1849 suggest that green turtles were harvested for their meat, especially at the mouth of North Creek, Grand Turk, and exported to New York (Fleming 2001).

## 9.4. Organisations Involved with Marine Turtles in TCI

### 9.4.1. Department of Environment and Coastal Resources (DECR)

The DECR were the key TCOT project partners in TCI, providing excellent advice, staff time, as well as technical and logistical support. Two officers from the DECR attended the TCOT Workshop in Grand Cayman, and one of these also attended the training course in Bermuda in August 2003. Prior to working on TCOT, the DECR had carried out no dedicated marine turtle research or monitoring.

The DECR is a large department with 30 full-time staff, a few part-time staff including a Fisheries sub-department, as well as the Protected Area Department (PAD) that was formally created in 2003. There are DECR offices at the new National Environment Centre (HQ of PAD), Grand Turk (DECR HQ) and South Caicos (office of the Chief Fisheries Officer). DECR have several vehicles and vessels, including two large enforcement patrol boats, a shallow-draught jet boat, as well as some smaller patrol boats and whalers. The DECR is responsible for enforcing several key pieces of legislation relevant to marine turtle management, including the Fisheries Protection Ordinance, Revised Edition 1998 and the National Parks Ordinance, Revised Edition, 1998, and is regularly consulted by other government departments with respect to other key issues such as planning, tourism development and education (M. Fulford-Gardner (DECR) pers. comm. 2003).



**Photo 9.5.** One of the DECR's fast patrol boats (Photo P. Richardson).

DECR belong to various inter-agency working groups and committees, including the statutory Fisheries Advisory Committee that provides recommendations on fishery management; the National Parks Environmental Advisory Committee that provides recommendations on National Park management and disburses a *Conservation Fund Micro-Projects Programme*; a CITES Working Group that meets quarterly to steer the necessary preparations for CITES extension; and a Scientific Authority that also meets quarterly to discuss and advise on current and planned research programmes in TCI (M Fulford-Gardner (DECR) pers. comm. 2002). DECR also coordinate the National Fishermen's Day, traditionally held in July on South Caicos, where fishers and appropriate agencies meet to discuss fisheries issues and celebrate the TCI fisheries sector. Two DECR officers participated in TCOT capacity-building initiatives, but one of these officers has since left the department. To date, the DECR have not instigated any systematic marine turtle research or conservation programmes, and Fleming (2001) states that the DECR is '*hampered in its efforts to manage and conserve marine life by a shortage of staff*'. DECR communications with DECR management suggest that DECR staff time is over-committed to the various programmes the department is currently involved with, and have little time to dedicate to marine turtle conservation or research (J. Campbell (DECR) pers. comm. 2003).

### 9.4.2. Turks & Caicos National Trust

The Trust is based on Providenciales, and in 2002 had 200 adult members and 80 junior members. Recently the Trust has been involved in various conservation projects. These include the conservation of Rock Iguanas on various Cays and the conservation of various historical sites. The Trust has also been a key partner in the Darwin Project to establish a management plan for the Ramsar site on North, Middle and East Caicos. The Trust did not have an active involvement in TCOT due to staff commitments, but certainly has the capacity to contribute to future turtle conservation initiatives. The Trust has a strong focus on education, and runs a schools awareness programme and produces "Eco-echoes", a quarterly newsletter for their junior supporters. The Trust is considering reintroducing 'Tessa', an old turtle character from previous "Eco-echoes" editions, in order to publicise turtle conservation efforts in TCI.

#### Recommendations

##### 9.1.1.2. Establish a multi-stakeholder marine turtle management process

- a) Identify and establish a marine turtle conservation and management advisory process under the Scientific Authority and/or the Fisheries Advisory Committee. This process should be led and coordinated by the DECR and should encourage input from representatives of all interest groups and stakeholders (e.g. government agencies and departments such as DECR and PAD, Department of

*Planning, TCI Tourist Board; NGO's such as the TCI National Trust; hoteliers; dive operators; construction industry representatives; fishers; schools and colleges and specially interested members of the public). Scientific Authority and/or Fisheries Advisory Committee meetings should discuss marine turtle management issues and advise DECR decisions, paying particular attention to the turtle fisheries, habitat protection, exploring possibilities for sourcing funding, further research/population monitoring, education and outreach, as well as investigating potential economic benefits of marine turtle conservation. When necessary, DECR could also seek external advice from appropriate experts. It is recommended that appropriate stakeholder input is facilitated by stakeholder attendance at some meetings, with financial support being offered by the Government of TCI (e.g. support of stakeholder inter-island travel etc) when necessary.*

#### **9.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the Turks and Caicos Islands**

- a) *Raise awareness among residents of the presence in TCI of distinct foraging and nesting turtle populations that contribute to the regional turtle populations, through informational materials 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 the TCI National Trust conservation awareness programmes to include curriculum-linked, multi-media marine turtle related educational materials, and expand these programmes to include all schools, with those located in key fishing communities in TCI, as priority.*

#### **9.5. Status of Nesting Marine Turtles in TCI**

There has been only one systematic survey of nesting in TCI, when Fletemeyer (1983) carried out partially ground-truthed aerial surveys in 1982, the results of which are shown in Table 9.2. Fleming (2001) states that in the early 1990's a DECR officer carried out 'beach surveys and tagging exercises' but DECR could not locate any data or reports arising from this survey during TCOT. From his surveys, Fletemeyer (1983) estimated that the TCI hawksbill nesting population consisted of between 125 to 275 nesting females, the green turtle nesting population

consisted of between 45 and 105 nesting females, and the loggerhead nesting population consisted of between 25 and 75 females. However, he stated that his estimates of the green and loggerhead populations were made with little confidence and were based on conversations with fishers and divers rather than actual nest counts, with hawksbill nests being the most commonly encountered during his surveys. Ehrhart (1989) later used Fletemeyer's estimate of loggerhead nesting to claim that loggerheads nest in regionally significant numbers in TCI, a claim that has recently been repeated in the literature (Fleming 2001; Proctor & Fleming 1999).

##### **9.5.1. Monitoring efforts**

Due to logistical reasons, TCOT was unable to carry out a systematic survey of nesting in TCI. However, as indicated in table 9.2, TCOT did record some turtle nesting activity and conversations with fishers during the TCOT SEQ indicate that some nesting still occurs on the Cays. Table 9.2 also shows where Fletemeyer recorded nesting activity either through physical surveys or through interviews with fishers.

TCOT surveys indicate that low-level nesting occurs on several of the remote Cays and along the northern shores of the North and Middle Caicos, while nesting populations on Providenciales, Grand Turk and Salt Cay appear to have been largely extirpated. TCOT has confirmed that some



**Photo 9.6.** Peter Richardson and Jasmine Parker (DECR) inspect a recently emerged hawksbill nest on Fish Cay (Photo S. Ranger).

LOCATION	SPECIES	SOURCE
West Caicos (PA - most westerly beaches lie within West Caicos Marine National Park)	Ei, Cm, poss. Cc	Fletemeyer 1983 (TCOT interviews indicated some nesting still occurs on west shore)
Providenciales (PA - NW Point Marine National Park encompasses most westerly beaches, with the remainder within Pigeon Pond and Frenchman's Creek Nature Reserve)	Ei, poss. Cm, Cc	Fletemeyer 1983 (TCOT interviews indicated that beaches at NW Point and further south were nesting beaches in the 1950's. TCOT found no evidence of nesting on NW Point, Providenciales Sept 2003)
Water Cay	Ei, poss. Cm, Cc	Fletemeyer 1983
Pine Cay	Ei, Cm poss Cc	Fletemeyer 1983
Stubbs Cay (PA –within Fort George Land and Sea National Park)	Ei	Fletemeyer 1983
Parrot Cay	Ei, poss. Cm, Cc	Fletemeyer 1983
North Caicos (PA - beaches on East Bay Islands National Park are protected)	Ei, poss. Cm, Cc	Fletemeyer 1983 (TCOT interviews indicate that some nesting still occurs on north shore)
Highas Cay	Ei, Cm, poss. Cc	Fletemeyer 1983 (TCOT interviews indicate that some nesting still occurs on north shore, with one fisherman suggesting this is a nationally important rookery)
Middle Caicos	Ei, Cm, poss. Cc	Fletemeyer 1983 (TCOT confirmed Ei nesting Sept. 2003)
East Caicos (PA - some northerly beaches lie within International Ramsar site)	Ei, Cm, Cc	Fletemeyer 1983 (TCOT interviews indicate that the beaches along the north shore of East Caicos may host nationally important turtle rookeries)
Long Bay (East Caicos)	Poss. Ei	Fletemeyer 1983 (TCOT interviews indicate that these beaches may host nationally important turtle rookeries)
Grand Turk (PA - all westerly beaches lie within Columbus Landfall Marine National Park)	Ei, poss. Cm, Cc	Fletemeyer 1983 (TCOT surveys found no nesting Sept 2002)
Gibbs Cay (PA - lies with Grand Turk Cays Land and Sea National Park)	Cm & poss. Ei	Fletemeyer 1982 (DECR confirmed 1 Cm nest Sept. 02)
Cotton Cay	Poss. Ei	Fletemeyer 1983 (TCOT interviews indicate nesting still occurs)
East Cay (PA - lies with Grand Turk Cays Land and Sea National Park)	Ei	Fletemeyer 1983 (TCOT interviews indicate nesting still occurs)
Salt Cay	Poss. Ei, Cm, Cc	Fletemeyer 1983 (TCOT interviews indicate occasional nests are encountered)
Big Sand Cay (PA - beaches lie within Big Sand Cay Sanctuary)	Ei, Cm	Fletemeyer 1983 (TCOT confirmed Cm nesting Sept. 2003)
South Caicos	Ei, poss. Cm, Cc	Fletemeyer 1983
Fish Cay (PA pending- recently leased to the TCI National Trust, Sanctuary status pending, R. Wild, pers. comm. 2003)	Ei, poss. Cm	Fletemeyer 1983 (TCOT confirmed Ei nesting Sept. 2003)
Big Ambergris Cay	Ei, poss. Cm	Fletemeyer 1983 (TCOT confirmed Ei nesting Jan. 2004)
Little Ambergris Cay (PA pending- recently leased to the TCI National Trust, Nature Reserve status pending, R. Wild, pers. comm. 2003)	Poss. Ei & Cm	Fletemeyer 1983 (TCOT interviews indicate nesting still occurs)
Bush Cay (PA - lies within French, Bush and Seal Cays Sanctuary)	Ei	Fletemeyer 1983 (DECR found 15 Ei nests on 9 <sup>th</sup> January 1992, TCOT found 3-4 nests, probably Ei, Sept. 2002)
French Cay (PA - lies within French, Bush and Seal Cays Sanctuary)	Ei, Cm, poss Cc	Fletemeyer 1983 (TCOT interviews indicate some nesting still occurs here, with some fishermen suggesting this is a nationally important rookery)
White Cay (PA - lies within French, Bush and Seal Cays Sanctuary)	Ei	Fletemeyer 1983 (TCOT interviews indicate nesting still occurs)
Lower Seal Cay (PA - lies within French, Bush and Seal Cays Sanctuary)	Unknown	TCOT interviews indicate some nesting still occurs here
West Sand Spit	Cm, poss. Cc, Ei	Fletemeyer 1983 (TCOT interviews indicate nesting still occurs)
Nurse Cay	Poss. Ei	Fletemeyer 1983
Sand Bars Cay	Poss. Ei, Cm	Fletemeyer 1983
Shot Cay (PA - lies within French, Bush and Seal Cays Sanctuary)	Ei, poss. Cm	Fletemeyer 1983

**Table 9.2.** Nesting activity indicated by Fletemeyer's 1982 surveys (and other sources, including TCOT, where indicated). NOTES: Location: PA – Protected Area. Species: Ei=hawksbill, Cm=green, Cc= loggerhead.

hawksbill and limited green turtle nesting still occurs in TCI, but found no evidence to support the claim that TCI supports a regionally important nesting population of loggerhead turtles. Fletemeyer (1983) suggests that the nesting season for all turtle species in the TCI extends from April to August inclusive. However, TCOT surveys confirmed that green and hawksbill turtles nest in September, and in January 1992, DECR found 15 hawksbill nests on Bush Cay. One TCOT SEQ interviewee who formerly collected turtle eggs claimed to have collected eggs from June to September, whereas 5 claimed they could collect them all year (see section 9.6.3). To understand the likely nesting season for green, hawksbill and possible loggerhead nesting populations in TCI, it is necessary to consider the nesting seasons of these species on nearby islands.

The loggerhead turtle nesting season in the Cayman Islands extends from May to August, green turtle nesting in the Bahamas occurs from June to September (in Hirth 1997), and in nearby Cuba, the hawksbill season extends from August to February, with peak nesting activity occurring between September and January (Moncada *et al.* 1999). Therefore, the likely composite marine turtle nesting season in the TCI is from May to January. TCOT uses this and individual species' nesting seasons to guide recommended legislative amendments with respect to the introduction of a closed season for turtle harvest at sea.

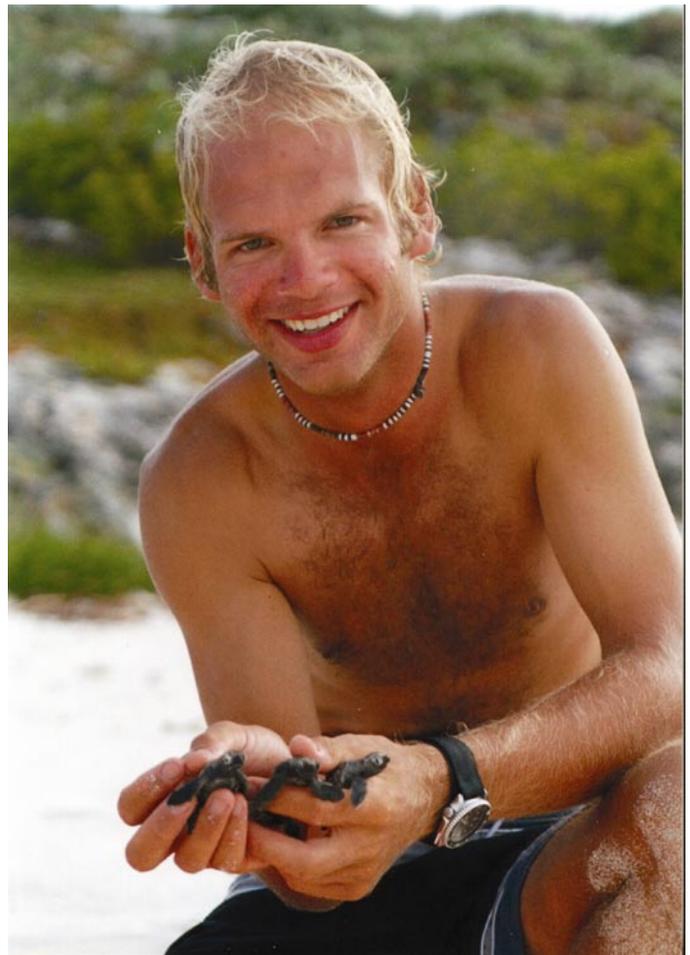
### 9.5.2. Genetics of nesting populations

No nesting green turtles or hatchlings were sampled in TCI during TCOT and only one hawksbill hatchling was sampled, from a recently emerged nest on Fish Cay in September 2002. TCOT genetic analysis of this sample has revealed a previously undescribed haplotype, provisionally entitled TCOT3. During TCOT genetic analyses, TCOT3 was also discovered in **foraging** hawksbill populations in Anguilla, BVI and Montserrat, as well as in nesting hawksbill populations in Anguilla and Montserrat (see section 10.4.4). Further sampling of TCI's nesting populations is urgently required to fully understand and establish their genetic identity.

### 9.5.3. Data from TCOT SEQ

Of the 92 TCOT SEQ interviewees, only 29 (31.5%) said that they had noticed trends in turtle nesting activity in TCI. Of these, only 7 (24.1%) said that green turtle nesting had increased and 2 (6.9%) said that hawksbill turtle nesting activity had increased in the last 5 years. One respondent said that green turtle nesting had decreased, 1 said that it had stayed the same, and this was mirrored by the responses to hawksbill nesting trends. Only 3 respondents answered the question specifically about loggerhead nesting, with 1 respondent each suggesting that nesting had increased, decreased and stayed the same in the last 5 years.

Nineteen (65.5%) of the 29 respondents who had noticed trends in turtle nesting activity in TCI in the last 5 years answered the question generally, and these present perhaps a more useful indication of perceived changes in nesting activity. Of these, 1 (5.3%) thought nesting



**Photo 9.7.** Duncan Vaughan (ex-DECR) on Fish Cay with hawksbill hatchlings from the only turtle nest sampled in TCI during TCOT (Photo S. Ranger).

activity had increased, 6 (31.6%) thought it had decreased and 8 (42.1%) thought it had remained the same. These respondents do not present a clear pattern of perceived change, and this may be because nesting now appears to be largely limited to remote cays that are not regularly visited by the majority of interviewees and therefore encounters with turtle nests are unusual. However, from these limited responses, there seems to be general perception that turtle nesting activity has either stayed the same or decreased in the last five years.

Species-specific responses to the question regarding perceived nesting trends since respondents could remember were similar and therefore as unclear as the species-specific responses described above. Of the 19 respondents who answered the question generally, 2 (10.5%) thought that nesting had increased, 12 (63.2%) thought that nesting had decreased and 5 (26.3%) thought that it had remained the same. Again, while these responses only give a limited impression of perceived changes, one can conclude that there is general perception that turtle nesting activity has decreased in TCI since people can remember.

#### 9.5.4. Threats to TCI's nesting populations

The general perception of declining nesting activity in TCI may reflect real nesting population trends. The extensive take of nesting females and their eggs, prior to and since the introduction of the Fisheries Protection Regulations, 1976, are likely to have had serious adverse impacts on nesting populations. Several TCOT SEQ interviewees commented that the harvest of nesting females and their eggs was common practice on Salt Cay and Grand Turk earlier in the 20<sup>th</sup> Century, but TCOT surveys suggest that turtle nesting activity on these islands is now either absent or rare. Other interviewees noted that they had seen nesting activity on Grand Turk and on the west coast of Providenciales when they were younger, but not in recent years.

Egg collection and overfishing were identified by 3.2% (n=2) and 8.1% (n=5) respectively of the 62 TCOT SEQ interviewees who provided reasons for a perceived decrease in turtle populations in TCI. This suggests that the majority of interviewees do not perceive current or historical levels of harvest of turtles and their eggs in TCI as major threats. In contrast, tourist development of TCI was the most commonly identified reason for a decline in nesting activity, identified by 38.7% (n=24) of the 62 respondents who gave reasons for a decline of nesting and foraging populations. Development encompassed specifically identified adverse effects of light pollution, boat traffic, vehicle traffic behind the nesting beaches, disturbance on the nesting beaches and the toxic effects of suntan lotion in inshore waters.

Tourism is the main economy of the TCI, and has experienced accelerated growth since the international runway was built on Providenciales in 1986 (Gaudian & Medley 2000; Robinson & Fulford 1997). Since then, there has been significant pressure to develop beaches for tourism, especially in Providenciales, although significant tourist development has occurred on Grand Turk and lower levels of development has occurred on the other islands and some small cays. Sand for construction is often mined from the beaches (Gaudian & Medley 2000; Proctor & Fleming 1999; Robinson & Fulford, 1997). Despite development guidelines provided by the TCI Development Manual (Govt. of TCI 1996), which include a recommended setback of 60feet from the high-tide line and preservation/rehabilitation of beach vegetation, developers routinely build permanent structures within the set-back threshold and clear beach vegetation for development projects. In many cases this has led to beach destabilisation and coastal erosion (Gaudian & Medley 2000; Robinson & Fulford 1997).

Insensitive tourism development certainly has the potential to impact turtle nesting beaches, and may well have done so in TCI. However, both Providenciales and Grand Turk have extensive stretches of undeveloped beaches lying within protected areas (see table 9.2), where, according to some TCOT SEQ interviewees, nesting females and their eggs were historically harvested and where nesting now appears to be absent. This suggests that extensive harvest at the nesting beaches has led to the demise of some rookeries within TCI.

Fortunately, the majority of the existing nesting beaches lie within the network of protected areas in TCI, where the erecting of any structure is prohibited unless authorised by the Director of Planning under the National Parks Ordinance, 1998 (see table 9.2). Notable exceptions that lie without the protected area network are Big Ambergris Cay and Highas Cay (immediately east of North Caicos) and Long Bay (East Caicos), cays that were consistently referred to as important turtle nesting sites during the TCOT SEQ. Big Ambergris Cay is privately owned and a large new hotel complex is currently under construction there (Anon 2002), whereas plans have been proposed to the TCI Government to develop East Caicos into a cruise liner port and tourist resort (Pienkowski 2002). This development is of particular concern as it would involve extensive and ecologically catastrophic development of the northern shore, reported to be the site of an important rookery, and part of the International Ramsar site, where development is prohibited unless authorised by the Director of Planning. These developments highlight the urgent need to identify TCI's marine turtle rookeries and protect those rookeries deemed nationally important.

#### Summary

In conclusion, knowledge of turtle nesting activity remains limited and this is of significant conservation concern for TCI's nesting marine turtle populations. Based on collated local knowledge, nesting populations in TCI have been extensively harvested and appear to have declined from the inhabited islands, with some nesting still occurring on remote cays and beaches. TCOT SEQ suggests that a significant percentage of the interviewees perceived development of beaches as a major reason for this decline, and that there is a relatively low level of awareness regarding the adverse impacts of egg and nesting female turtle harvest. This may explain why there has been relatively poor compliance with, and enforcement of, the national legislation that has prohibited these harvests since 1976. Tourism development may have impacted some nesting beaches in TCI, and certainly has the potential to impact on those rookeries located without TCI's network of protected areas.



**Photo 9.8.** Development immediately adjacent to a beach within Princess Alexandra National Park, Providenciales (Photo P. Richardson).

## **Recommendations**

### **9.1.2.2. Amend Planning Policy and Beach Management**

- a) *Where possible, protected status should be extended to all nationally important nesting sites within TCI.*
- b) *Introduce planning regulations to mitigate the adverse impacts of development, including, for example light pollution, nesting female disturbance and erosion on all other nesting beaches.*
- c) *Where the extension of protected status to identified nesting beaches is not possible, TCOT recommends that TCI Government ensures, as a matter of priority, that any development occurring adjacent to important turtle rookeries is undertaken sensitively under the planning regulations mentioned above, to mitigate against disturbance and destruction of habitat.*
- d) *Under the guidance of the marine turtle conservation and management process, develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings (e.g. property lighting regimes).*

### **9.1.3.1. Establish systematic monitoring efforts at index nesting beaches**

- a) *Seek funds for and establish a comprehensive survey of the beaches of TCI to identify key nesting sites. Ideally, this should involve aerial surveys carried out on at least a monthly basis from April to February inclusive, for three consecutive nesting seasons. These surveys should be followed up by ground truth surveys at sites that show the most nesting activity. Once these 'index' nesting sites have been identified, TCOT recommends that they are regularly monitored on foot (e.g. at least twice a month during the nesting season) to ascertain trends in nesting abundance. Surveys of index nesting sites undertaken in this way should also facilitate extensive genetic sampling to further establish the genetic identity of TCI's nesting turtle populations.*

### **9.1.4.1. 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. This programme should encourage hoteliers to claim ownership of nest protection and encourage them and their guests to benefit from hatchling emergencies.*

- b) *Develop a network of interested beachfront residents and beach/sea users willing to report any turtle strandings and ensure DECR 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) *If nesting activity is detected on developed beaches, DECR should develop guidelines for beachfront property owners with respect to minimising adverse impacts on nesting turtles and hatchlings and distribute in the form of an accessible leaflet.*

- e) *Where possible, ensure school participation in any rookery monitoring programmes to sensitise children to importance of rookery protection.*

### **9.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the Turks and Caicos Islands**

- 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.*

## **9.6. Status of Foraging Marine Turtles in TCI**

TCI provides extensive foraging habitat for green and hawksbill turtles, while some foraging loggerhead turtles have also occasionally been reported (Carr *et al.* 1982; Fletemeyer 1983). Features of the TCI landscape bear testament to the presence of foraging turtles, with Turtle Pond, Turtle Creek and Turtle Cove found on Providenciales alone. Fletemeyer encountered large numbers of green turtles foraging on the seagrass beds immediately south of North, Middle and East Caicos, as well as in the tidal creeks that permeate the southern shores of these islands. Fletemeyer's stomach content analysis of harvested green turtles from these creeks indicates that they are foraging primarily on seagrass (*Thalassia testudinata*). Green turtles were also recorded feeding on sea grass beds at Highas Cay and Bottle Creek on the north shore of North Caicos. At Bottle Creek, Fletemeyer (1983) captured 9 foraging juvenile green turtles ranging from 26.5cm to 45cm CCL (mean±SD = 40.3cm ± 6.7cm) and 1 foraging sub-adult green turtle (71cm CCL) during his 1982 surveys. Fletemeyer also encountered large numbers of hawksbill turtles of different sizes on TCI's shallow and deepwater fringe and patch reefs, as well as one juvenile on a seagrass bed and several juveniles at Ocean Hole. Ocean Hole is a 1km wide, deep-water submerged hole in the limestone platform on the Caicos Bank immediately south of Middle Caicos.

Location	Species	Source
West Caicos (PA – West Caicos Marine National Park)	Ei, Cm	Slade, 2004 (Caribbean Turtlewatch)
Providenciales – North West Point (PA – North West Point Marine National Park)	Ei, Cm	Slade, 2004 (Caribbean Turtlewatch)
Providenciales – various sites in Princess Alexandra Land and Sea National Park (PA)	Ei, Cm	Presence of Ei & Cm confirmed by TCOT surveys Sept. 2002. Slade, 2004 (Caribbean Turtlewatch)
Providenciales – Blue Hills	Cm	Fletemeyer, 1983
Providenciales – Silly Creek	Cm	Presence of Cm confirmed by TCOT surveys Sept. 2002
Little Water Cay (PA – lies within Princess Alexandra Land and Sea National Park)	Cm	Fletemeyer, 1983 (TCOT SEQ indicated large foraging turtle populations here)
Pine Cay	Ei	Fletemeyer, 1983 (TCOT SEQ indicated large foraging turtle populations here)
Parrot Cay	Unidentified	Fletemeyer, 1983 (TCOT SEQ indicated large foraging turtle populations here)
Southern coast & creeks of North, Middle and East Caicos (PA - Ramsar Site)	Ei, Cm	Fletemeyer 1983 (Presence of Ei & Cm confirmed by TCOT surveys Sept. 2002)
Ocean Hole (PA – lies within Vine Point and Ocean Hole Nature Reserve)	Ei, Cm	Carr et al, 1981, Fletemeyer 1983 (presence of Cm confirmed by TCOT surveys Sept. 2002)
Bottle Creek	Cm	Fletemeyer 1983 (TCOT SEQ indicated large foraging turtle populations here)
Highas Cay	Ei, Cm	Fletemeyer 1983 (TCOT SEQ indicated large foraging turtle populations here)
Windward Passage Going Through (PA - lies within the International Ramsar site)	Cm, Ei	TCOT SEQ indicated large foraging turtle populations
Bell Sound, South Caicos (PA – lies within Bell Sound Nature Reserve)	Ei	Presence of Ei confirmed by TCOT sampling Sept. 2002
Six Hills Cay (PA – lies within Admiral Cockburn Nature Reserve)	Ei	Presence of Ei confirmed by TCOT sampling Sept. 2002
Long Cay (PA – lies within Admiral Cockburn Nature Reserve)	Ei	Presence of Ei confirmed by TCOT sampling Sept. 2002
Middleton Cay (PA – lies within Admiral Cockburn Nature Reserve)	Ei	Presence of Ei confirmed by TCOT sampling Sept. 2002
Big Ambergris Cay	Ei, Cm	Fletemeyer 1983 (Presence of Ei confirmed by TCOT surveys Sept. 2002)
Little Ambergris Cay (PA pending– leased to the National Trust, Nature Reserve status pending, R Wild pers. comm., 2003)	Ei, Cm	Fletemeyer 1983 (Presence of Ei confirmed by TCOT sampling Sept. 2002)
Fish Cay (PA pending– leased to the National Trust, Sanctuary status pending, R Wild pers. comm., 2003)	Ei, Cm	Fletemeyer 1983 (Presence of Ei confirmed by TCOT surveys Sept. 2002)
Bush Cay (PA – lies within French, Bush and Seal Cays Sanctuary)	Ei	Presence of Ei confirmed by TCOT sampling Sept. 2002
Grand Turk (PA – extensive foraging habitat lies within Columbus Landfall Marine National Park, Grand Turk Cays Land and Sea National Park and South Creek National Park)	Ei, Cm	Fletemeyer 1983
Gibbs Cay (PA – lies within Grand Turk Cays Land and Sea National Park)	Ei, Cm	Fletemeyer 1983
Cotton Cay	Ei, Cm	Fletemeyer 1983
East Cay (PA – lies within Grand Turk Cays Land and Sea National Park)	Ei, Cm	Fletemeyer 1983
Salt Cay	Ei, Cm	Fletemeyer, 1983, Groombridge & Luxmore, 1989 in Proctor & Fleming, 1999
Big Sand Cay (PA – lies within Big Sand Cay Sanctuary)	Cm	Presence confirmed by TCOT surveys Sept. 2002
Pear Cay (PA – lies within French, Bush and Seal Cays Sanctuary)	Ei	Presence confirmed by TCOT sampling Oct. 2002
French Cay (PA – lies within French, Bush and Seal Cays Sanctuary)	Ei, Cm	Slade, 2004 (Caribbean Turtlewatch)

**Table 9.3.** Marine turtle foraging areas in TCI as identified by Fletemeyer's 1982 surveys and other sources. NOTES: Location: PA – Protected Area. Species: Ei=hawksbill, Cm=green, Cc= loggerhead.

Local fishers also describe a 'mulatto' turtle, although Carr *et al.* (1982) and Fletemeyer (1983) suggest that this may be a local name for the loggerhead turtle, despite some fishers clearly identifying loggerhead turtle as a distinct and separate species. Fletemeyer does not discount that 'mulatto' turtles may in fact be ridley turtles (*Lepidochelys* spp.), but did not record either olive ridleys or Kemp's ridleys during his surveys. Table 9.3 shows sites where foraging green and hawksbill turtles were encountered during Fletemeyer's 1982 survey, as well as records from other sources, including TCOT and associated programmes.

### 9.6.1. Monitoring efforts

Little or no long-term monitoring of TCI's foraging marine turtle populations has been carried out, and therefore trends in abundance of these populations are unknown. Fleming (2001) reports that a dive operator on Grand Turk buys turtles from fishers and has tagged and released nearly 300 turtles in the last few years. TCOT staff were unable to access this operator's records and therefore the results of this effort are unclear.



**Photo 9.9.** A juvenile green turtle swims over sea grass beds at Bight Reef, Princess Alexandra National Park (Photo P. Richardson).



**Photo 9.10.** Jasmine Parker takes a genetic sample from a juvenile green turtle caught within the Ramsar site (Photo P. Richardson).

During the TCOT project in TCI, systematic surveying of index foraging sites was implemented (with advice from TCOT) by Lorna Slade at Bight Reef (40 visits), Smith's Reef (13 visits), Turtle Gardens (18 visits), Turquoise Reef (14 visits) and Table Top (11 visits), all within the boundaries of the Princess Alexandra National Park along the north shores of Providenciales (Slade in press). The sites were similar, each consisting of an area of patch reef adjacent to a seagrass bed. Sites were visited between February 2002 and February 2004 before 13:00hrs and snorkel surveys were carried out for 30 minutes at relatively consistent speeds. Any turtles encountered were identified and an estimate of Straight Carapace Length (SCL) was noted, as was the turtles' behaviour and various environmental factors such as weather and visibility. Juvenile green (30cm to 66cm SCL) and hawksbill (25cm to 51cm SCL) turtles were encountered at all sites except Table Top where no turtles were encountered. These surveys indicate that Princess Alexandra National Park provides foraging habitat for juvenile green and hawksbill turtles, and they will be fully reported in time by Lorna Slade and her TCOT collaborators. No other systematic surveying of index sites was implemented under TCOT.

Slade (in press) also coordinated Caribbean Turtlewatch in TCI. Dive Provo and Flamingo Divers regularly completed Caribbean Turtlewatch datasheets, resulting in 318 and 118 recorded turtle sightings respectively. Dives were conducted at fringe reef sites off West Caicos, French Cay, North West Point (Providenciales), Princess Alexandra National Park (Providenciales) and South West Reef (Providenciales), with green and hawksbill turtles seen at all sites except South West Reef, where no turtles were encountered during the survey period. Hawksbill turtles were the most commonly encountered species (83.4% of sightings), including individuals with estimated SCL's of between 23cm and 122cm. It is of interest that the next most commonly encountered species was the 'mulatto', constituting 4.7% of sightings (n=20) including individuals with estimated SCL's of between 31cm to 91cm.

When asked to identify this species on the WIDECAST photographic turtle ID chart, dive operators consistently indicated that they were seeing Kemp's ridley turtles. TCI Caribbean Turtle watch data included 13 loggerhead sightings (3.1% of sightings) including individuals with SCL's between 61cm and 122cm, 12 green turtle sightings (2.8% of sightings) including individuals with estimated SCL's of between 40cm and 91cm, while 23 sightings were unidentified (5.5%). Preliminary analysis of the TCI Caribbean Turtlewatch data therefore suggests that TCI's fringing reefs provide foraging habitat for juvenile, sub-adult and adult hawksbill turtles, with similar size classes being represented on the fringing reefs within smaller populations of green and loggerhead turtles. TCI's fringing reefs may also support a small foraging population of Kemp's Ridleys, although their presence in TCI has not yet been corroborated.

### 9.6.1.1. TCOT genetic sampling and tagging

Green and hawksbill turtles were captured by TCOT staff, DECR or accompanying fishers during sampling trips to the International Ramsar site, South Caicos, Middle Caicos and some of the cays south of South Caicos (see below). Turtles were tagged, sampled and biometric measurements were taken on board the boats used and turtles were returned to the water where they were caught. However, most of the turtles sampled were captured opportunistically by South Caicos fishers during normal fishing activity and brought to South Caicos where they were tagged, sampled and measured by DECR officers (see below).

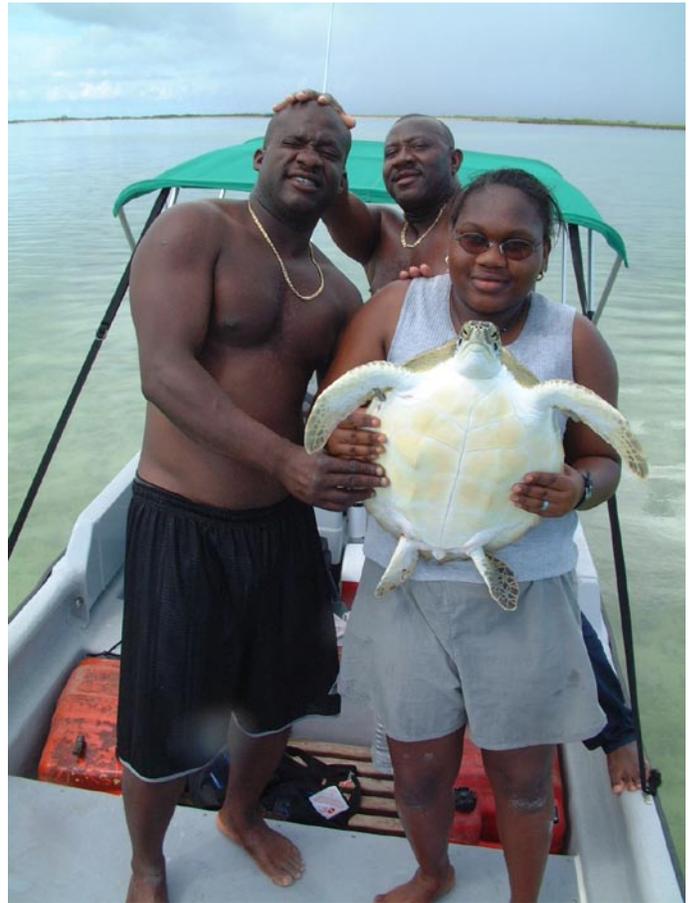
**Morphometric data:** Straight carapace length, width and plastron length measurements are recorded for turtles on capture and following each recapture.

**Genetic Sampling:** Skin biopsies are obtained from a rear flipper with a sterile 4-millimetre biopsy punch or scalpel and preserved in a buffer solution of 20% dimethyl sulfoxide (DMSO) saturated with Sodium Chloride (NaCl) (Dutton 1996).

**Tagging:** All captured turtles are tagged according to standard protocols to prevent collection of duplicate genetic samples and to elucidate demographic parameters. Metal Inconel tags are applied to the posterior edge of each front flipper and Passive Integrated Transponder (PIT) tags are injected into the shoulder muscle (Balazs 1999).

During scoping surveys, TCOT staff observed foraging juvenile green turtles in the Silly Creek, south Providenciales in September 2002. TCOT genetic sampling confirmed that the sea grass beds and tidal creeks associated with the International Ramsar Site on the southern shores of North, Middle and East Caicos provide extensive foraging habitat to a significant population of juvenile and sub-adult green turtles. TCOT sampled within the Ramsar site because accompanying fishers suggested that the site encompasses the best turtling grounds in the archipelago. Fifteen (88.2%) of the 17 green turtles captured for TCOT sampling were caught on the sea grass beds within the Ramsar site during three sampling trips, while the other two were caught off South Caicos and at Six Hills Cay (see Table 9.4, Mean CCL(cm)  $\pm$  SD; 51.5  $\pm$  7.8). In addition, TCOT staff witnessed the landing of an adult green turtle (CCL=103.5cm) at Cockburn Harbour, South Caicos by a local turtle fisher on the 4<sup>th</sup> September 2002. He had found it resting at the base of a coral head in patch reef at Six Hill Cay and he and his crew had hauled it aboard with lobster hooks. When butchered, the animal yielded many developing eggs and had a gut packed with freshly ingested seagrass. The lower intestine was impacted with a blockage consisting of plastic bags, burlap packaging, copper wire and plastic drinks containers. This turtle was probably captured during an inter-nesting interval and may have been part of TCI's green turtle nesting population. Six Hill Cay lies within the Admiral Cockburn Nature Reserve and as such fishing is prohibited within the Reserve boundaries.

Samples were also taken from 41 live captured hawksbill turtles and one suspected hawksbill/loggerhead hybrid (see table 9.4 - Mean CCL (cm)  $\pm$  SD; 40.9  $\pm$  10.2). The hawksbills were either caught and sampled by TCOT (n=2) or the DECR (n=9), were landed by fishers for butchery (n=4), or were landed by fishers for the DECR to sample (n=26). This cooperation was facilitated by Amber Thomas, former DECR Conservation Officer at South Caicos, who issued a request to some South Caicos fishers that they opportunistically catch and land any turtles they encounter



**Photo 9.11.** DECR officers worked with South Caicos fishermen during TCOT sampling (Photo P. Richardson).



**Photo 9.12.** An adult female green turtle landed at South Caicos in September 2002 (Photo P. Richardson).



**Photo 9.13.** Gut contents of a butchered adult female green turtle, showing ingested marine litter (Photo P. Richardson).

while undertaking their normal fishing, usually for other target species such as lobster (A Thomas (DECR) pers. comm. 2002). From September to December 2002, 6 South Caicos fishers caught and landed 26 hawksbill turtles and 2 green turtles for the DECR to sample, tag and release, while 4 hawksbills landed for butchering were also sampled. The butchered hawksbills had CCL's of 47cm, 48cm, 58cm and 80cm respectively and were therefore larger than the mean hawksbill landed for TCOT to tag and release. It is worth noting that these butchered turtles do not represent the total number of turtles landed for use in the described period, as most fishers would not bring green turtles to the DECR for sampling, rather they would take them directly to Providenciales for sale (A. Thomas (DECR) pers. comm. 2003).

Fibropapillomatosis (FP) is a widespread and sometimes fatal epizootic disease that is commonly associated with green turtles, but has also been pathologically confirmed to occur in populations of hawksbill, leatherback, loggerhead and olive ridley turtles and has been reported in Kemp's ridley and flatback turtles (Aguirre 1998; Aguirre *et al.* 2000, Barragan & Sarti 1994; D'Amato & Moraes-Neto 2000; Herbst 1994; Huerta *et al.* 2002; Jacobsen *et al.* 1989). FP has been recorded in turtle populations around the world, including green turtle populations in the Cayman Islands and both the British and US Virgin Islands (Eliziar *et al.* 2000; Overing 1996; Wood & Wood 1993). Seven (41.2%) of the 17 juvenile green turtles captured for TCOT genetic sampling exhibited FP like growths (see table 9.4). Biopsies of the growths were taken and will be examined in the UK and described in later publications. In addition, during TCOT SEQ, a recreational bonefish angler reported the accidental capture, on rod and line, of a sub-adult hawksbill turtle in the tidal creeks of the Caicos Islands, which apparently also exhibited FP-like growths on the head and flippers. Conversations with TCI fishers have revealed that FP-like symptoms are locally referred to as 'old turtle disease'.

Species	Mean CCL (cm) ± SD (range)	Capture location	Caught by
Green (n=17)	51.5 ± 7.8 (38.3-64.8)	International Ramsar site	Fisherman (n=2) & TCOT (n=15) for TCOT all turtles tagged & released; FP=7)
Green (n=1)	103.5	Six Hills Cay	Fishermen (butchered for sale)
Hawksbill/ loggerhead hybrid(n=1)	43.3	Unknown	Fisherman (tagged & released)
Hawksbill n=41)	40.9 ± 10.2 (22.9-80)	South Caicos (n=4), Middleton Cay (n=1), Big Ambergris Cay (n=4), Six Hills Cay (n=11), Bell Sound (n=3), International Ramsar site (n=3), Bush Cay (n=1), Long Cay (n=1), Iguana Cay, Middle Caicos (n=1), Fish Cay (n=3), Long Cay (n=1), Pear Cay (n=1), Unknown (n=6)	Fishermen (n=30), DECR (n=9), TCOT (n=2) (All tagged & released except 4 that were butchered)

**Table 9.4.** Live captured turtles genetically sampled during TCOT (FP= indicates presence of fibropapilloma-like growths).



**Photo 9.14.** A South Caicos fisher with green and hawksbill turtles caught during TCOT sampling within the Ramsar site (Photo P. Richardson).

### 9.6.2. Genetics of foraging populations

TCOT genetic analyses have shown that the haplotypes of foraging turtles in TCI have also been described in a number of other nesting and foraging sites (see section 10.4.4).

**Foraging green turtles in TCI:** Haplotypes described in the 17 samples that generated data during TCOT genetic analysis (1 sample failed) have also been described in **foraging** populations in Anguilla (via TCOT), Bahamas, Barbados, BVI (via TCOT), Florida, Montserrat (via TCOT), Nicaragua and West Africa. Some of these haplotypes have also been described in **nesting** populations in Ascension Island, Aves Island, Brazil, Costa Rica, Florida, Mexico, and Suriname, as well as Bioko, Guinea Bissau, and Sao Tome and Principe on the west coast of Africa.

**Foraging hawksbill turtles in TCI:** Haplotypes described in the 38 samples that generated data during TCOT genetic analysis (8 samples failed) have also been described in **foraging** populations in Anguilla (via TCOT), BVI (via TCOT), Cayman Islands (via TCOT), Cuba, Montserrat (via TCOT) and Puerto Rico. Some of these haplotypes have also been described in **nesting** populations in Anguilla (via TCOT) Antigua, Barbados, Belize, Brazil, Cuba, Mexico, Montserrat (via TCOT), Puerto Rico and the US Virgin Islands.

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 during 2005 and more definitive answers will be available then. At this point, however, it can be clearly highlighted that the turtles foraging in TCI waters will undoubtedly include those originating from a number of nesting colonies across the Caribbean region. Detailed information will be disseminated as part of the cross-territory FCO Overseas Territories Environment Programme (OTEP) funded project, which will focus on Turtle Conservation and the Environment Charter and Multilateral Environment Agreements. However, further sampling of TCI's foraging turtle populations is required to fully understand and establish their genetic identity.

### 9.6.3. Threats to TCI's foraging turtle populations

Illegal fishing within TCI's network of protected areas may be considered a threat to foraging populations of marine turtles, as these areas have been established as refuges for TCI's wildlife, including marine turtles (Gaudian & Medley 2000). It is worthy of note that of the 30 hawksbills captured by fishers as described in section 9.6.1, 50% (n=15) were caught in the protected areas of Six Hills Cay (n=9), the International Ramsar site (n=1), Bell Sound, South Caicos (n=1), Long Cay (n=1), Middleton Cay (n=1), Bush Cay (n=1) and Pear Cay (n=1), where fishing is prohibited under the National Parks Ordinance, 1998. The hawksbill captured at Pear Cay in October 2002, was an adult female (CCL=80cm) and was one of those butchered for sale.

This reinforces some TCOT SEQ interviewee claims that illegal fishing occurs in several of the protected areas (see section 9.7.1), particularly those away from population centres where enforcement is non-existent (Gaudian & Medley 2000). These sites, as well as the others listed in tables 9.3 and 9.4, provide extensive foraging habitat for what is probably a large population of green and hawksbill turtles in TCI's waters.



**Photo 9.15.** Fibropapilloma-like growths on juvenile green turtle caught within the Ramsar site (Photo P. Richardson).

During TCOT SEQ, several interviewees claimed that migrant fishers from the Dominican Republic and Haiti were illegally fishing for turtles and other species in TCI's waters (see section 9.7.1), but TCOT was unable to validate or quantify the extent of this harvest (see section 9.6.4). Indeed, the current legal turtle harvest may also pose a threat to TCI's foraging turtles, but as there are no programmes to monitor the turtle fishery or trends in turtle population abundance, it is currently impossible to determine the impacts of this harvest of TCI's turtles.

There are few other threats to TCI's foraging turtles. Proctor & Fleming (1999) report that TCI reefs show little sign of being deleteriously affected by human activity, while Gaudian and Medley (1995; in Gaudian & Medley 2000) showed that there was small but measurable diver impacts on reef benthos. However, there are concerns that inadequate sewage disposal facilities at recent tourism developments may lead to inshore water contamination (Robinson & Fulford 1997), and in May 2002, TCOT staff witnessed juvenile green turtles swimming amongst significant sewage pollution at Turtle Cove, which lies in the Princess Alexandra National Park. Extensive and prolonged sewage effluent can significantly and adversely affect coral reef and seagrass bed ecosystems (Gibson & Smith 1999). The sewage and hyper-saline water discharge pollution in Turtle Cove is currently being addressed by the Planning Department, Environmental Health Department and DECR (B. Riggs (DECR) pers. comm. 2004).



**Photo 9.16.** Raw sewage pollution at Turtle Cove marina in May 2002 (Photo P. Richardson).

In addition, Slade reports that pleasure boats have been known to collide with turtles in the Princess Alexandra National Park, although the significance of this as a threat to TCI's foraging turtle populations is unclear (L. Slade pers. comm. 2004). Cruise liners are currently received at Grand Turk, and the cruise liner industry is a recognised source of pollution and damage to marine turtle habitats (Klein 2002; NMFS 1993). In Puerto Rico and the USVI, cruise liners have run aground or anchored on coral reefs causing extensive damage to the reefs and in some cases turtle nesting beaches (NMFS 1993), and the potential exists for similar local damage to turtle foraging habitat to occur in TCI as a result of increased cruise liner traffic.

#### **9.6.4. Data from TCOT SEQ**

Of the 92 TCOT SEQ interviewees, 62 (67.4%) said that they had noticed trends in numbers of turtles at sea (as opposed to not noticing or not answering the question, n=30).

Of these, 36 interviewees gave non-species-specific (general) answers about trends in turtles at sea in the last 5 years, while 26 gave species specific answers about green and hawksbill turtles. Of these 26, 10 thought that green turtle populations had increased in the last 5 years, 6 thought they had decreased, 9 thought numbers had stayed the same and 1 did not know. Therefore 73.1% of interviewees who noticed species-specific trends suggested that green turtle populations had increased or stayed the same in the last 5 years. Ten of these 26 thought that hawksbill populations had increased in the last 5 years, whereas 4 thought they had decreased, 5 thought they had remained the same, 1 did not know and 6 did not answer this question for hawksbills. Therefore 57.7% who noticed species-specific trends suggested that hawksbill populations had increased or stayed the same in the last 5 years. Only one interviewee, a recreational fishing boat charter owner, gave an answer about leatherbacks, suggesting they had decreased in the last 5 years and only 6 interviewees answered about loggerheads, with equal numbers (n=2) suggesting that populations had increased, decreased and stayed the same.

Of the 36 that answered these questions generally, 11 (30.6%) thought that turtle populations had increased at sea in the last 5 years, 13 (36.1%) thought that turtle numbers had decreased and 10 (27.8%) thought numbers had stayed the same. Two (5.6%) did not know about turtle trends in the last 5 years. Therefore, only 36.1% of those interviewees who gave answers about general trends in turtle numbers thought that populations had decreased in the last five years, whereas 58.4% suggested that populations had increased or stayed the same. Responses to TCOT SEQ therefore suggest that turtles in TCI's waters have either stayed the same or increased in the last 5 years.

The same 62 respondents who noticed trends in turtle populations in the last 5 years also noticed trends in turtle populations since they could remember, and the answers of 36 of these respondents were general. Of

the 26 interviewees that noticed species-specific trends in abundance, 11 suggested green turtle populations had increased since they could remember, 6 said that populations had decreased, 7 said that populations had stayed the same and 2 did not know. Therefore 69.2% (n=18) of interviewees giving species specific responses suggested that green turtle populations had either increased or stayed the same since they could remember. Similarly, 11 respondents suggested that hawksbill populations had increased since they could remember, 4 suggested that they had decreased, 3 suggested they had stayed the same, 2 did not know and 6 did not answer this question. Therefore, 53.8% (n=14) of these respondents thought that the TCI hawksbill population had increased or stayed the same as far as they could remember.

The 36 respondents who answered this question generally mirrored the species-specific answers, with 11 (30.6%) respondents suggesting that turtle populations had increased since they could remember, 13 (36.1%) suggesting they had decreased, 10 (27.8%) suggesting that they had stayed the same while 2 (5.6%) respondents did not know. Therefore 58.4% (n=21) of these respondents thought that turtle populations had increased or stayed the same since they could remember, while 36.1% suggested they had decreased. Again, the majority of TCOT SEQ respondents who noticed trends in turtle abundance suggest that TCI foraging turtle populations are the same or have increased since they can remember.

It is interesting to note that when the current and former turtle fishers' answers to these questions are isolated from other TCOT SEQ interviewees, the results are similar. Nineteen current and former fishers (52.8% of all 36 respondents who answered generally) answered these questions, of which 5 suggested that turtle numbers had increased in the last five years, 6 suggested that had decreased and 7 suggested that they had stayed the same, while 1 respondent did not know. Therefore 63.2% (n=12) of these 19 fishers thought that turtle populations were the same or had increased in the last 5 years, while 31.6% (n=6) thought that numbers had decreased. These same fishers answered generally about turtle trends at sea since they could remember and 5 suggested that numbers had increased, 7 suggested that numbers had decreased and 6 suggested that populations were the same, with 1 who did not know. Therefore 57.9% (n=11) of these 19 fishers believed that turtle numbers had increased or were the same since they could remember, while 36.8% thought populations had decreased (n=7).

When the dive operator, recreational fishing boat charter and boat trip operator responses are isolated, 6 interviewees gave opinions about general trends in turtle numbers at sea. Three of these respondents suggested that TCI's turtle populations had increased in the last 5 years, whereas 3 said they had stayed the same. Three of these respondents suggested that turtle populations had increased since they could remember, 1 said that they had decreased and 2 suggested that they had remained the same.

The 62 TCOT SEQ interviewees who noticed trends in TCI's foraging turtle populations only offered 4 reasons for the perceived increases in numbers. Nineteen (30.6%) suggested that decreased catch was responsible for population increase, 4 suggested that decreased egg collection was responsible, 1 respondent suggested that the National Parks were the reason and 1 suggested that the populations were undergoing a natural increase.

This perceived stability/increase in TCI's populations of foraging turtles may well reflect real population trends due to factors at play way beyond the boundaries of TCI's territorial waters. Previous studies have shown that Caribbean hawksbill and green turtle foraging aggregations are typically comprised of individuals originating from a diversity of regional nesting populations (Bass & Witzell 2000; Diaz-Fernandez *et al.* 1999; Luke *et al.* 2004). Preliminary analysis of TCOT genetic samples indicates that the foraging turtle populations found in the waters of the UK Overseas Territories in the Caribbean are also likely to comprise of mixed stocks (see section 10). While the exact nature of the genetic stock composition of these populations cannot yet be determined by data generated from the relatively low sample sizes collected during TCOT, a review of previous analyses of nearby foraging populations may provide some indication of the possible stock composition of TCI's foraging turtles. For example, Bass & Witzell (2000) analysed the mtDNA of the juvenile green turtle population foraging of the east central Florida coast. Their results suggested that this population is comprised of individuals originating from nesting beaches in Costa Rica (53%), USA and Mexico (42%), as well from Aves Island (Venezuela) and Suriname (4%). A similar study of juvenile green turtles foraging in the Bahamas territorial waters suggested contributions from Costa Rica (80%), United States and Mexico (5%), Aves Island and Suriname (14%), as well as Ascension Island and Guinea Bissau (1%) (in Bass & Witzell 2000). TCOT genetic analysis has identified haplotypes in TCI's green turtle population that are shared with nesting populations in Ascension Island, Aves Island, Brazil, Costa Rica, Florida, Mexico, and Suriname, as well as some West African nesting populations. The large nesting populations at Ascension, Tortuguero (Costa Rica), Yucatan Peninsula (Mexico) and Florida appear to be stable or increasing as a result of rigorous and prolonged conservation measures at the nesting beaches (Bjorndal *et al.* 1999; Godley *et al.* 2001; Seminoff 2004; Troeng & Rankin in press). However, the green turtle population nesting on Venezuela's Aves Island, the second largest green turtle rookery in the Wider Caribbean Region after Tortuguero, appears to have experienced a 90-98% decline over 3 generations (ca 130 years) (Seminoff 2004). Nevertheless, if the large, stable or increasing green turtle nesting populations in the Wider Caribbean are making a significant contribution to TCI's foraging green turtle populations, then extensive or increased production of hatchlings from these nesting beaches may well result in increased recruitment into the TCI foraging population.

Similarly, while Meylan (1999) found hawksbill populations in the Caribbean region to be declining or severely depleted in 22 of 26 countries and territories where data were available, the protected and monitored nesting populations of Barbados, Doce Leguas Cay (Cuba), Mona Island (Puerto Rico, USA) and Yucatan (Mexico) appear to be increasing (Meylan 1999; IUCN 2002). Hawksbill populations nesting at Buck Island (USVI), Jumby Bay, Antigua and Tortuguero in Costa Rica appear to be stable (IUCN 2002). TCOT genetic analysis has identified haplotypes in the TCI foraging hawksbill population that are shared with nesting populations in Anguilla, Antigua, Barbados, Belize, Brazil, Cuba, Mexico, Montserrat, Puerto Rico and the US Virgin Islands. As with the green turtle foraging populations, if these large, increasing or stable regional nesting populations make significant contributions to TCI's foraging hawksbill population, then extensive and increased production of hatchlings at these nesting beaches may result in increased recruitment into TCI's foraging populations.

### Summary

In conclusion, despite extensive historical and contemporary harvest of marine turtles in TCI's waters, TCOT SEQ indicates that local foraging turtle populations, largely consisting of green and hawksbill turtles, have remained stable, or possibly increased since most of the interviewees can remember as well as in the last 5 years. TCOT staff observations suggest that both green and hawksbill turtles are abundant in TCI's waters and that patch and fringing reef, tidal creek and seagrass bed habitat within TCI's waters may be of regional importance to both green and hawksbill turtles. TCOT believes that the International Ramsar Site is of particular importance to regional green turtle populations.

### Recommendations

#### 9.1.3.2. Establish systematic monitoring efforts at index foraging sites

- a) *Seek funds for and establish a systematic aerial survey of TCI's waters to understand the current distribution of turtles and identify index foraging sites. Through these surveys, index foraging sites should be identified, and frequently (e.g. once per month) and systematically monitored via boat/snorkel surveys or CPUE sampling to assess trends in abundance of TCI's foraging turtle populations.*
- b) *Expand the sampling regime initiated under TCOT to establish the genetic 'identity' of TCI's nesting and foraging populations. This sampling could be included as part of the surveys mentioned above. The participation of turtle fishers should be encouraged where practicable. Sampling should be extensive and should include an assessment of the prevalence of fibropapilloma (FP) in the foraging, and if possible, nesting turtle populations.*

*c) Caribbean Turtlewatch has the potential to monitor certain regularly used dive sites for presence and absence of turtles, but requires dedicated staff time to liaise with willing dive operators, and treat data generated through the programme. TCOT recommends that if resources allow, DECR/ PAD continue and maintain Caribbean Turtlewatch with current participating dive operators in Providenciales as a relatively cheap method of monitoring turtle abundance at index foraging sites.*

### 9.7. Direct Use of Marine Turtles in TCI (20<sup>th</sup> Century and beyond)

In 1907 the Government passed the TCI's first Turtle Protection Ordinance, aimed primarily at preventing illegal turtle take by Bahamians. In 1910, the Caicos Development Company leased the Chalk Sound lagoon to a Mr George Silly for raising and canning turtles, lobsters and other shellfish. The cannery continued to operate until the Second World War, which led to a shortage of tin plate, but apparently the cannery's trade in turtle meat had 'tapered to nil' by 1930. TCI continued to export turtle shell thereafter with £343 worth exported in 1929, with various similar amounts exported up until 1933, when only £150 worth was exported in 1933 at the onset of the Depression, which devastated the island's economy (Sadler 1997). The reasons for the decline in commercial trade of turtles from TCI are unclear, although declining turtle populations and a decline in demand have been suggested (Fletemeyer 1983), and the Depression is likely to have significantly affected foreign demand for luxury delicacies such as turtle meat. In 1941, the Fisheries Protection Ordinance was created to provide a framework to regulate all of TCI's fisheries, and these were revised in 1976 with special provisions for the turtle fishery (see below - Fleming 2001).

Throughout the 20<sup>th</sup> Century, turtles continued to be fished for domestic consumption, and eggs were also harvested for sale, especially on South Caicos and Salt Cay (Fleming 2001). A popular early 20<sup>th</sup> Century TCI calypso regularly performed by South Caicos ripsaw bands is titled '*I Dig There*' and recounts how two well known South Caicos men were out collecting turtle eggs one night when one steals the eggs found by another (Bowen 2002). The chorus reads:

*'I dig there  
Garland dig there  
Garland push his finger in my hole  
In my hole, in my hole  
Garland push his finger in my hole'*

In 1970, Dr Robert Schroeder of Mariculture Ltd (now the Cayman Turtle Farm) visited TCI with a view to establishing another turtle farm, but apparently nothing resulted from his visit (Sadler 1997). In 1976, the Government of TCI introduced the Fisheries Protection Regulations that for

the first time prohibited the collection of turtle eggs and protected nesting female turtles on the beach (Proctor & Fleming 1999). Domestic harvest of turtles at sea continued in the late 1970's, when Meylan (in Carr *et al.* 1982) reported that no commercial harvest of turtles occurred, but juvenile green and hawksbill turtles were chased down in boats and captured 'partly for sport and partly for consumption'. Meylan did not notice any tourist trade in turtle products, and while she did not visit the main tourist island of Providenciales, there was only low-level tourism in TCI at the time. Riggs (DECR pers. comm. 2004) suggests that since the 1970s there has not been a significant trade in turtle shell products to tourists visiting TCI, although Meylan notes that '*insignificant*' trade in hawksbill scutes occurred between local fishers and Haitian buyers (Carr *et al.* 1982).

From a survey carried out in 1981, and contrary to Meylan's finding 2 years earlier, Fletemeyer (1983) estimated that the annual commercial harvest of turtles in TCI stood at about 850 animals, consisting mostly of juvenile green turtles weighing between 2 and 8kgs, with some juvenile and adult hawksbill opportunistically taken during the lobster fishing season. Fletemeyer estimates that about 70 to 90 fishers harvested turtles, most of whom were targeting other species, but would take turtles opportunistically. He also reported that turtle meat was found year round, but sporadically, in TCI's markets, and all was consumed locally. Turtle meat sold at US\$1/lb live weight or US\$1.90 to US\$2.50/lb for butchered meat. Shell was sold at between US\$10 to US\$20/lb and eggs were sold at 50 for US\$1. In addition to the commercial sale of meat, Fletemeyer estimated subsistence takes of 8,000 to 10,000 turtle eggs, 20 to 30 nesting females and between 200 to 400 turtles at sea. On the basis of his findings, Fletemeyer states that '*Fishing pressure at this level does not seem to pose a serious threat to the survival of the sea turtle population in the waters off the Turks and Caicos Islands*'.

Fletemeyer's (1983) reports of egg harvest and sale, as well as harvest of nesting females, are interesting because these takes would have been in direct contravention of the Fisheries Protection Regulations, 1976. He states that at the time there was '*virtually no legal enforcement*' of the regulations, and 2 years earlier Meylan (in Carr *et al.* 1982) concurs, stating that enforcement of the regulations by the authorities was '*probably inadequate*'. Rudd (2003) writes about the recent history of TCI's fisheries and states that compliance with fishery regulations has been poor since the 1960's. This was exacerbated by the rampant drug trafficking through TCI in 1980's, especially South Caicos, the main fishing centre of TCI, which '*encouraged a culture of distrust and disregard for authority in TCI*'. There are no recorded cases of arrest or prosecution for violation of the turtle fishery regulations, despite apparent and significant violation since the Fisheries Protection Regulations were introduced in 1976 (Fleming 2001; Fletemeyer 1983).

These regulations were revised by the Fisheries Protection Ordinance 1998, but the provisions for turtle harvest remained the same. Section 14 of the Ordinance states:

*'14.(1) Any person who takes or is in possession of or sells any marine product smaller than the legal size shall be guilty of an offence: provided that a person shall not commit an offence under this regulation if having inadvertently taken any marine product which is undersize, he forthwith returns the same to the water unharmed.*

(c) *Turtles*

(i) *Hawksbill Turtle (Eretmochelys imbricata) a shell measurement of 20 inches in length measured from the neck scales to the tail piece and a weight of at least 20 lbs;*

(ii) *Green Turtle (Chelonia mydas) a shell measurement of twenty inches in length measured from the neck scales to the tail piece and a weight of at least 20 lbs;*

(iii) *Any other turtle, a weight of at least 20 lbs.'*

Section 14 states:

(1) *No person shall –*

(a) *take any turtle on any beach or at any place above the low water mark*

(b) *take or be in possession of or offer to buy or sell, any laid turtle eggs.*

(2) *Any person who contravenes the provisions of this regulation shall be guilty of an offence.*

The National Parks Ordinance was also revised in 1998, and the National Parks Regulations – Section 8 under the Ordinance prohibit '*the taking of any animal or plant by any method on land or at sea*' in any designated National Park, Nature Reserve or Sanctuary.

During TRAFFIC surveys in the UK Overseas Territories in 1998, Allan (1998) found 6 restaurants in TCI selling turtle dishes and, surprisingly, 3 turtle carapaces for sale that had apparently been illegally imported from South-East Asia. Gaudian & Medley (2000) reported that local interest in turtle meat in TCI was 'waning' at the end of the 20<sup>th</sup> Century, while Bowen (2003) suggests that the diet of Turks and Caicos Islanders has changed significantly over the past few decades, with the consumption of some traditional dishes (including, for example, turtle stew), having declined, and food of USA origin, such as deep-fried chicken and pork ribs, becoming more prominent. Fleming (2001) concurs, reporting that in 2000, few turtles were thought to be taken, with only 3 or 4 fishers consistently taking turtles and others catching them opportunistically. Fleming cites Grand Turk, South Caicos and Salt Cay as centres of turtle fishing activity and describes contemporary fishing methods, including the setting of nets in creeks, as well as jumping and spearing turtles on the seagrass beds. The meat from this harvest is cooked at home or sold to '*restaurants catering to local people*' at US\$2 per lb live weight or US\$3 per lb for meat. Fleming (2001) cites one restaurant selling dishes of turtle stew and steak at between US\$14.95 and US\$16.95 per dish. Contrary to Fleming's perceptions, Rudd (2003) acknowledges that there is no information about catch levels, but estimates that the turtle harvest in TCI is '*likely in the hundreds per year*'.

Fleming (2001) did not find any turtle carapaces for sale in TCI during her survey in 2000, but claimed that they were regularly offered for sale to tourists in the mid-1990s. One turtle fisher reported to Fleming that in the early 1990's he would sell hawksbill scutes to Dominican traders at US\$20 per lb and others suggested that Dominican fishers illegally fished for turtles on TCI's Mouchoir Banks. Marte *et al.* (2003) report that there is an extensive and illegal trade in tortoiseshell products in the Dominican Republic, which specifically targets visiting tourists. It is interesting to note that illegal trade of hawksbill scutes out of the Dominican Republic has been recorded and Fleming (2001) describes two incidents where Japanese customs officers seized two illegal shipments of raw hawksbill shell originating from the Dominican Republic in 1994. The seizures totalled over 600 kg of scutes and were confiscated from Japanese businessmen involved in the Bekko (tortoiseshell) trade. Marte *et al.* (2003) suggest that most tortoiseshell jewellery sold in the Dominican Republic appears to be made from the scutes of sub-adult and adult hawksbill turtles, which are apparently absent from Dominican Republic waters. Adult hawksbills are present in TCI's waters, and it is possible

that the scutes of adult turtles caught in the TCI turtle fishery have been exported to the Dominican Republic to supply the trade there. Fleming (2001) also reports on a historic link between the TCI turtle fishery and the Japanese market for hawksbill scutes, with Japanese customs reporting the import of a total of 234kgs of scutes from TCI in 1970 and 1971.

### Summary

TCI waters appear to host significant foraging populations, and limited nesting populations, of green and hawksbill turtles. These have been extensively exploited for meat, eggs and shell for at least 1,300 years, and exploitation continues today. Despite successive 20<sup>th</sup> Century legislation regulating TCI's turtle fishery, some and perhaps most turtle fishers have ignored many of the regulations and this appears to have been largely ignored by the enforcement authorities. To date there has been no published or properly reported scientific monitoring of TCI's turtle fishery and without this data, or data pertaining to the origins of TCI's mixed stock foraging populations, it is impossible to accurately determine the impact of TCI's turtle fishery on

Measures of direct exploitation	Past	Present	Never	No response or not applicable
<b>By life stage</b>				
Females on beaches	0	0	50	42
Eggs from beach	17	7	68	0
Turtles in water (intentional)	15	35	8	34
Turtles in water (incidental)	NA	8	50	34
<b>By product</b>				
<b>Meat</b>				
Fishers who sell meat	9	22	18	43
Meat vendors	6	10	8	69
Meat consumers	25	52	14	1
<b>Eggs</b>				
Collectors who sell eggs	1	0	18	73
Egg consumers	18	13	60	1
<b>Non-edible</b>				
Fishers who sell shells	2	1	46	43
Shell vendors	1	0	23	68
Shell consumers	11	4	75	2
Worked shell consumers	8	3	79	2
<b>Measures of indirect exploitation</b>				
Turtles indirectly used in business	7 advertising	16 attraction	14 feature of professional activities	
<b>Total interviews</b>	<b>92</b>			

**Table 9.5.** Summary of TCOT interviewees involved in marine turtle use in TCI, categorised by type of use.

<b>Are you aware of any activities that infringe on TCI turtle harvest laws (n=92)?</b>						
	<b>Yes</b>		<b>No</b>		<b>No answer</b>	
<b>n=</b>	17		72		3	
<b>%</b>	18.5		78.3		3.3	

<b>If yes, what are they (n=17, multi-answers allowed)?</b>						
<b>Infringements</b>	<b>Capture of undersize turtles</b>	<b>Collecting eggs</b>	<b>Harvesting nesting turtles</b>	<b>Turtle fishing in National Parks</b>	<b>Exporting meat (to Miami)</b>	
<b>n=</b>	10	4	2	3	1	

<b>Who is engaged in activities that infringe on these laws (n=17, multi-answers allowed)?</b>						
<b>Social group</b>	<b>Native</b>	<b>Naturalised</b>	<b>Resident</b>	<b>Visitor (tourist)</b>	<b>Haitian/ Dominican migrant fishermen</b>	<b>Don't know</b>
<b>n=</b>	10	0	1	2	5	1

**Table 9.6.** TCOT SEQ interviewee perceptions of infringements of TCI legislation.

these foraging populations or nesting populations of origin. However, it is reasonable to predict that the extensive, long-term harvest of nesting female turtles and their eggs in TCI will have had significant, adverse impacts on the islands' turtle nesting populations.

#### 9.7.1. Data from TCOT SEQ

Table 9.5 gives a summary of the type of use current marine turtle use as identified by the TCOT SEQ. Despite current and long-standing legislation (see section 9.3) regulating turtle harvest in TCI, only 51 (55.4%) of the 92 TCOT SEQ interviewees claimed to know any details about this legislation. Forty (43.5%) could not describe any laws and 1 did not answer. Of those 51 that suggested they could describe the law, 41 (80.4%) mentioned the size limit, 7 (13.7%) mentioned the prohibition of egg harvest, 3 (5.9%) mentioned the prohibition of nesting female harvest, 5 (9.8%) mentioned no harvest in National Parks, 1 thought that there was a quota in effect, 1 thought there was a total ban on turtle fishing and 2 respondents thought there were no laws regulating turtle harvest. Eight interviewees volunteered measurements for the legal size limits, but 7 of these were incorrect.

When the 92 TCOT SEQ interviewees were asked if they could describe legislation regarding purchase of turtle products, only 16 (18.5%) suggested they could describe the legislation, whereas 72 (78.3%) said they could not. Of those that suggested they could describe the legislation, only 1 respondent mentioned the prohibition of purchase of eggs, 4 mentioned the prohibition of purchase of undersize turtles, 5 mentioned a prohibition on the export of turtle shells, 1 thought that purchase of shells was prohibited, 1 thought that purchased turtles had to be slaughtered immediately after purchase and 3 respondents thought there were no laws regarding purchase of turtle products. TCOT staff also encountered situations where DECR officers appeared to be unaware of the details of the turtle harvest legislation.

Table 9.6 gives an overview of TCOT SEQ interviewee perceptions regarding violation of turtle harvest laws in TCI. Only 18.5% (n=17) of interviewees said they were aware of legislation infringements. The most commonly identified infringement was the capture of undersize turtles (n=10), followed by the harvest of eggs (n=4). Interviewees also identified the capture of nesting females, fishing in National Parks and the illegal export of turtle meat.

Most interviewees who were aware of infringements believed that native TCI Islanders (n=10) were responsible, followed by migrant fishers (n=5), while interviewees also thought that some expatriates and tourists were responsible for infringements.

#### Summary

There appears to be very low awareness of the current regulations regarding marine turtle harvest in TCI, even amongst some DECR officers, and this may be a factor influencing apparently poor compliance and enforcement. Effective legislation is an important component of a turtle management strategy. It is therefore essential that DECR staff and the TCI public have a better understanding of the current legislation if it is to be generally respected and complied with by the TCI public.

#### **Recommendation**

##### **9.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the Turks and Caicos Islands**

- 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.*

### 9.7.2. Harvest of adults on the nesting beach

The harvest of nesting female turtles has been prohibited by TCI legislation since 1976. None of the fishers interviewed for the TCOT SEQ who currently catch or formerly caught turtles said that they catch the females on the nesting beach, although 2 TCOT SEQ interviewees believe that this still occurs (see section 9.7.1). Two turtle consumers, both over 45 years old and born on Salt Cay, said that when they were children their fathers used to catch and kill nesting female turtles on Salt Cay beaches. This was apparently common practice at the time. In an informal interview with Alton Higgs, an elderly bush doctor, beachcomber and resident of Middle Caicos, Higgs said that up to the 1970s nesting female turtles were more common in TCI and men would regularly turn and slaughter nesting females at night. One Grand Turk resident and TCOT SEQ interviewee recalled how he used to encounter local men turning and killing nesting females on Grand Turk until the early 1990s. While this practice may once have been commonplace in TCI, nesting females turtles are rarely encountered by TCI islanders these days, as nesting appears to be limited to remote cays that are rarely visited at night. Illegal harvest of nesting turtles is therefore likely to occur only occasionally. Nesting females may still be caught occasionally at sea, and TCOT staff sampled an adult female green turtle in September 2002, which had developing eggs in the ovaries, that may well have been caught during an inter-nesting interval.

### 9.7.3. Harvest of eggs

The harvest of turtle eggs was prohibited in 1976, although Fletemeyer (1983) reports that turtle egg harvest continued in the early 1980's. TCOT SEQ identified 7 (7.6%) of the 92 respondents who still collect turtle eggs and 17 who used to collect eggs. As can be seen in Table 9.7, of the 17 former turtle egg collectors, over 40% (n=7) continued to collect turtle eggs after the practice was prohibited in 1976, reinforcing Rudd's (2003) assertion that compliance with fishery regulations in TCI is poor. When asked to give reasons why they stopped collecting eggs, only 1 of the 17 former egg collectors cited the law as a reason, 6 said that they no longer visit the beach, 4 said that they only used to collect eggs as children with their fathers, 4 suggested that they had gained a conservation awareness, 1 said that they had only collected as a one-off event and 1 said that turtle nests were no longer available.

Of all 24 former and current egg collectors identified during TCOT, 50% (n=12) said that they collected eggs opportunistically, whereas 3 suggested other factors that influenced when they collected eggs (season, full moon and personal desire) and 9 did not suggest such factors. Only one interviewee said he sold turtle eggs, but had stopped visiting the beaches and collecting in 1990. Prior to that he sold turtle eggs for US\$3 for a dozen to South Caicos men, who considered the eggs to have aphrodisiac properties.

Of the 7 current egg collectors, 5 said that they collect eggs on a yearly basis (between 2 and 4 times per year), 1 said that he collects eggs when the opportunity arises, and 1 (a South Caicos fisherman) claimed that he collects green turtle eggs on a monthly basis throughout the year. This individual expressed a preference for collecting green turtle eggs because he believed *'the taste is stronger'*.

During informal TCOT interviews, dive operators on Salt Cay claimed that occasional nests deposited on Salt Cay and neighbouring Big Sand Cay are still collected by Salt Cay residents. Furthermore, TCOT staff witnessed freshly laid turtle eggs of unknown origin or species being offered to bystanders in Cockburn Harbour, South Caicos in May 2003 and DECR officers made no attempt to enforce the law. TCOT SEQ identified 18 (19.6% of all 92) interviewees who formerly consumed turtle eggs and 13 (14.1%) interviewees who currently consume turtle eggs. Of the 18 former egg consumers, only 2 cited the law as a reason for stopping. Five said there was no longer any opportunity to eat eggs, 2 said they had developed an allergy to the eggs, 1 said he had developed a dislike of the eggs, 4 said they were no longer fishing (and so were no longer finding nests) and 4 did not provide an answer.

Of the current egg consumers, only 3 stated how they get the eggs. Two said that they receive them as gifts on a yearly basis and one Grand Turk resident claimed that she buys them from fishers every week during June and July for US\$1 per dozen. TCOT SEQ did not distinguish between follicular (unlaid) eggs, which can be legally traded under the Fisheries Protection Regulations 1998, and laid eggs, which cannot be traded. It is possible that some of the egg consumption recorded by TCOT SEQ involved unlaid eggs.

Year stopped collecting eggs	'60's	'70's	'80's	'90's	2000's	Year stopped not recorded	Still collecting	Never collected
No. of TCOT SEQ interviewees	3	4	2	4	1	3	7	68
% of former egg collectors (n=17)	17.6	23.5	11.8	23.5	5.9	17.6	Na	Na

**Table 9.7.** Summary of egg collecting history of TCOT SEQ interviewees (n=92).

## Summary

Despite current legislation, egg harvest and consumption continues in TCI. Although the scale of current harvest is unclear, prolonged and extensive egg harvest has the potential to adversely affect small nesting populations of turtles. TCOT therefore recommends that DECR makes every effort eliminate egg harvest in TCI through education and enforcement.

### Recommendations

#### 9.1.1.1. Increase the capacity of the Department of Environment and Coastal Resources and the Protected Areas Department

a) Ensure DECR/PAD has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis for turtle monitoring programmes. Given the importance of all natural resources in the network of Protected Areas, and apparent poor compliance with the National Parks Ordinance, TCOT recommends that an increased capacity to effectively patrol the protected areas should be treated as a priority.

#### 9.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the Turks and Caicos Islands

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.

#### 9.7.4. Harvest at sea

The harvest of turtles at sea appears to be the most prevalent form of turtle harvest in TCI. TCOT SEQ interviewed 13 former and 45 current fishers (total =58). Fifty-two of these fishers targeted conch, 54 targeted lobster, 54 targeted fish and 49 (84.5%) catch or have caught turtles. Of the 45 current fishers, 25 (55.6%) claimed that lobster was their most important target species, 15 (33.3%) identified finfish, 4 (8.9%) identified conch and 1 fisher did not answer the question. None of the current fishers identified turtle as their most important target species.

Fifteen (30.6%) of the 49 fishers who claimed they catch turtles no longer do so. One of these fishers ceased turtle take in the 1950's, 1 in the 1970's, 4 in the 1980's, 4 in the 1990's and 2 since 2000. Six (40%) of the 15 said they stopped turtle fishing because they arranged alternative employment or no longer had the time to fish, which were the dominant reasons given for stopping. Two respondents said they stopped because they had retired, 2 said they had stopped due to personal ethics (conservation), 2 stopped fishing due to ill health, 2 said they stopped catching turtles

because the fishery was no longer economically viable for them, 1 respondent stopped because he moved away from the islands and 1 did not answer the question. Of these 15 fishers, only 1 said turtles were a very important component of his catch before he stopped taking them, 4 said they were somewhat important and 6 said they were unimportant, while 4 did not answer the question. Therefore, according to the TCOT SEQ interviewees, turtles are of limited importance to current and recent historical fisheries by TCI fishers.

However, 75.6% (n=34) of the 45 current fishers interviewed during TCOT SEQ currently catch turtles. In addition, TCOT SEQ identified one bar owner from Providenciales who does not regularly fish, but occasionally catches turtles for sale as turtle meat dishes at his bar. Therefore it is possible that more TCI Islanders occasionally catch turtles for consumption, but are not registered fishers. Including the above mentioned bar owner, the total number of TCI Islanders currently catching turtles identified by the TCOT SEQ is 35 and the total number of current and former turtle fishers is 50. Of these, 33 (66%) catch or caught turtles opportunistically (while targeting other species), 7 catch or caught turtles intentionally, 9 catch or caught turtles both opportunistically and intentionally and 1 fisher did not give an answer to the question.



**Photo 9.17.** A fisher butchers turtle meat in Cockburn Harbour South Caicos (Photo P. Richardson).

Forty-seven (94%) of all 50 turtle fishers said they preferred to catch green turtles, 1 preferred hawksbill, 1 had no preference and 1 did not answer the question. Eighteen (36%) of the 50 turtle fishers said they preferred hawksbill turtle as their second choice while 1 fisherman said that he prefers to catch hawksbills as a first choice. Forty fishers offered a reason why they preferred to catch green turtles, with *'better taste'* as the dominant reason given (n=21), followed by *'better meat'* (n=9) *'more demand'* (n=7) and *'meat has better texture'* (n=3). The one fisherman who preferred to catch hawksbills said he preferred them because they are easier to catch and more abundant than the other species. Three fishers gave reasons why they caught hawksbills as a second choice, including *'for the shell'* (n=2) and *'easier to catch'* (n=1). Four fishers gave reasons why they tend not catch loggerheads, including meat's *'strong smell'* (n=1), *'poor taste'* (n=2) and *'poor texture'* (n=1).

As expected with a regulated fishery with no closed season, no seasonality of turtle fishing was detected in TCI, with 37 (74%) of the 50 turtle fishers claiming that they caught or catch green turtles all year, whereas 28 (56%) said that they catch or caught hawksbills all year. Of the 35 current fishers, 15 said that they catch turtles on a yearly basis, 3 said that they catch them on a monthly basis, 6 said that they catch them on a weekly basis and 11 did not give an answer to the question. None of the current turtle fishers said that they catch turtles on a daily basis. The factors influencing when fishers catch turtles included *'to make money'* (n=24), *'demand'* (n=21), *'personal choice'* (n=13), *'opportunistic'* (n=4), *'sport'* (n=1), *'weather'* (n=1) and bycatch (n=1).

A few of the older retired fishers described the recent historical use of turtle nets strung across creeks to catch turtles, especially in North and Middle Caicos, but nowadays turtles tend to be caught by hand. This involves chasing turtles in boats on the shallow seagrass beds and jumping on them when they tire, or snagging hawksbills with lobster hooks while fishing for lobster on coral heads. Twenty-four (68.6%) of the 35 current turtle fishers reported catching green turtles by hand or with a lobster hook, 20 (57.1%) reported catching hawksbills by hand or lobster hook, with other methods used to catch greens and hawksbills including nets (n=2), Hawaiian sling (n=2) and speargun (n=1).

**Recorded green turtle harvest:** Thirty-one (88.6%) of the 35 current fishers gave estimates of their average annual green turtle harvest, with estimates ranging from 1 turtle per year to 50 per year and a mean of 6.7 per year (Median (IQ range); 5 (2-9.5)) and a total estimated average catch of 209 green turtles per year for these 31 fishers. If the average catch is applied to the fishers who did not report catch numbers, then annual green turtle catch is probably closer to 236 turtles for all current turtle fishers identified by TCOT SEQ.

Green turtles of various sizes are currently caught with smallest reported at 2.3kg and the largest reported as

226.8kg. Twenty-five of the 35 current turtle fishers offered estimates of the average sized green turtle they catch. These ranged from 11.3kg to 90.7kg, with a mean of 32.4kg  $\pm$  SD19.7kg. Therefore adults and small juveniles are caught, but larger juveniles and sub-adults tend to make up the majority of the catch.

**Recorded hawksbill harvest:** Twenty-three (65.7%) of the 35 current fishers gave estimates of their average annual hawksbill turtle harvest, with estimates ranging from 1 turtle per year to 30 per year and a mean of 5.3 per year (Median (IQ range)=3(1.5-5)) and a total estimated catch of 121 hawksbill turtles per year for these 23 fishers. If the average catch is applied to the fishers who did not report catch numbers then the average annual hawksbill turtle catch is probably closer to 184 turtles for all current turtle fishers identified by TCOT SEQ.

Hawksbill turtles of various sizes are currently caught, with the smallest reported at 4.5kg and the largest reported as 158.7kg. Twenty of the 35 current turtle fishers offered estimates of the average sized hawksbill turtle they catch. These ranged from 13.6kg to 90.7kg, with a mean of 36.7kg  $\pm$  SD21.4kg. Therefore adults and small juveniles are caught, but larger juveniles tend to make up the majority of the catch. It is worth noting that DECR staff witnessed the landing of an adult female hawksbill (80cm CCL) captured at Pear Cay within the French, Bush and Seal Cays Sanctuary. The turtle was butchered for sale.

**NB.** TCOT SEQ interviews with turtle fishers were usually carried out in the presence of a DECR officer associated with a government department responsible for the enforcement of the Fisheries Protection Ordinance. After some interviews, DECR officers privately commented to TCOT staff that turtle fishers had under-reported their catch during interviews. TCOT SEQ indicates a very low level of awareness about current turtle harvest legislation in TCI and it is possible that fishers under-reported their catch due to concerns about whether or not they had infringed legislation they knew little about.

**Loggerhead and leatherback harvest:** No fishers claimed to prefer catching loggerheads and only 1 retired fisher claimed that he used to prefer loggerhead turtles as his second preferred species (after greens), and 1 current turtle fisher offered estimates for the number and size of loggerhead turtles caught. He claimed to catch 4 or 5 loggerheads per year ranging in size from 34 - 136kg. As discussed above, there is little demand or preference for loggerhead meat in TCI and the species is rarely encountered in TCI's waters. Therefore, while some loggerheads appear to be occasionally caught in TCI, they are not a viable or significant component of the TCI turtle fishery. TCOT SEQ suggests there is no harvest of or demand for leatherback turtles and their products in TCI.

## Summary

Turtle fishers in TCI tend to catch turtles on an opportunistic, yearly basis, with a view to selling the turtle or meeting a known demand. TCOT SEQ identified at least 16 fishers who intentionally target turtles and at least 9 fishers who

catch turtles on a weekly or monthly basis, probably to meet known demand.

In 2003, there were 491 commercial fishers licensed to fish in TCI in 2003 (J. Campbell (DECR) pers comm. 2004), and if the TCOT SEQ sample was representative, then approximately 371 (75.6%) of TCI fishers may still be catching turtles. However, the TCOT SEQ sample is not representative, for the following reasons:

- In South Caicos, where most of the fishers were interviewed during TCOT SEQ, DECR officers assisting TCOT staff with the SEQ would specifically contact fishers who were known to target turtles. It is highly likely that because of DECR's assistance, the TCOT SEQ sample of 16 intentional turtle fishers included most fishers who are known to specifically target turtles.
- South Caicos fishers tend to fish in pairs or larger crews, and it is possible that if more than 1 person was interviewed from any pair or crew, then the number of turtles caught by individual crews may have been double counted in the TCOT SEQ survey.
- TCOT SEQ interviewed 31 fishers resident in South Caicos (the TCI's major fishing population), 14 resident in Providenciales, 7 in Grand Turk and 4 in Salt Cay, but

only 1 (retired) fisherman resident in North Caicos and 1 former fisherman from Middle Caicos. No licensed or unlicensed expatriate fishers (Haitian and Dominican) were interviewed and therefore they, and fishers from North and Middle Caicos are under-represented in TCOT SEQ.

While the actual number of fishers who catch turtles in TCI is not known, only 9.2% of the licensed fishers in TCI were interviewed during TCOT SEQ, and therefore the 34 fishers identified during TCOT SEQ probably represent only a fraction of the number of individuals currently engaged in turtle harvest. The majority of fishers who catch turtles reported that they do so on an opportunistic basis and it is therefore reasonable to assume that, based on the TCOT SEQ, and given the limited regulation and enforcement of the turtle fishery, many more fishers in TCI will opportunistically catch a turtle if they think they can sell or use it. Furthermore, several fishers interviewed during TCOT SEQ claimed that migrant fishers from the Dominican Republic and Haiti currently catch turtles. Gaudian & Medley (2000) estimated that there were about 3,000 illegal immigrants in TCI, but the TCOT SEQ did not interview any migrant fishers.

To date there has been no monitoring of the turtle fishery in TCI and therefore it is impossible to accurately quantify the current harvest of turtles in TCI. TCOT SEQ indicates that most fishers catch turtles opportunistically. Twenty-

<b>a There should be regulations for which species of turtle can be caught</b>				
	yes	no opinion	no	na
n	19	5	21	3
%	38	10	42	6
<b>b There should be regulations for the type of fishing gear and methods that can be used to catch turtles</b>				
	yes	no opinion	no	na
n	27	3	15	3
%	54	6	30	6
<b>c There should be regulations for the number of turtles that can be caught</b>				
	yes	no opinion	no	na
n	24	2	17	3
%	48	4	34	6
<b>d There should be size limits for turtles caught</b>				
	yes	no opinion	no	na
n	42	0	20	3
%	84	0	40	6
<b>e Open and closed zones should be set for turtle fishing</b>				
	yes	no opinion	no	na
n	25	0	20	3
%	50	0	40	6
<b>f Open and closed seasons should be set for turtle fishing</b>				
	yes	no opinion	no	na
n	24	3	18	3
%	48	6	36	6

**Table 9.8.** Current and former turtle fisher attitudes to potential conservation options (n=50).

**Question: Who should be involved in setting regulations (multiple responses allowed)?**

Category	No. of responses	Percentage of fishers
Fishers	21	42
Government	12	24
DECR	33	66
Parks Department	3	6
Local People	2	4
Tour operators	1	2
Scientists	1	2
Other	1	2
Not applicable (no laws necessary)	3	6
No answer	3	6

**Table 9.9.** Turtle fishers' (n=50) opinions on who should be involved in setting turtle harvest regulations.

two fishers who only catch turtles opportunistically offered average annual green turtle catch values during TCOT SEQ and 15 fishers who only catch turtles opportunistically offered average annual hawksbill turtle catch values. Their average annual takes were  $4.7 \pm SD3.3$  green turtles per year and  $5.6 \pm SD6.6$  hawksbills per year (TCOT SEQ indicated that while hawksbills were not the preferred species, TCOT sampling and TCOT SEQ suggested that they were easier to catch, especially by lobster fishers, and therefore may be more likely captured by opportunistic turtle fishers). The 22 opportunistic green turtle fishers represent 48.9% of the total current fishers identified during TCOT SEQ and the 15 opportunistic hawksbill turtle fishers represent 33.3%. While the fishers in the TCOT SEQ sample may not be representative for the reasons given above, if 48.9% of TCI's licensed fishers catch 4.7 green turtles each per year and 33.3% of TCI's fishers catch 5.6 hawksbills each per year, then the TCI annual green and hawksbill turtle harvests may be as high as 1,128 green turtles per year and 907 hawksbill turtles per year respectively.

Therefore, the likely annual take of green turtles in TCI is between 236 and 1,128 turtles and the likely annual take of hawksbill turtles is between 184 and 907 turtles. Due to the sampling biases described above, these are low confidence estimates. However, TCOT SEQ indicates that several thousand kilograms of turtle meat is probably consumed in TCI each year (see section 9.7.5.2), and these estimated annual take values would be required to satisfy this demand. These estimates represent the largest current annual take of marine turtles in the UK Overseas Territories in the Caribbean.

**Attitudes of fishers towards potential conservation measures**

Table 9.8 presents turtle fishers' attitudes to fishery conservation options. Three (6%) former turtle fishers thought that turtle fishing should be prohibited in TCI and therefore did not think that any of the harvest management options were applicable. The TCOT SEQ revealed general consensus of opinion about only one of the fishing

options. However, more of TCI's former and current turtle fishers agreed with the potential conservation measures than disagreed, with the exception of species protection regulations, where 42% of the fishers disagreed with species protection regulations compared to 38% who agreed.

The only option that did solicit general consensus amongst the turtle fishers was the size limit option, where 84% agreed and 6% disagreed. All 25 of the 42 turtle fishers who agreed with size limits and justified their position suggested that a *minimum* size limit is necessary. It is worth noting that, despite this apparent agreement with the current minimum size limit, the capture of undersize turtles was the most commonly identified infringement of TCI's Fisheries Protection Ordinance, 1978 (see section 9.7.1). Therefore, while fishers may appreciate this regulation, compliance amongst fishers may be low. The majority of turtle fishers also agreed with regulations for the type of fishing gear and methods used to catch turtles. Of the 27 fishers who agreed with regulations, 12 suggested spearguns should be banned, 9 suggested that nets should be banned, 7 suggested turtles should only be caught by hand and 2 said that nets should be allowed.

It is interesting to note that 40% of turtle fishers disagree with the concept of open and closed zones for turtle fishing. This significant disagreement may explain why there is apparent poor compliance with the National Parks Ordinance amongst TCI's fishers.

Table 9.9 shows the opinions of the 50 turtle fishers with respect to which institutions should be responsible for setting marine turtle fishery regulations. As expected, 66% believe that the DECR should be involved in setting the regulations. Forty-two percent of these fishers also believed that fishers should be involved in the process of establishing fishery regulations. That there is less agreement among fishers on management options in TCI than in other OTs (see other OT reports) suggests fisher inclusion in the discussion of changes to the fishery in TCI will be particularly important.

## Recommendations

### 9.1.2.1. Amend harvest legislation:

TCOT recommends that the Fisheries Protection Ordinance, 1998 is amended to include the following provisions:

- 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 also yield an equivalent maximum curved carapace length for green and hawksbill turtles that should be stipulated in any amended legislation.*
- b) *Consider a continued minimum size limit, as most fishers already accept this as an established conservation measure. A suggested minimum would be 20lbs (9.07kg) with an equivalent minimum curved carapace length for green and hawksbill turtles that should also be stipulated in any amended legislation.*
- c) *Establish a limited turtle fishing licensing scheme, whereby licensed turtle fishers agree to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including statutory monthly catch reporting by fishers to DECR (including incidental catch), and voluntary reporting of all turtles caught in advance of slaughter for biometric measurement and sampling by DECR. Quotas should be reactive and based on number of licensed turtle fishers and stock assessments established through the monitoring regimes. The DECR should have the statutory power to implement spot checks at fish landing sites to assess compliance and to close the fishery if stock monitoring reveals abundance declines below a pre-established and measurable level.*
- d) *Establish a closed season to be reviewed every five years (to facilitate legislative adaptation to possible nesting season shift caused by climate change) to prevent capture of adult turtles entering TCI's waters to breed.*



**Photo 9.18.** TCOT staff sample hawksbill turtle meat at a restaurant in Providenciales (Photo S. Ranger).

The shells of green turtles tend not to be sold because the marginal scutes are used, along with plastron and the head, and are boiled to make 'jelly' for soups and stews. The intestines are cleaned and used as is all muscle tissue and the flippers. All these body parts are classed as meat for the purposes of TCOT SEQ. The portion of green turtle carapace including the costal and vertebral scutes is discarded, as is the cloaca. Hawksbill carcasses are similarly used, except the carapace is often left intact for sale or to extract the scutes for sale, because the marginal scutes cannot be used to make 'jelly' and therefore the shells are potentially worth more intact.

#### 9.7.5.1. Sale of meat by turtle fishers

The market for turtle meat in TCI appears to be driven primarily by restaurants catering to local people and special orders for turtle meat from private customers, often ordered for dinner parties and celebrations, e.g. birthdays. Indeed, turtle was served at the lunch break of the DECR-organised Annual Fishermen's Day in South Caicos in July 2003.

**Sale of whole turtles:** Eight of the 15 fishers who sell whole turtles offered information regarding the annual amount of whole green turtles they sell. They sold between 1 and 12 whole green turtles per year, with a mean of 4.7 (SD=4.3). Twelve fishers offered information on their price for whole green turtle sales, ranging from US\$2 per lb to US\$3.5 per lb with a mean of US\$2.6 (SD=0.7).

#### 9.7.5. Trade in turtle meat

Turtle meat is the primary turtle product traded from the TCI turtle fishery. Of the 35 current turtle fishers, 22 (62.9%) said that they sold turtle products, while 13 (37.1%) said that they did not. Of these 22, 15 (68.2%) sell the turtle whole, 18 (81.8%) sell the butchered meat, 8 (36.4%) sell the carapace and 2 (9.1%) sell shell pieces.

Only 2 of the 15 fishers who sell whole turtles offered information regarding the annual amount of whole hawksbill turtles they sell. They sold 1 and 12 whole hawksbill turtles per year respectively. Nine fishers offered information on their price for whole hawksbill turtle sales, ranging from US\$1 per lb to US\$3.5 per lb with a mean of US\$2.5 (SD=0.6). The fishers set these prices, which occasionally change but not significantly. Most of these fishers sell whole turtles at the fish landing site (n=10), over half sell whole turtles at the restaurants they supply (n=7), while others sell them at customers homes (n=4), at markets (n=2, both Grand Turk), on the street (n=2) and hotels (n=1). Some fishers said they charge restaurants and hotels more than they do private customers.

**Sale of butchered turtles:** Nine of the 18 fishers who sell butchered turtles offered information regarding the annual amount of butchered green turtles they sell. They sold between 1 and 12 butchered green turtles per year, with a mean of 4.7 (SD=±3.3). Sixteen fishers offered information on their price for butchered green turtle meat, ranging from US\$2 per lb to US\$3.5 per lb with a mean of US\$3.1 (SD=1).

Four of the 18 fishers who sell butchered turtles offered information regarding the annual amount of butchered

hawksbill turtles they sell. They sold between 1 and 2 butchered green turtles per year, with a mean of 1.4 (SD=0.5). Nine fishers offered information on their price for butchered hawksbill turtle meat sales, ranging from US\$0.5 per lb to US\$4.5 per lb with a mean of US\$2.7 (SD=1). The fishers set these prices, which rarely change. Most of these fishers sell butchered turtle meat at the fish landing site (n=14), some sell to the restaurants (n=5), some sell at the homes of private customers (n=4), some sell at markets (n=3) and some sell on the street (n=3).

Therefore, butchered meat is sold for more per weight than whole turtles and more fishers sell butchered meat than whole turtles. Turtle meat tends to be sold at the fish landing site, or directly to restaurants, with some sale at customer's homes and other locations. TCOT SEQ indicated that, with the exception of the fish market on Grand Turk, there were no retail outlets selling turtle meat in TCI and that leatherback and loggerhead meat is not sold.

**9.7.5.2. Sale of meat by direct vendors**

Twenty-four of the 92 TCOT SEQ interviewees worked for or owned a business that could sell turtle products, and of these 15 were restaurants, 5 gift shops, 1 a dive shop and 2 fish processing plants. Table 9.10 gives an overview of the history of sale of turtle products for these businesses.

<b>Type of business interviewed during TCOT SEQ (n=23)</b>				
	<i>Restaurant</i>	<i>Gift Shop</i>	<i>Dive Shop</i>	<i>Fish Processing Plant/ Fish market</i>
<b>No.</b>	15	5	1	2
<b>Sale of marine turtle products (n=23)</b>				
<b>No. and type of business</b>	<i>Currently selling</i> 8 restaurants (meat) [6 in Provo, 1 in GT and 1 in S Caicos] 1 fish market (meat)	<i>Formerly sold</i> 5 restaurants (meat) 1 gift shop (shells)		<i>Never sold</i> 1 restaurant 1 dive shop 1 fish processing plant 4 gift shops 1 artisan
<b>When stopped and reasons for stopping (n=6)</b>				
<b>Reason/Date</b>	<b>1970's</b>	<b>1980's</b>	<b>1990's</b>	<b>2000's</b>
<b>No demand</b>	1 gift shop (shells)	1 restaurant	2 restaurants	na
<b>Management change</b>	Na	Na	1 restaurant	1 restaurant
<b>Reasons for never selling (n=8)</b>				
<b>Reason</b>	<i>Conservation awareness</i>	<i>No demand</i>	<i>Customer influence</i>	<i>Not started to sell yet</i>
<b>Number</b>	3 gift shops	1 Gift shop 1 Fish plant 1 restaurant	1 dive shop	1 shell artisan (currently works with conch shell but plans to start making tortoiseshell jewellery)

**Table 9.10.** Overview of direct turtle product vendors from TCOT SEQ.

Table 9.10 shows that lack of demand is the dominant reason why former turtle product vendors stopped selling products, and this is also one of the main reasons why some vendors have never sold turtle products. Three vendors have never sold products because of personal conservation awareness and 1 due to customer influence, presumably because the customers also have a conservation ethic. An increased conservation ethic amongst TCI's tourists may have also resulted in the lack of demand for turtle products that led to 4 vendors ceasing sale of turtle products between the 1970s and 1990s.

All 8 vendors currently selling turtle products are selling meat only. Of these, 8 purchase green turtles, 6 purchase hawksbill turtles and 1 (restaurant) does not distinguish between the species. The fish market owner buys turtle meat on a daily basis, whereas 2 restaurants buy it weekly, 2 restaurants buy it monthly, 3 restaurants buy it on a yearly basis and 1 restaurant buys turtle meat less than yearly.

One restaurant buys meat from fishers who deliver and also buys meat from the fish landing sites at the Five Cays fish processing plants at Provo. Four restaurants only buy meat from the fishers who deliver it, as does the fish market owner in Grand Turk. Three restaurants only buy meat from fish landing sites (Quayside at Leeward Marina - Provo, Five Cays - Provo, West Road - Grand Turk) and 1 restaurant owner in Providenciales catches his own turtles. Therefore the most common route that turtle meat takes to the vendor is via direct delivery by the fishers, followed by purchase at the fish landing sites. Seven of the current vendors reported that the fishers determine the price they pay for turtle meat, whereas 1 vendor exchanges goods for the turtle meat he receives from fishers and 1 bar owner catches his own turtles.

Of the 15 current and former vendors, 12 claimed to have noticed trends in availability of turtle meat (changes in availability of other products was not recorded). Only 1 of these vendors (Grand Turk fish market owner) thought that availability of meat had increased in the last 5 years, whereas 3 thought it had decreased and 6 thought it had stayed then same (the other three vendors either did not know or did not answer the question). The fish market owner also thought that availability of turtle meat had increased since he could remember, 6 thought it had decreased and 4 thought it had stayed the same (the other 2 did not answer the question). Reasons for decreased availability included less turtles caught (n=3), less turtles available because they have been scared away (n=1) and less demand (n=1). The fish market owner thought that availability had increased because 'more turtles are being caught'.

While there are no clear trends from these answers, availability of turtle meat has probably stayed the same in the last 5 years but has decreased since the respondents could remember. However, it is interesting to note that the fish market owner claims to notice more turtles being caught in the last 5 years and since he can remember, and this may indeed be the case in Grand Turk.



**Photo 9.19.** A typical turtle stew dish at a restaurant in Providenciales (Photo P. Richardson).



**Photo 9.20.** Turtle on the menu of a restaurant in Providenciales (Photo S. Ranger).

Eleven (73.3%) of the 15 current and former vendors said that they sell/sold turtle products all year, while 4 did not answer the question. Ten of these 11 vendors said that there were no particular holidays or events when they sold more turtle products and 4 did not answer the question. However, 1 former Providenciales restaurant owner claimed that more turtle is sold to male clients during the August Carnival and the fish market owner said that he sells more turtle meat at Christmas and Easter. Therefore, turtle products are sold all year round, and there may be increased demand in Grand Turk and Providenciales during some holiday periods

Three restaurants offered information regarding the number of turtle dishes they sell per week, amounting to 12 dishes per week, 15 dishes per week and 95 dishes per week. Eight restaurants offered information about the price of their turtle dishes, which ranged from US\$5 per dish to US\$12 per dish with a mean of US\$8.7 per dish (SD=2.5). Therefore, TCI restaurants selling turtle meat may generate between approximately US\$100 to US\$760 or more gross income

per week from selling turtle dishes. It is therefore of little surprise that 2 (22.2%) of the 9 current turtle vendors said that the sale of turtle meat was very important, 3 (33.3%) said that it was somewhat important and 4 (44.4%) said it was unimportant to their business. Therefore, over half of these vendors suggested that the sale of turtle meat is of some importance to their businesses.

Of the 14 current and former turtle meat vendors (excluding the former shell vendor), 10 noticed trends in the demand of turtle products and 4 had not noticed trends. Of these 10 vendors, 1 said that demand had increased in the last 5 years, whereas 1 said that demand had decreased and 5 said that it had stayed the same. Three did not answer the question. In contrast, while 1 vendor thought that demand had increased since they could remember, 6 vendors said that demand had decreased and 3 said that it had stayed the same. Again, while trends are difficult to distinguish from these answers, demand for turtle products has probably stayed fairly constant in the last 5 years, but has decreased in the living memory of these vendors. The vendors did not provide any dominant reasons for perceived changes in demand, with only 4 offering reasons for decrease, including 'migration of people' (away from South Caicos, n=1), 'other meats available' (n=1), 'young people don't like turtle meat' (n=1) and 'less turtles caught' (n=1). These reasons were corroborated during an interview with David Bowen, the Director of the Department of Culture, who has recently written about the changing diet of Turks and Caicos Islanders (Bowen 2003). Reasons for an increase in demand included 'increased demand due to decreased availability' (n=1) and 'tourism' (n=1).

Contrary to Fleming's (2001) assertion that turtle meat is sold in 'restaurants catering for local people', tourists may well present a significant demand for turtle meat. Four (28.6%) of the 14 current and former turtle meat vendors stated that tourists were among the main purchasers of turtle meat. However, local people do provide an important market for turtle meat and 11 (78.6%) vendors stated that local people were their main customers, 1 vendor stated that expatriates were among their regular customers and 2 vendors stated that visitors from neighbouring Caribbean states were among their important customers. One restaurant owner said that Haitian and Dominican workers particularly like to eat turtle.

## Summary

While the availability and demand for turtle shell has decreased in the last few decades, there is still a thriving commercial trade in turtle meat in the Turks and Caicos Islands. Turtle dishes are financially important to the restaurants that sell them, which are found mainly in Providenciales and Grand Turk, and sold throughout the year to tourists, expatriates and mainly local people who provide a thriving demand for turtle meat dishes. This demand may have decreased in recent decades, as a diversity of imported foods has become more popular with younger generations of Turks and Caicos Islanders.

### Recommendation

#### 9.1.2.3. Recommendations regarding Multilateral Environmental Agreements and TCI national legislation

- b) Given that article III of CMS accommodates the needs of traditional subsistence users of marine turtles, the Government of TCI should consider the role of trade in the subsistence fishery economy of TCI, and limit commercial activities regarding the sale of turtle products.

#### 9.7.5.3. Consumption of turtle meat

There is a strong tradition of marine turtle consumption in the Turks and Caicos Islanders, which is still manifested in the current population. Of the 92 TCOT SEQ interviewees, 79 (85.9%) reported some form of turtle consumption, while 12 (13%) reported no use at all. 1 interviewee did not answer questions regarding use. However, this sample is not representative as there is a very strong sampling bias towards fishers, a social group that is likely to use turtle products more than other groups. Table 9.11 presents an overview of the TCOT SEQ interviewees' turtle consumption.

A significant percentage (83.7%) of interviewees has eaten or currently eats turtle meat, with over half of the sample reporting that they currently eat turtle meat. In contrast, significant percentages have never eaten eggs (65.2%), never used whole shells (81.5%) or never used worked shells (85.9%).

	Meat	Eggs	Whole shell	Worked shell
<b>Currently</b>	52	13	4	3
<b>Formerly</b>	25	18	11	8
<b>Never</b>	14	60	75	79
<b>Not recorded</b>	1	1	2	2

**Table 9.11.** An overview of the turtle consumption history of TCOT SEQ interviewees (n=92).

In the last 5 years...				
	Increasing	Decreasing	Same	Don't know
Number	1	16	15	5
%	2.7	43.2	40.5	13.5

Since you can remember...				
	Increasing	Decreasing	Same	Don't know
Number	1	20	13	2
%	2.7	54.1	35.1	5.4

**Table 9.12.** Former and current turtle meat consumers perceptions of trends in turtle meat availability (n=37).

Ten interviewees gave reasons for why they no longer eat meat, 7 of whom said it was due to ethical reasons (e.g. religion, vegetarianism and conservation), 2 said they have never had the opportunity and 1 said that they were not interested. Twenty-three interviewees gave reasons why they had stopped eating turtle meat, with no dominant reasons emerging. Seven interviewees (30.4%) said they had developed a dislike for turtle meat and 5 (21.7%) said that they no longer have the opportunity to eat turtle meat, while other reasons included the development of *allergies to turtle meat* (n=3), no longer fishing and so *no longer catch turtles* (n=3), *ethical reasons* (n=3) and *no longer interested in eating turtle meat* (n=2).

Table 9.12 shows trends in availability of turtle meat as perceived by 37 former and current turtle meat consumers. Availability appears to have decreased or stayed the same in the last 5 years and decreased since the respondents could remember.

Turtle meat is not a staple component of the diet of most the 52 current turtle meat consumers identified by the TCOT SEQ. Almost half (n=25) eat turtle meat on a yearly basis, while 16 (30.8%) eat it on a monthly basis and 5 (9.6%) eat it on a weekly basis. Two consumers eat it less than once a year and 1 has only eaten it a few times in his/her life. Three current meat consumers did not answer the question. To most of these consumers, turtle meat represents a speciality dish that is infrequently consumed. As expected from the answers of turtle fishers regarding preferred species, of the 77 current and former turtle meat consumers, 61 (79.2%) said green turtle was amongst their preferred species. Seven (9.1%) included hawksbill amongst their preferred species, while 2 said they preferred loggerhead and 1 included 'mulatto'. Eight consumers said they did not have a preference and 9 consumers did not answer the question. Thirty-one current and former turtle meat consumers offered answers about when they purchase turtle products, and 28 of these stated that they buy turtle meat all year round. The other 3 gave different answers, which included different periods in the year.

Thirty-five current and former turtle meat consumers gifted turtle meat, with 88.6% (31) gifting to friends, 68.6% (24) gifting to family and 1 respondent each reporting that they gift meat to neighbours and customers (restaurant owner). Thirty-four current and former turtle meat consumers offered information about where they purchase turtle products. Ten said they buy it at fish landing sites, 10 said they buy it in restaurants, 7 said that fishers bring it to their homes, 3 said that they buy it in the market and 4 said they receive it as gifts.

Sixty (78%) of the current and former turtle meat consumers used turtle meat for food (TCOT SEQ did not record an answer from the other 17 consumers). These consumers would cook the meat into steamed steak, stew, soup, 'turtle balls', while some consumers simply fried or boiled the meat. The 52 current turtle meat consumers stated how much turtle meat they ate per year, ranging from 0.2kg to 43.5kg per year with a mean annual consumption of 7.1kg  $\pm$  SD10.4. These 52 current turtle meat consumers are therefore eating approximately 369.2kg of turtle meat per year, although it is important to note that 63% (n=58) of the TCOT SEQ sample consisted of former and current turtle fishers, who may be more likely to eat turtle meat than other social groups. Therefore, there may be a significant bias towards turtle consumers in this sample. However, it is reasonable to assume that in a population of 20,000 people (with most being either TCI belongers, Haitians or Dominicans) in a country that has an established culture of turtle meat consumption, the number of current turtle meat consumers in TCI is one or two orders of magnitude greater than the number of current consumers identified during the TCOT SEQ. The annual consumption of turtle meat in TCI may therefore amount to thousands, and perhaps tens of thousands of kilograms of turtle meat per year.

### Summary

The availability of turtle meat has decreased or stayed the same in the last 5 years but has decreased in the living memory of TCOT SEQ respondents. It is unclear why availability has decreased. However, foraging turtle populations have either remained stable or increased in

recent decades (see section 9.6.4), while demand for turtle meat has probably decreased in recent decades (see section 9.5.6.2). Therefore, the perceived decreased availability of turtle meat is more likely to be due to a decreased turtle fishery effort in response to decline in demand, rather than declining foraging turtle populations. Bowen (2003) suggests that new, imported foods have replaced traditional TCI foodstuffs, including turtle meat. Nevertheless, despite the decreased demand for and availability of turtle meat, a demand still exists amongst locals, tourists and other visitors to the islands. TCI fishers are catching hundreds, if not thousands of turtles, mostly juvenile green turtles, each year to satisfy this demand. Turtle meat consumers primarily buy turtle meat raw at the various fish landing sites (e.g. Five Cays – Provo, West Rd - Grand Turk, Cockburn Harbour – South Caicos), buy cooked turtle dishes at a number of restaurants on Providenciales and Grand Turk, or receive raw meat delivered to their homes by fishers.

### 9.7.6. Trade in shells and shell products

#### 9.7.6.1. Sale of turtle shells

As described above, green turtle shells tend not to be sold individually but are butchered as meat. Only 3 of the 45 current turtle fishers said that they sell green turtle shells for between US\$25 and US\$50 per shell depending on the size. One of these fishers said that he sells about 5 green turtle shells per year at about US\$30 per shell. Only 1 current turtle fisher said that he currently sells 1-2 whole hawksbill turtle shells per year for about US\$50 per shell. Seven of the 15 former turtle fishers said that they used to sell hawksbill shells, usually to tourists, with 1 stating that he sold shells *'when the tourists were allowed to take them home'*. The shells were sold at between US\$25 to US\$60 each depending on the size, and were sold at customers homes (n=4), the fish landing site (n=3), market (n=1), restaurant (n=1), retail (n=1) and to tourists on yachts (n=1). In addition, 1 elderly former turtle fisher (>65 years old) recounted how, when he was a boy, his father would catch and preserve whole hawksbills to sell as curios to the foreign sailors on the boats that shipped salt out of TCI.

TCOT SEQ suggests that there was a limited trade of hawksbill and green turtle shells between TCI's fishers and tourists some years ago, but the trade seems to have largely died out. This is probably due to a decreased market as a result of increased tourist awareness regarding trade in endangered species. One fisher said that when there was a tourist market for turtle shells, the fishers would set the price. Nowadays if someone asks him for a turtle shell the customer will set the price depending on how much they are prepared to pay. While surveys of gift shops in TCI during TCOT were not exhaustive, they did not reveal any whole turtle shells for sale anywhere in TCI during field visits.

#### 9.7.6.2 Sale of shell pieces

TCOT staff did not find any evidence of worked turtle shell for sale in any retail outlets in TCI. During TCOT SEQ, 3 fishers stated that they used to sell raw turtle scutes to

foreign traders but they have not done so for a long time. One fisher stated that *'Chinese people and people from the Dominican Republic used to come to South Caicos (1986-87) to buy shell, but don't come any more'*. Prices of hawksbill scutes during this time ranged from US\$2.50 per lb to US\$20 per lb of scute, with an average price of US\$12.50 per lb (n=5).

However, 1 fisher said that he currently sells about 1 to 2 hawksbill shells worth of scutes per year and another fisher claimed that several South Caicos fishers save the scutes from the hawksbills they catch to sell to a Dominican trader who lives on South Caicos. This report was corroborated by another from an old fisherman in South Caicos, who told TCOT staff that the discarded hawksbill shells often seen in Cockburn Harbour are left there so that the connective tissue decomposes, and the scutes can be easily removed for sale to Dominican traders.

As discussed in section 9.7, there is extensive illegal trade in tortoiseshell products in the Dominican Republic, and in recent years the Japanese authorities have seized illegal imports of hawksbill scutes from Japanese businessmen travelling from the Dominican Republic. TCOT was not able to assess the status of illegal trade in hawksbill scutes between TCI and the Dominican Republic, but based on TCOT SEQ it appears that a limited trade probably continues today.

### **Recommendations**

#### **9.1.1.1. Increase the capacity of the Department of Environment and Coastal Resources and the Protected Areas Department**

- a) *Ensure DECR/PAD has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis for turtle monitoring programmes. Given the importance of all natural resources in the network of Protected Areas, and apparent poor compliance with the National Parks Ordinance, TCOT recommends that an increased capacity to effectively patrol the protected areas should be treated as a priority.*

#### **9.1.2.3. Recommendations regarding Multilateral Environmental Agreements and TCI national legislation**

- a) *CITES should be extended to TCI as soon as possible, and the appropriate domestic legislation drafted and gazetted, to address the possible trade of hawksbill scutes from TCI to neighbouring states.*

<b>Have you ever accidentally caught turtles while fishing for other target species?</b>				
	<b>Yes</b>		<b>No</b>	
<b>No.</b>	8 (7 current, 1 former fisher)		50	
<b>%</b>	13.8		86.2	
<b>No. of turtles caught accidentally each year (n=8)</b>				
<b>No. caught</b>	<b>Once</b>	<b>1-2 per year</b>	<b>3-4 per year</b>	<b>10-12 per year</b>
<b>No. respondents</b>	2	3 (incl. 1 former fisher)	1	2
<b>State of turtles caught accidentally (n=8)</b>				
	<b>Mostly alive</b>	<b>Equal dead and alive</b>	<b>Mostly dead</b>	
<b>No. of respondents</b>	8	0	0	
<b>Methods used when accidentally catching turtles (n=8)</b>				
	<b>Gill nets (for bonefish)</b>		<b>Hook and line</b>	
<b>No. of respondents</b>	3		5	
<b>Species caught (n=8, multiple answers)</b>				
	<b>Green</b>	<b>Hawksbill</b>	<b>Loggerhead</b>	
<b>No. of respondents</b>	7	2	1	
<b>Fate of turtles captured accidentally (n=8)</b>				
	<b>Release</b>	<b>Sell</b>	<b>Use</b>	
<b>No. of respondents</b>	3	2	3	
<b>Do you think other fishers accidentally catch turtles? (n=58)</b>				
	<b>Yes</b>	<b>No</b>	<b>Don't know</b>	<b>No answer</b>
<b>No. of respondents</b>	6	1	2	49
<b>What is the fate of these turtles? (n=6)</b>				
	<b>Release</b>	<b>Sell</b>	<b>Use</b>	
<b>No. of respondents</b>	0	3	3	

**Table 9.13.** Overview of incidental capture of turtles.

### 9.7.7. Incidental catch in marine fisheries

Incidental capture of turtles in TCI appears to occur at very low levels, as described by the 58 current and former fishers interviewed during TCOT SEQ. Table 9.13 gives an overview of incidental catch in TCI.

Most (86.2%) of the current and former fishers said that they did not incur incidental catch of turtles, while 7 current and 1 former fisher (13.8%) said they did. Of these, 5 accidentally catch turtles on hook and line and 3 catch them in gill nets set for bonefish. All 8 fishers report that incidentally caught turtles are usually found alive, whether in nets or on a hook and line, with 5 reporting that they either sell or use the turtles they catch. Incidental catch levels appear to be low, but this is consistent with fishing methods used to catch

conch and lobster, (i.e. diving and capture by hand or by hook). The level of current regular catch (reported by only 5 of these fishers) ranges from 1 to 12 turtles per year with a mean of about 3.5 turtles per year. The TCOT SEQ current fisherman sample represents 9.2% of the fishers licensed in TCI 2003. If the level of bycatch is representative of TCI's fishers as a whole, then annual bycatch of turtles in TCI may be at least 190 turtles per year. As can be seen in Table 9.12, most incidentally caught turtles are used and most respondents thought that other fishers would use any turtle they accidentally caught.

One fisher's recent encounter with an incidentally caught turtle is of particular interest. He snagged a hawksbill turtle 'of about 40lbs' on a bonefish line while fishing in a tidal creek

on the southern shores of North Caicos in September 2003. The turtle exhibited fibropapilloma-like symptoms, with large 'scrambled egg or cauliflower' like growths on both sides of the head and shoulders, but especially on the right side where the growth covered the eye. Despite the growths, the turtle was very energetic and put up a good fight before it was reeled in and released. Fibropapilloma may therefore be present in the TCI's foraging hawksbill population as well as in the foraging green turtle population.

## Recommendations

### 9.1.2.1. Amend harvest legislation

c) Establish a limited turtle fishing licensing scheme, whereby licensed turtle fishers agree to abide by strict regulations regarding fishery practice, limited quotas and catch recording, including statutory monthly catch reporting by fishers to DECR (including incidental catch), and voluntary reporting of all turtles caught in advance of slaughter for biometric measurement and sampling by DECR. Quotas should be reactive and based on number of licensed turtle fishers and stock assessments established through the monitoring regimes. The DECR should have the statutory power to implement spot checks at fish landing sites to assess compliance and to close the fishery if stock monitoring reveals abundance declines below a pre-established and measurable level.

### 9.1.3.2. Establish systematic monitoring efforts at index foraging sites

b) Expand the sampling regime initiated under TCOT to establish the genetic 'identity' of TCI's nesting and foraging populations. This sampling could be included as part of the surveys mentioned above and fishers participation should be encouraged where practicable. Sampling should be extensive and should include an assessment of the prevalence of fibropapilloma (FP) in the foraging, and if possible, nesting turtle populations.



Photo 9.21. DECR leaflets using turtle images.

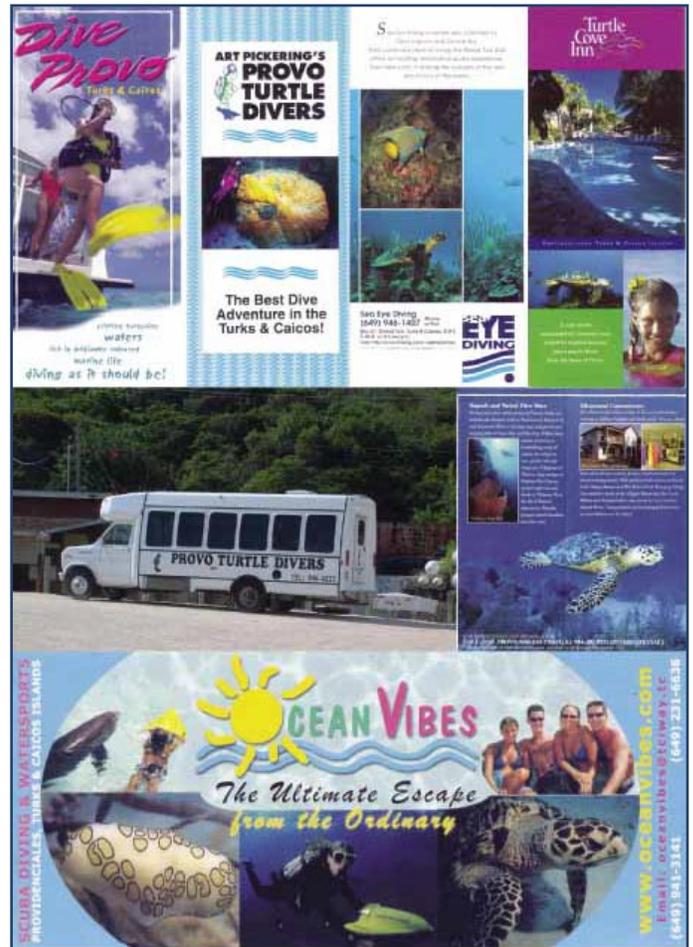


Photo 9.22. Turtle images are used to promote tourism in TCI.

## 9.8. Indirect Use

The main indirect uses of turtles in TCI include dive/snorkel tours and the sale of turtle related merchandise in tourist gift shops. The Protected Areas Department also used photographs of hawksbill turtles in a leaflet promoting TCI's national parks (*Welcome to the Turks & Caicos Islands – "Beautiful by Nature"*) and a promotional leaflet entitled *Enjoy the National Parks of Grand Turk and Salt Cay*. The Turtle Cove Inn in Providenciales uses a stylised turtle image as a logo and the names of some private residences on Providenciales refer to turtles.

### 9.8.1. Turtle watching on beaches

Turtle nesting activity appears to be restricted to remote cays and therefore turtle-watching on beaches is unlikely to be viable as mainstream tourist activity.

### 9.8.2. Dive/snorkelling tourism

Dive tourism is a significant business in TCI, with approximately 20 operators based in Providenciales (n=13), Grand Turk (n=3), Salt Cay (n=3) and North Caicos (n=1). At least 5 of these operators use photographs of hawksbill turtles in their promotional leaflets. Some of the larger dive operators also run boat trips and snorkel tours for tourists, and TCOT SEQ identified 3 individuals (2 fishers and 1 restaurant owner) who ran private boat trips including snorkel tours. One of the fishers catches turtles for consumption, but during TCOT surveys, expressed a reluctance to fish for

<b>Advertising</b>	<b>Attraction</b>	<b>Professional</b>
<i>Turtles are used as a way of promoting a service</i>	<i>Customers may see live turtles or buy turtle merchandise</i>	<i>Involvement in marine turtle research, conservation and education</i>
1 recreational fishing charter company	4 boat tour operators (incl. 1 former operator)	2 DECR employees
6 (of 10) dive operators	9 (of 10) dive operators 3 gift shops	
<b>7 (35%)</b>	<b>16 (80%)</b>	<b>2 (10%)</b>

Mean percentages of customer categories for the commercial indirect users (n=18, not incl. DECR)

<b>Local</b>	<b>Expat</b>	<b>Tourist</b>
4.1	8.4	87.3

**Table 9.14.** Summary of indirect turtle users identified during TCOT SEQ (n=20).

turtles when running snorkel trips because *'they don't like to see it'*. He would occasionally catch a turtle to show to his customers and then release it.

### 9.8.3. Aquaria holding captive turtles

There are no such facilities in the TCI other than the laboratory aquarium at the DECR office on South Caicos that was used to house some of the turtles captured by fishers specifically for TCOT tagging and sampling.

### 9.8.4. Gift Shops

There are several gift shops around the TCI, but most are found on Providenciales. Employees of 3 gift shops were interviewed during TCOT SEQ and the shops sold significant quantities of merchandise featuring turtle images, including t-shirts, key rings, fridge magnets, caps, towels, cuddly toys and games (PIC).

### 9.8.5. Data from the TCOT SEQ

Table 9.14 gives an overview of the indirect turtle users identified by TCOT SEQ. Nineteen current and 1 former indirect users answered questions about their use/involvement with turtles during TCOT SEQ, with the majority using turtles as an attraction for tourists, either as live animals in the wild or as merchandise using turtle imagery.

When asked the question, would you still use/be involved with turtles if they were no longer found in TCI, 8 (40%) said yes and 9 (45%) said no, while 3 did not answer the question. Ten (50%) respondents said that their services would stay the same if turtles were no longer found in TCI, whereas 8 (40%) said that their services would decrease. One (DECR) respondent said their services would increase (more research to investigate cause) if turtles were no longer found in TCI and the question was not applicable to the former boat trip operator. While these results suggest that the services of these indirect users are not dependent on the presence of turtles in TCI, 8 (40%) said that turtles

were very important to their services, 7 (35%) said they were somewhat important and 4 (20%) said they were unimportant, while the question was not applicable to the former boat trip operator.

The majority of these users therefore perceive turtles as important to their services. Nine out of the 10 dive operators said that their customers are generally excited when they see turtles on the dive, with 2 operators comparing tourist interest in turtles to other large marine animals they might see, such as sharks and eagle rays. All 3 gift shop owners/managers said that their customers buy merchandise with turtle images because they associate turtles with the TCI, often because they have encountered turtles while snorkelling. One Providenciales gift shop owner directs her tourist customers to 'Coral Gardens', a snorkelling site in Princess Alexandra National Park, where juvenile green turtles and occasionally hawksbills are often encountered. She said that these tourists usually return to her shop to thank her and often buy turtle-related merchandise *'as a conversational piece back home'*.

## 9.9. 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'. While details of responses to these questions have been circulated to project partners in TCI, 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 (96.7%)
- Turtles are culturally valuable in this TCI (88%)
- Turtles should be protected, regardless of their use to humans (87%)
- The government needs to actively work to protect sea turtles (85.9%)

- Turtles play an important ecological role in our natural environment (85.9%)
- Some income from tourism should be used to support sea turtle conservation (84.8%)
- As turtles are migratory, they should be managed in cooperation with neighbouring states (84.8%)
- Local people should be allowed to catch and eat sea turtles, provided it doesn't threaten the regional population (80.4%)
- Turtles are an economically valuable resource in TCI (78.3%)
- Turtles should be used both as a tourist attraction and as a source of food (70.7%)
- Local people should be allowed to purchase sea turtle meat (70.7%)
- The government needs to do more to ensure that existing laws regarding marine turtles are effectively enforced (68.5%)

- enforced (40.2% agree, 30.4% disagree)
- Tourists should be allowed to purchase sea turtle meat (51.1% agree, 42.4% disagree)

A majority of respondents disagreed that:

- Turtle fishing should be stopped completely (67.4%)
- Turtle fishing should be unregulated (65.2%)
- Tourists should be allowed to purchase sea turtle shell and take it home with them (52.2%)

These results suggest that marine turtles are considered to be ecologically and culturally important to the TCI and, therefore, there is wide support for marine turtle use, both direct and indirect, and turtle conservation in Turks and Caicos Islands. There is particularly high support for general 'feel good' statements (e.g. *It is important that sea turtles exist in the wild in the future*), and wide acceptance of the role of government in turtle conservation.

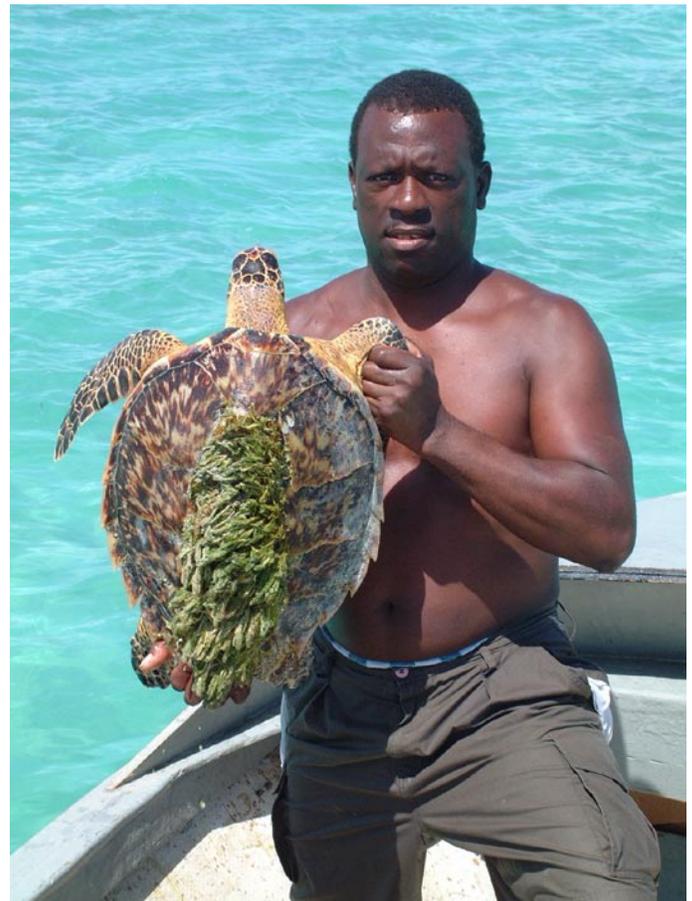
There was less agreement among the interviewees regarding the following statements:

- Turtles should be used as a tourist attraction rather than as a source of food (47.8% agree, 39.1% disagree)
- Turtle fishing should be stopped until more information is known on the size and health of the populations (44.6% disagree, 42.4% agree)
- Existing laws protecting marine turtles are effectively

More contentious are statements related to the effectiveness of current enforcement efforts, management options to assess turtle populations and the role of tourism in the local marine turtle product trade. This was reflected by the fact that over 50% of interviewees were opposed to the sale of turtle shell souvenirs to tourists. The majority of interviewees did not feel that turtle fishing should be stopped completely but felt that some regulation of the fishery is necessary.



**Photo 9.23.** Turtle merchandise for sale in a gift shop in Providenciales (Photo P. Richardson).



**Photo 9.24.** South Caicos fisher with a hawksbill turtle caught, tagged and released within the Ramsar site (Photo P. Richardson).

## 9.10. Capacity Building and Outreach Activities During TCOT

### 9.10.1. Capacity building

In September 2002, DECR officers Jasmine Parker and Amber Thomas attended the TCOT training workshop in the Cayman Islands, and Jasmine attended the Bermuda Turtle Project In-water course in August 2003 with support from the Foreign and Commonwealth Office. In addition, other DECR officers have been closely involved in some TCOT fieldwork and local fishers were involved in TCOT sampling at every opportunity. The capacity of the DECR staff to carry out marine turtle monitoring has been significantly improved through the TCOT project, but Amber Thomas has since left the DECR and therefore there is a need for further capacity building within the DECR and PAD with respect to marine turtle conservation and management.

### 9.10.2. Outreach activities

TCOT staff did not carry out any dedicated outreach activities during field visits, apart from one public presentation about turtles in TCI and TCOT that was held in September 2003 at the new Environmental Centre, Providenciales. TCOT also produced an informational leaflet entitled '*Turtles and Tourism: how you can help*', which was distributed at tourist centres throughout Providenciales and Grand Turk. Amber Thomas, formerly of DECR, carried out some educational activities with South Caicos school children, which often involved them visiting the DECR aquarium to view the turtles temporarily held captive there.

### Recommendations

#### 9.1.4.2. Implement general awareness programmes regarding marine turtle conservation in the Turks and Caicos Islands

- a) *Raise awareness among residents of the presence in TCI of distinct foraging and nesting turtle populations that contribute to the regional turtle populations, through informational materials 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 the TCI National Trust conservation awareness programmes to include curriculum-*

*linked, multi-media marine turtle related educational materials, and expand these programmes to include all schools, with those located in key fishing communities in TCI, as priority.*

#### 9.1.1.1. Increase the capacity of the Department of Environment and Coastal Resources (DECR) and the Protected Areas Department (PAD)

- a) *Ensure DECR/PAD has the capacity, staff and resources to carry out enforcement and monitoring duties relevant to marine turtle management, including data collection, entry, management and analysis for turtle monitoring programmes. Given the importance of all natural resources in the network of Protected Areas, and apparent poor compliance with the National Parks Ordinance, TCOT recommends that an increased capacity to effectively patrol the protected areas should be treated as a priority.*
- b) *It is recommended that national and international funding is sourced to support further capacity-building, as well as dedicated marine turtle population monitoring, turtle genetic sampling, turtle fishery monitoring and turtle conservation awareness and outreach programmes.*
- c) *Ensure that all new research and conservation staff are adequately trained in marine turtle biology, as well as research and conservation techniques.*

**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.*

### 9.11. Acknowledgements

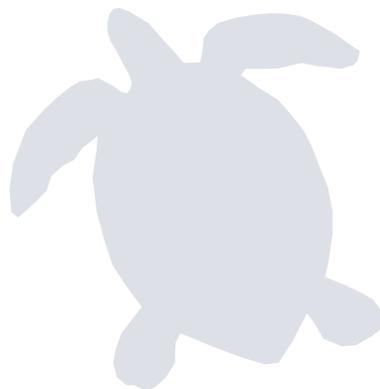
First of all we would like to thank the 92 individuals who gave up their time to answer the TCOT SEQ and who so generously shared their experiences and opinions. Their contribution is central to this report.

Throughout the planning and execution of this project, we received support from everyone we dealt with in TCI, but we would like to express our particular appreciation to a few people. Many thanks to the Deputy Director, DECR Michelle Fulford Gardner and Director Judith Campbell for all their time and help with TCOT. Without their input and logistical support the project would not have been able to operate in TCI. Special thanks are also extended to the DECR staff, especially Jasmine Parker, Tatum Fisher and Levarado who gave us so much of their time. We would also like to thank former DFGMR employees who were integral to the success of TCOT in TCI, including Amber Thomas, Duncan Vaughan and former director Mark Day. We are particularly indebted to Lorna Slade, her husband Rob Wild and their family. Lorna significantly contributed to TCOT fieldwork and coordinated Caribbean Turtlewatch, while Rob offered excellent advice in his capacity as PAD advisor. Furthermore, Rob, Lorna and family generously accommodated Peter, Sue and Lisa a number of times during TCOT fieldwork and helped them get around Providenciales, and for that we are very grateful. Jennifer Silver contributed significantly to supporting Amber and Jasmine in completing approximately 50% of the TCOT SEQ, and her independent research has contributed to our understanding of fisher responses to this research exercise. We would also like to thank Brian Riggs, Matthew Godfrey, Vin Fleming, Duncan Vaughan, Mike Pienkowski and Rob and Lorna Slade for reviewing this section. Finally, we would also like to thank all those fishers who helped out with TCOT genetic sampling in TCI and all other TCI Islanders that helped us achieve our objectives in TCI.

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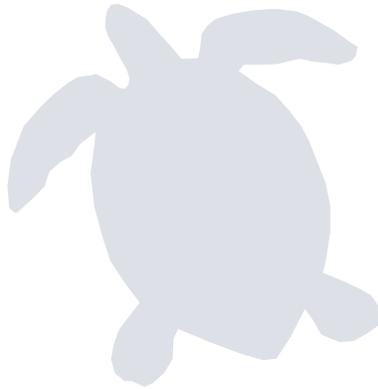


# Towards a Molecular Profile of Marine Turtles in the Caribbean Overseas Territories



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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.

## **10. Towards a Molecular Profile of Marine Turtles in the Caribbean Overseas Territories.**

<b>Contents</b>	<b>Page</b>
<b>10.1. Summary and Recommendations</b>	<b>224</b>
<b>10.2. Introduction to the Use of Molecular Markers in Marine Turtles</b>	<b>224-225</b>
<b>10.3. Background to Analyses Within TCOT</b>	<b>225</b>
<b>10.4. Samples from Anguilla, British Virgin Islands, Cayman Islands, Montserrat and Turks and Caicos Islands</b>	<b>225-229</b>
10.4.1. Methodology	225-226
10.4.2. Anguilla	226
10.4.3. British Virgin Islands	226
10.4.4. Cayman Islands	227
10.4.5. Montserrat	227
10.4.6. Turks and Caicos Islands	228
10.4.7. Overview	228-229
<b>10.5. Samples from Bermuda</b>	<b>229-230</b>
10.5.1. Introduction	229
10.5.2. Green turtles	229
10.5.3. Hawksbill turtles	229
10.5.4. Loggerhead turtles	229-230
<b>10.6. Acknowledgements</b>	<b>230</b>
<b>10.7. References</b>	<b>230-231</b>
<b>Tables 10.2-10.17</b>	<b>232-236</b>

## 10.1. Summary and Recommendations

### Summary

The genetics component of TCOT involved collection of genetic samples on a vast scale from nesting and feeding populations of green turtles (*Chelonia mydas*), hawksbills (*Eretmochelys imbricata*), loggerheads (*Caretta caretta*) and leatherbacks (*Dermochelys coriacea*) from Anguilla, the British Virgin Islands, the Cayman Islands, Montserrat and the Turks and Caicos Islands. A total of 383 samples were successfully analysed (following 530 analysis runs), including 112 from nesting females/hatchlings and 271 from foraging turtles. A fragment of the mitochondrial DNA control region was sequenced and the haplotype of each sample was determined through alignment against known sequences.

Hawksbill nesting populations in Anguilla, the British Virgin Islands (BVI), Montserrat, and Turks and Caicos (TCI) were described for the first time, and were found to exhibit six different haplotypes, two of which were previously undescribed. In the Cayman Islands we found 7 haplotypes among the Cayman Turtle Farm green turtle breeding population, and 3 among the wild nesting population. The loggerhead nesting population in the Cayman Islands exhibited 2 known haplotypes and one new one. The feeding green turtle populations at all TCOT sites combined exhibited a total of 9 different haplotypes, including two previously undescribed. The hawksbill feeding populations exhibited 14 haplotypes, 4 previously undescribed.

We compared our results with haplotype distributions for nesting and foraging ground populations in the Caribbean region and the Atlantic Ocean basin to attempt to establish possible qualitative links between sites. An overview is also presented regarding additional green turtle, hawksbill and loggerhead samples from Bermuda that have been collected by the Bermuda Turtle Project and analysed by Dr. Peter Meylan of Eckert College, USA.

A total of 446 samples are still pending analysis from Anguilla, BVI, Cayman, Montserrat and TCI. Leatherback sample analysis will be carried out in the near future in collaboration with the Dr. Peter Dutton of the Southwest Fisheries Science Center, USA.

### Recommendations

#### 10.1.1. It is recommended that sample sizes for both nesting and feeding populations are increased at all sites.

In the IUCN MTSG Techniques Manual (1999) Fitzsimmons *et al.* recommended that: “*Sampling sizes for mixed stock assessment depend on the number of candidate source populations and the level of differentiation between nesting colonies. A typical feeding ground population should include at least 100 individuals.*” Given the low genetic variability observed among certain species (such as green turtles, for example) we recommend that feeding ground studies should attempt to maximise sample sizes, to include as

many as 200 individuals wherever possible. Samples of foraging populations can be part of ongoing inwater monitoring/research protocols but should also be part of the recording process, which we highly recommend as part of all remaining marine turtle fisheries.

#### 10.1.2. We recommend that as many as possible of the potentially contributing rookeries in the region be described and their level of differentiation be carefully assessed.

Baseline rookery descriptions for mixed stock assessments should be based on larger sample sizes than what has been available to date for most populations. In addition, we recommend that a concerted effort be made to sample the greatest possible number of potentially contributing baseline rookeries worldwide. For nesting rookeries in the Caribbean OT's which are all critically reduced, sampling will be limited to as many possible individuals that can be accessed in the population, with the acknowledgement that this will confound the likelihood of finding definitive answers as to which foraging grounds are used by the remnant populations nesting in the Caribbean OT's.

#### 10.1.3. International coordination should be strengthened.

In order for the genetic results to be applied most effectively in management and conservation efforts of regional marine turtle populations a regional view must be taken. Coordinated international efforts in conservation are essential in the management of such migratory species. Through a better understanding of distribution and migratory behaviour of sea turtle populations provided through genetic studies, management strategies will be more targeted and efficient in future.

## 10.2. Introduction to the Use of Molecular Markers in Marine Turtles

Habitat use, philopatry, mating behaviour and migratory patterns play an important role in determining population structure, and molecular techniques have proved effective in gaining insights in these behaviours so difficult to observe in sea turtles (Allard *et al.* 1994; Bass *et al.* 1996; Bowen *et al.* 1995; Bowen *et al.* 1996; Dutton 1996; FitzSimmons *et al.* 1997; Karl *et al.* 1992; Meylan *et al.* 1990; Norman *et al.* 1994). Sea turtles maintain fidelity to the nesting site of birth (natal homing), which leads to strong genetic differentiation of nesting populations over time (Meylan *et al.* 1990). This variability can be detected via sequencing of the fast-evolving mitochondrial DNA (mtDNA) control region, that can provide levels of resolution appropriate to phylogeographic studies based on matrilineal inheritance (Bowen *et al.* 1992; Encalada *et al.* 1996; Lahanas *et al.* 1994; Lahanas *et al.* 1998).

In addition, mitochondrial DNA polymorphisms can be used as genetic markers, linking turtles in genetically-mixed foraging aggregations to their nesting beach origins. Recent genetic studies have demonstrated that hawksbills and green turtles recruit to foraging grounds from multiple

nesting beaches (Bass *et al.* 1996; Bass 1999; Bowen *et al.* 1996). This implies that foraging aggregations may originate from nesting beaches in a range of jurisdictions. Without knowledge of migratory patterns, the effects of threats on nesting beaches, foraging grounds, and migratory corridors cannot be evaluated for populations (Bowen 1995).

Genetic studies are key to unravelling the fundamentals of marine turtle distribution and population dynamics. Studies in the Atlantic involving or focussing on the Caribbean have been undertaken or are underway on hawksbill turtles (Bass 1999; Bass *et al.* 1996; Diaz-Fernandez *et al.* 1999; Engstrom *et al.* 2002), green turtles (Bass & Witzell 2000; Bowen *et al.* 1992; Encalada *et al.* 1996; Lahanas *et al.* 1994; Lahanas *et al.* 1998), loggerhead turtles (Bowen *et al.* 1994; Encalada *et al.* 1998; Engstrom *et al.* 2002) and leatherback turtles (Dutton 1999).

### 10.3. Background to Analyses within TCOT

At the time of the TCOT project launch, work was already underway in Bermuda and Cayman. This led to TCOT molecular work on hardshelled sea turtles being carried out in 3 ways.

1. Samples from **Anguilla, British Virgin Islands, Montserrat and Turks and Caicos Islands** were analysed by Dr. Angela Formia and Prof. Mike Bruford at Cardiff University (CU).
2. Samples from the **Cayman Islands** were already subject to a preliminary investigation by Janice Blumenthal (then Eckerd College, USA) and Dr. Peter Meylan (Eckerd College and Bermuda Turtle Project). This work was extended greatly and additional analyses were carried out by J. Blumenthal at CU under the supervision of Dr. Formia and Prof. Bruford as part of TCOT.
3. Samples from **Bermuda** have already been subject to extensive and ongoing analysis by Dr. Peter Meylan and colleagues. They opted to continue working independently but have kindly contributed a section to this report for the sake of completeness.
4. **Leatherback turtle samples** have been routed to Peter Dutton of the US National Marine Fisheries Service, Southwest Fisheries Science Centre, La Jolla California, USA. Samples will be analysed as part of PD's global leatherback genetics project. Samples and data will be stored or repatriated to OT partners upon request. Ten leatherback samples collected in Anguilla (6) and BVI (4) from nesting females have yet to be analysed.

Here we summarise the sampling and analysis, which have been undertaken to date and we give an intimation of the level of data likely to be available in the near future. Possible qualitative links are given but should be treated with great caution as not all possible links are likely and increased

sampling will be needed to allow maximum likelihood and bayesian analyses of the relative contributions of different source populations to foraging areas. Sampling during TCOT has exceeded expectations and we already have an excess of samples in hand. Additional funds have been given by Defra to run an additional 200 samples in FY 2004/05. It is expected that by Spring 2005, we will be closer to giving more quantitative answers regarding possible linkages between nesting populations and foraging grounds/harvests.

Rigorously analysed results will subsequently be made available in the peer-reviewed literature in scientific publication authored by key personnel in the UK and UK OTs. Please contact Angela Formia <formiaa@cardiff.ac.uk> for updates regarding TCOT genetics other than for Bermuda. For Bermuda we refer interested parties to Peter Meylan <meylanpa@eckerd.edu>.



**Photo 10.1.** Taking a tissue sample from a juvenile hawksbill turtle (Photo CIDoE).

### 10.4. Samples from Anguilla, British Virgin Islands, Cayman Islands, Montserrat and Turks and Caicos Islands

(Text contributed by Angela Formia and Janice Blumenthal)

#### 10.4.1. Methodology

Samples were collected from a wide variety of sources, such as nesting females, hatchlings recovered from nests, animals captured as part of turtle fisheries, dead strandings of whole individuals or old carapaces, and uncooked meat in restaurants. Each sample consisted of a tissue biopsy

		Anguilla	BVI	Cayman	Montserrat	TCI	Total
<b>Nesting Samples</b>	Farmed Green	0(0)	0(0)	48(52)	0(0)	0(0)	48(52)
	Wild Green	0(0)	0(0)	4(51)	0(3)	0(0)	4(54)
	Hawksbill	2(2)	2(2)	0(0)	3(4)	1(1)	8(9)
	Loggerhead	0(0)	0(0)	48(69)	0(0)	0(0)	48(69)
	Hybrid	0(0)	0(0)	4(4)	0(0)	0(0)	4(4)
	<b>Subtotal</b>	<b>2(2)</b>	<b>2(2)</b>	<b>104(176)</b>	<b>3(7)</b>	<b>1(1)</b>	<b>112(188)</b>
<b>Foraging/Harvest</b>	Green	16(16)	21(23)	0(0)	2(8)	17(18)	56(65)
	Hawksbill	4(5)	66(68)	103(149)	4(9)	38(46)	217(279)
	Loggerhead	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
	<b>Subtotal</b>	<b>20(21)</b>	<b>87(91)</b>	<b>103(149)</b>	<b>6(17)</b>	<b>55(64)</b>	<b>271(342)</b>
<b>Total</b>		<b>22(23)</b>	<b>89(93)</b>	<b>207(325)</b>	<b>9(24)</b>	<b>56(65)</b>	<b>383(530)</b>

**Table 10.1.** The number of samples successfully analysed as part of TCOT. (Numbers in parentheses are the number of sample analysis runs that were undertaken to obtain data).

(skin whenever available), approximately 5 mm in diameter, taken from the neck or flipper and causing minimal disturbance to live animals. All samples were stored at ambient temperature in 20% w/v DMSO in saturated NaCl.

Samples were collected by a network of researchers and field assistants throughout the study area, and posted (with all appropriate CITES permits) to Cardiff University for laboratory analysis. A total of 530 sample runs were carried out in Cardiff between the project start date and March 2004, yielding data for 383 samples (i.e. pieces of tissue), including 89 from BVI, 9 from Montserrat, 56 from TCI, 22 from Anguilla, and 207 from Cayman (see below regarding analysis failure rates). Additional sampling is ongoing, as we continue to build up the sample size available. Mixed stock analyses and population assignment tests will be carried out upon completion of all field-work and laboratory analysis.

DNA was extracted from each sample according to standard protocols (Allen *et al.* 1998; Milligan 1998). A fragment of the mtDNA was amplified using Polymerase Chain Reaction (PCR) and specific primers for each species: LTCM1 and HDCM1 for green turtles (Allard *et al.* 1994), TCR5 and TCR6 for loggerheads (Norman *et al.* 1994) and LTEi9 and H950 for hawksbills (Abreu-Grobois, unpublished). The fragments obtained varied in length between approximately 400 and 850 base pairs. Negative controls were used to test for contamination. PCR products were cleaned and sequenced in both directions using Big Dye Terminator chemistry (Applied Biosystems) and analysed with an automatic sequencer. Sequences were then aligned and edited using appropriate software and matched against previously published haplotypes. Any new haplotypes were assigned a preliminary nomenclature with the initials TCOT. Haplotype designations for green turtles and loggerheads were based on identifications summarised at <http://accstr.ufl.edu/genetics.html>. Hawksbill designations were assigned based on a haplotype classification by Abreu-Grobois. Where previously published haplotypes were based on shorter fragments than those amplified during this

study, we indicate the old nomenclature in brackets below. Resequencing of these shorter haplotypes is in progress and we refer interested parties to Abreu-Grobois at <alberto.abreu@ola.icmyl.unam.mx>. Hawksbill haplotype designations presented here are, therefore, preliminary and possible nomenclature errors will be investigated and addressed as part of the full analysis of the TCOT genetic sample base.

#### 10.4.2. Anguilla

##### i) Green turtle (see table 10.2)

###### **Nesting**

Samples tried: 0  
Data generated: 0  
Samples pending: 0

###### **Foraging**

Samples tried: 16  
Data generated: 16  
Samples pending: 35

##### ii) Hawksbill turtle (see tables 10.3 and 10.4)

###### **Nesting**

Samples tried: 2  
Data generated: 2  
Samples pending: 0

###### **Foraging**

Samples tried: 5  
Data generated: 4  
Samples pending: 17

#### 10.4.3. British Virgin Islands

##### i) Green turtle (see table 10.5)

###### **Nesting**

Samples tried: 0  
Data generated: 0  
Samples pending: 0

###### **Foraging**

Samples tried: 23  
Data generated: 21  
Samples pending: 35

##### ii) Hawksbill turtle (see tables 10.6 and 10.7)

###### **Nesting**

Samples tried: 2  
Data generated: 2  
Samples pending: 1

###### **Foraging**

Samples tried: 68  
Data generated: 66  
Samples pending: 60

#### 10.4.4. Cayman Islands

##### i) Green turtle (see tables 10.8 and 10.9)

The Cayman Turtle Farm was established in 1968, and has released over 30,000 headstarted turtles into Cayman waters. Recent papers document the long-term survival and reproductive contributions of turtle farm releases (Bell & Parsons 2002; Bell *et al.* submitted; Wood & Wood 1993). An assessment of genetic identity is necessary in order to evaluate impacts of releasing farmed turtles on wild populations, with additional relevance to issues of captive breeding and reintroduction of endangered species.

##### **Farm Turtles**

Samples tried: 52  
Data generated: 48  
Samples pending: 91

##### **Wild nesting population**

Samples tried: 51  
Data generated: 4\*  
Samples pending: 85

\*(Failed samples were degraded tissue collected from dead, non-emergent hatchlings and embryos).

##### **Foraging**

Partners in the Cayman Islands are approaching collection of sufficient samples to accurately characterize origins of foraging green turtles in the Cayman Islands. TCOT has facilitated collection of genetic samples in the Cayman Islands, and continued funding will permit sequencing of these samples in hand. A total of 35 foraging samples are in hand, but yet to be analysed.

##### ii) Hawksbill turtle (see table 10.10)

##### **Nesting**

Hawksbill nesting is reported in historical accounts (Lewis 1940) and Wood & Wood (1994) and Aiken *et al.* (2001) documented several occurrences of hawksbill nesting. However, hawksbill nesting has not been recorded in 2001-2004, and is now believed to have been extirpated (C. Bell (CIDoE) pers. comm. 2004).

##### **Foraging**

Samples tried: 149  
Samples completed: 103  
Samples pending: 58

##### iii) Loggerhead turtle (see table 10.11)

##### **Nesting**

Samples tried: 69  
Samples completed: 48  
Samples pending: 53

##### **iv) Hybrid samples**

Early anecdotal accounts of hybrid turtles were collected in Cayman and summarized in Lewis (1940), though in recent years, Carr (1967) and Wood & Wood (1994) found no evidence hybridization in the Cayman Islands. However, in 2002, the Cayman Islands Department of Environment documented two nests on Seven Mile Beach, from which

hatchlings displayed intermediate diagnostic morphological characteristics (variable numbers of prefrontal scales and lateral scutes). Based on morphological evidence, these hatchlings were believed to be *Chelonia mydas* x *Caretta caretta* hybrids. Sequencing of the mitochondrial DNA control region revealed *Caretta caretta* mtDNA sequences, while identity of the male parent awaits confirmation via analysis of single-copy nuclear (scn) DNA markers. Additionally, a juvenile, believed to be *Eretmochelys imbricata* x *Caretta caretta* based on intermediate morphological characteristics was sampled by the Department of Environment in 2002. Sequencing revealed a mitochondrial DNA sequence typical of *Caretta caretta*. Previously, *Chelonia mydas* x *Caretta caretta* hybrids have been documented in Australia, Japan, and Brazil, while *Eretmochelys imbricata* x *Caretta caretta* hybrids have been documented in Japan, Brazil, and the USA (references reviewed in Seminoff *et al.* 2003).

#### 10.4.5. Montserrat

##### i) Green turtle (see table 10.12)

##### **Nesting**

Samples tried: 3  
Data generated: 0  
Samples pending: 0

##### **Foraging**

Samples tried: 8  
Data generated: 2  
Samples pending: 0

##### ii) Hawksbill turtle (see table 10.13 and 10.14)

##### **Nesting**

Samples tried: 4  
Data generated: 3  
Samples pending: 0

##### **Foraging**

Samples tried: 6  
Data generated: 4  
Samples pending: 0

Three additional samples collected in Montserrat failed to amplify and species identification could not be confirmed. Overall, the 15 failed samples from Montserrat were taken from poor quality tissue, 9 from dead and decayed hatchlings and 2 from dead stranded adults. DNA fragments of sufficient size and quality could not be amplified despite attempting several extraction and PCR protocol variations.



**Photo 10.2.** Juveniles gathered from foraging sites for tissue sampling (Photo P. Richardson).

#### 10.4.6. Turks and Caicos Islands

##### i) Green turtle (see table 10.15)

###### **Nesting**

Samples tried: 0  
Data generated: 0  
Samples pending: 0

###### **Foraging**

Samples tried: 18  
Data generated: 17  
Samples pending: 0

##### ii) Hawksbill turtle (see table 10.16)

###### **Nesting**

Samples tried: 1  
Data generated: 1  
Samples pending: 0

###### **Foraging**

Samples tried: 46  
Data generated: 38\*  
Samples pending: 0

\*(The 8 failed samples were taken from poor quality tissue, including the inner surface of carapaces and deteriorated muscle tissue; DNA fragments of sufficient size and quality could not be extracted).

#### 10.4.7. Overview

##### **Green turtles**

Green turtle foraging samples from Anguilla, BVI, Montserrat and TCI have revealed two previously undescribed haplotypes (TCOT1 and TCOT2). Additional samples are available from individuals at Cayman, BVI, Anguilla and TCI foraging grounds, which will be analysed in future. The haplotypes exhibited by foraging individuals at all sampled sites, except Montserrat, belonged to two different and divergent haplotype groups, one which is common in the southern Caribbean and southern Atlantic rookeries (such as Suriname, Venezuela, Ascension, Guinea Bissau, Bioko, Sao Tome, Principe and Brazil), and one which is common in Mexico, Florida and Costa Rica rookeries. In other words, due to the presence of haplotypes CMA-5, CMA-8 and CMA-32 at one or several of the feeding sites analysed, we cannot exclude that rookeries in the southern Caribbean and southern Atlantic may be contributing to our Caribbean mixed aggregates, in addition to rookeries such as Tortuguero, Mexico and Florida which appear to contribute a majority of the haplotypes. Mixed stock analysis will be used to resolve the feeding stock composition based on best available data for rookery characteristics.

Vice versa, the presence of nesting haplotypes such as CMA-5 and CMA-8 in West African foraging grounds (Formia 2002) indicates that the gene flow may be occurring in both directions. In other words, rookeries in the western Atlantic such as Ascension, Suriname, Venezuela, Mexico and Brazil may be contributing individuals to African mixed stocks. It is indeed possible that future analysis of nesting green turtles in the TCOT study area may also show links with African feeding grounds.

Although green turtle rookeries throughout the Atlantic have been genetically described in several studies (Allard *et al.* 1994; Encalada *et al.* 1996; Lahanas *et al.* 1994; Lahanas *et al.* 1998), these data are currently being extended and

detailed by a number of research groups. All additional nesting samples obtained at our Caribbean study sites will be valuable contributions to understanding the overall haplotype distribution of nesting populations, and thus to correctly assigning individuals at sea to their respective rookeries of origin.

##### **Hawksbill turtle**

Insufficient data are available on the haplotype composition of hawksbill turtle rookeries found in the eastern Atlantic. It is therefore not possible, at present, to assess any potential contribution from these rookeries to mixed aggregates. None of the haplotypes found in Caribbean feeding grounds or rookeries appear to belong to highly divergent haplogroups, although hawksbill haplotypes generally exhibit greater variability than green turtles (i.e. distribution not consisting of few common and many rare haplotypes).

To date, we have analysed nesting individuals from four previously unstudied hawksbill rookeries (Anguilla, BVI, TCI and Montserrat). Among these we have identified 2 previously undescribed haplotypes (TCOT3 and TCOT6). However, it must be noted that they are both equivalent to haplotype EiA011, as designated by A. Abreu-Grobois (pers. comm. 2004). However, EiA011, like many other hawksbill haplotypes, was identified based on a much shorter sequence (approximately 500 bp) than that analysed here, not including the region where TCOT3 and 6 are differentiated. Thus, we maintained here the TCOT designations until the matter can be resolved by re-sequencing of the original EiA011 samples.

We have also found 5 haplotypes previously undescribed among foraging hawksbills (TCOT3, TCOT4, TCOT5, TCOT6, TCOT7). TCOT4, TCOT5 and TCOT7 have not yet been found among known rookeries, which may be explained by small sample sizes for sampled rookeries and/or unsampled nesting sites. Unfortunately, sample sizes available are not yet sufficient to provide accurate haplotype distributions of the nesting populations at our four study sites. Statistically significant assessments of the origin of



**Photo 10.3.** Genetics sampling, Tortola, BVI (Photo B. Godley).

individuals in foraging grounds and harvests are contingent on thorough descriptions of potentially contributing baseline rookeries and on extended sequencing of known haplotypes to include longer fragments.

### **Loggerhead Turtle**

Only the Cayman Islands have a notable loggerhead nesting population, although nesting is suspected by this species elsewhere in the TCOT range. The presence of loggerhead haplotypes, which may be unique to nesting beaches in the Cayman Islands, indicates that knowledge of genetic diversity in the Atlantic is incomplete for the species, and highlights the need for future research. Genetic diversity of small nesting beach populations is vulnerable due to exploitation both on nesting beaches and on foraging grounds overseas. However, the impacts of that exploitation cannot be assessed until genetic surveys are completed for small rookeries. Continued research on critically reduced populations such as the Cayman Islands will contribute to a crucial evaluation of loggerhead genetic diversity in the Caribbean.

**(End of Section by Formia/Blumenthal)**

## **10.5. Samples from Bermuda**

**Peter Meylan, Anne Meylan and Jennifer Gray of the Bermuda Turtle Project write:**

### **10.5.1. Introduction**

Blood or tissue samples of green turtles, hawksbills and loggerheads from Bermuda have been studied by the Bermuda Turtle Project. Preliminary results on green turtles (Engstrom *et al.* 1998) and hawksbills (Meylan *et al.* 2004) have been presented at the International Symposia on Sea Turtle Biology and Conservation. In all cases, published control region primers have been used to amplify sequences of approximately 550bp. In most cases, a sequence was generated in one direction and aligned with a published sequence for confirmation. Most of the green turtle samples were initially processed by students in Eckerd College genetics classes. These students isolated and amplified DNA from a small subsample of blood or tissue. They then cleaned the PCR product which was sent to the BEECS lab at the University of Florida for sequencing. Edited sequences were returned from UF and aligned by students who made the initial haplotype determination. Haplotype determinations were confirmed before being added to the database. Hawksbill and loggerhead samples were processed entirely by the BEECS lab.

### **10.5.2. Green turtles**

As of December 2003, 1222 genetics samples from Bermuda green turtles have been collected. Control region sequences are now available for 128 of these, with about 30 more in various stages of completion. Among the sequenced samples are at least 10 different genotypes, seven of which match published haplotypes and three of which have not been published to our knowledge. These haplotypes represent, at a minimum, contributions from

three different nesting beaches, but may represent all eight of the major green turtle nesting aggregations in the Atlantic (not including Mediterranean). Just over one hundred of these sequences represent a random sample from the available genetic material collected by the Bermuda Turtle Project. They are being used to estimate stock contribution to the green turtle aggregation in Bermuda. The remaining samples were not chosen at random but instead were selected for sequencing after we learned of an individual turtle's capture in another country. These samples, which are presumed to represent the various feeding grounds of the population, have been processed to test for patterns of dispersal from Bermuda that may be explained by genotype. Because they were not selected at random, they are not used in the mixed stock analysis.

### **10.5.3. Hawksbill turtles**

There are now approximately 80 genetic samples of hawksbills available from Bermuda. Control region sequences have been generated for 58 turtles that were identified as hawksbills based on morphology. However, four of these have turned out to be hawksbill X loggerhead hybrids, that is, they had mitochondrial genomes of *Caretta*. Among the remaining 54 sequences, there are at least eight haplotypes. Five of these match published haplotypes from around the Caribbean, three are unpublished to our knowledge. About half of these data are from animals that were captured alive and in good health; the other half are from stranded animals.

### **10.5.4. Loggerhead turtles**

The stranding network at the Bermuda Aquarium has made a diligent effort over the last 10 years to take genetic samples from the few loggerheads that strand in Bermuda each year. A total of 43 samples are now available. Of these, 31 have been sequenced so far; four others are in various states of completion. This relatively small sample is highly informative, containing as many different haplotypes as the larger samples of hawksbills and greens. With a sufficiently large sample size, these results will allow us to



**Photo 10.4.** Samples from hatched nests are also used in analyses (Photo B. Godley).



**Photo 10.5.** TCOT staff sample hawksbill turtle meat at a restaurant in Providenciales, TCI (Photo S Ranger).

determine the nesting beaches of origin of the contingent of post-hatchling loggerheads that are observed in Bermuda waters and/or strand on Bermuda beaches on a nearly annual basis.

**(End of section by Meylan, Meylan and Gray)**

## 10.6. Acknowledgements

The molecular analysis is one of the major endpoints of all TCOT endeavours and in some way has involved almost every member of all project partners. For this effort we are very grateful. Individuals and organisations are acknowledged in OT-specific chapters. The TCOT staff would like to acknowledge the candid and generous collaboration of Janice Blumenthal, Mike Bruford, Angela Formia, Jennifer Gray, Anne Meylan and Peter Meylan in the production of this overview of the progress to date. We acknowledge the assistance of the UK CITES management authority at Defra. Finally, many thanks to those who offered constructive peer review which greatly helped improve its clarity of reporting: Alberto Abreu-Grobois, Vin Fleming, Jennifer Gray and Peter Meylan.

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**Photo 10.6.** Sampling procedures being demonstrated at the TCOT Workshop, CI (Photo P. Richardson).

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Haplotype	Nesting	Foraging
CM-A1	Florida, Mexico	Bahamas, Florida, Nicaragua, Barbados, Anguilla, BVI, TCI
CM-A3	Florida, Mexico, Costa Rica, Aves	Bahamas, Florida, Barbados, Anguilla, BVI, TCI, Montserrat
CM-A5	Mexico, Aves, Suriname, Sao Tome	Bahamas, Florida, Nicaragua, Barbados, West Africa, Anguilla, BVI, TCI, Montserrat
CM-A8	Bioko, Ascension, Guinea Bissau, Sao Tome, Principe, Brazil	Anguilla, TCI, West Africa
New (TCOT1)	Not yet identified	Anguilla

**Table 10.2.** Green turtle haplotypes recorded in foraging grounds in Anguilla and the nesting and foraging aggregations where turtles with these markers have previously been described (Encalada *et al.* 1996; Formia 2002; Lahanas *et al.* 1994; Lahanas *et al.* 1998; This Study).

Haplotype	Nesting	Foraging
EIA023 (Q, MXI)	Anguilla, Mexico	Anguilla, BVI, Cuba, Mexico, Puerto Rico, TCI
New (TCOT3)	Anguilla, Montserrat, TCI	Anguilla, BVI, Montserrat, TCI

**Table 10.3** Hawksbill turtle haplotypes recorded in nesting turtles in Anguilla, and the nesting and foraging aggregations where individuals with these markers have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996, Bowen *et al.* 1996, Diaz-Fernandez 1999, This Study).

Haplotype	Nesting	Foraging
EIA001 (A, CU1)	Antigua, Barbados, Brazil, Cuba, Montserrat, Puerto Rico, USVI	Anguilla, BVI, Cuba, Montserrat, Puerto Rico, TCI, CI
EIA023 (Q, MXI)	Anguilla, Mexico	Anguilla, BVI, Cuba, Mexico, Puerto Rico, TCI
New (TCOT3)	Anguilla, Montserrat, TCI	Anguilla, BVI, Montserrat, TCI

**Table 10.4.** Hawksbill turtle haplotypes recorded in foraging turtles in Anguilla and the nesting and foraging aggregations where turtles with these markers have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).

Haplotype	Nesting	Foraging
CM-A1	Florida, Mexico	Anguilla, Bahamas, Barbados, BVI, Florida, Nicaragua, TCI
CM-A3	Aves, Costa Rica, Florida, Mexico	Anguilla, Bahamas, Barbados, BVI, Florida, Montserrat, TCI
CM-A5	Aves, Mexico, Sao Tome, Suriname,	Anguilla, Bahamas, Barbados, BVI, Florida, Montserrat, Nicaragua, TCI, West Africa
CM-A28	Unpublished	BVI, unpublished
CM-A32	Ascension and unpublished	BVI, unpublished
New (TCOT2)	Not yet identified	BVI

**Table 10.5.** Green turtle haplotypes recorded in foraging turtles in the BVI and the nesting and foraging aggregations where turtles with these marker have previously been described (Encalada *et al.* 1996; Formia 2002; Formia *et al.* unpublished-b; Lahanas *et al.* 1994; Lahanas *et al.* 1998; This Study).

Haplotype	Nesting	Foraging
EIA009 (c, F)	Belize, BVI, Cuba, Puerto Rico, USVI	BVI, Cuba, Mexico, Puerto Rico, TCI, CI
New (TCOT6)	BVI	Not yet identified

**Table 10.6.** Hawksbill turtle haplotypes recorded in hatchlings/nesting turtles in the British Virgin Islands and the nesting and foraging aggregations where turtles with these markers have previously been described (Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).

Haplotype	Nesting	Foraging
EIA001 (CU1, A)	Antigua, Barbados, Brazil, Cuba, Montserrat, Puerto Rico, USVI	Anguilla, BVI, Cuba, Montserrat, Puerto Rico, TCI, CI
EIA002 (g, alpha)	Not yet identified	BVI, Cuba, Puerto Rico, TCI, CI
EIA009 (c, F)	Belize, BVI, Cuba, Puerto Rico, USVI	BVI, Cuba, Mexico, Puerto Rico, TCI, CI
EIA020 (PR2, N)	Puerto Rico	BVI, Cuba, Puerto Rico, TCI
EIA023 (Q, MXI)	Anguilla, Mexico	Anguilla, BVI, Cuba, Mexico, Puerto Rico, TCI
EIA024 (Q, MXII)	Mexico	BVI, Cuba, Mexico, Puerto Rico, TCI, CI
EIA029 (CU3)	Cuba	Cuba, BVI
New (TCOT3)	Anguilla, Montserrat, TCI	Anguilla, BVI, Montserrat, TCI,
New (TCOT4)	Not yet identified	BVI
New (TCOT5)	Not yet identified	BVI

**Table 10.7.** Hawksbill turtle haplotypes recorded in foraging turtles in the British Virgin Islands and the nesting and foraging aggregations where turtles with these markers have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).

Haplotype	Nesting	Foraging
CM-A1	Florida, Mexico	Anguilla, Bahamas, Barbados, BVI, Florida, Nicaragua, TCI
CM-A3	Aves, Costa Rica, Florida, Mexico	Anguilla, Bahamas, Barbados, Florida, BVI, Montserrat, TCI
CM-A5	Aves, Mexico, Suriname, Sao Tome	Anguilla, Bahamas, Barbados, BVI, Florida, Montserrat, Nicaragua, West Africa
CM-A16	Mexico	TCI
CM-A17	Mexico	Barbados
Unpublished	Unpublished	

**Table 10.8.** Green turtle haplotypes recorded in the Cayman Turtle Farm and the nesting and foraging aggregations where turtles with these markers have previously been described (Encalada *et al.* 1996; Formia *et al.* unpublished-b; Lahanas *et al.* 1994; Lahanas *et al.* 1998; This Study).

Haplotype	Nesting	Foraging
CM-A1	Florida, Mexico	Bahamas, Barbados Florida, Nicaragua
CM-A3	Aves, Costa Rica, Florida, Mexico	Bahamas, Barbados Florida
Unpublished	Unpublished	Unpublished

**Table 10.9.** Green turtle haplotypes recorded in Cayman Islands nesting turtles/hatchlings and the nesting and foraging aggregations where turtles with these markers have previously been described (Encalada *et al.* 1996; Lahanas *et al.* 1994; Lahanas *et al.* 1998; This Study).

Haplotype	Nesting	Foraging
EIA001 (CU1, A)	Antigua, Barbados, Brazil Cuba, Puerto Rico, USVI	Anguilla, BVI, Cuba, Montserrat, Puerto Rico, TCI
EIA002 (g, alpha)	Cuba	Cuba, Puerto Rico, TCI
EIA003 (B, e)	Antigua	Mexico, Puerto Rico
EIA009 (c, F)	Cuba, Belize, Puerto Rico, USVI,	BVI, Cuba, Mexico, Puerto Rico, TCI
EIA018 (PR3, L)	Puerto Rico	Cuba, Puerto Rico
EIA024 (Q, MXII)	Mexico	BVI, Cuba, Mexico, Puerto Rico, TCI
EIA028 (b)	Not yet identified	Puerto Rico, TCI
EIA029 (CU3)	Cuba	Cuba, BVI
Unpublished	Unknown	Foraging only
New	Unknown	Cayman Islands

**Table 10.10.** Hawksbill turtle haplotypes recorded in foraging turtles in the Cayman Islands and the nesting and foraging aggregations where turtles with these markers have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).

Haplotype	Nesting	Foraging
B	Florida, North East FL – NC, Mexico, Greece-SE Mediterranean	Chiriqui Lagoon Panama, Eastern Atlantic
J	Mexico, Greece-SE Mediterranean	Chiriqui Lagoon Panama, Eastern Atlantic
Novel Haplotype	Cayman Islands	Not yet identified

**Table 10.11.** Loggerhead haplotypes recorded in nesting turtles/hatchlings in the Cayman Islands and the nesting and foraging aggregations where turtles with these markers have previously been described (Encalada *et al.* 1998; Engstrom *et al.* 2002; Laurent *et al.* 1998; This Study).

Haplotype	Nesting	Foraging
CM-A3	Florida, Mexico, Costa Rica, Aves	Bahamas, Florida, Barbados, Anguilla, BVI, TCI, Montserrat
CM-A5	Mexico, Aves, Suriname, Sao Tome	Bahamas, Florida, Nicaragua, Barbados, West Africa, Anguilla, BVI, TCI, Montserrat

**Table 10.12.** Green turtle haplotypes recorded in foraging turtles from Montserrat and the nesting and foraging aggregations where turtles with these markers have previously been described (Encalada *et al.* 1996; Formia 2002; Formia *et al.* unpublished-b; Lahanas *et al.* 1994; Lahanas *et al.* 1998; This Study).

Haplotype	Nesting	Foraging
EIA001 (CU1, A)	Antigua, Barbados, Brazil, Cuba, Montserrat, Puerto Rico, USVI	Anguilla, BVI, Cuba, Montserrat, Puerto Rico, TCI, CI
New (TCOT3)	Anguilla, Montserrat, TCI	Anguilla, BVI, Montserrat TCI

**Table 10.13.** Hawksbill turtle haplotypes recorded in nesting turtles from Montserrat and the nesting and foraging aggregations where these markers have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).

Haplotype	Nesting	Foraging
EIA001 (CU1, A)	Antigua, Barbados, Brazil, Cuba, Montserrat, Puerto Rico, USVI	Anguilla, BVI, Cuba, Montserrat, Puerto Rico, TCI, CI
New (TCOT3)	Anguilla, Montserrat, TCI	Anguilla, BVI, Montserrat TCI

**Table 10.14.** Hawksbill turtle haplotypes recorded in foraging turtles from Montserrat and the nesting and foraging aggregations where these markers have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).

Haplotype	Nesting	Foraging
CM-A1	Florida, Mexico	Bahamas, Florida, Nicaragua, Barbados, Anguilla, BVI, TCI
CM-A3	Aves Costa Rica, Florida, Mexico	Anguilla, Bahamas, Barbados, BVI, Florida, Montserrat, TCI
CM-A5	Aves, Mexico, Sao Tome, Suriname	Anguilla, Bahamas, Barbados, BVI, Florida, Montserrat, Nicaragua, TCI, West Africa
CM-A8	Ascension, Bioko, Brazil, Guinea Bissau, Principe, Sao Tome	Anguilla, TCI, West Africa
CM-A16	Mexico	TCI

**Table 10.15.** Green turtle haplotypes we recorded in foraging turtles from the Turks and Caicos Island and the nesting and foraging aggregations where turtles with these markers have previously been described (Encalada *et al.* 1996; Formia 2002; Formia *et al.* unpublished-a; Formia *et al.* unpublished-b; Lahanas *et al.* 1994; Lahanas *et al.* 1998; This Study).

<b>Haplotype</b>	<b>Nesting</b>	<b>Foraging</b>
<b>New (TCOT3)</b>	Anguilla, Montserrat, TCI	Anguilla, BVI, Montserrat, TCI

**Table 10.16.** Hawksbill turtle haplotypes recorded in hatchling/nesting turtles from the TCI and the nesting and foraging aggregations where turtles with this marker have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).

<b>Haplotype</b>	<b>Nesting</b>	<b>Foraging</b>
<b>EIA001 (CU1, A)</b>	Antigua, Barbados, Brazil, Cuba, Montserrat, Puerto Rico, USVI,	Anguilla, BVI, Cuba, Montserrat, Puerto Rico, TCI, CI
<b>EIA002 (g, alpha)</b>	Not yet identified	BVI, Cuba, Puerto Rico, TCI, CI
<b>EIA003 (e, B)</b>	Antigua	Mexico, Puerto Rico, TCI, CI
<b>EIA009 (c, F)</b>	Belize, BVI, Cuba, Puerto Rico, USVI	BVI, Cuba, Mexico, Puerto Rico, TCI, CI
<b>EIA020 (PR2, N)</b>	Puerto Rico	BVI, Cuba, Puerto Rico, TCI
<b>EIA023 (Q, MXI)</b>	Anguilla, Mexico	Anguilla, BVI, Cuba, Mexico, Puerto Rico, TCI
<b>EiA024 (Q, MXII)</b>	Mexico	BVI, Cuba, Mexico, Puerto Rico, TCI, CI
<b>EIA028 (b)</b>	Not yet identified	Puerto Rico, TCI, CI
<b>New (TCOT3)</b>	Anguilla, Montserrat, TCI	Anguilla, BVI, Montserrat, TCI
<b>New (TCOT7)</b>	Not yet identified	TCI

**Table 10.17.** Hawksbill turtle haplotypes recorded in foraging turtles from the TCI and the nesting and foraging aggregations where turtles with these markers have previously been described (A. Abreu-Grobois pers. comm. 2004; Bass *et al.* 1996; Bowen *et al.* 1996; Diaz-Fernandez 1999; This Study).





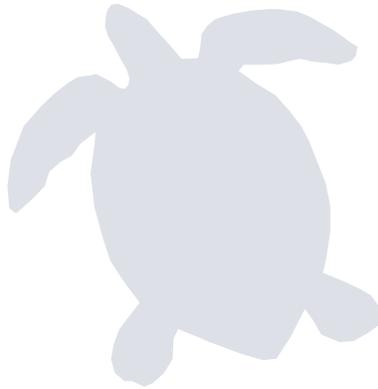
# Capacity Building and Support: Essential Components of TCOT



Foreign & Commonwealth  
Office



**defra**  
Department for Environment  
Food and Rural Affairs



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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.

# 11. Capacity Building and Support: Essential Components of TCOT

## Contents

	Page
<b>11.1. Summary</b>	<b>238-241</b>
<b>11.2. TCOT Training Workshop</b>	<b>241</b>
<b>11.3. TCOT Training Workshop CD</b>	<b>241</b>
<b>11.4. International Field Course -</b> <i>Biology and Conservation of Sea Turtles, Bermuda 2003</i>	<b>241-244</b>
<b>11.5. Additional TCOT technical and practical assistance</b>	<b>244-247</b>
11.5.1. Tagging and genetics sampling equipment	244
11.5.2. Technical advice notes	244
11.5.3. TCOT datasheets	244
11.5.4. Continuous practical in-situ support	244-246
11.5.5. Regional email listserv	246
11.5.6. TCOT Bibliography	247
11.5.7. Additional grants	247
11.5.8. Dissemination of TCOT outputs	247
<b>11.6. Acknowledgements</b>	<b>247</b>
<b>11.7. References</b>	<b>247</b>

## 11.1. Summary

In recent years, the lack of collaborative research and monitoring of biodiversity in the UK Overseas Territories has been recognised as a serious impediment to the formation of effective conservation strategies (Oldfield & Sheppard 1997). Such strategies are particularly necessary in some Territories in order to mitigate the adverse environmental impacts of intensive development pressures. Generally, marine turtle research, conservation and management have been neglected in some UK Overseas Territories in the Caribbean and consequently little is known about many turtle populations there. While Bermuda, the British Virgin Islands, the Cayman Islands and Montserrat had initiated varying degrees of local marine turtle population monitoring and research prior to TCOT, little monitoring had occurred in Anguilla and the Turks and Caicos Islands.

From the outset, TCOT was designed to meet its objectives through collaborative research involving key project partners in each UK Overseas Territory in the Caribbean. This approach was intended to facilitate appropriate and sympathetic logistical design of local research programmes, and had the potential to leave a legacy of skills and motivation required to establish long-term monitoring of marine turtle populations. Inevitably, TCOT required a significant capacity-building element in order to introduce required knowledge and methodological skills where they were absent and to standardise existing knowledge and methodologies between the Territories. Thus, TCOT initiated a range of activities to build capacity for marine turtle conservation and management amongst the local TCOT project partners and associates.

As a result of TCOT capacity building, officers in project partner institutions carried out genetic sampling and tagging programmes independently of TCOT staff field trips in Anguilla, British Virgin Islands, Cayman Islands, Montserrat and the Turks and Caicos Islands (Bermuda's sampling programme is ongoing and was not affected by TCOT capacity building). Foraging population monitoring



**Photo 11.1.** James Gumbs inspects tracks at Windward Point, Anguilla (Photo S. Ranger).



**Photo 11.2.** Sue Ranger and Lisa Campbell during TCOT SEQ in Anguilla (Photo P. Richardson).

occurred independently of TCOT staff field visits in the British Virgin Islands, Cayman Islands and the Turks and Caicos Islands, and nesting site monitoring occurred to varying degrees in Anguilla, British Virgin Islands, Cayman Islands and Montserrat (there is no nesting in Bermuda and TCOT surveys revealed nesting in the Turks and Caicos is now restricted to remote cays).

Arguably, the socio-economic survey component of the capacity building programme was least successful in terms of facilitating project partner activity independent of TCOT staff field trips, although some surveys were carried out independently of TCOT staff field visits in Bermuda, British Virgin Islands, Cayman Islands and to some extent in the Turks and Caicos Islands. However, in all Territories except Bermuda and the Cayman Islands, additional TCOT staff field visits were needed to collect the required socio-economic survey sample.

The relative failure of the socio-economic survey capacity building was due to a number of factors. First, none of the project partner officers tasked with this survey had any social science training (whereas many had previous biological training) and were therefore reluctant to take responsibility for a survey they did not fully understand. Second, there was a conflict of interests with many of the project partner officers who are professionally responsible for law enforcement. Some sections of the socio-economic



Photo 11.3. Participants of the TCOT Training Workshop (Photos P. Richardson and S. Ranger).

questionnaire solicit information from interviewees about potentially illegal activities and therefore some project partner officers were uncomfortable about soliciting this information without recourse to legal action (and their effectiveness in gathering such information from fishermen could be questioned). Indeed, in the Cayman Islands and Bermuda, where the survey was implemented without the need for intensive TCOT staff time, individuals not associated with law enforcement carried out the questionnaire surveys. Third, the socio-economic questionnaire is a long and complex document, and the survey interviews sometimes took two hours to complete. Therefore, to achieve adequate sampling, this survey had the potential to take up an enormous amount of any one project partner officer's time budget, and in most cases the project partner institutions could not afford to allocate sufficient time to the officers concerned. Regardless of these constraints, project partners participating in this component of the work undoubtedly gained skills and confidence in the work through the process. For example, while additional resources and personnel were needed to facilitate survey completion in TCI, a TCI partner was present for and often played an active role in the administration of almost all surveys conducted. Furthermore, as the survey was intended as a one-time data gathering activity, as opposed

to the biological monitoring protocols put in place, lack of success in this area of skills transfer should not impact on TCOT's legacy.

Capacity building in other research methodologies was relatively successful, and as a result of TCOT significant additional marine turtle data collection has been achieved in all the UK Overseas Territories in the Caribbean (with the exception of Bermuda). However, some project partner institutions also encountered logistical problems in allocating the relevant officers with sufficient time and resources to carry out the biological sampling and monitoring. In these cases, monitoring and sampling effort was also heavily subsidised by and dependent on TCOT staff time during their field visits. Inevitably, project partner institutions will experience some staff turnover, and already two of the project partner officers who attended the TCOT Workshop have left their positions. Nevertheless, as a result of TCOT capacity building, long-term monitoring projects have been strengthened or established in the British Virgin Islands, Cayman Islands and Montserrat and there is now significantly greater interest in establishing such programmes amongst the project partner institutions in Anguilla and the Turks and Caicos Islands.

<b>TCOT Project Partner</b>	<b>Delegates</b>
<b>Anguilla</b> - Department of Fisheries & Marine Resources,	James Gumbs
<b>Bermuda</b> - Bermuda Turtle Project	Jennifer Gray
<b>British Virgin Islands</b> - Department of Conservation and Fisheries	Arlington Pickering, Mervin Hastings
<b>Cayman Islands</b> – Cayman Islands Department of Environment	Gina Ebanks-Petrie, Timothy Austin, John Bothwell, Joni Solomon, Catherine Bell, Janice Blumenthal, Jon Clamp, Nell Beaumont (volunteer).
<b>Cayman Islands</b> – Cayman Islands National Trust	Matt Cottam
<b>Cayman Islands</b> – Cayman Turtle Farm	Ken Hydes, Joe Parsons, Jose Bodden, Michael Finelli
<b>Montserrat</b> - Government of Montserrat	John Jeffers
<b>Turks and Caicos Islands</b> – Department of Environment and Coastal Resources	Amber Thomas, Jasmine Parker
<b>Marine Turtle Research Group</b> , UK (TCOT Project Co-ordinator)	Brendan Godley
<b>Marine Conservation Society</b> , UK (TCOT Team)	Peter Richardson, Sue Ranger
<b>Duke Marine Laboratory</b> , USA (TCOT Team)	Lisa Campbell
<b>Wider Caribbean Sea Turtle Conservation Network (WIDECAST)</b> , USA	Karen Eckert

**Table 11.1.** Delegates of the TCOT Regional Training Workshop: Marine Turtle Research and Monitoring.

However, with further support it is conceivable that the project partner institutions in Anguilla and the Turks and Caicos Islands could establish their own marine turtle monitoring programmes. This chapter documents the capacity building initiatives that were carried out under TCOT.

## 11.2. TCOT Training Workshop

The initial phase of TCOT's capacity building programme commenced with the 'TCOT Regional Training Workshop: Marine Turtle Research and Monitoring' hosted by TCOT project partners the Cayman Island Department of Environment (CIDoE) and the Cayman Turtle Farm in summer 2002.



The workshop was funded by the Foreign and Commonwealth Office's Environment Fund for the Overseas Territories (EFOT) and took place between the 27th August and the 2nd September. 24 delegates attended the Workshop, with at least one representative from each of the Territories within the remit of TCOT (see table 11.1).

The workshop involved classroom discussion components covering the following areas: current status of marine turtle research in the Territories; marine turtle biology; research protocols; socio-economic questionnaire surveys; the WIDECAST tagging programme; foraging site transect methodology and project fundraising. Marine turtle nesting track identification videos, donated by the Florida Fish and Wildlife Service, were handed out to all delegates along with key publications and other materials sourced by Dr Karen Eckert of WIDECAST. WIDECAST also provided metal flipper tags and pliers, series of which were allocated to and disbursed among the delegates.

Practical sessions were held at the CIDoE, the Cayman Turtle Farm, at monitored turtle rookeries and on CIDoE research vessels covered field methodologies such as marine turtle hand-capture, tagging, measuring, genetic sampling, nest-excavation and socio-economic questionnaire interview techniques. The Cayman Turtle Farm hosted a guided tour of the Farm, explained the complexities of commercial production of marine turtles for consumption and donated the Workshop dinner and entertainment. Notes on the Workshop proceedings are included in Appendix 11.1.

## 11.3. TCOT Training Workshop CD

As a result of the workshop, TCOT produced resource CDs for all workshop delegates and other TCOT project partners. The content of the 2 CDs is summarised in table 11.2 below.

## 11.4. International Field Course - *Biology and Conservation of Sea Turtles, Bermuda 2003*

Each year the Bermuda Aquarium and Zoo hosts an 'In-water marine turtle biology and conservation course' in collaboration with Drs Peter and Anne Meylan as part of the Bermuda Turtle Project. Brendan Godley participated in the course in 2002 during a TCOT field visit to Bermuda, at the same time as Catherine Bell (CIDoE, Cayman Islands) and James Gumbs (DFMR, Anguilla), whose attendance was organised independently of TCOT. Consequently, the TCOT team realised the utility of the course for project partners and in 2003, designed a proposal to increase TCOT project partner attendance of the course. The proposal was submitted by MCS, with support from the 6 relevant Governor's offices, to the FCO's Environment Fund for the Overseas Territories, who agreed to fund course attendance of 5 officers from TCOT project partner institutions and Peter Richardson of the MCS. Course attendees funded by the grant are listed in table 11.3. This grant also funded Jennifer Gray's attendance of the 24<sup>th</sup>

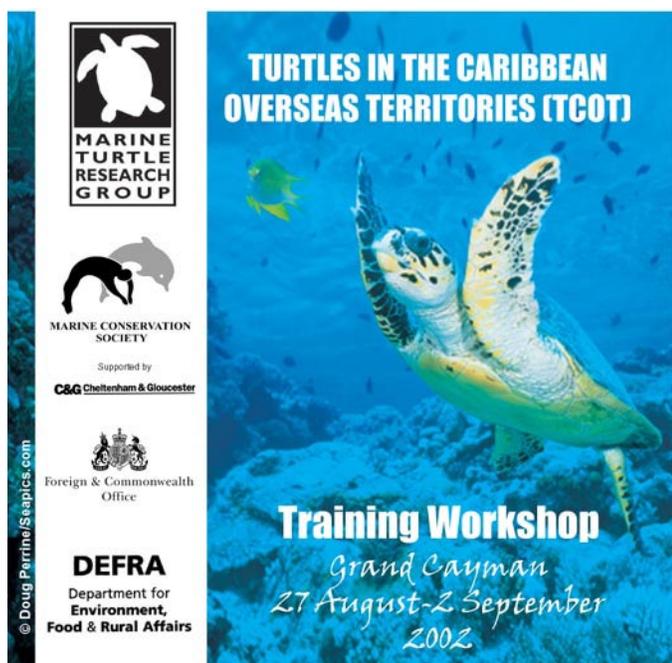


Photo 11.4. TCOT Training Workshop CDs (Photo S. Ranger).

## **CD1 - TCOT Workshop**

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<b>1.1. General</b>	TCOT Workshop briefing document, TCOT Workshop Proceedings Notes (incl. contact details of all participants), TCOT Participants contact list, DEFRA TCOT leaflet for CITES CoP12, WIDECAS recommendations for a regulatory framework for marine turtle management.
<b>1.2. TCOT partner country reports</b>	Microsoft PowerPoint presentations given at the TCOT workshop by Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Montserrat and Turks and Caicos Islands.
<b>1.3. TCOT introduction, methodology and conservation issues</b>	Microsoft PowerPoint presentations given at the TCOT workshop including: Introduction to TCOT, Marine Turtle Biology and TCOT Methodology, Bermuda Turtle Project Net Sampling Methodology, Cayman Genetic Analysis Overview, Cayman In-water Hand Capture Methodology, Introduction to Socio-Economic Assessment, Questionnaire Explanation, Sea Turtle Project Data Management, Sea Turtles and Light Pollution, Turtle Conservation in Japan, Why Tag a Sea Turtle (WIDECAS tag programme).
<b>1.4. Fundraising</b>	Guidance notes, application forms and contact details for over 20 sources of funding relevant to marine turtle conservation and research in the Overseas Territories including: BP Conservation, British Airways, British Chelonia Group, Chelonia Research Foundation, Conservation, Food and Health Foundation, Darwin Initiative, Department of Food and Rural Affairs/ Flora & Fauna International, Foreign and Commonwealth Office, Global Greengrants Fund, MCS Turtle Conservation Fund, National Wildlife Federation, National Fish and Wildlife Service, PADI, People's Trust For Endangered Species, and others.
<b>1.5. Photographs</b>	Over 200 photographs, mostly from the MCS marine turtle photo library along with contributions from the CIDoE, arranged into categories including: Conservation, Research and awareness, Harvest, TCOT workshop, Threats, Tiger shark photographs, Turtle pictures.
<b>1.6. Press coverage</b>	Press releases, newspaper and internet articles about the TCOT Workshop.
<b>1.7. TCOT bibliography, MTRG publications and other scientific papers.</b>	The TCOT Bibliography, a Seaturtle.org ID key, as well as 35 .pdf format papers from the Marine Turtle Research Group, arranged into categories including: Diving behaviour, hatchling development, nesting, pollution, research methods, satellite telemetry, status estimates.
<b>1.8. TCOT monitoring protocols and sample datasheets</b>	The TCOT research protocols as well as 6 different sample datasheets from TCOT, the CIDoE and the Bermuda Turtle Project.
<b>1.9. Caribbean Turtlewatch</b>	Dive survey publicity poster, instructions for dive operators, datasheets in pdf format and Access database for entry of dive data.

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## **CD2 - NOAA 'Electronic Reading Room' downloads**

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<b>2.1. Recovery plans</b>	NOAA US Atlantic Recovery Plans and US Pacific Recovery Plans for six species of marine turtle.
<b>2.2. Symposia</b>	14 separate and full .pdf format copies of Proceedings from all sea turtle symposia from the 8 <sup>th</sup> Annual Workshop on Sea Turtle Conservation and Biology (1988) to the 20 <sup>th</sup> Annual Symposium on Sea Turtle Biology and Conservation (2000) inclusive.
<b>2.3. Turtle documents</b>	5 additional marine turtle papers and proceedings from the NOAA Electronic Reading Room, dealing with issues such as the Cuban hawksbill harvest, long-lining, TED's and status assessments.

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**Table 11.2.** Contents of the TCOT REGIONAL TRAINING WORKSHOP CD.



**Photo 11.5.** Participants of the *International Field Course - Biology and Conservation of Sea Turtles*, Bermuda 2003 (Photos P. Richardson).

TCOT Project Partner	Delegates
Anguilla - Department of Fisheries & Marine Resources,	Carlos Sasso
Bermuda - Bermuda Turtle Project	Jennifer Gray (Course host)
British Virgin Islands - Department of Conservation and Fisheries	Arlington Pickering, Shannon Gore
Cayman Islands – Cayman Islands Department of Environment	Joni Solomon
Turks and Caicos Islands – Department of Environment and Coastal Resources	Jasmine Parker

**Table 11.3.** TCOT attendees of the 'In-water marine turtle biology and conservation course', 2003.

Annual Sea Turtle Symposium, where she presented a paper about the International Field Course.

The course took place from the 4<sup>th</sup> to the 15<sup>th</sup> of August 2003 and reinforced the theoretical side of marine turtle research and conservation, as well as including practical training such as genetic sampling (tissue and blood sampling), tagging (flipper tags, PIT's and satellite telemetry), necropsy protocols and in-water net capture. A MCS press release about the course generated media coverage in Bermuda, BVI, Cayman Islands, Montserrat and the Turks and Caicos Islands.

### 11.5. Additional TCOT technical and practical assistance

In addition to the above capacity building events, the TCOT team provided continuous technical and practical assistance to the TCOT project partner institutions. These are outlined below:

#### 11.5.1. Tagging and genetics sampling equipment

All necessary equipment required by TCOT project partner institutions to carry out marine turtle biometric measuring, tagging (flipper and PIT), genetics sampling and storage



**Photo 11.6.** WIDECAST tags on a hawksbill in Anguilla (Photo P. Richardson).

was provided on demand by the TCOT project. The limited equipment and consumables budget was complimented by WIDECAST's donation of tagging equipment, as part of the WIDECAST Wider Caribbean Tag Inventory programme, to all Territories that required tags. In addition, a Marine Conservation Society grant contributed the deployment of a satellite tag on a nesting female leatherback turtle in BVI, and local fundraising efforts in the Cayman Islands contributed to the deployment of satellite tags on 5 individual nesting females there (green and loggerhead turtles) with further planned.

#### 11.5.2. Technical advice notes

The TCOT team produced technical advice notes regarding standard monitoring protocols for nesting and foraging site surveys (see appendix 11.2 and 11.3 respectively). These were distributed to all TCOT project partners and have been widely downloaded from the website.

#### 11.5.3. TCOT datasheets

The TCOT team designed, produced and disseminated the following data collection sheets: TCOT Genetics Sampling Sheet (see appendix 10.1); TCOT Socioeconomic Questionnaire (see appendix 2.1); Caribbean Turtlewatch data collection package (see appendix 2.2, 2.3 & 2.4). TCOT also produced a tourism awareness leaflet entitled *Marine Turtles and Tourism: How you can help*, which included information about the marine turtles of the Caribbean and the threats they face. The leaflet was locally distributed by the project partners to appropriate tourist centres in the Overseas Territories (e.g. airports, hotels, certain attractions etc, see appendix 11.4). The leaflet included a feedback form on which tourists could record the details of any relevant encounters they had with marine turtles in the Territories, including sightings at sea as well as any experiences of marine turtle consumption. A blank space was left on the leaflets on which the TCOT project partners could include their address in order to receive any tourism feedback and any information collected through these leaflets was the sole responsibility of the project partners.

#### 11.5.4. Continuous practical in-situ support

To reinforce the training given to project partners during the TCOT Workshop and the Bermuda Turtle Project course,

Territory	Year	Months	Staff (no. of staff weeks)
Anguilla	2002	March	PR & SR (2 weeks)
		September	PR & SR (2 weeks)
	2003	April-May	PR, SR & LC (5 weeks)
	2004	April-May	PR & SR (6 weeks)
			<b>Total staff weeks: 15</b>
Bermuda	2002	August	BG (1 week)
	2003	August	PR (1 week)
			<b>Total: 2</b>
British Virgin Islands	2002	July	BG (2 weeks)
	2003	April-May	BG, PR & LC (4 weeks)
	2003	November-December	BG, AMcG (6 weeks)
			<b>Total: 12</b>
Cayman Islands	2002	August-September	BG, LC, PR & SR (8 weeks)
	2003	October	BG (1 week)
			<b>Total: 9</b>
Montserrat	2002	February	BG (1 week)
	2002	June	BG (1 week)
	2003	August-September	CM (4 weeks)
			<b>Total: 6 weeks</b>
Turks and Caicos Islands	2002	March	PR & SR (1 week)
	2002	September	LC, PR & SR (3 weeks)
	2003	May-June	JS & LC (7 weeks)
	2004	September	LS & PR (3 weeks)
			<b>Total: 14</b>
			<b>Overall staff week total: 58</b>

**Table 11.4.** Outline of TCOT staff field trips in each Territory. AMcG= Andy McGowan, BG= Brendan Godley, CM= Corinne Martin, JS= Jennifer Silver, LC= Lisa Campbell, LS= Lorna Slade, PR= Peter Richardson, SR=Sue Ranger.



**Photo 11.7.** TCOT staff during field visits (Photos P. Richardson, S. Ranger and B. Godley).

<b>TCOT staff/Project partner</b>	<b>Source and Amount</b>	<b>Project</b>
<b>Department of Fisheries and Marine Resources, Anguilla</b>	British Chelonia Group (UK£500)	Construction of turtle sampling nets.
<b>Cayman Islands Department of Environment</b>	National Fish and Wildlife Foundation (UK£18,000)	Support of in-water sampling programme
<b>Cayman Islands Department of Environment TCI DECR associate (Lorna Slade) BVI Conservation and Fisheries Department</b>	International Sea Turtle Society (>UK£2,000)	Attendance at the International Sea Turtle Symposia
<b>Marine Conservation Society</b>	Foreign and Commonwealth Office Environment Fund (UK£16,000)	Attendance of the Bermuda Turtle Project in-water course for 5 project partner officers and Peter Richardson, as well as Jennifer Gray's attendance of the 24 <sup>th</sup> Annual Sea Turtle Symposium.
<b>Marine Turtle Research Group</b>	Marine Conservation Society (UK£4,000)	Deployment of a satellite tag on a nesting leatherback in BVI
<b>Marine Turtle Research Group</b>	Darwin Initiative (UK£162,000)	Biodiversity Action Plan for Anegada
<b>Marine Turtle Research Group</b>	Natural Environment Research Council (UK£47,000)	Satellite telemetry and diving behaviour of hawksbill turtles in collaboration with the BVI Conservation and Fisheries Department.
<b>Marine Turtle Research Group</b>	Foreign and Commonwealth Office, Department for International Development: Overseas Territories Environment Programme (OTEP) (UK£100,000)	Promotion of marine turtle conservation and management in the context of the Environment Charters and MEA's, to be carried out in collaboration with TCOT project partners in Anguilla, British Virgin Islands, Cayman Islands, Montserrat and the Turks and Caicos Islands.
<b>Marine Turtle Research Group</b>	Department of Environment, Food and Rural Affairs (UK£15,000)	Continued TCOT genetic sampling.

**Table 11.5.** Successful grant applications during TCOT.

TCOT staff spent considerable time in the field assisting with monitoring and sampling regimes. In Anguilla, Montserrat, Turks and Caicos Islands, and to some extent the British Virgin Islands, project partner institutions experienced logistical difficulties in implementing meaningful and regular monitoring regimes due to lack of human and physical resources, and in some cases due to the inaccessibility of remaining critical marine turtle habitat. In these cases it was necessary for TCOT staff to supplement the activities of the TCOT project partners by spending significant amounts of time in the field to ensure that adequate samples and socio-economic questionnaire data were collected. In several cases the field time incurred by TCOT staff amounted to significantly more than budgeted in the original project bids to Defra and the FCO, however this extra field time led to successful completion of significant TCOT sampling

in all Territories and assistance of project partners with data analysis, reporting and grant proposal writing. TCOT staff contact with project partners between field trips was extensive, involving e-mail, postal, fax and telephone correspondence. Table 11.4 presents a digest of TCOT staff time in each Territory.

#### **11.5.5. Regional e-mail listserv**

Although project partners did not use the TCOT listserv as widely as anticipated, it has been extremely useful in disseminating information from the TCOT staff to the partners in a prompt and efficient manner. It should be noted, however, that the infrastructure in several project partner institutions did not allow many employees daily access to e-mail or regular and reliable internet access.

### 11.5.6. TCOT Bibliography

Since the onset of TCOT, the coordinating staff have compiled and updated a bibliography of literature pertinent to the conservation and biology of marine turtles and their habitats in the UK Overseas Territories in the Caribbean. The bibliography is now in its fourth generation and is included in Appendix 11.5.

### 11.5.7. Additional Grants

TCOT staff worked with all willing OT partners to help raise funds and win grant awards for additional projects, either within the TCOT scope or pertinent to the overall TCOT mission. An outline of the successful applications made during TCOT is included in table 11.5.

In addition to these efforts, TCOT has supported unsuccessful grant applications by CIDoE to; BP Conservation Awards, Professional Association of Dive Instructors (PADI), and the People's Trust for Endangered Species.

### 11.5.8. Dissemination of TCOT outputs

The Marine Turtle Research Group, University of Exeter in Cornwall has supported, reviewed and facilitated the following publications by TCOT project partners:

Bell CDL, Parsons J (2002) Cayman Turtle Farm Head-starting Project Yields Tangible Success. Marine Turtle Newsletter 98:5-6

Hastings M (2003) A Conservation Success: Leatherback Turtles in the British Virgin Islands. Marine Turtle Newsletter 99:5-7

In addition, the following paper has been submitted:

Bell CDL, Parsons J, Austin TJ, Broderick AC, Ebanks-Petrie G, Godley BJ (submitted) Some of them came home: Cayman Turtle Farm head-starting project. Oryx

Additional scientific papers will be published which will focus on the TCOT data including subject areas as diverse as marine turtle genetics, exploitation, nesting status and in-water monitoring. For example, papers outlining the status and conservation of marine turtles in Cayman and Montserrat are in their final stages of preparation at the time of writing. All TCOT publications will be co-authored by the appropriate members of the TCOT project in the UKOTs, UK and USA.

### Recommendation

***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.*

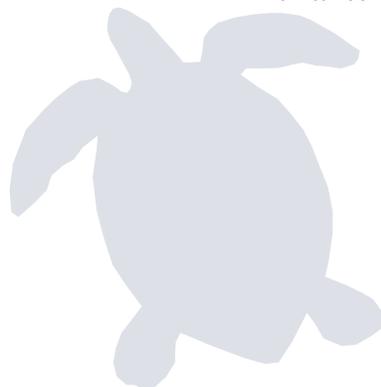
### 11.6. Acknowledgements

Many thanks to all TCOT partners for their gusto and enthusiasm for fieldwork. In particular CIDoE, CTF and WIDECASST whose collaboration ensured the tremendous success of the TCOT workshop. In addition to conservation organisations, we must also thank members of the fishing communities of Anguilla, BVI and TCI who contributed so significantly to inwater capture sessions. We thank Denise Dudgeon (FCO) for comments on this chapter.

### 11.7. References

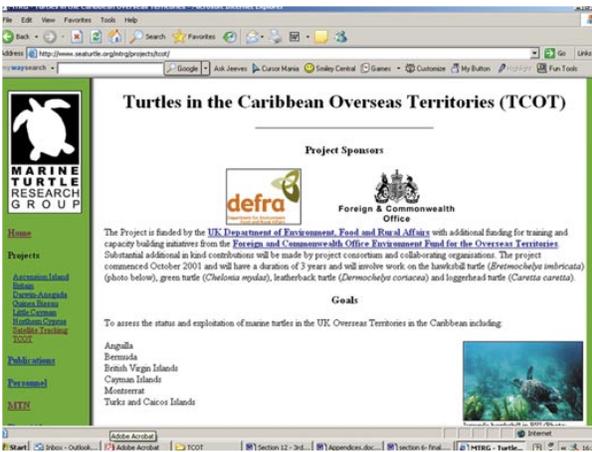
Oldfield S, Sheppard C (1997) Conservation of biodiversity and research needs in the UK Dependent Territories. *Journal of Applied Ecology* 34: 1111-1121

Proctor, D., Fleming, L.V. 1999. Biodiversity in the Overseas Territories. Peterborough, JNCC.





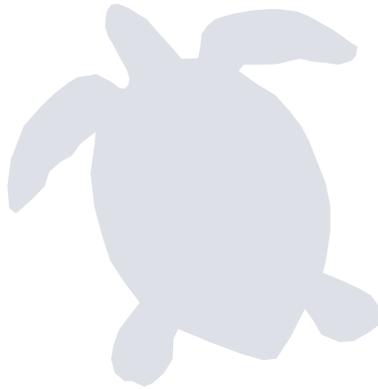
# TCOT Publicity: Getting the Message Across



Foreign & Commonwealth  
Office



Department for Environment  
Food and Rural Affairs



This document is part of a larger publication and should be cited as:

Godley BJ, Broderick AC, Campbell LM, Ranger S, Richardson PB (2004) 12. TCOT Publicity. Getting the Message Across. In: An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean. pp 248-253. Final Project Report for the Department of Environment, Food and Rural Affairs and the Foreign and Commonwealth Office.

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.

## 12. TCOT Publicity: Getting the Message Across

### Contents

	Page
12.1. TCOT Website < <a href="http://www.seaturtle.org/mtrg/projects/tcot/">http://www.seaturtle.org/mtrg/projects/tcot/</a> >	249
12.2. TCOT Leaflet <i>Marine Turtles and Tourism</i>	249
12.3. Printed Reports	249
12.4. Press Releases	250
12.5. Summary of TCOT Media Coverage until July 2004	250-251
12.5.1. International	250
12.5.2. Overseas Territories	250
12.5.3. UK	251
12.6. Scientific Papers	251
12.7. TCOT Presentations	251-253
12.7.1. International Scientific Meetings	251
12.7.2. Public Meetings in the OT's	252
12.7.3 Oral Presentations at Meetings in the UK and the USA	253
12.8. Educational Pack	253

The TCOT staff have maximised publicity of the project, having issued press releases at key moments in the project's progress, engaged broadcast and print media during field trips and expended significant effort in addressing conferences and other international fora. In addition, the TCOT website has publicised the project on the Internet and a number of informational documents have addressed an array of audiences.

### 12.1. TCOT Website

<<http://www.seaturtle.org/mtrg/projects/tcot/>>

The website was created in the early stages of TCOT and presents an outline of the project, as well as including some of the TCOT outputs.

The site was designed and is hosted courtesy of SEATURTLE.ORG and displays the logos of Defra, FCO and the institutions represented by the coordinating team. Project partners are listed and links to partner websites are maintained where appropriate. It has been visited extensively, with over 17,250 visitors by July 2004. TCOT outputs posted on the site to date include:

- TCOT Bibliography (>2,200 downloads)
- TCOT Genetics Sampling Sheet (>1,200 downloads)
- TCOT Tourism Leaflet (>800 downloads)
- TCOT Press Releases (>1000 downloads)
- TCOT Workshop Report (>300 downloads)
- TCOT Advice Notes (>500 downloads)

To facilitate partner input, the final report was hosted on the website in draft format and to maximise dissemination it will be published there in its entirety.

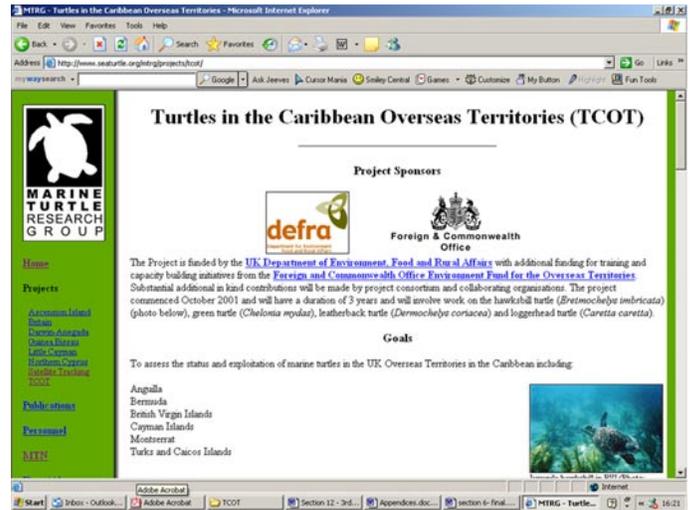


Photo 12.1. TCOT website.

### 12.2. TCOT Leaflet 'Marine Turtles and Tourism'

As described in section 11, one of the first TCOT outputs was production of 10,000 information leaflets designed to inform tourists visiting the Overseas Territories about the turtles they may encounter there (appendix 11.4). These were funded by MCS with support of Cheltenham and Gloucester plc.

### 12.3. Printed Reports

TCOT staff have produced sequential reports throughout the duration of the project. These are outlined in table 12.1 below.

Date	Document	Audience
May 2002	Briefing report	CITES Hawksbill Range States Dialogue Meeting
October 2002	TCOT briefing leaflet (Appendix 12.1)	Distributed by UK delegation, CITES CoP12
April 2003	Notes from the TCOT Regional Training Workshop: Marine Turtle Research And Monitoring (Appendix 11.1)	Project partners and public
February 2004	Interim TCOT report: Marine Turtle Utilisation in the Caribbean OT's (content superseded by this report).	Defra & Steering Group
August 2004	Final TCOT report (1 <sup>st</sup> Draft)	Defra, Steering Group, Peer Review Panel & Project Partners.
October 2004	Final TCOT report	Public

Table 12.1. Reports produced during TCOT.

## 12.4. Press Releases

The following TCOT press releases were issued at key events in the project's progress:

**TCOT launch - 'UK to Investigate Marine Turtle Exploitation in the Overseas Territories'**, released 14.11.01. (Appendix 12.2).

**TCOT Workshop - 'Research into Endangered Caribbean Turtles Gets Boost from UK Support'**, released 22.11.02. (Appendix 12.3).

**FCO supports TCOT attendance of Bermuda course - 'Conservation Officers From The UK's Caribbean Overseas Territories Learn How To Save Endangered Turtles'**, released 15.08.03. (Appendix 12.4).

A final press release will be issued with the launch of the final TCOT report and by then TCOT press releases will have generated in excess of 50 responses in international, national and local print and broadcast media. The summary below lists all recorded media coverage regarding TCOT up to July 2004.



Photo 12.2. TCOT launch press coverage.

## 12.5. Summary of TCOT Media Coverage until July 2004

### 12.5.1. International Coverage

Nov 2001	Article on <i>Navalweb.com</i>
Nov 2001	Article in <i>IWMC World Conservation Trust Newsletter</i>
Feb 2002	Article in <i>UKOTCF Forum News 21</i>
Aug 2002	Interviews re. the TCOT workshop on <i>BBC Radio Caribbean</i>
Oct 2002	Announcement in the <i>Marine Turtle Newsletter</i>
Feb 2004	Article in <i>UKOTCF Forum News 24</i>

### 12.5.2. Coverage in the Overseas Territories

#### Anguilla

March 2002	Interview on <i>Radio Anguilla</i>
	Interview on <i>Heart Radio</i>
March 2003	Interview on <i>Radio Anguilla</i>
Aug 2003	Interview on <i>Radio Anguilla</i>
May 2004	Article in <i>The Anguillan</i>

#### Bermuda

Winter 2002	Article in <i>Critter Talk Vol 25 Number 4</i>
Aug 2003	Article in the <i>Royal Gazette</i>
Aug 2003	Article in the <i>Bermuda Sun</i>
April 2004	Article in <i>Critter Talk Vol 27 Number 2</i>

#### BVI

May 2003	Article in <i>The BVI Beacon</i>
	Article in the <i>Standpoint</i>
Aug 2003	Article in <i>The BVI Beacon</i>

#### Cayman

Aug 2002	Article on <i>Caymannetnews.com</i>
	2 articles in the <i>Caymanian Compass</i>
	2 radio interviews
	1 TV interview
Aug 2003	Article on <i>Caypolitics.com</i>
Aug 2003	Article in <i>Caymanian Compass</i>
Jan 2004	Article in in-flight magazine <i>Destination Cayman 2004</i>

#### Montserrat

Nov 2001	Article in the <i>Montserrat Reporter</i> ,
Jun 2002	3 radio features
	2 newspaper articles
Aug 2003	1 newspaper interview in the <i>Montserrat Reporter</i> .
Sept 2003	3 interviews on <i>Montserrat Radio JZB</i>
	1 interview on <i>Family Radio</i>

#### TCI

Nov 2001	Article in <i>The Turks and Caicos Free Press</i>
July 2002	Picture story feature in <i>Times of the Islands</i>
Apr 2002	1 local radio interview
Aug 2003	1 article in the <i>Turks &amp; Caicos Free Press</i>
Sept 2003	1 local radio interview
	1 article in the <i>Turks &amp; Caicos Free Press</i>



Photo 12.3. TCOT training workshop press coverage.

**12.5.3. Coverage in the UK**

- Nov 2001 Article in the *South Wales Evening Post*
- Nov 2001 Article in the *Western Mail*
- Dec 2001 Article in *Country Living*
- Jan 2002 Article in *Biodiversity News*
- Mar 2002 Article in *Diving Trade*
- April 2002 Article in *Talk Turtle* and on the *Adopt-a-Turtle renewal poster*
- Aug 2002 Article in the *Wrexham Evening Leader*
- Oct 2002 Photo-feature article in MCS magazine *Marine Conservation*
- Dec 2002 Article on *icWales.co.uk*
- July 2003 Article in *Testudo*
- Sept 2003 Interview for *Nature* programme, BBC Radio 4.

**12.6. Scientific Papers**

The MTRG has supported, reviewed and facilitated the publication of various scientific papers authored by TCOT project partners (see section 11).

**12.7. TCOT Presentations**

The TCOT staff have made every effort to present the TCOT project to a wide audience at various formal and informal fora in the UK, the Overseas Territories and at international meetings.

**12.7.1. International Scientific Meetings**

- Apr 2002 Poster at International Sea Turtle Symposium, Miami (PR)
- Mar 2003 Oral at the UKOTCF Conference, Bermuda (BG)
- Mar 2003 Poster at the UKOTCF Conference Bermuda (BG)
- Mar 2003 Oral International Sea Turtle Symposium, Kuala Lumpur (SR)
- Mar 2003 Poster at International Sea Turtle Symposium, Kuala Lumpur (PR)
- Feb 2004 Poster at International Sea Turtle Symposium, Costa Rica (JB)
- Feb 2004 Poster at International Sea Turtle Symposium, Costa Rica (CB)
- Feb 2004 Poster at International Sea Turtle Symposium, Costa Rica (LS)
- Feb 2004 Oral at International Sea Turtle Symposium, Costa Rica (JS)
- Feb 2004 Oral at International Sea Turtle Symposium, Costa Rica (JG)
- May 2004 Oral at Annual Meeting of Canadian Association of Geographers (JS)





**Photo 12.6.** Brendan Godley presents TCOT at UKOTCF conference, Bermuda, March 2003.

**12.7.3. Oral Presentations at Meetings in the UK and the USA**

- Oct 2002 British Chelonia Group Northern Symposium, Chester (PR)
- Oct 2002 Marine Conservation Society Annual Conference, Edinburgh (PR)

- Oct 2002 AGM of the UKOT Conservation Forum, Cambridge (BG)
- Nov 2002 Guest lecture, Wildlife Conservation MSc, University of Reading (PR/SR)
- Mar 2003 London Dive Show, Excel Centre (PR)
- Nov 2003 Guest lecture, Wildlife Conservation MSc, University of Reading (PR)
- Mar 2004 Oral at Duke University Marine Lab Advisory Board Meeting (LC)
- Apr 2004 Oral at Duke University Board of Visitors Meeting (LC)

**12.8. Educational Pack**

Educational materials have been produced by the Marine Conservation Society to encourage teachers and educators in the UK to use marine turtles as their subject matter across a range of disciplines. These materials have been distributed to all OT's. Building upon this, as part of an OTEP funded project, the team, in conjunction with local partners, will design educational materials (for school children and adults) to increase awareness and report back some of the findings of recent turtle research in the OTs. We will work with each OT to design OT specific educational resources including local data, images and input from local people.

