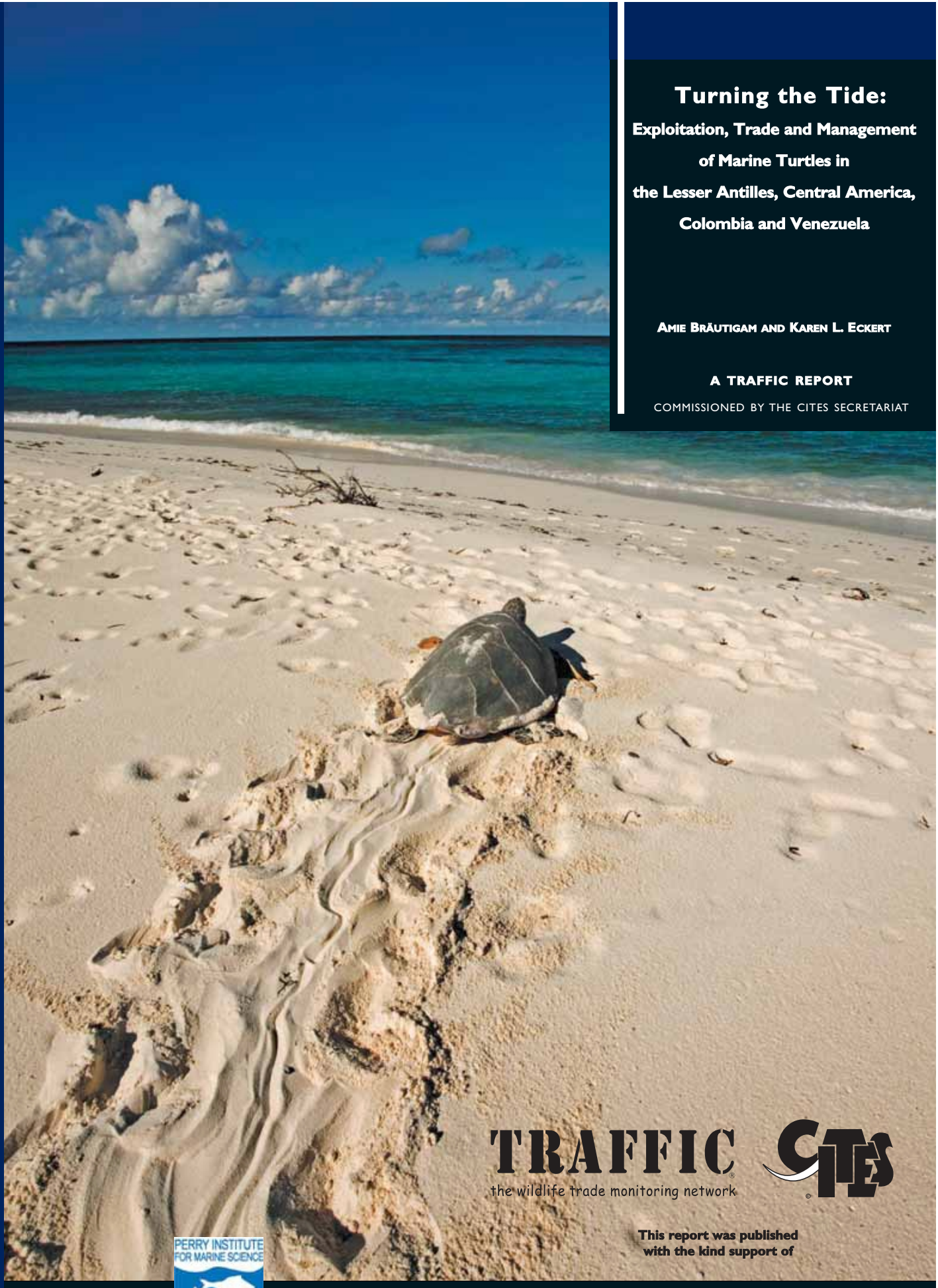

Turning the Tide:

Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela

Amie Bräutigam and Karen L. Eckert

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Front cover photograph: A female Hawksbill Turtle *Eretmochelys imbricata* heads back to the sea after laying eggs.

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TURNING THE TIDE:

EXPLOITATION, TRADE AND MANAGEMENT OF MARINE TURTLES IN THE LESSER ANTILLES, CENTRAL AMERICA, COLOMBIA AND VENEZUELA

by Amie Bräutigam[1] and Karen L. Eckert[2]

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[2] Wider Caribbean Sea Turtle Conservation Network (WIDECAST)

Credit: Nature Foundation of Sint Maarten

Children in Sint Maarten, Netherlands Antilles, play a game designed to foster appreciation of marine turtle conservation; since November 2004, an educational co-ordinator for the three Windward Islands of the Netherlands Antilles (Sint Maarten, Saba and Sint Eustatius) has focused on promoting awareness of the issue through school visits, puppet shows, songs and other grass roots activities.

TABLE OF CONTENTS

FOREWORD

When TRAFFIC completed a review of the exploitation, trade, and management of marine turtles in 11 countries and territories in the Northern Caribbean in 2001, the overall picture revealed was a patchwork of national management regimes. Some countries had allocated significant resources to manage and conserve marine turtles, while next to nothing has been done in others. Relevant regulations were rigidly enforced in some territories; in others, for a variety of reasons, enforcement was virtually absent. Legislation was comprehensive in some countries while incomplete and outdated in others. The review re-emphasised the challenges facing management and conservation strategies for marine turtles that were formulated and implemented on a country-by-country basis.

The impetus for the present study was a call for assistance made by the First CITES Wider Caribbean Hawksbill Turtle Dialogue Meeting, held in Mexico City in May 2001. Noting the findings of TRAFFIC's research in the Northern Caribbean, participants requested an extended analysis of the situation in the rest of the Wider Caribbean Region to be used as a basis for better regional co-operation. In December 2001, the CITES Secretariat commissioned TRAFFIC International to undertake this work, and the result is this new report on exploitation, trade and management of marine turtles in the 26 political jurisdictions of the Lesser Antilles, Central America, Colombia and Venezuela. Its comprehensiveness and authority are testament to the incredible persistence and dedication of the authors and the much-valued participation of so many expert contributors working in the region.

This report illustrates, perhaps unsurprisingly, that the management patchwork found in the earlier study extends throughout the wider Caribbean. It highlights enormous variation from country to country in the quality of management regimes, data collection, population monitoring and controls on exploitation. It clearly demonstrates the co-dependency between national management regimes and documents a range of examples of innovative and effective actions by governments, NGOs and communities that have potential for expansion and adaptation across the region.

A clear message of this body of work is that greater co-operation between the countries of the Caribbean is urgently needed to benefit marine turtle populations and the people who benefit from them. Significant progress has already been made in the area of regional co-operation, particularly with the coming into force in 2000 and 2001, respectively, of the Protocol to the Cartagena Convention concerning Specially Protected Areas and Wildlife (SPAW) and the Inter-American Convention for the Protection and Conservation of Sea Turtles, as well as two CITES Hawksbill Range State dialogue meetings. However, much more needs to be done.

Only with concerted effort and better co-operation can we hope to turn the tide in favour of marine turtle populations in the Wider Caribbean Region. TRAFFIC will continue its contribution to meeting this goal and remains committed to collaborating with the many dedicated organizations and individuals who are determined to succeed in addressing this important conservation challenge.

Steven Broad
Executive Director
TRAFFIC International

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EXECUTIVE SUMMARY

This comprehensive review of exploitation, trade and management of marine turtles in the Wider Caribbean Region (WCR) highlights findings related to the legal framework for marine turtle management, patterns of domestic exploitation and use and international trade, and a variety of core management issues, including population monitoring, fishery controls and law enforcement. While there have been many advancements over the past half-century in our understanding of marine turtle biology and of the management needs of these species, the review concludes that actual management of marine turtles, and of marine turtle exploitation in particular, has in many ways not kept pace with this understanding nor with the contemporary scope of threats to their survival. The report documents the implications of management shortcomings in one country for the management and conservation efforts being made in others and, finally, calls attention to a range of activities that are being undertaken at the national level to address these problems and which could be expanded or adapted across the region.

Although all fall within the WCR, the 26 jurisdictions that have been reviewed for this analysis—the overseas territories and Small Island States of the Lesser Antilles, six Central American countries, Colombia and Venezuela—are widely diverse geographically, ecologically, culturally and economically. They also vary considerably as regards the status of marine turtles and the context for their conservation and management: the legal frameworks, management regimes, and type and degree of constraints on effective marine turtle management. The differences between jurisdictions and regions with respect to key elements of this study are discussed in the **Regional Overview** and presented in the tables in that section. The major findings are set forth below and followed by a short-list of priorities for immediate action at the national level.

1. The legal framework for marine turtle management is inadequate in large and small ways in the majority of the jurisdictions covered in this study. Not only is there often confusion as to the rules that apply and, in some instances, direct conflict between laws, but exploitation in those countries where it is permitted by law is, with few exceptions, not controlled in accordance with the principles of sustainability. In some instances, competing or overlapping management authorities create confusion—and consequent lapses—in the exercise of these authorities. In addition to shortcomings in the laws governing exploitation, there are shortcomings with respect to the laws governing marine turtle trade, internal and international.

   In most of the eight Latin American countries reviewed and in at least two of the insular States, there is a need to rationalize the body of legislation pertaining to marine turtles and to revise it as necessary so that there are clear rules and authorities in relation to marine turtle exploitation and trade and the broader range of marine turtle management and conservation needs. Similarly, in most of the Latin American countries examined, there is a particular need for effective controls on exploitation that is currently exempt from these laws, specifically exploitation of turtles and eggs that continues under the aegis of "subsistence" or "indigenous" use but in the absence of any legal or operational definition of these terms.

2. There are many encouraging signs that governments are seeking to strengthen the legal framework for marine turtle management. In Belize, the framework has evolved, taking full note of biological principles, through maximum size limits, to a legally permitted take for traditional use only of species other than the Hawksbill Turtle *Eretmochelys imbricata*. In several other jurisdictions—including Montserrat, Nevis (Federation of Saint Kitts and Nevis), Antigua and Barbuda, Dominica, Trinidad and Tobago, Colombia and Guatemala—

marine turtle management measures and broader conservation needs have been or are being reviewed; in several, regulations are pending that would establish maximum *versus* the prevailing minimum size limits and/or lengthen closures to embrace peak nesting periods. The governments of two jurisdictions, Anguilla and Saint Lucia, implemented moratoria in the mid-1990s so as to review management measures prior to prospective reinstatement of a turtle fishery (the moratorium in Saint Lucia lapsed before revised measures could be established; the moratorium in Anguilla was renewed in 2005).

3. Marine turtles are completely protected by law from exploitation in fewer than half of the 26 jurisdictions reviewed. In the remaining jurisdictions, marine turtles benefit from varying degrees of legal protection. With few exceptions (namely, Costa Rica [in relation to a programme at Ostional on the Pacific coast] and Belize, which clearly define, regulate and control the exemptions for exploitation of marine turtles within an otherwise protective legal regime), and regardless of these differences, the legal norms in place do not limit exploitation in such a way as to contribute to the sustainability of marine turtle populations. In effect, they do not serve management that would be consistent with the standards and practice of sustainable use. Thus, for many jurisdictions, a suite of both national and international commitments to ensure the survival of these threatened species remains largely unfulfilled.

4. In some countries, turtle fisheries operate on an occasional and opportunistic basis, while in others they continue to be the focus of dedicated effort and generate significant income through the marketing of the animals and their products. Official statistics on levels of exploitation of marine turtles at the national level do not exist for any jurisdiction in which such exploitation is permitted, as monitoring is either non-existent, sporadic, or fragmentary, being based on voluntary reporting or only conducted at some of the sites where marine turtles are landed. Consequently, levels of exploitation of marine turtles are largely unknown at the national level and it is, therefore, impossible to derive any credible estimate of the numbers of marine turtles taken at the regional level.

   In some instances, information on exploitation is available from non-government sources. The most comprehensive dataset comprises the results of monitoring efforts by researchers working with the Wildlife Conservation Society (WCS); these have documented the region's largest legal marine turtle fishery, as part of which ca. 300 to 500 fishers have landed ca. 11 000 Green Turtles *Chelonia mydas* per year over the past decade. In the insular Caribbean, research conducted by a graduate student at the University of the West Indies has documented aspects of exploitation in several Eastern Caribbean countries and, for example, estimated an annual take of 782 turtles in Grenada and almost 600 turtles in Saint Vincent and the Grenadines.

   Fewer data exist on levels of exploitation of marine turtle eggs, which are more extensively protected by law in the WCR than are marine turtles. The marketing of eggs is open and widespread in several of the Central American countries and, while in Costa Rica most of the eggs in trade are considered to derive from a specific sustainable-use programme at Ostional on the Pacific Coast, in Guatemala there is concern that virtually every egg laid in the country is collected for human consumption.

   Finally, the numbers of marine turtles taken incidentally in industrial and artisanal fisheries are largely unknown and, thus, impossible to factor into any overall estimates of marine turtle mortality. Losses to incidental take have been documented to be high in some reviewed jurisdictions (e.g. Trinidad and Tobago, Guadeloupe) and are believed to be high in others and, thus, warrant further investigation and, as necessary, mitigation.

5. Information relating to international trade in marine turtles is mixed. There is little evidence, based on official statistics, of large commercial trade; most of the trade reported to the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in recent years consists of seizures of personal items or scientific specimens, with only a small number of (illegal) commercial shipments. Notwithstanding, an extensive and clandestine regional trade persists, mainly in Central America. Most international trade from the insular jurisdictions consists of personal items and curios purchased by tourists; there are few statistics on tourist-mediated trade and often no official knowledge that such export has occurred. There is little concrete evidence of significant stockpiling of marine turtle products (Nicaragua and Costa Rica are the only two countries in which stockpiles were reported). Existing levels of international trade are described as a "problem for management" only for the mainland countries of the Americas.

6. Enforcement of marine turtle legislation is generally considered to be inadequate. In some instances, this arises from a lack of clarity in the legal provisions that apply and the authorities charged with enforcement. In addition, logistical and other constraints, including socio-cultural dynamics, complicate enforcement. Concerns are noted as to the low level of attention often afforded infractions of this type of legislation by law enforcement officials and the judiciary. Some participants in this study cited the low priority given to these issues as evidence of political apathy towards natural resource law in general and noted, as well, the social complexities of enforcing natural resource law in rural coastal communities where much (in some instances most) illegal activity occurs. The data suggest an increase in arrests and prosecutions in very recent years and also underscore the positive contribution of community-based beach patrols—sometimes under specific co-management agreements with government agencies—in reducing or eliminating illegal activity, especially on nesting beaches.

7. Management of marine turtles in the region covered in this study varies greatly but in most cases must be considered inadequate not only for the recovery of populations but for the prevention of further population declines. The following points should be especially noted:

    - no stock assessment in the usual sense has been conducted at the national level for any jurisdiction in this study; the countries that come closest to meeting this standard are Barbados, which, uniquely, supports continual monitoring of both nesting and foraging stocks, and Nicaragua, where the Green Turtle fishery has recently been the focus of an intensive evaluation through the efforts of scientists working with WCS;
    - legal exploitation has not been based on any scientific evaluation of the resource;
    - legal exploitation continues with no consideration of effects on population levels, i.e. without taking into account the status or trend of local populations or shared stocks throughout their biological range;
    - controls on exploitation are not consistent with current understanding of marine turtle biology and marine turtle management best practice; in the insular Caribbean, for example, closures rarely encompass the reproductive season, and minimum-size limits target the age classes that should most be protected;
    - there is very little monitoring of legal exploitation and only sporadic or fragmentary monitoring where it is conducted, with the result that overall levels of exploitation and trends in those are unknown virtually throughout the region;
    - there is very little sustained population monitoring, such that data-based marine turtle population trends are largely unknown;

- some degree of illegal take occurs in every jurisdiction but is largely unquantified (although suspected levels of illegal take were characterized as not a problem for management in several of these);
- the take of eggs, particularly in Central America, is intensive and pervasive;
- levels of incidental take in fisheries are, with a few exceptions, unknown and largely unaddressed in existing management regimes, despite compelling evidence that they constitute the single largest source of mortality in some jurisdictions; and
- habitats, both terrestrial and marine, critical to marine turtle survival have not been identified in most jurisdictions and, where known, often fall outside the boundaries of parks, reserves or other actively managed areas, thus suggesting that the safeguarding of critical habitat for marine turtles has generally not been well integrated into coastal zone planning processes.

8. A growing body of data from flipper-tagging, satellite-tracking and genetic analyses is documenting transboundary movements of marine turtles and delineating individual marine turtle stocks. These data unequivocally point to the need for co-ordinated effort in managing marine turtles that, for example, nest or forage in Bonaire, Barbados, or Costa Rica, where they are protected by law, and travel to, for example, Dominica, Honduras, Nicaragua, Saint Vincent and the Grenadines, or another country where they are legally exploited. In some instances, these contradictory management regimes impinge on non-extractive marine turtle projects, such as at Tortuguero and Gandoca in Costa Rica or at Matura and Grande Riviere in Trinidad, that are generating significant economic benefits to local communities.

9. The complexity of marine turtle management is clearly a challenge for many governments in the region, who face many constraints in improving their effectiveness. The limited capacity of many of the governments of Small Island Developing States of the insular Caribbean to discharge increasing environmental mandates is one such constraint. The extreme poverty of coastal communities in Central America, who have few economic alternatives to the marine turtle resource, is as serious a challenge as any government can face and has not only regional but hemispheric implications. As inadequate marine turtle management is the result of many economic, cultural and political factors, improvements must be devised that, if not fully address, at least take into account, these many factors. While, in many jurisdictions, marine turtle management is by law already cross-sectoral, it is not adequately integrated at the operational level. Although migratory marine turtles offer the best example of the need for an integrated approach to ensure effective management, this need also applies to other marine resources (e.g. Queen Conch *Strombus gigas*, Spiny Lobster *Panulirus argus* and reef fishes) that are depleted or at risk of depletion.

10. The complexity of marine turtle management across the WCR suggests not only a need for a more concerted, co-ordinated, cross-sectoral approach at the operational level, within governments and among other actors, but also at the diagnostic level. Social scientists, rural development specialists and development assistance donor agencies should engage in assessing the dynamics that dictate marine turtle exploitation and in developing solutions to the factors that underlie over-exploitation. The same attention should be paid to identifying more sustainable patterns of coastal development, as habitat loss—both terrestrial and marine—is identified as a major threat to marine turtle recovery in many jurisdictions.

11. A major finding of this study is that non-governmental organizations (NGOs), including community-based organizations (CBOs), are making large contributions to marine turtle conservation and basic research in the region; in some countries, they are also making large contributions to marine turtle management, including

strategic planning, monitoring of legal fisheries and of nesting and other populations, record-keeping, poaching deterrence, training and capacity-building, and public outreach. While this non-governmental investment is generally viewed as positive, there is a need to recognize the essential, fundamental role of government in marine turtle conservation and management and, thus, the need for governments to engage—politically, logistically and financially—in this work. The need for sustainability in management, which is complicated by the fact that NGOs and CBOs generally rely for their operations on funds raised from external sources, should be given serious consideration by governments and the donor community.

12. Existing and growing partnerships between government, NGOs, CBOs and local communities, built on shared priorities, pooled resources and equal credit/benefit, offer particular promise in addressing the management challenges facing marine turtles. As one of many examples, in Nicaragua, WCS is working with local communities and relevant government agencies to monitor the fishery for Green Turtles along the Caribbean coast and develop a management and conservation plan for marine turtles in that region. Many locally-based NGOs, such as Nature Seekers in Trinidad, have also been pioneers in this field.

    A particularly positive development in recent years has been the increase in "co-management" arrangements between governments and local communities, whereby sustainable-use projects are implemented on the basis of mutually agreed conditions and procedures. In cases where governments have come to terms with the fact that they cannot fulfill their management or enforcement mandates without reliable help from those much closer to the resource, they may grant the community (which generally seeks enhanced economic opportunity) exclusive extraction, eco-tourism or other rights. In return for needed assistance in fulfilling its public mandate to manage the resource, the government provides opportunities for local communities to benefit from the resource. This is the case in Saint Lucia (in a partnership with the Desbarras community), Trinidad (in a partnership with the Matura community and others), Costa Rica (with the [Pacific] programme in Ostional) and elsewhere in the region. These agreements, when thoughtfully constructed, produce real benefits for conservation and sustainable management because stakeholders have a true stake in the health of the affected resource.

13. There are numerous examples documented in this study of innovative approaches to addressing over-exploitation of marine turtles and enhancing their management and conservation. Many of them focus on information-sharing and direct, sustained engagement of local communities and other stakeholder groups and, in doing so, have generated significant interest in and support for marine turtle conservation. Supporting and supplementing these are several dozen field projects sponsored by governments and NGOs in the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), a scientific network affiliated with the Caribbean Environment Programme of the United Nations Environment Programme (UNEP) and providing an operational mechanism for training, communication, collaborative research and the replication of successful programmes across more than 40 participating WCR States and territories.

    In Costa Rica, such efforts include an NGO-run certification programme for retail establishments that undertake not to sell marine turtle products and a turtle tourism scheme at Gandoca, whereby, through an arrangement between an NGO (*Asociación ANAI*) and the local community, lodging is provided to turtle researchers, thus generating alternative income for the community and leading to a reduction in egg poaching; in Nicaragua, community meetings and radio spots aimed at informing local communities about marine turtle conservation issues and the results of conservation projects under way have lowered the incidence of

Hawksbill Turtle poaching; in Bonaire, a local newspaper has dedicated space for regular updates of the international movements of marine turtles locally fitted with satellite-transmitters; in Antigua, a home-owners association sponsors the hemisphere's most comprehensive Hawksbill Turtle demographic study; in Dominica, the hiring of former marine turtle poachers as beach patrollers has dramatically reduced the killing of nesting turtles in Rosalie Bay; in Trinidad, co-management agreements between the government and coastal communities have eliminated marine turtle poaching while creating new capacity in rural areas for entrepreneurial activity ranging from reforestation programmes to literacy campaigns and youth employment; in Barbados, the University of the West Indies hosts a regional tagging centre, providing training, field equipment and record-keeping software to small-scale marine turtle field projects throughout the region. These examples are drawn from countries examined for this review and, with numerous other initiatives in the WCR, offer an insight into what might be achieved; they also hold promise that developing partnerships between governments, private and corporate interests, NGOs and other sectors may meet with enduring success.

Particularly worthy of note is a multi-institutional, multi-stakeholder effort in Colombia to develop a sustainable-use regime to alleviate heavy, largely illegal commercial exploitation of over 1000 marine turtles per year in Guajira Department. Bringing together indigenous Wayúu fishers, economists, biologists, and management agencies, a programme has been developed that includes a system of transferable capture quotas for certain size classes of turtles; these would decline in number over time and apply only to local use of meat, thus excluding other marine turtle products and marketing and sale beyond these points. Although this programme has not yet been implemented, the process of its development and analyses undertaken thus far offer numerous suggestions for similar efforts to contain illegal and/or unsustainable marine turtle exploitation in the region.

14. Further improvements in marine turtle management at the national level will clearly involve operationalizing management at the regional level in the WCR. The differing legal protection afforded marine turtles at the national level results in an incoherent regional scenario whereby the same turtles are fully protected in some jurisdictions and legally hunted in others, and investments in management and conservation in one jurisdiction are undermined by inadequate management measures in others. Designing and implementing an integrated, unified, collaborative management strategy for marine turtle stocks using the entire Caribbean basin, under the aegis of regional bodies with relevant mandates, such as the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) and/or the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), is essential. Priority first steps at the national level that can serve as a basis for such a strategy are set out below.

Priorities for immediate action

The **Recommendations** section of this report contains comprehensive guidance for improving the management and conservation of marine turtles in the WCR. Recognizing, however, that addressing the full management needs of marine turtles necessitates a long-term commitment, the setting of priorities for implementation, and consultation with other governments sharing turtle stocks, **immediate**, **first-step priorities for action by governments and their collaborators**, based on the elements specifically evaluated in this review, are to:

1. **Establish scientifically based limits on the exploitation of marine turtles**. If marine turtle populations are not to be further depleted owing to inappropriate and inadequate restrictions on legal exploitation (including in cases where legal exemptions to marine turtle protections exist, such as for subsistence and indigenous uses), measures must urgently be taken to protect the large juvenile and adult turtles that are the most important marine turtle age classes to conserve. Particularly important measures are:

    - legal protection for all turtles on land, in order to protect nesting females;
    - maximum size limits in order to protect large juveniles and breeding-age animals (the life stages known to have the highest reproductive value); and
    - limits on access and codification of use rights, such as specific licences and exploitation quotas for marine turtle fishers and egg collectors.

2. **Organize and conduct a comprehensive frame survey (marine turtle catch and use assessment)** to quantify and characterize marine turtle exploitation at the national level, including the landing of turtles at sea or hunting on nesting beaches, the exchange and marketing of turtles and turtle products, numbers and types of fishers (and gears) involved, processing and marketing patterns, and the importance to livelihoods of the income derived from marine turtle exploitation. This survey should also aim to assess the role of incidental take of marine turtles in other fishing operations, including the extent to which this constitutes the primary means of capturing marine turtles, the parameters that dictate whether a turtle is landed or killed, and how significant this take might be for marine turtle management.

3. **Establish a systematic monitoring programme**, including national and regional networks of Index monitoring sites[1] (to document population size and trend *in situ*) and recording requirements for all fishers landing marine turtles. The involvement of fishers should be considered integral to the development and implementation of effective monitoring programmes, which should be designed to offer reliable indications of the numbers of marine turtles captured, the species and sizes, as well as catch-per-unit effort (CPUE), and the importance of the marine turtle exploitation to subsistence and livelihoods. In addition, it should be designed to enable these data to be managed over time so as to serve as a basis for analysis of trends and what these might mean for marine turtle populations and their management needs.

4. **Prepare and implement an outreach strategy** to increase awareness of and appreciation for marine turtle conservation and management and their relation to the broader national agenda as regards land use and development patterns, biodiversity conservation, economic priorities and cultural norms. Such a strategy should seek to engage multiple sectors—fishers and coastal communities, the tourism industry, and residents and visitors, especially in high-tourism areas.

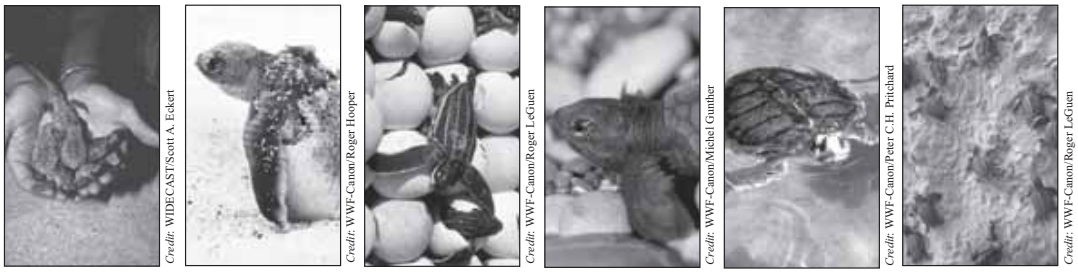
[1] Characterizing a site, whether foraging or nesting, as an 'Index' site implies the consistent and long-term application of standardized population monitoring protocols to ensure the data are suitable for trend analysis. Survey boundaries are specifically set and adhered to from year to year, and the survey area is representative (i.e. it should attempt to represent a range of threat and protection levels, a variety of turtle life stages, and a range of turtle population densities). The emphasis of this protocol is on establishing index methods for measuring trends in relative abundance at fixed locations; therefore, the sampling strategies at each Index site should ideally be structured in a manner that allows inference to a larger area of interest.

5. **Develop and implement a compliance strategy**, including stakeholder workshops; periodic patrols of landing sites and markets and other points of sale, as well as beaches and foraging areas at times of heightened marine turtle activity; and training for members of the law enforcement community and the judiciary. Such a strategy should recognize the deterrent effect of an enforcement presence, which could be made possible through the deputizing of members of the community (cf. Trinidad and Tobago's Honorary Game Warden programme) to support marine turtle enforcement. Proactive, non-punitive judgments—such as those mandating that offenders participate in conservation-related activities, including habitat clean-ups or supervised beach patrols—have been described as successful in some jurisdictions, as have been the operation of marine turtle "hotlines" for reporting and seeking a response to marine turtle infractions and other activities. Greater awareness of and support for the legal norms applying to marine turtles, including the prohibitions in place and penalties that apply, are needed throughout the WCR. Similarly helpful would be the development and dissemination of protocols to follow in cases of specific marine turtle interactions, such as when a turtle is taken incidentally in a net or reported to be injured.

6. **Increase government participation in regional agreements** that provide an operational basis for a unified, science-based and multilateral response to the management, recovery and sustainable use—whether extractive or non-extractive—of marine turtles in the WCR. The most prominent of these agreements are the SPAW Protocol to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and IAC. Sub-regional agreements, such as the trilateral *Acuerdo de Cooperación para la Conservación de las Tortugas Marinas en la Costa Caribeña de Costa Rica, Nicaragua y Panamá* (*Acuerdo Tripartito*), provide additional possibilities for co-operation in management efforts for these species.

INTRODUCTION

Marine turtles enjoy iconic status in many parts of the world, in many cultures and many sectors (Frazier, 2005a and b), including in the Caribbean (Eckert and Hemphill, 2005). Being among the first reptiles—and marine species—to have been identified as threatened with extinction, marine turtles have been largely protected from international commercial trade under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since the late 1970s and have benefited from several decades of conservation investment. While there have been many advancements over the past half-century in our understanding of marine turtle biology and management needs, the actual management of marine turtles, and of marine turtle exploitation in particular, has in many ways not kept pace with this understanding nor with the contemporary scope of threats to their survival. The consequence of this has been continued high levels of mortality in legal target fisheries, as fisheries by-catch, among adult females on nesting beaches, and through widespread collection of eggs, as well as losses from habitat and other factors. Until the Japanese Government disallowed the import of Hawksbill Turtle *Eretmochelys imbricata* shell (or *bekko*) on 1 January 1993, exploitation included large numbers of this species killed around the world, including the Caribbean Sea, to supply this international market.



Hatchlings, from left to right: Hawksbill Turtle, Green Turtle, Leatherback, Loggerhead, Kemp's Ridley and Olive Ridley.

There is long-standing concern, as expressed by governments and civil society alike, that continuing exploitation in many marine turtle range States is compromising management and conservation efforts in other range States and inhibiting the recovery of depleted populations at regional and global levels. Much of this concern arises from increasing understanding and appreciation of the shared nature of marine turtle stocks. Marine turtles benefiting from legal protection or active, science-based management in certain range States invariably travel through or to countries where they are—or risk being—subject to exploitation that is legal and, in many instances, subject to few controls. Effective management and conservation of these species clearly requires a co-ordinated approach amongst countries harbouring the same turtle stocks.

A number of multilateral initiatives aimed at providing a basis for collaboration and co-ordination on marine turtle management have been undertaken in recent years. In the Wider Caribbean, these include the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, which entered into effect in 2000, and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), which entered into force in 2001. In addition, region-wide inter-governmental meetings devoted to addressing shared marine turtle management have been convening in the region for more than two decades (e.g.

Bacon *et al.*, 1984; Ogren, 1989; Eckert and Abreu Grobois, 2001; IUCN, 2002), as have innumerable technical workshops and consultations.

Recognizing that identifying and implementing concrete steps to co-ordinate management efforts for marine turtles at the regional level must be grounded in the management efforts and capacities of constituent States, TRAFFIC North America undertook a review of exploitation, trade and management of marine turtles in 11 countries and territories in the northern Caribbean (Fleming, 2001). The review documented a patchwork of national management regimes for marine turtles ranging from complete protection and active investment in conservation and management to very few restrictions on exploitation and little to no investment in management and conservation. In so doing, the review re-emphasized the fundamental challenges of attempting to manage and conserve solely on a country-by-country basis species that use the totality of the Caribbean basin and, in the case of the Loggerhead *Caretta caretta* and Leatherback *Dermochelys coriacea*, much of the North Atlantic Ocean, at different stages and times of their lives.

Participants in the First CITES Wider Caribbean Hawksbill Turtle Dialogue Meeting, held in Mexico City in May 2001, noting the TRAFFIC report and its implications for marine turtle management throughout the Caribbean, called on the CITES Secretariat to undertake a similar analysis for the rest of the Wider Caribbean Region (WCR). It was clear at that time that, only once a full picture could be made of the situation in each country, could the participants and other stakeholders begin to formulate a strategy for a more co-ordinated approach to management of these species. To this end, the Secretariat commissioned TRAFFIC International to conduct an assessment of the exploitation, trade and management of marine turtles in the 26 political jurisdictions of the Lesser Antilles, Central America, Colombia and Venezuela.

The findings presented in the pages that follow are the result of consultation, research, analysis and synthesis conducted by the authors over a period of nearly three years, drawing on their own decades of experience and expertise and those of many others in the region. The report highlights the persistence of largely outdated management regimes in many countries, including the minimum size limits that prevail in many insular States, a lack of systematically collected data on marine turtle landings, the near-absence of credible (data-based) estimates of population trends and, particularly in the continental States, widespread exploitation under blanket legal protection or poorly defined and largely uncontrolled exemptions to such protection. In addition, it documents the implications of management shortcomings in one country for the management and conservation efforts being made in another. Equally importantly, it documents a range of activities that are being undertaken at the national level to address these problems and which could be expanded or adapted across the region.

It is within this context that this report aims to form the basis of an open, deliberate, constructive dialogue between governments and other stakeholders in the WCR regarding shared needs and responsibilities for marine turtle management. The commitment of the authors and that of their institutions, as well as of the many contributors, to the analysis presented here stands as testament both to the gravity ascribed to the marine turtle management failings that are revealed and to the hope that, in documenting both these failings and the many innovative—and pioneering—approaches to marine turtle conservation in the region, with a well-co-ordinated effort, it will be possible to build a future where marine turtles might once again fill a varied panoply of ecological, socio-cultural, and economic roles.

MARINE TURTLES OF THE CARIBBEAN

The WCR (**Figure 1**) includes nesting and foraging grounds, as well as important migration corridors, for six of seven extant marine turtle species. All six of these species are included in the *IUCN Red List of Threatened Species*: the Kemp's Ridley *Lepidochelys kempii*, Hawksbill Turtle *Eretmochelys imbricata* and Leatherback *Dermochelys coriacea* are classified as Critically Endangered, and the Loggerhead *Caretta caretta*, Green Turtle *Chelonia mydas* and Olive Ridley *Lepidochelys olivacea* are classified as Endangered (see **Appendix I**) (IUCN, 2004). These classifications reflect the species' global status. Extinction risk is assessed on the basis of quantitative criteria in relation to past or projected future population declines, population size and trends, and the size and trend of area of occupancy within the overall geographic range. (Fuller details of the IUCN Red List and its Categories and Criteria can be accessed at www.iucnredlist.org.)

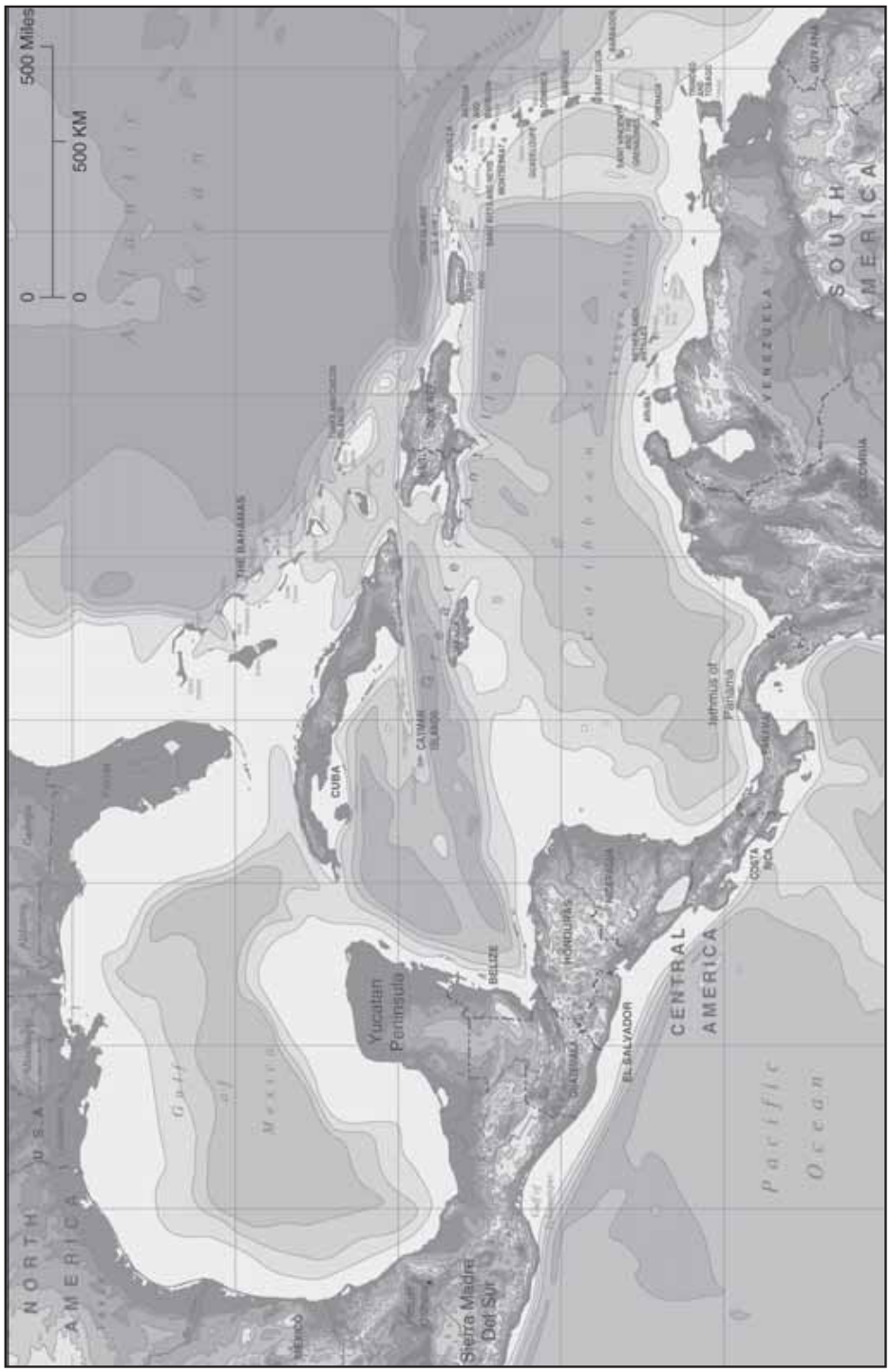
Causal factors contributing to the threatened status of the marine turtles of the WCR include legal and illegal targeted fisheries, as well as incidental capture in fishing gear; killing of gravid females on nesting beaches; egg collection and national and international trade; pollution and other degradation to foraging grounds; and loss of nesting habitat to coastal development (e.g. NRC, 1990; Eckert, 1995a; Meylan and Donnelly, 1999; Witherington and Martin, 2000; Eckert and Abreu Grobois, 2001; Seminoff, 2004). Threats accumulate over long periods of time and can occur anywhere in a population's range; thus, declines typically result from a combination of factors, both domestic and foreign. In general, and notwithstanding documented examples of apparently rising or recovering populations (Leatherback: Dutton *et al*., 2005; Green Turtle: Troëng and Rankin, 2005; Hawksbill Turtle: Krueger *et al*., 2003a; Richardson *et al.,* 2004; Diez and van Dam, Chelonia Inc., unpubl. data; Kemp's Ridley: Márquez *et al*., 1999), marine turtle populations throughout the WCR are so severely reduced from historical levels (Carr 1955; Parsons, 1962; Rebel, 1974; King, 1982; Groombridge and Luxmoore, 1989; Ross *et al.,* 1989; Reichart, 1993; Jackson, 1997; Meylan and Donnelly, 1999; Bjorndal and Bolten, 2003) as to be considered by Bjorndal and Jackson (2003) "virtually extinct" from the standpoint of their role in Caribbean marine ecosystems.

Some of the largest marine turtle breeding colonies that the world has ever known, including those of Green Turtles in the Cayman Islands (Lewis, 1940; Aiken *et al.,* 2001), have all but vanished. Nesting trends for Green Turtles elsewhere in the WCR are mixed, with rising trends at Tortuguero (Costa Rica), currently the region's largest colony, as well as in the USA and Mexico, but long-term declines at Aves Island (Isla de Aves, Venezuela), once a globally significant site (Seminoff, 2004). According to León and Bjorndal (2002), "current hawksbill populations in the Caribbean represent at most 10% of pre-Columbian levels", while Meylan (1999a) reported Hawksbill Turtle populations to be "declining or depleted in 22 of the 26 political units in the Caribbean for which status and trend information [was] available". Hawksbill Turtle nesting in the Yucatán Peninsula (Mexico), estimated to have comprised ca. 40% of all known Hawksbill nesting in the WCR (Meylan, 1999a; IUCN, 2002), is steadily declining: nests counted in 2004 amounted to a mere 37% of those counted in 1999 (Abreu Grobois *et al*., 2005). Importantly, several countries examined in the present review cited anecdotal reports of increasing numbers of juvenile Green and Hawksbill Turtles, a finding worthy of focused investigation.

The largest nesting colony of Leatherbacks in the WCR (Ya:lima:po, French Guiana), recently reported as having declined by more than 50% from 1987 to 1998 (Chevalier and Girondot, 2000), has now been re-evaluated from a broader perspective, incorporating nesting data from throughout the Guianas (recognizing that the annual nesting effort tends to migrate seasonally, tracking the ever-shifting coastline). A reconstructed time-series of

Figure 1

Map to show the Wider Caribbean Region (WCR), including the Lesser Antilles, Central America, Colombia and Venezuela—the geographical focus of this report.



Leatherback nesting activity along the 600-km coastline of Suriname and French Guiana, corrected for capture effort, shows that nesting activity has been "stable or slightly increasing in this region since 1967" (M. Girondot, Université de Paris, *in litt*., 23 November 2005). Similarly, there is no evidence of contemporary decline in nearby Trinidad, the world's largest insular nesting Leatherback colony (S. Eckert, WIDECAST, pers. comm., 2005), and some small, long-protected colonies are growing in size (Dutton *et al*., 2005). In contrast, there is considerable anecdotal evidence that Leatherback nesting has "dramatically declined" throughout much of the Eastern Caribbean (Eckert, 2001). Reviews are inconclusive for this species in Central America (Troëng *et al.,* 2004), indicating that longer periods of data collection are necessary.

Dramatic reductions during the second half of the 20th century at the region's largest nesting colonies of both the Olive Ridley and Kemp's Ridley are well documented (Ross *et al*., 1989; Reichart, 1993; Márquez, 1994; Marcovaldi, 2001), presently rising numbers of nesting Kemp's Ridley (Márquez *et al*., 1999) notwithstanding. Finally, the Loggerhead nesting colonies of eastern Florida (USA), the largest in the WCR, have been steadily declining since 1998 (FFWCC, 2004), following more than a decade of rising trends (Witherington and Koeppel, 2000) and despite more than three decades of federal protection.

Marine turtles have provided nutrition, wealth and in other ways been useful to humans for more than 2500 years (Peterson, 1997; Versteeg *et al*., 1990). They fed indigenous tribes (Frazier, 2003) and helped make foreign colonization possible; Carr (1955) observed that, "all early activity in the New World tropics—exploration, colonization, buccaneering, and even the manoeuverings of naval squadrons—was in some way or degree dependent on turtle." Green Turtles, exclusively herbivorous (Bjorndal, 1982), were savoured for their mild flesh and historically traded in enormous volumes (Parsons, 1962; King, 1982; Groombridge and Luxmoore, 1989; Jackson, 1997). Similarly, the colourful carapace scutes of the Hawksbill Turtle once featured prominently in the region's foreign export earnings, historically in trade with Europe but more recently (increasingly dramatically in the early 1970s) in trade to Asian markets, primarily Japan (Parsons, 1972; Mack *et al*., 1982; Milliken and Tokunaga, 1987; Groombridge and Luxmoore, 1989; Meylan and Donnelly, 1999).

Often overlooked have been the ecological services that these species deliver. Marine turtles, once numbering in the inestimable tens of millions (Jackson, 1997) and not atypically described by early writers as a "never failing resource" (e.g. Long, 1774, cited in King, 1982), are becoming known to science as having contributed significantly to nutrient cycling on sandy beaches (Bouchard and Bjorndal, 2000), as well as productivity in seagrass beds and diversity in coral reefs (León and Bjorndal, 2002; Bjorndal and Jackson, 2003). Hatchlings entered the food chain by the millions, month after month during the nesting season, with, by current estimates, only one egg in a thousand surviving to become an adult turtle (Frazer, 1986). More recently, marine turtles have become popular subjects for dive and nature tourism and, in this context, are increasingly becoming a source of revenue for coastal communities in the region, such as in Costa Rica, Grenada, Saint Lucia and Trinidad and Tobago (e.g. Troëng and Drews, 2004).

Life history and life cycle

Marine turtle life-history strategies, complex but largely known, have not changed over time. These animals are slow-growing, late-maturing (age at sexual maturity in the WCR ranges from 11 to 16 years [Kemp's Ridley: Zug *et al.*, 1997] to three decades or more [Green Turtle: Frazer and Ladner, 1986], depending on the species) and long-lived, with naturally high rates of egg and young juvenile mortality and low rates of adult mortality. These

attributes, coupled with an overlapping iteroparous life cycle—long life-expectancy coupled with discrete multiple breeding seasons and overlapping generations (Chaloupka and Musick, 1997)—mean that long-term data collection is vital for the estimation of key demographic parameters and for informing management decisions.

Early attempts to incorporate Western Atlantic Loggerhead life-history data into population model simulations revealed that even 100% survival in the first year of life would not reverse population decline, suggesting that protection limited to the egg/hatchling stage was unlikely to be effective and that only by reducing large juvenile and adult mortality could extinction be averted (Crouse *et al*., 1987). Frazer (1989) used the concept of reproductive value—a measure of the value to the population of an individual female turtle of a particular age—to emphasize the critical importance of ensuring that large turtles be protected. On this basis, and noting that the regulatory framework in the WCR had been focusing marine turtle fisheries "incorrectly for over 350 years", he recommended to Caribbean fishery managers at the Second Western Atlantic Turtle Symposium in 1987 that any exploitation of marine turtle populations must be restricted on the basis of maximum—not minimum—size limits. More contemporary mathematical treatments (e.g. Crowder *et al*., 1994; Heppell *et al*., 1999, 2000 and 2004) have only reinforced the conclusion that protecting large juvenile and adult turtles from exploitation is an essential component of any sustainable marine turtle management regime. While Caribbean fishery managers recognize that "understanding these [life-history] aspects is fundamental to the development of management programs" (*Santo Domingo Declaration*—Eckert and Abreu Grobois, 2001), the regulatory framework has been slow to respond.

Compounding the management challenges posed by life-history traits are those arising from an elaborate life cycle defined by a broadly predictable but often poorly understood series of changes—so-called *ontogenetic shifts* in location and habitat (Frazier, 2001; Heppell *et al*., 2003)—that occur over the course of a marine turtle's life and often incorporate long-distance migration. At any point in time, a genetically distinct population of marine turtles is spread across several, and perhaps several dozen, geo-political units. This complicates significantly the delivery of management and conservation and evidences the need for active co-operation and collaboration among range States in the management of shared stocks.

Research indicates that individual marine turtles are unlikely to remain in natal habitats throughout their lives. Hatchlings emerge from the sand, orient to the sea, and engage in a swim frenzy, well known to science, that ultimately leads them into oceanic convergence zones that offer food and shelter during the early years. Young juveniles (with the exception of the elusive giant Leatherback) eventually return to coastal waters, assuming their characteristic diets, and may travel significant distances through multiple political jurisdictions during the estimated one to four decades required to reach sexual maturity. At maturity, adult females return to the general area where they were born, sometimes undertaking trans-oceanic journeys, to engage in egg-laying. Seasonal nesting populations and nearshore foraging aggregations exhibit varying degrees of genetic relation; thus, conservation measures directed at local nesting colonies will not necessarily benefit local foraging stocks and *vice versa*. Foraging assemblages are typically a mixed assortment of (primarily) juveniles and (fewer) adults drawn from nesting rookeries near and far. Nesting assemblages, on the other hand, comprise females drawn to the beach by the gravity of instinct, the signature of their natal coastline indelibly marked in their genetic code (e.g. Bowen and Witzell, 1996; Bowen and Karl, 1997; Bass, 1999; Díaz-Fernández *et al.*, 1999; Dutton *et al.*, 1999; Bowen, 2003). Adult females pass the code to their daughters, who will repeat the cycle as long as the natal beach provides suitable habitat.

Species overview and general trends

The smallest and most localized marine turtle species in the WCR are the Ridleys. The Kemp's Ridley, largely confined to the Gulf of Mexico, nests primarily in Tamaulipas, Mexico, with foraging grounds extending northwards along the eastern seaboard of the USA (Márquez, 1994). Its range is not considered to extend to any of the countries examined in this review. An active bilateral conservation and research partnership between Mexico and the USA has successfully brought this species back from the brink of extinction (Márquez *et al*., 1999); while the population is still depleted, there are an estimated 6000 adults (male and female), and the population is growing (D. Shaver, US National Park Service, pers. comm., 2005). In contrast, the Olive Ridley is largely confined to the southern Caribbean, predominantly the Guianas. The largest colony in the region was until recently located at Elianti Beach, Suriname, where egg collection (Reichart, 1989) and incidental capture in commercial fisheries (Laurent *et al*., 1999) are implicated in the loss of nearly 95% of this population since 1968: the number of nests declined from over 3000 per year in the late 1960s, to fewer than 500 in the early 1990s (Reichart, 1993), to fewer than 200 today (Hilterman *et al*., 2001). Today, the most significant colony appears to be located in eastern French Guiana, where ca. 2000 nests were laid (by perhaps 1500 females) in 2004; lower-density nesting is recorded in western French Guiana where, in 2004, ca. 600 nests were laid within the Amana Nature Reserve (B. de Thoisy, Association Kwata, unpubl. data).

Credit: WWF-Canon/Urs Woy

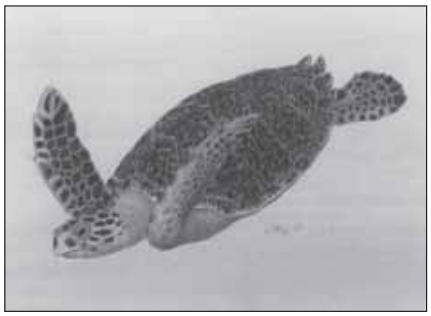
Credit: Scott A. Eckert/WIDECAST

Kemp's Ridley *Lepidochelys kempii* (top) and Olive Ridley *Lepidochelys olivacea*

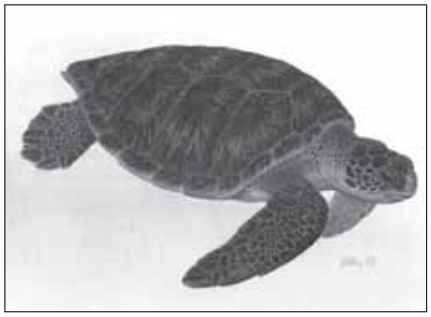
In addition to hosting remnant populations of Kemp's and Olive Ridleys, the WCR harbours remnant populations of four other marine turtle species that today comprise some of the world's largest remaining stocks. In Tortuguero, Costa Rica, Green Turtles typically nest in the tens of thousands per year in a widely fluctuating pattern that shows a clearly increasing trend (Troëng and Rankin, 2005). A rookery of similar size is found at Raine Island, Australia, but no other rookery in the world approaches these numbers (Seminoff, 2004). Historically, the largest Green Turtle rookery in the Caribbean is credited to the Cayman Islands, but the population was all but extinguished by commercial exploitation two centuries ago (Aiken *et al*., 2001). Exploitation pressure has remained high on this, the most edible of marine turtle species, with the apparent result that nesting is reported at low densities or greatly depleted in most of the countries examined in this study. Based on the data available, the heaviest exploitation in a single country in the region occurs in Nicaragua, the primary foraging ground for the Tortuguero nesting colony and possibly the most important foraging ground for this species in the entire Atlantic system (Carr *et al*., 1978), where an estimated 11 000 Green Turtles have been killed annually during the past decade (Lagueux, 1998).

Hawksbill Turtles, providers of tortoiseshell (the colourfully patterned scutes that cover the carapace) have, like Green Turtles, been exploited for centuries. The tortoiseshell from hundreds of thousands of turtles in the WCR

was imported into the UK and France during the 19th and early 20th centuries (Parsons, 1972) and additional hundreds of thousands of turtles contributed to the region's trade with Japan prior to the imposition of a zero quota on Hawksbill shell imports to Japan in 1993 (Milliken and Tokunaga, 1987; Groombridge and Luxmoore, 1989; Canin, 1991; Donnelly, 1991). What is believed to have been, historically, the largest nesting colony in the WCR—Playa Chiriquí in Bocas del Toro Province, Panama—reported only 465 nests in 2004 (Ordoñez *et al*., 2005). Today, the largest nesting colony in the WCR is located on the shores of the Yucatán Peninsula, Mexico, where long-term monitoring indicates a persistent decline in recent years: ca. 2400 nests were laid in the States of Campeche and Yucatán (including Isla Holbox) in 2004, a 63% drop in numbers since 1999, when ca. 6400 nests were laid there (A. Abreu Grobois, UNAM, pers. comm., 2005). For most of the countries in the region, nesting is characterized as depleted and occurring at low densities, with the important exception of rising trends at a handful of small but well-studied colonies (Krueger *et al*., 2003a; Richardson *et al.,* 2004) and anecdotal observations of increases in foraging juveniles at selected sites (e.g. Puerto Rico, Barbados). The spongivorous Hawksbill Turtle (Meylan, 1988) is confined to tropical latitudes and is believed to complete its life cycle within the confines of the Caribbean Sea; notwithstanding, intriguing tag returns, such as that from a juvenile tagged in Brazil and later killed in Dakar, Sénégal (Marcovaldi and Filippini, 1991), hint at life-history behaviours that are still poorly understood.



Credit: WWF-Canon/Urs Woy

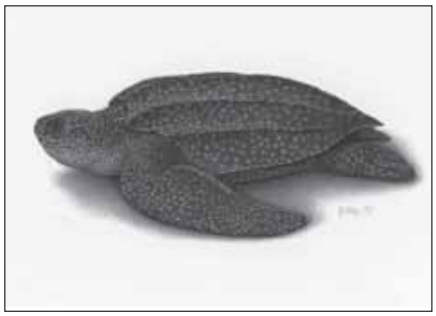


Credit: WWF-Canon/Urs Woy

Hawksbill Turtle *Eretmochelys imbricata* (top) and Green Turtle *Chelonia mydas*

Leatherbacks are the largest and most migratory of the marine turtles; lacking a hard bony shell, they are also the most visually distinctive. Gravid females arrive seasonally at preferred nesting grounds, but adults spend most of their time in temperate and even sub-arctic latitudes where they prey on oceanic jellyfish and other soft-bodied invertebrates (WCR summaries by Eckert, 1995b and 2001; Dutton *et al*., 1999); little is known of the biology or distribution of juveniles (Eckert, 2002). Satellite-tracking of post-nesting females has confirmed that they depart the Caribbean after egg-laying and navigate along trans-oceanic corridors to western African coasts and the high seas of the North Atlantic (Eckert, 1998 and 2006; Hays *et al*., 2004a). The largest nesting colonies in the region are located in Trinidad and the Guianas (primarily French Guiana and Suriname), where several thousand adult females converge annually with no indication of declining trends, and along the Costa Rica-Panama coast, where 3000 nests were recorded at Playa Chiriquí (Panama) alone in 2004 (Ordoñez *et al*., 2005). Leatherbacks prefer high-energy shorelines and deep, unobstructed access (Eckert, 1987). They are often referred to as colonizers, being the first to exploit newly emerging habitat along the ever-shifting coastlines of the Guianas (Pritchard and Trebbau, 1984; Girondot and Frétey, 1996). They exhibit less site-fidelity than the other species and, while the majority of females will return repeatedly to the same nesting ground, it is not unusual for individuals tagged at one nesting beach to be reported nesting elsewhere (Pritchard, 1973; Eckert *et al.*, 1989). Nesting by Leatherbacks has been documented in most of the insular Caribbean countries examined in this study, in several—e.g. Aruba, Dominica, Grenada, Saint Lucia, Trinidad and Tobago—at greater densities than other marine turtle species.

Finally, the omnivorous Loggerhead, described as the most ecologically generalized marine turtle (Bolten, 2003), is found nesting in both tropical and temperate latitudes. Hatchlings from nesting beaches in the WCR, and particularly those in the south-eastern USA, enter the North Atlantic Gyre where they remain for 7–12 years before returning to the Western Atlantic to settle in coastal benthic feeding grounds at a size of ca. 40-60 cm (straight carapace length) (Bjorndal *et al*., 2000). There are at least four genetically distinct Loggerhead nesting sub-populations in the western North Atlantic, based on mitochondrial DNA (Encalada *et al.,* 1998). Only South Florida (USA) is described as a "major" nesting ground in the WCR, while nesting in Cuba, Mexico, Belize, Guatemala, Honduras, Colombia and Venezuela is described as "minor [fewer than 1000 nests per year] or relatively poorly known" (Ehrhart *et al*., 2003). The South Florida colony has been declining for several years: fewer than 50 000 nests were laid in 2004 (State-wide), the equivalent of some 12 000 females (based on 4.1 nests per female—TEWG, 2000), the lowest nest count since 1988 (FFWCC, 2004).



Credit: WWF-Canon/Urs Woy

Credit: WWF-Canon/Urs Woy

Leatherback *Dermochelys coriacea* (top) and Loggerhead *Caretta caretta*

Transboundary movements

Marine turtles are migratory at all life-history stages (Lohmann *et al*., 1997), a reality well-known to science but as yet poorly translated into national and regional management norms. As with any shared resource, co-ordination among range States with regard to management is an unavoidable prerequisite for success at local and national levels. Transboundary movements of marine turtles among range States in the WCR are documented through the return of flipper tags that have been fitted to marine turtles for more than five decades (Carr, 1967) and, more recently, by satellite-tracking. In addition to identifying markers, an address on the flipper tag enables fishers and others to return the tag (sometimes for a small monetary or other reward, which serves as an incentive). A satellite transmitter fitted to a turtle's carapace enables the animal's movements and a range of additional data to be collected on an almost-constant basis, for more than two years in some cases (S. Eckert, WIDECAST, pers. comm., 2005).

The largest bodies of data on international movements have been collected through the recovery of tags in the Nicaraguan Green Turtle fishery and from females nesting at Tortuguero, Costa Rica. Carr *et al.* (1978) tabulated international tag returns from Green Turtles tagged at Tortuguero during the period 1956–1977, which indicated that the waters of Nicaragua, in particular the Miskito Bank area, are the principal feeding grounds for the Tortuguero nesting colony. Carr *et al.* (1982) reported that the recovery in Nicaragua of two tags that had been put on Green Turtles at Aves Island was the first evidence that the Miskito Bank may be a feeding habitat for two different major breeding populations of Western Atlantic Green Turtle stocks. Green Turtles caught in the waters of Nicaragua had been tagged in the Bahamas, Bermuda, Brazil, Cuba, Florida (USA), Grand Cayman, Yucatán (Mexico) and Panama, as well as in Costa Rica and Venezuela. Similarly, two Loggerheads taken in Nicaragua had been tagged in Panama and the Azores (Portugal) (Lagueux, 1998). According to sources cited in Meylan

(1999b), Hawksbill Turtles captured in Nicaragua had been tagged at Tortuguero (Costa Rica), in the US Virgin Islands, and the Yucatán (Mexico); such tags have been recovered there in recent years from elsewhere in the region (C. Lagueux, WCS, *in litt*., 13 June 2005).

Evidence from flipper-tagging, satellite-tracking programmes and genetic analyses has shown that the marine turtles nesting in Costa Rica migrate through, forage and breed in various other countries and that, for example, Green and Hawksbill Turtles travel through Costa Rican waters between the reefs of Bocas del Toro, Panama and the Miskito Cays, Nicaragua. The analysis of Carr *et al.* (1978) of over 1100 international tag returns over the period 1956–1977 from Green Turtles tagged at Tortuguero indicated that this nesting population is drawn from turtles that feed throughout the western Caribbean. Although the great majority of tag recoveries were from Nicaragua, more than 10 returns were from Colombia, Panama, Mexico, Venezuela and Cuba. Carr *et al*. (1982) reported that a Green Turtle tagged at Tortuguero was later captured in the Gulf of Paria on the west coast of Trinidad. Movements of Hawksbill Turtles tagged nesting at Tortuguero show a similar pattern: they have been recaptured at various sites in Nicaragua, Panama and Honduras (Bjorndal *et al*., 1985, cited in Meylan 1999b). Recent genetic analyses point to nesting female Hawksbill Turtles from Tortuguero foraging in Cuba, Mexico and Puerto Rico (Troëng *et al*., 2005).

Similar patterns are evident in other large datasets. For example, tagging of Green Turtles nesting on Aves Island has provided evidence of long-distance movement into other jurisdictions; tags from this programme have been returned from: Barbados, Bonaire, Brazil, Colombia, Cuba, Dominica, the Dominican Republic, Grenada, Guadeloupe, Guyana, Haiti, Martinique, Mexico, Nicaragua, Puerto Rico, Saint Kitts, Saint Lucia, Saint Vincent and the Grenadines and Venezuela (Vera, 2004).

International movements are also increasingly being documented through satellite telemetry and, in many instances, made available on the Internet (e.g. at www.seaturtle.org/tracking; www.bonaireturtles.org; www.cccturtle.org and www.hawksbillwwf.org/). For example:

- a Hawksbill Turtle satellite-tagged in Antigua migrated into Belizean waters (Searle, 2001);
- a number of turtles (several Hawksbill Turtles, one Green Turtle and one Loggerhead) satellite-tagged in Bonaire have travelled through and to at least seven countries in the region: Venezuela, Colombia, Dominican Republic, Honduras, Nicaragua, Panama, Puerto Rico (USA) and the Virgin Islands (Sea Turtle Conservation Bonaire, unpublished data);
- four post-nesting Hawksbill Turtles satellite-tagged in Barbados in 1998 stayed in the country's waters for only a few months before travelling to Grenada, Dominica, Trinidad and Venezuela, respectively, where some foraged at the same sites for up to 1.5 years (Horrocks *et al*., 2001);
- three of four adult female Hawksbill Turtles satellite-tracked after nesting at Playa Chiriquí, Panama, travelled to distant countries, including Nicaragua and Jamaica, where they stayed for extended periods (the fourth was killed shortly after her release from the nesting beach) (A. Meylan, *in litt.*, 15 March 2005);
- a female Hawksbill Turtle satellite-tagged after nesting in the Zapatilla Cays, Panama, travelled to Honduras and remained there for several months, after which the battery failed, but the turtle was recorded again on the same nesting beach two years later (Meylan and Meylan, unpubl. data); and
- a male Green Turtle satellite-tagged at Bocas del Toro, Panama, travelled to the San Bernardo Archipelago in Colombia (A. Meylan, *in litt*., 15 March 2005).

Flipper-tagging of Leatherbacks is documenting a pattern of behaviour somewhat less precise in nesting beach fidelity. Recent, largely unpublished examples documented in this review corroborate an existing body of WCR-related literature (Pritchard, 1973; Eckert *et al.*, 1989; Boulon *et al*., 1996). For example:

- a Leatherback tagged during nesting in Saint Lucia in 2003 later nested in Barbados (J. Horrocks, Barbados Sea Turtle Project, pers. comm., 2004);
- a Leatherback tagged while nesting in the US Virgin Islands in April 2004 nested twice on Rosalie Beach, Dominica, in May of that year (Byrne, 2004), while a Leatherback tagged while nesting on Rosalie Beach in April 2004 later nested twice on Cipara Beach, Peninsula de Paria, Venezuela (H. Guada, CICTMAR, pers. comm., 2004), and another tagged on Rosalie Beach in 2004 nested some weeks later in Martinique (R. Byrne, RoSTI, pers. comm., 2005);
- two Leatherbacks nested in Tobago in 2004 after having nested (and been tagged) in Grenada earlier in the season (W. Herron, SOS Tobago, *in litt*., 8 August 2004);
- a Leatherback that nested in Grenada in 2004 had originally been tagged in Panama (Ocean Spirits, *in litt.*, 24 October 2004); and
- data from the tagging of marine turtles in the Paria Peninsula and Isla de Margarita (Venezuela) have recently begun to indicate migrations of these nesting animals back and forth between Venezuela and Trinidad, as has been recorded in 1999 and during the period 2001-2004 (CICTMAR, 2002; J. Horrocks, pers. comm., cited in H. Guada, *in litt*., 19 September 2004; Rondón *et al*., 2004).

Equally important for management is that satellite-tracking of Leatherbacks is providing unique insight into the extraordinary long-distance movements of these animals around and across entire ocean basins. Recent examples of the WCR-related trajectories include those of:

- nine Leatherbacks satellite-tagged in Trinidad between 1995 and 2004: the three longest records documented post-nesting females returning to high-latitude Atlantic foraging grounds (as far north as the Flemish Cap) and continuing on to foraging grounds associated with the Mauritania Upwelling off the west coast of Africa (Eckert, 1998 and 2006);
- 10 Leatherbacks satellite-tracked from two Atlantic Florida rookeries during the period 2000-2002: most of these animals exploited continental shelf foraging grounds along the eastern seaboard of the USA, and as far north as Cape Breton (March-October), moving off the continental shelf during winter months; one female journeyed to foraging grounds associated with the Mauritania Upwelling (Eckert *et al*., 2006);
- eight post-nesting female Leatherbacks satellite-tagged in Grenada in 2003: two travelled north-west, arriving within a few hundred kilometres of Cape Cod and Nova Scotia before turning southwards, while the remaining five that left the Caribbean travelled north-east, reaching latitudes between the Azores and the UK before some turned south (Hays *et al*., 2004a and 2004b); and
- Leatherbacks that have been satellite-tracked from Trinidad to Cape Breton, Nova Scotia and in the reverse direction: an adult male Leatherback was tracked from Nova Scotia to Galera Point, Trinidad, where it resided for 96 days before returning to Nova Scotia (James *et al*., 2005).

In summary, while marine turtles have clearly evolved to be faithful to a preferred nesting ground (widely believed, based on several lines of evidence, to be their natal nesting ground), there is ample evidence that some individuals, and Leatherbacks in particular, are more flexible in their nest-placement strategies. Leatherbacks may nest in multiple political jurisdictions, even over the course of a single reproductive season. In the case of

the Guianas, where sand deposits suitable for nesting may shift with each passing year, Leatherbacks are able to locate new deposits and exploit them successfully for nesting, despite the passage of an intervening two years or more. In other cases, the cues that motivate a turtle to relocate outside preferred nesting ground can be deadly, such as when a female leaves a protected rookery and enters the waters of a jurisdiction where she is not protected.

In all cases, the implication for management is that a unified regulatory regime would greatly assist in the regional conservation and sustainable use of shared stocks. The situation of turtles protected on their nesting grounds returning to foraging grounds in other jurisdictions where some type of legal exploitation (for commercial or subsistence purposes or indigenous use) is permitted extends across the WCR; less documented but known also to occur is the scenario whereby turtles protected on their foraging grounds return to nest in jurisdictions where they are partially protected or unprotected. For example, legally protected Hawksbill and Green Turtles tagged in Barbados have been captured in Saint Vincent and the Grenadines, Grenada, Cuba, Saint Lucia, Nicaragua, Trinidad and Venezuela (J.A. Horrocks, University of the West Indies, pers. comm., cited in Meylan, 1999; Krueger *et al*., 2003b; Luke *et al*., 2004; J.A. Horrocks, pers. comm., 2006). Post-nesting Hawksbill Turtles from the Jumby Bay Hawksbill Project in Long Island, Antigua, have been captured in Dominica (Fuller *et al*., 1992) and Saint Kitts (Meylan, 1999). Marine turtles protected in Bonaire have travelled to several countries where exploitation is permitted, including Colombia, the Dominican Republic, Honduras and Nicaragua. In Central America, post-nesting Green Turtles leave the protection of Tortuguero National Park and return to foraging pastures characterized by high levels of exploitation in Nicaragua (Campbell, 2003).

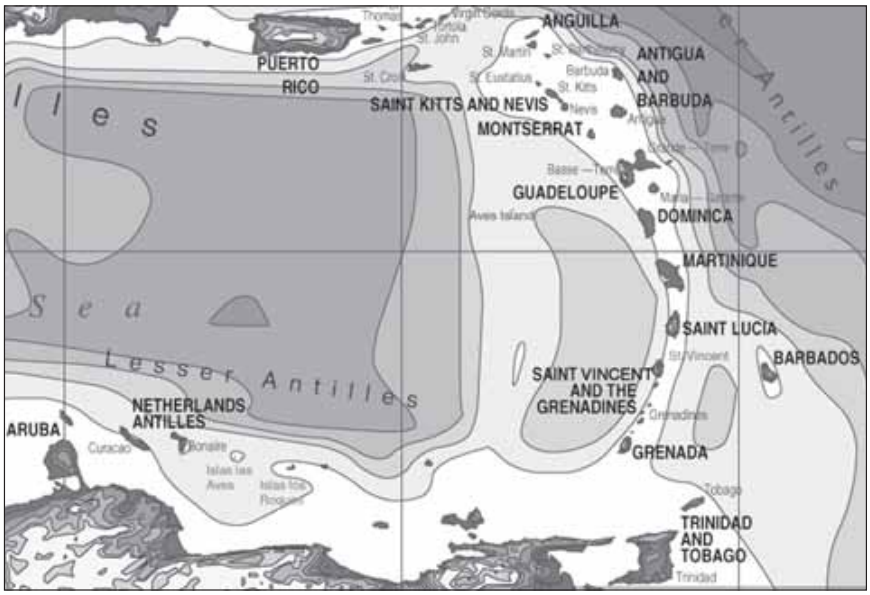
METHODS AND DEFINITIONS

As mandated by the CITES Secretariat, this study reviewed marine turtle exploitation, trade and management in 26 political jurisdictions in the WCR: Anguilla and Montserrat, two UK overseas territories; Guadeloupe (comprising Saint Martin and Saint Barthélémy) and Martinique, two overseas departments of France; the five islands comprising the Netherlands Antilles (Saba, Sint Eustatius, Sint Maarten, Bonaire, Curaçao); Aruba, Antigua and Barbuda, Barbados, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago; Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia and Venezuela. For each of these jurisdictions, the study aimed to:

- document current legislation governing exploitation, trade and management of marine turtles;
- document—and quantify where possible—levels of legal and illegal exploitation and trade in marine turtles and their products;
- document the existence and status of stockpiles of marine turtle products;
- document management initiatives being undertaken and the constraints to conservation and management of marine turtles; and
- provide recommendations for improving the management of exploitation and trade in marine turtles at the local, national and regional levels, in order to maintain the availability of the marine turtle resource, focus management planning, strengthen conservation initiatives and enhance law enforcement efforts.

Funding constraints dictated that this be largely a desk study, a compilation of information obtained from government and non-government sources in the region and a review of available statistics and relevant literature. As a first step, a questionnaire was designed to gather relevant information and available data from within the

Figure 2 Map showing islands of the Lesser Antilles included in this study



different jurisdictions. This questionnaire was produced in three languages and individualized to each jurisdiction through the inclusion of information on the legal framework, as available from existing sources, and of international trade information from the CITES database (up to and including 2000) and from Japanese Customs statistics on Hawksbill shell imports up to and including 1992. The questionnaire was circulated to all CITES Management and Scientific Authorities, to the agencies responsible for fisheries (including marine turtles) in the target region, to country co-ordinators of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), and other agencies and individuals known to be involved in marine turtle management and conservation. Questionnaires were completed for all but two of the 26 jurisdictions reviewed, and for many both government and non-government responses were returned. The authors were persistent in seeking direct input from stakeholders in all jurisdictions, including the two for which no questionnaire was returned. An English version of the questionnaire is included in **Appendix III**.

Although a specific request was made in the questionnaires for available statistics on exploitation and trade, few data on this aspect of the study were returned by respondents; a major effort was, thus, directed at the compilation and review of information from other sources. All marine turtle species with the exception of the Australian population of the Green Turtle have been included in CITES Appendix I since 1977, and the Caribbean population of the Hawksbill Turtle has been listed in CITES Appendix I since 1975. A review was undertaken of all trade in marine turtles reported to CITES for the countries concerned during the years from 1975, when CITES entered into force, to 2004, inclusive. Statistics on CITES trade derive from annual reports filed by CITES member States in fulfillment of their obligations under Article VIII of the Convention and are maintained in the CITES Trade Database, which is managed by the UNEP World Conservation Monitoring Centre (UNEP-WCMC), based in Cambridge, UK. The Centre provided a comparative tabulation, reports of trade in marine turtles made by exporting and importing countries, for this purpose.

Because CITES trade data were not expected to provide much more than a glimpse into a trade that has been largely illegal under the terms of the Convention for the past 30 years, and because the largest documented international trade in marine turtles during this time involved Hawksbill shell, or *bekko*, imported into Japan

under the terms of that country's CITES reservation (which exempted it from CITES Appendix-I commitments for this species until it was formally withdrawn in July 1994), Japanese Customs statistics for the years up to and including 1992, the last year that Japan permitted Hawksbill shell imports, were compiled by TRAFFIC East Asia-Japan. An important source of information on international, regional trade in Central America—as well as internal trade in those countries—was the assessment of trade in marine turtles and their products in Central America undertaken by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (Central American Marine Turtle Conservation Network) (Chacón, 2002).

A central focus of this review has been the national legal framework for management of exploitation and trade in marine turtles. For the insular Caribbean, it has generally been possible to review directly the legal instruments governing exploitation of marine turtles. For most of the mainland Americas, however, where there is an enormous body of legislation of different types—and numerous, sometimes conflicting, legal analyses on the subject—it has, at times, only been possible to consult secondary sources. It should be noted that access to national environmental, including fisheries, legislation is increasingly available through the Internet, such as through the websites of national legislative assemblies (e.g. those of Costa Rica and Guatemala) or individual government agencies that have responsibilities for wildlife and environmental management (e.g. the *Corporación Hondureña de Desarrollo Forestal* (COHDEFOR) and the *Secretaría de Agricultura y Ganadería* (SAG) in Honduras and the *Ministerio de Fomento, Industria y Comercio* (MIFIC), in Nicaragua) and the on-line legislation database maintained by the Food and Agriculture Organization of the United Nations (FAO) at faolex.fao.org/faolex/. However, the available documentation generally does not include the agency resolutions and decrees and supporting regulations that form part of the full body of legal measures relevant to marine turtles. Information on the adequacy of CITES-implementing legislation is largely derived from reports on the CITES National Legislation Project, which has been under way since 1992.

Although in some instances the information has been readily available, it was impossible under the terms of reference for this review to address systematically the legal measures in place to deal with the other pressures that marine turtles face, which themselves are numerous and diverse, such as protected area designation and management and coastal zone management; these are in many instances directly relevant to overall marine turtle management. It has likewise been impossible to investigate the full range of socio-economic aspects of marine turtle exploitation, which are varied and variably important across the region and merit further analysis.

An essential source of information has been the national marine turtle strategies that have been compiled for most of the jurisdictions examined in this study. For seven countries in the insular Caribbean, as well as Belize and Venezuela, these have been the national Sea Turtle Recovery Action Plans (STRAPs) prepared by WIDECAST and published under the auspices of the United Nations Caribbean Environment Programme (CEP). (A complete list of CEP Technical Reports, including all STRAPs, is available at www.cep.unep.org/pubs/Techreports/techreports/) For three additional countries (Anguilla, Trinidad and Tobago, and Panama), draft STRAPs, currently in review, have been used. National marine turtle strategies have been prepared through government-led processes in Colombia (MMA, 2002), Guatemala (Sánchez Castañeda *et al.,* 2002) and the French Antilles (overseas departments of Guadeloupe and Martinique), the last of which is a draft recovery plan still in review (Chevalier, 2003), and these have been equally useful. The final report on the status and exploitation of marine turtles in the UK overseas territories in the Wider Caribbean (Godley *et al.*, 2004), prepared under the auspices of the UK Department of Environment, Food and Rural Affairs and the UK Foreign and Commonwealth Office, has been an essential source of information for Anguilla and Montserrat. It should

be noted that for only five of the 26 jurisdictions reviewed for this study—Dominica and Grenada in the insular Caribbean and Costa Rica, Honduras and Nicaragua—is there currently no national strategy for marine turtle conservation and/or management; a WIDECAST-led national strategy is currently in process for Dominica, Grenada and Costa Rica, as is a management plan for marine turtle conservation in the Nicaraguan Caribbean (Lagueux *et al*., 2002).

Additional foundational documents were the national reports submitted to the First and Second Western Atlantic Turtle Symposia (in 1983 and 1987, respectively), the National Biodiversity Strategy and Action Plans and national reports (including those on protected areas) prepared under the auspices of the Convention on Biological Diversity (CBD), and the national reports and supporting documents submitted to the First and Second CITES Wider Caribbean Hawksbill Turtle Dialogue Meetings (in 2001 and 2002, respectively), available from the CITES Secretariat, the CITES website, or other sources.

While for a few of the jurisdictions, the relative lack of recent information and in-country input, especially from government sources, has created difficulties, the major challenge in compiling this report has been the opposite problem—an enormous body of information from a range of stakeholder processes, field studies, legal analyses, scientific literature, website postings and other activities, as well as reports to CITES and other inter-governmental fora, including the CEP and FAO. Persistent effort was directed, particularly through the Internet and WIDECAST country co-ordinators, to identifying and locating primary sources of information and as much as is known to be readily available is reflected here. All documentation—primary and synthesis sources, legislation, unpublished data—was reviewed in the original language of publication, whether English, Spanish or French or, in the case of the Netherlands Antilles, in official English translations.

A point of geography should be noted. With the exception of Belize, which borders only the Caribbean Sea, and El Salvador, which borders only the Pacific Ocean, the Central American countries and Colombia harbour marine turtle populations on both their Caribbean and Pacific coasts. Because the focus of this study has been on the marine turtles of the Caribbean, the status of and management programmes for marine turtles on the Pacific coasts of these countries have generally been excluded from the review. In some instances, however, it has been impossible to separate out issues relating to marine turtles on the Pacific coasts from those in the Caribbean sector of these countries.

In order to assess fully the importance and implications of the present situation with respect to the parameters examined, it was considered essential to review the historical context, including, where possible, the evolution of national legislation, historical information on exploitation and trade, and other relevant information. This is particularly important in the case of marine turtles, which are documented as being severely depleted in the Caribbean Sea after centuries of exploitation and are still subject to exploitation throughout the region.

The assessment incorporated several rounds of multi-sectoral in-country review and required nearly three years to complete. While some jurisdictions may be mildly outdated by the time of publication, the review comprises the most up-to-date information available from published and non-published sources (English, Spanish, French). A concerted effort was made, in conjunction with TRAFFIC, to provide the responsible government agencies with an opportunity to review their national summary prior to publication and to incorporate the comments received.

A few points are necessary with respect to definitions. The operative definitions are those associated with exploitation, trade and management. We have defined "exploitation" as the direct take of marine turtles and their eggs, excluding indirect exploitation, such as by fisheries by-catch or mortality associated with habitat degradation (e.g. hatchling death associated with beach-front lighting), and non-extractive uses, such as eco-tourism associated with marine turtles. "Trade" refers to international movement of marine turtles, eggs and/or marine turtle products, except where specifically described as domestic or internal.

The review is predicated on the assumption, encoded in various international treaties and agreements and often explicit in national law, that living marine resources are to be managed in a sustainable fashion for the benefit and enjoyment of present and future generations and, furthermore, that use, if sustainable, can serve human needs on a continual basis while fulfilling ecological roles and contributing to the conservation of biological diversity. Therefore, in documenting marine turtle "management" in the jurisdictions under review, the focus has not been simply on the legal measures in place to control exploitation but on whether those measures were and are sufficient to ensure that exploitation is sustainable, namely that it is not causing or exacerbating population declines in marine turtle populations.

In recognition of the fact that the legal measures are only a framework for management, an analysis was undertaken of the operational measures taken by governments, in many instances supported by NGOs or CBOs, to ensure that exploitation is not causing population declines. Most important among these measures is the monitoring of marine turtle exploitation through the recording of the number of animals killed or eggs collected and the biometrics of that exploitation, including catch-per-unit effort and other parameters that would enable an assessment of trends over time; and the monitoring of wild populations so as to discern trends and inform assessments of the affects of exploitation on marine turtle populations and whether any adjustments in controls on that exploitation may be necessary to prevent population declines.

Along a similar vein, in recognition of differing interpretations of the terms "conservation" and "management", this study took a broader view of management to embrace what many would consider "conservation" measures, including the establishment of protected areas, to protect marine turtle habitats and/or marine turtles from direct fishing or incidental mortality in fishing operations; education and awareness aimed at promoting compliance with the law and engaging stakeholders in management efforts; species research and conservation, including population surveys and nest protection programmes; as well as a wide variety of training and capacity-building initiatives. Awaiting a similarly comprehensive assessment are a number of foundational issues—including development priorities (especially pertaining to the coastal zone), access and use rights, regulatory capacity, trade controls, and the cultural and socio-economic dimensions of marine turtle use—which, along with a working knowledge of biological factors and constraints, help define a modern management regime. These issues are presented in context, but not treated in-depth.

Final mention should be made of the fact that, although governments are the major actors in deciding on management policy and practice affecting marine turtles and thus their action (and inaction) is of primary relevance in this study, the contribution of NGOs and CBOs is also of major importance. Not only are such organizations undertaking many of the actions relating to marine turtle management in the WCR, they are often doing so in close co-ordination with government agencies, typically under a government permit, and in some instances through formal agreements. Hence, an effort has been made to document the key contributions that are being made by these organizations to marine turtle conservation and management in individual countries.

Monetary values in this text are, in most instances, given in local currencies, using ISO codes, and weights expressed variously in imperial and metric units, as originally reported: one kilogramme = 2.2046 lb; t = metric tonne.

REGIONAL OVERVIEW

As would be expected of a region as geographically, ecologically, culturally and economically diverse as the Lesser Antilles, Central America, Colombia and Venezuela, there is considerable variability in the status of marine turtles and the context for their management: the legal frameworks, management regimes and types and degrees of constraints to effective marine turtle management. The differences between jurisdictions and regions with respect to key elements of this study are discussed below and summarized in the three tables in this section.

Legal framework for marine turtle management

Variability in legal frameworks

The variability of the legal frameworks in place for marine turtle management in the 26 jurisdictions reviewed is illustrated in **Table 1**. The situation of a patchwork of different and often conflicting legislation was a key finding of the TRAFFIC review of marine turtle management in the northern Caribbean and Mexico (Fleming, 2001) and it is not surprising that the pattern extends throughout the WCR. Some jurisdictions have completely protected marine turtles for over a decade; others have few controls on the exploitation and trade in these species. These differences affect individual marine turtles travelling short and long distances from one jurisdiction to another; they also affect fishers, in some instances travelling a very short distance from one site to another. This variability has obvious implications for the efficacy of the legal controls that a country has put into place with the ostensible purpose of managing marine turtles. Because marine turtles are migratory at all life-history stages (Lohmann *et al*., 1997), as with any shared resource, a co-ordinated region-wide approach to management is an unavoidable prerequisite for success at local and national levels.

Perhaps the most extreme example of the implications of the difference in legal frameworks is the situation of the Tortuguero nesting population of Green Turtles in Costa Rica, the largest in the Western Hemisphere and one of the two largest remaining in the world. A large (but unknown) proportion of this nesting population forages off the coast of Nicaragua, where these turtles are subject to heavy fishing pressure. Although scientists in the past decade have discerned promising signs that the Tortuguero nesting population is increasing, there is concern that the Green Turtle fishery in Nicaragua, renewed in the 1990s after operating at much lower levels during the previous decade as a result of the country's civil war, has been depleting the next breeding cohort, such that this population may suffer a sudden and severe decline.

The region is replete with examples of marine turtles tagged at protected nesting grounds, only to be killed in foraging grounds during open seasons in other jurisdictions. Contacts in at least two insular Caribbean jurisdictions indicated that the existence of a legal fishery for marine turtles in a neighbouring jurisdiction was a factor cited by fishers responding negatively to proposals for stricter limits on the exploitation of marine turtles. Hence, there are political as well as management consequences of the difference in legal regimes.

There is particular variability in the legal frameworks in place among—and within—the eight Latin American countries examined. Marine turtles are fully protected in Venezuela (although the extent to which legal protection applies operationally to indigenous take requires clarification); in Belize and Costa Rica (in relation to the Pacific coast), there are clearly defined, regulated and controlled exemptions for certain forms of exploitation within an otherwise protective legal regime. In Guatemala, Honduras and Colombia, important exemptions to otherwise complete legal protection allow for the extraction of eggs (Guatemala), of turtles for indigenous use (Honduras), and turtles for subsistence use (Colombia), but these exemptions are not clearly defined, specifically regulated, or limited on a scientific basis, nor are they effectively enforced. These exemptions effectively negate protection. In the Nicaraguan Caribbean, marine turtles are legally protected with the exception of Green Turtles, the fishery for which is, as of 2005, limited to subsistence use but not restricted on any scientific basis. In Panama, the legal situation appears confused, in that marine turtles are conferred full protection under certain legal instruments, while exemptions for subsistence and indigenous use (of wildlife and natural resources, not specifically marine turtles) are set forth in other pieces of legislation.

Within this variability is an unfortunate common thread, as discussed below: with the exception of Belize and Costa Rica, no jurisdiction in which exploitation is legally permitted has established a scientific basis for that exploitation and/or manages it in accordance with the principles of sustainability. This is a major shortcoming in the management of marine turtles at both the national and regional level.

Adequacy of the frameworks

In many of the jurisdictions under review, the legal framework is weak by nature, or there are major gaps in the law. In some instances, the framework is largely composed of administrative law *versus* decrees or other "higher" instruments, thus meaning that (in addition to being less well known) they carry less weight and are more difficult to enforce. The converse is also a problem: laws are not supported with regulations detailing how and by whom they should be implemented or enforced. Shortcomings that are particularly noteworthy for this study are:

- **Lack of clarity**. In many countries, there is a relatively long history and a large body of laws and legal measures adopted on behalf of marine turtles. Consequently, there is often confusion as to what laws and regulations apply. This problem is particularly acute in the mainland American countries reviewed, which operate in a maze of laws, decrees, ministerial resolutions, departmental resolutions, interim memoranda, etc. Not only is it difficult to discern what legal provisions take precedence over what others, this situation also leads to differing interpretations of the law. This confusion extends in many instances to protections—or exemptions—afforded marine turtle eggs as opposed to marine turtles. The apparent high demand and extensive use of marine turtles, as well as varying levels of internal and international trade in marine turtle eggs and other products, in particular in these mainland American countries, underscore the need for a much clearer set of rules governing the exploitation and trade in marine turtles, their eggs, and products.

- **Lack of coherence**. In addition to confusion regarding the rules that apply there are, in many instances, conflicts within the legal framework. These result in large part from the way in which wildlife legislation, generally but not exclusively relating to terrestrial species, and fisheries legislation, applying to aquatic, including marine species, have evolved. Marine turtles, largely but not exclusively marine species, have been variably interpreted as "wildlife" (e.g. in relation to hunting prohibitions and penalties set forth in wildlife legislation) but have most commonly fallen, legislatively speaking, under the fisheries framework which,

generally (several jurisdictions in the insular Caribbean being an exception), does not provide measures to control activities relating to marine turtle exploitation on land. As the legislation has evolved, so have the structures for implementation. Because marine turtles are listed under CITES, which generally translates automatically into national law in CITES Parties operating under civil law, and because they are also listed as threatened species on national Red Lists in most of the Latin American countries reviewed, they come under the mandate of wildlife departments and environment ministries; however, fisheries agencies often have a mandate that includes marine turtles, as exploited marine species, and have issued separate provisions relating to their exploitation. This has created jurisdictional conflict in several countries that has, in some instances, severely impeded management. In Belize, for example, full protection provided for marine turtles in the 1981 wildlife law was rescinded early in 1982 owing to provisions in the fisheries regulations that permitted exploitation of marine turtles. In Trinidad and Tobago, the conflict between the absolute protection afforded through the wildlife law and the five-month open season provided through the fisheries regulations has created a situation whereby few controls on marine turtle exploitation are exercised outside protected areas. In Costa Rica, a similar conflict was ultimately adjudicated by the country's Supreme Court (*Sala Cuarta*), which, in 1999, declared unconstitutional the issuance of permits for a Green Turtle fishery by the national fisheries agency.

Exacerbating the problems arising from overlapping or conflicting mandates amongst different government agencies is the situation whereby management responsibility has devolved to regional governments or municipalities or indigenous regions or communities (e.g. in Panama and Nicaragua) that have been conferred degrees of autonomy regarding natural resource use.

In several of the Latin American countries reviewed, marine turtles are an important resource for indigenous peoples and at least three countries explicitly permit the exploitation of marine turtles for subsistence and/or indigenous use. However, this exploitation is not regulated or controlled and is not monitored. In Nicaragua, levels of exploitation of Green Turtles by the indigenous Miskitu and others during an open season that, as of 2005, allows for subsistence use only have been estimated to be in the order of 11 000 per year. Virtually all of the turtles taken in the fishery over the past decade have been sold in commercial markets. In Venezuela, where there is no legal exemption for indigenous or subsistence take, exploitation by indigenous Wayúu and others is extensive, but there appears to be little effort to bring it under control. That several of the countries in the region (Colombia, Costa Rica, Dominica, Guatemala, Honduras, Venezuela) have ratified International Labour Organization (ILO) Convention Nº 169 Concerning Indigenous and Tribal Peoples in Independent Countries, which gives autonomy to indigenous peoples to use natural resources in their natural habitat, appears to have created a constitutional conflict and a *de facto* exemption to prevailing marine turtle protective legislation in certain countries where exploitation continues in the absence of specific management measures and effective controls.

- **Obsolescence**. Wildlife legislation enacted several decades ago in many countries often did not take account of economic and/or cultural realities and has either not evolved to address these more fully or has evolved in a less-than-comprehensive manner. Blanket bans on the take and sale of wildlife, a standard for several decades in most (if not all) of the mainland American countries reviewed, have not been consistent with the true situation of wildlife use, with the result that such use—which in the case of marine turtles is extensive—has often been uncontrolled and unmanaged. As efforts are being made to bring wildlife and related legislation more in line with current principles and practice of sustainable-use and socio-cultural realities, the

Table I

Summary findings on the legal status of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Jurisdiction	CITES Status	Current Legal Framework for Exploitation and Trade at National or Caribbean Level[1]								
		Exploitation Prohibited		Exploitation Legal – Restrictions on Take						
	(Entry into Force)	Complete Protection (indefinite) – exemptions[2]	Moratorium (fixed period)	Prohibition on take of: eggs (E), nests (N), nesting females (NF), or certain species	Closed season	Minimum Size Limits	Maximum Size Limits	Annual Quota	Permits/ Licenses Required	Gear Restric-tions
Anguilla (GB)	NP		√ (1995-2020)							
Sint Maarten (AN)	P (07.1999)	√								
Saba (AN)	P (07.1999)	√								
Sint Eustatius (AN)	P (07.1999)	√								
Saint Kitts & Nevis	P (05.1994)			E, N, NF	√	√				√
Antigua & Barbuda[2]	P (10.1997)			E, N	√	√				√
Montserrat (GB)	P (10.1976)				√	√				
Guadeloupe (FR)	P (08.1978)[3]	√								
Dominica	P (11.1995)			E, N, NF	√	√				
Martinique (FR)	P (08.1978)[3]	√								
Saint Lucia	P (03.1983)			E, N, NF	√	√				√
Barbados	P (03.1993)	√								
Saint Vincent & the Grenadines	P (02.1989)[4]			E, N	√	√				√
Grenada	P (11.1999)			E; Leatherback	√	√			?	√
Trinidad & Tobago	P (04.1984)	Legal situation confused		E	√					√
Bonaire (AN)	P (07.1999)	√								
Curaçao (AN)	P (07.1999)	√								
Aruba (NL)	P (03.1995)	√								
Venezuela	P (01.1978)	√								√
Colombia	P (11.1981)	√ – subsistence take		Hawksbill Turtle						√
Panama	P (11.1978)	Legal situation confused							√	√
Costa Rica	P (09.1975)	√[5]							√	√
Nicaragua	P (11.1977)	√ – Green Turtle subsistence take			√					√
Honduras	P (06.1985)	√ – indigenous take								√
Guatemala	P (02.1980)	√ – eggs							√ (receipt)	√
Belize	P (09.1981)	√ – traditional use		Hawksbill Turtle					√	√

KEY: P = Party **NP** = Non-Party √ = Yes **blank space** = No **?** = available information is unclear or contradictory

To emphasize the variability of legal regimes between adjacent range States, insular jurisdictions are listed in geographical order from Anguilla south to Aruba, and the mainland American countries are listed starting with Venezuela, the furthest south-east, and moving north through Colombia and Central America (see **Figure 1**).

Table 1 (continued)

Summary findings on the legal status of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Notes:

1 "Caribbean" refers to the Caribbean sector of those countries of the mainland Americas that have both Pacific and Caribbean coasts; it should be noted that the legal framework for marine turtle exploitation, particularly that of Olive Ridleys, on the Pacific coasts is excluded from this table as it has largely been from the overall analysis.

2 The terms "subsistence", "traditional" or "indigenous" use or take are those used in the relevant legislation.

3 France acceded to CITES with reservations on the Appendix-I listing of both the Green Turtle and Hawksbill Turtle; these were withdrawn in 1984.

4 Saint Vincent and the Grenadines maintains a CITES reservation on the Appendix-I listing of the Hawksbill Turtle.

5 The sole exemption to total legal protection for marine turtles in Costa Rica exists for the collection of Olive Ridley eggs at Ostional on the Pacific coast of the country through a well documented sustainable-use programme.

necessary provisions to ensure that the exemptions are well-defined, adequately controlled and monitored have generally not been included. There is also a need for greater flexibility in the evolving legal framework so as to enable management agencies to implement—and adapt in a timely as well as case-specific fashion—management strategies that may involve sustainable-use components.

Despite a body of scientific knowledge of marine turtles that has been rapidly growing over the past several decades, the legal controls on marine turtle exploitation in most cases do not reflect current understanding of marine turtle management requirements. It has been known for two decades that the most important size classes to protect (in almost any long-lived, late-maturing species) are the large juveniles and breeding-age adults, yet minimum size limits—which focus the take on large juveniles and adults—are, inexplicably, the standard throughout the insular Caribbean where legal fisheries operate. This is often coupled with a lack of coincidence between the annual closed season and the annual nesting season, again leaving breeding-age adults vulnerable to capture. The only jurisdiction to have implemented maximum size limits is Belize, which later prohibited all marine turtle exploitation with the exception of capture for traditional purposes, authorized on the basis of a specific permit.

- **Lack of enforceability**. In addition to the above-mentioned inadequacies, management of marine turtles is often hindered by the lack of implementing regulations or regulations that not only lack clarity, coherence and relevance, but can be unenforceable. Size limits based on weight *versus* length, for example, are difficult to adhere to if implemented at sea (where, appropriately, animals not within the limit can more easily be returned to the water), while restricting exploitation to males caught particular distances from shore—when neither condition is verifiable (pre-reproductive turtles cannot be visually distinguished as to sex; the site of capture often cannot be known)—only further reduces the potential effectiveness of the regulatory framework in promoting sustainable use.

- **Inadequate trade controls**. A number of the jurisdictions under review have been identified by the CITES National Legislation Project as having inadequate legislation to implement CITES and supporting wildlife trade controls. Particularly acute in Central America is the lack of legal provision for controlling internal and international trade in marine turtles and turtle products. In several countries, there appears to be a need for much more specific provisions regarding the marketing and sale of marine turtles and marine turtle products, as documented by Chacón (2002).

- **Inadequate penalties and judicial procedures**. Enforcement of management controls and protective legislation is impeded in some jurisdictions by inadequate penalties for offences and by the lack of either clear judicial procedures or a body of case law that supports vigorous prosecution and punishment for offences. Where seizures have been made and court cases filed, there have been problems of these not being taken forward by the courts or of court cases taking so long to proceed that they effectively serve as no deterrent to illegal activity. In the case of Costa Rica, the absence of penalties under the wildlife legislation for marine species had until recently made it difficult to prosecute marine turtle violations; this shortcoming has now been rectified through enactment of a specific marine turtle law that provides for such penalties.

  Conversely, the question has been raised as to whether particularly severe penalties (very high fines and long prison terms) in two of the jurisdictions reviewed actually impede enforcement, in the sense that they are so punitive that no law enforcement or fisheries officer enforces them. In addition, they are also viewed by some

members of the public as ridiculous, thus suggesting that they may engender disrespect for the law—and marine turtle conservation—more generally. There appears to be a need for further effort to review and establish penalties that will serve as effective deterrents to marine turtle infractions and to encourage proactive and non-punitive options designed to enhance compliance.

- **Significant progress being made in some jurisdictions**. There are numerous examples of significant progress made in recent years in enhancing the legal frameworks for marine turtle conservation and management. Particularly notable are the jurisdictions that have recently enacted full or partial (e.g. species-specific, such as for Leatherbacks in Grenada) moratoria to safeguard depleted populations and assess future management options; have recently enacted legislation that both clarifies and enhances the norms that apply to marine turtles (e.g. a national marine turtle law and new fisheries law in Costa Rica that, *inter alia*, provide specific penalties for marine turtle infractions); or have recently enacted legislation that significantly enhances the basis for management and/or enforcement (e.g. a new fisheries law and implementing regulations in Nicaragua). Revisions to prevailing legal frameworks that are pending in several countries provide for more appropriate restrictions on exploitation, such as maximum size limits (e.g. in Antigua and Barbuda, and Dominica), while stakeholder processes are also under way in several countries (e.g. Grenada, Nicaragua, and Trinidad and Tobago) to review marine turtle management objectives and/or address specific marine turtle management problems. Finally, the institution of national moratoria on the capture, sale and possession of marine turtles is under discussion in several countries. In all these instances, and in order for such measures to be successful, they will require public support, as well as the capacity to follow through with monitoring programmes and other management measures, and in the case of moratoria, to use the period of the moratorium to conduct a marine turtle stock assessment aimed at defining current population trends and the feasibility of managing a truly sustainable take.

  Also noteworthy are changes in the regulatory framework relative to habitat conservation, including lighting ordinances (e.g. in Belize) designed to minimize disorientation and mortality of egg-bearing females and their young while on the nesting beach; marine protected area designations that embrace critical marine turtle habitat (e.g. Belize, Costa Rica, Dominica, Netherlands Antilles, Nicaragua); and the establishment of marine reserves, where fishing is prohibited, or other time-area fisheries closures (e.g. Belize, Dominica, Guadeloupe, Martinique, Saint Vincent and the Grenadines).

Exploitation of marine turtles at the national level

- **Widespread exploitation of marine turtles**. Of the 26 jurisdictions covered in this study, fewer than half fully protect marine turtles. In the remaining jurisdictions, marine turtles benefit from varying degrees of legal protection. In at least four Latin American countries, legal exemptions for subsistence and indigenous take provide for significant levels of exploitation.

  In the ***insular Caribbean*** jurisdictions reviewed, full protection is afforded marine turtles in: Aruba, Barbados, Guadeloupe, Martinique and the Netherlands Antilles. In Anguilla, a 10-year moratorium on marine turtle exploitation was renewed for a further 15 years in December 2005. In Saint Lucia, a moratorium on marine turtle exploitation instituted in 1996 lapsed in September 2004 and was not renewed. In Trinidad and Tobago, a decades-long conflict between the wildlife and fisheries legislation has created a degree of management confusion for marine turtles. The remaining jurisdictions, Antigua and Barbuda, Dominica,

Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines (seven of the nine members of the Organization of Eastern Caribbean States (OECS)) regulate marine turtle exploitation on the basis of an archaic framework that ignores the fundamentals of marine turtle biology and wildlife management, i.e. through: minimum size limits, which target exploitation on large juvenile and adult age classes critical to maintaining marine turtle populations; closed seasons that often do not cover the full breeding season; unenforceable mandates (e.g. restricting exploitation to males caught particular distances from shore); and few other restrictions, such as quotas and licences, on access or gear.

In the ***mainland America*** countries reviewed, full legal protection for marine turtles is afforded in only one country, Venezuela (where it appears to be unenforced in relation to indigenous take). In Honduras, the country's adherence to ILO Convention Nº 169 provides an exemption for exploitation by indigenous peoples. In Panama, exploitation appears to be legal at least in some circumstances (subsistence, indigenous use). Legal exemptions to the full protection afforded marine turtles are narrow, clearly articulated and closely regulated in both Costa Rica (managed collection of Olive Ridley eggs in the Ostional Wildlife Refuge on the Pacific coast) and Belize (traditional take of marine turtles other than Hawksbill Turtles by permit only). In Guatemala, an exemption for the collection and marketing of eggs, the legality of which is subject to debate, has created a situation where well over 90% of marine turtle eggs laid in the country are believed to be collected for consumption. In Nicaragua, which during the past decade has harboured the region's largest legal marine turtle fishery, enactment of a new fisheries law and fisheries regulations in 2005 restrict the heretofore artisanal Green Turtle fishery to subsistence-use only but provide for no biologically based limits. In Colombia, an exemption to full protection permits subsistence fishing for marine turtles.

For every jurisdiction for which information has been obtained, illegal take is known to occur, but few statistics exist on the numbers involved. In some jurisdictions, illegal take is not considered to be at levels that impede management, and an objective assessment suggests that that is the case. In others, illegal take is recognized as a serious management challenge. Illegal exploitation of marine turtles includes the collection of eggs, killing of nesting females (e.g. of Leatherbacks in Tobago, Grenada, Saint Vincent and the Grenadines, and Dominica), and fishing with prohibited gear, during the closed season, or in violation of the minimum size limits.

- **Exploitation is largely undocumented**. With the possible exception of Nicaragua, where information is available through the monitoring efforts of individual researchers working with an NGO, there is no national jurisdiction covered in this study for which there is official documentation or estimates of the total number of turtles taken legally at the national (in the case of the mainland Americas, Caribbean) level. Similarly, and once again with the exception of Nicaragua, none of the countries in which a legal take of marine turtles (or eggs) exists has in place a systematic monitoring programme to document marine turtle exploitation, such that the numbers of animals taken, importance of marine turtles to subsistence and livelihoods and other parameters of exploitation are largely unknown.

  Marine turtles are recorded at some landing sites (e.g. in Dominica, Grenada, Montserrat, Nevis, Saint Vincent and the Grenadines), but not all, and many fishers do not land turtles at these landing sites. There are no mandatory reporting requirements for marine turtles, and voluntary reporting is recognized as documenting only a portion of marine turtle landings statistics. Hence, an unknown proportion of marine turtles are not recorded in official landings statistics. In the mainland Americas, where exploitation occurs largely through

exemptions to legal protection, there is no official recording of the numbers of turtles that are landed or other aspects of the exploitation. In addition, there is little information available on exploitation for most of the jurisdictions in which legal fisheries operated but which now prohibit exploitation. Some of the most comprehensive information derives from non-government sources, such as research reports by NGOs (e.g. Chacón, 2002) and university students (Grazette, 2002), but is isolated in time or geographic scope.

There is a great range in the numbers of turtles estimated to be taken per year, and some level of take was reported from nearly all jurisdictions participating in this review. In the insular Caribbean these numbers can be very low, but, compared with the size of the nesting (which may number fewer than 10 reproductively active females per year) or foraging populations, may be significant. No fewer than 93 Green and Hawksbill Turtles were landed in January and February of 2002 around the tiny island of Nevis in the Lesser Antilles. A recent study estimated as many as 576 turtles, primarily Hawksbill and Green Turtles, landed annually in Saint Vincent and the Grenadines (Grazette, 2002) and 782 in Grenada (Grazette *et al*., in press). In Colombia, where subsistence fishing is permitted by law but the number of turtles killed annually is unknown, a recent study in one region of the country (Instituto Alexander von Humboldt, 2000, cited in MMA, 2002) estimated the annual take to be more than 2000 turtles, an impressive number in light of these species' recognized threatened status in the country. As noted above, more than 11 000 Green Turtles are estimated to be taken annually in the legal Green Turtle fishery operating on the Caribbean coast of Nicaragua.

The collection of eggs—in both the insular Caribbean and mainland Americas—is even less reliably quantified and the take associated with incidental capture in artisanal and commercial fisheries is, with a few notable exceptions, essentially unknown.

- **Widespread collection and marketing of eggs**. Although marine turtle eggs are more widely protected by law in the WCR than marine turtles, the collection of marine turtle eggs is intensive and pervasive throughout the region and is especially viewed as problematic in Central America. Although this exploitation is considered more intensive in relation to Olive Ridleys along the Pacific coast of the isthmus, it appears to be important in some areas on the Caribbean coast as well. This exploitation and the resulting trade are proving to be a serious challenge for management. In Guatemala, for example, where most if not all of the marine turtle nests laid are believed to be collected, the government authorities have instituted an informal "conservation quota" system that requires egg collectors to donate a percentage (15%, proposed to be increased to 20%) of the eggs from each nest to marine turtle hatcheries, in return for a receipt that legalizes the remainder for consumption and sale. In the absence of sustained patrols on all nesting beaches, it is impossible to determine the extent of compliance with this system. Some insular jurisdictions also reported egg poaching levels approaching 100% on some beaches. The exploitation is largely unquantified, and its impact on the Critically Endangered (cf. IUCN) Hawksbill Turtle and Leatherback is impossible to judge.

- **Declining markets for turtle products in the insular Caribbean countries reviewed**. While the consumption and marketing of marine turtle meat continue to be important in most of the insular Caribbean jurisdictions where marine turtle fisheries continue to operate, the commercial market for other marine turtle products in those jurisdictions examined for this review appears to have declined in relation to the situation 10 and certainly 20 years ago. In particular, there appears to be very little marketing of shell or shell products. Other than for Saint Vincent and the Grenadines, where some fishers have indicated to an independent researcher that they retain Hawksbill shells in anticipation of a possible opening of international markets

(Grazette, 2002), no information has been provided in the course of this study to suggest that there is a high demand for or that there are stockpiles in the insular Caribbean of Hawksbill shell products. Although there continue to be seizures of tourist souvenirs from the insular Caribbean in the USA and other countries (see **International trade in marine turtles**), these appear to be relatively low in number. As has been documented, for example, in Grenada and Saint Vincent and the Grenadines, where the majority of Hawksbill shells tend to be discarded, the impact of CITES and other controls in both exporting countries and import markets appears to have considerably reduced, if not virtually eliminated, the trade in Hawksbill shell in most of the insular Caribbean countries reviewed.

- **Persistent high demand for marine turtles and turtle products in the mainland Americas**. Consumption and marketing of marine turtles and turtle products in the mainland Americas reviewed are extensive. In most Central American countries, for example, the markets are many, and the marketing extends throughout the country. Although marine turtle meat appears to be marketed in coastal markets, Hawksbill objects and eggs of all species are marketed nationwide. The use of Hawksbill scutes in the manufacture of spurs for cockfighting is particularly common and supports both national and regional trade. Cosmetics and other products made from marine turtle oil are also marketed. Many of these products no doubt derive from "subsistence" and "indigenous" take and might be considered legal; however, this depends on the clarity and specificity of the laws in effect, which, in these countries, is a recognized problem. Much of it is clearly illegal. The national and international dimensions of this are documented in detail by Chacón (2002).

International trade in marine turtles

All marine turtle species occurring in the WCR have been included in CITES Appendix I since 1977 and the Caribbean population of the Hawksbill Turtle has been listed in CITES Appendix I since 1975. All jurisdictions examined for this review, with the exception of the UK overseas territory of Anguilla, are currently CITES Parties and many have been so since the early days of the Convention's operation. Hence, the complete protection from international trade afforded through CITES has applied to the marine turtles in much of the WCR for nearly three decades.

- **Little evidence of large commercial trade based on official statistics**. There is very little evidence in official statistics of significant trade in marine turtle products in the years since the closing of the Japanese market for *bekko* (Hawksbill shell) as of 1 January 1993. CITES annual report data, derived from the UNEP-WCMC CITES Trade Database, document relatively low levels of trade, primarily in scientific specimens and personal items, often reported seized, mostly to the USA. Fisheries departments in the insular Caribbean are generally unaware of seizures in importing countries: most reported no knowledge of any international trade in marine turtles from their jurisdictions. What is interesting to note from the CITES statistics is the number of transactions (the great majority recorded by the USA) involving the import of marine turtle eggs from Central America, most (but not all) of which were recorded as personal items that were seized on entry. It is unknown to what extent these transactions represent the full volume of illegal trade in eggs into the USA. However, they clearly reflect the importance of this commodity in these countries.

  In addition to trade in marine turtle eggs, CITES statistics document continued trade in marine turtle products—again, largely imports reported by the USA—such as Hawksbill shell items and turtle carapaces, as tourist souvenir specimens. There have also been a number of seizures of shipments that were recorded as

commercial shipments, of meat, relatively large numbers of carapaces, and shell items. As with eggs, it is impossible to make an inference from these statistics as to the true level of illegal trade in these items. However, there appears to be consensus from within the region that this international trade is low in comparison with the level of regional trade, in Central America in particular.

- **Extensive regional trade in Central America**. As documented most recently by Chacón (2002), the extensive marketing of marine turtle eggs and Hawksbill shell objects within Central American countries clearly moves beyond national borders. This trade is believed to be primarily regional, with the exception of the many Hawksbill shell objects which are also purchased by foreign tourists and exported—to an unknown degree without detection—to their home countries. There is some evidence of international trade in commercial quantities, namely in the form of seizures (including one shipment of Hawksbill scutes intercepted at the airport in Cartagena, Colombia, destined for Panama) and reports from market vendors of the origin of Hawksbill shell or shell objects (such as Colombian Hawksbill shell items on sale in Bocas del Toro, Panama). In some cases, these products are regularly (and illegally) exported to nearby island jurisdictions, such as cockfighting spurs from Colombia to Aruba.

- **Take by foreign fishers and the potential for trade**. Whether or not it is properly characterized as international trade, throughout the region covered in this study there are reports based on anecdotal information or documented evidence of take of marine turtles by foreign fishers, either subsistence/artisanal or industrial. In Honduras, fishers reported landing Hawksbill Turtles captured in Belize; in the San Andrés Archipelago (Colombia), marine turtles are believed to be captured by the Honduran conch and lobster fleets that operate in the area; in Trinidad, marine turtles are observed being brought on board Venezuelan vessels operating in Trinidadian waters. In Anguilla, where a moratorium on the take of turtles is in place, there have been enquiries into whether marine turtle meat could be imported from a neighbouring country where a legal fishery exists. This clearly demonstrates the potential for international trade even if such trade is not currently taking place.

Management issues

Management of exploitation

With few exceptions and regardless of the differences in the legal frameworks between the 26 jurisdictions reviewed, the legal norms in place in those countries in which exploitation is permitted do not limit exploitation in such a way as to contribute to the sustainability of marine turtle populations. In effect, they do not serve management that would be consistent with the standards and practice of sustainable use (see **Table 2**). Based on the broader definition of management adopted for this review, it is difficult to conclude other than there is little active management of marine turtles in many of the jurisdictions examined. This is not to say that a jurisdiction might not be quite adept at basic and/or applied research, habitat protection and/or general conservation, but less apparent is a holistic integrated effort aimed at maintaining the marine turtle resource over time, despite the fact that best practices developed to achieve this end are increasingly available. There is a general failure to apply basic principles of resource management, such as those set by FAO in the its Code of Conduct for Responsible Fisheries (FAO, 1995) and Guidelines on the Precautionary Approach to Capture Fisheries and Species Introductions (FAO, 1996).

It is not clear whether this failing results from the array of constraints to marine turtle management or from more perverse circumstances, whereby marine turtles, having either ceased to be an export commodity or been depleted to the point of no longer being considered a fisheries resource, are not valued as sufficiently important to warrant investment in their management. Clearly these animals continue to be an economic resource for some sectors of society, albeit primarily at the subsistence or artisanal level, and the object of attention for numerous research and conservation projects largely managed by NGOs and CBOs; however, they remain largely outside the priority management framework of governments.

- **Lack of stock assessment or impact assessment aimed at sustainability**. With the possible exception of a management programme for the legal collection and marketing of marine turtle eggs by the community of Ostional on the Pacific coast of Costa Rica and a recent comprehensive evaluation of the Green Turtle fishery in Caribbean Nicaragua under the auspices of the Wildlife Conservation Society (WCS), in no country has any stock assessment or impact assessment been reported to have been undertaken as a precursor to or part of the establishment or revision of legal controls on marine turtle exploitation. No attempt has been made, in any jurisdiction participating in this review, to determine a sustainable level of exploitation based on defined criteria, despite the fact that a sustainable take, even from such depleted populations as those in the Caribbean, is at least theoretically possible for some stocks. (Whether it would be truly sustainable would depend on the level of compliance, systematic monitoring and other aspects of the management regime.)

- **Failure to adopt marine turtle fishery controls that foster sustainability**. All of the legal fisheries in the insular Caribbean countries reviewed operate on the basis of minimum size limits (coupled, in most cases, with protection of nests and eggs), which targets exploitation on the large juveniles and adult turtles that decades of scientific research have demonstrated are the most important age classes to protect in order to prevent population declines and foster population recovery. Maintenance of this anachronistic standard defies the principles and practice of sustainable use. In no case are these fisheries defined as limited entry, with access restricted to bona fide turtle fishers, or restricted by quotas or other controls that could assist in promoting sustainability. An analogous problem exists in most of the mainland Americas countries reviewed, where exemptions for indigenous or subsistence take allow for uncontrolled, largely artisanal fisheries.

  Efforts under way to address high levels of marine turtle exploitation, much of it illegal, in Nicaragua and Colombia offer numerous insights into how such measures might be devised and implemented. In the case of Nicaragua, WCS, working with government agencies, fishers and other stakeholders, is discussing dramatic reductions in marine turtle fishing effort and options for alternative livelihoods as it works to develop a conservation and management plan (Lagueux *et al*., 2002). In Colombia, a multi-institutional, multi-stakeholder effort including indigenous Wayúu fishers aims at a sustainable-use regime for marine turtles in Guajira Department (Hernández, 2002). A programme not yet in implementation includes a system of transferable capture quotas for certain size classes of turtles, which would decline in number over time and apply only to local use of meat, thus excluding other marine turtle products and marketing and sale beyond these points. In both instances, the analyses undertaken and lessons learned thus far in these processes should be highly instructive for efforts to address illegal and/or unsustainable exploitation of marine turtles elsewhere in the region.

- **Lack of monitoring of legal exploitation to ensure sustainability**. The numbers of marine turtles being taken in legal fisheries are, with few exceptions, unknown, as, in most situations, no systematic or compre-

hensive monitoring is being taken of the number of turtles landed. The same is true of the legal collection of eggs. This situation is compounded by the lack of quantitative information on the number of turtles killed and nests excavated illegally. For some of the smaller islands in the Caribbean, estimates of both legal and illegal take are made, but these range in reliability, some of them being based on seizures and documented evidence and others on anecdotal information. In no instance, however, is there any indication that these numbers are analysed with a view to detecting trends that may be meaningful for an assessment of the impact of exploitation on marine turtle populations. The lack of monitoring of a legal take of marine turtles must be recognized as a serious shortcoming in management. In fact, there can be no management where systematic monitoring—recording of the numbers, species and age classes landed, fishing effort, and other parameters and analysis of the trends in those—is not taking place, and there can be no adaptive regime where there are no baseline data against which to evaluate the success (or failure) of conservation measures.

- **Insufficient monitoring of population trends**. In few of the jurisdictions where a legal fishery exists has there been a concerted effort to monitor marine turtle population trends *in situ* to ensure the fishery is not depleting marine turtle numbers.

  Some jurisdictions have had nesting beach programmes in place for years (in rare cases over a decade), but in many such programmes have only recently begun. In relatively few instances (Costa Rica, Antigua, Barbados, and Trinidad offer the best examples from this study), have these been under way long enough to allow managers to develop credible assumptions about the status of local populations. Nesting populations offer excellent insight into the status of the population as a whole and have the advantage of being predictable in place and time, which can facilitate regular monitoring. However, by the time a manager documents a serious decline on the nesting beach (reflecting unsustainable rates of mortality 20 to 40 years earlier), it can be too late to design and implement a successful recovery strategy—particularly if the major source of mortality is in a distant country.

  As earlier recommended by the CITES Wider Caribbean Hawksbill Turtle Dialogue Meetings, there is a need to develop standardized population monitoring protocols for implementation at Index sites throughout the region. Any successful management scheme must incorporate monitoring of both nesting and foraging populations, particularly foraging juveniles. At-sea census techniques are not as well developed or as straightforward to undertake from a statistical (analysis) point of view, but they are fundamental to understanding the dynamics of a population and its ability to sustain targeted levels of exploitation.

- **A range of noteworthy policy and management successes**. Many advancements are being made throughout the WCR in marine turtle management, including: national-level strategic planning; long-term population monitoring projects; dozens of basic and applied research programmes; innovative co-management agreements; monitoring programmes to document marine turtle exploitation; analyses and processes aimed at the development of sustainable-use regimes; organized public outreach initiatives; active media campaigns; public-private partnerships; involvement of communities and fishers in research and monitoring; certification schemes to encourage vendors to abide by national and international rules and regulations; significant investments in training and mentoring within and between countries; development of regional best practices on a wide variety of subjects; availability of conservation tools (e.g. a regional clearinghouse for tags and tagging technologies, database management software, curriculum materials, Internet-based resources); strengthening of national-level regulations; active regional networking among scientists and policy-makers;

and participation in two treaties that have recently entered into force and provide for the protection of marine turtles at the regional level. These have been emphasized in the country reports and can serve as models for replication.

Addressing other threats to marine turtles

Adequate management of exploitation of marine turtles (or any species) should take into account the other threats that they face. Two important threats of particular relevance to the WCR—but beyond the scope of this review—are discussed briefly below. Both warrant a comprehensive regional evaluation, along with recommendations and priorities for management action.

- **Loss and degradation of habitat**. In the insular Caribbean in particular, loss of nesting habitat to beach-front development is a major pressure on marine turtles. Degradation of nesting habitat can take many forms, but three problems that are particular prevalent in the insular Caribbean are: mining of beach sand for construction, coastal construction and armouring, and the effects of beach-front lighting, which deter females from coming to shore to nest and disorient hatchlings so that they are unable to find the sea.

  Similarly, and throughout the region, the loss of foraging habitat presents a significant management challenge. Losses accrue through the degradation and destruction of seagrass and live coral reef and more general degradation (e.g. from pollution, anchoring, over-fishing and marine recreational activities) of shallow coastal ecosystems, including mangrove and estuary habitats, that offer refugia, nurture prey species, and provide other important services. Marine turtle nesting and foraging habitats have been set aside in legally protected areas in a number of jurisdictions, but other measures to control the effects of human encroachment and activity have also been implemented and may be just as effective. There is a need for much broader consideration of marine turtle management needs as part of environmental impact assessment of coastal development projects.

- **Incidental mortality in fisheries.** In both the insular Caribbean and mainland Americas, the problem of incidental take and mortality of marine turtles in commercial and artisanal fisheries has been raised by many participants in this study and cited by a number of authors as a causal factor in population declines. Rates of incidental take may be even higher at a regional level than rates of direct take. Incidental capture of marine turtles in fisheries operations may be the most important factor limiting the recovery of marine turtles in the French Antilles, for example (Chevalier, 2003): more than half of the marine turtle mortalities or injuries recorded in Guadeloupe in the period 1999-2002 were attributable to fisheries interactions (Lartiges, unpubl. data, cited in Chevalier, 2003), and findings from a recent study (Delcroix, 2003) suggest that in Guadeloupe this is the single greatest cause of marine turtle mortality, exceeding all others combined and probably involving more than 1000 turtles per year (J. Chevalier, *in litt*., 27 August 2004). In another example, ca. 3000 gravid Leatherbacks have been estimated to be accidentally caught in gill nets offshore from nesting beaches in Trinidad every year (Lee Lum, 2003), killing more turtles than all other sources of mortality combined; this situation is currently receiving priority attention at the highest levels of government.

  There is a recognized need to quantify and promote measures to reduce incidental take of marine turtles. The deployment of turtle excluder devices (TEDs) is required by law in those countries operating a trawl fishery for shrimp, but some questions have been raised about how effectively this requirement is being enforced. In

the insular Caribbean, the problem of incidental mortality relates more to the use of coastal gill nets, longlines and other (non-trawl) fisheries, which are also deployed elsewhere in the region.

It is noteworthy that significant recent progress has been made in understanding the global challenge of incidental capture of marine turtles in fishing operations, but few countries have comprehensive programmes in place to address the problem at local levels. While the issue of incidental capture was outside the scope of this review, the subject has increasingly been the focus of inter-governmental dialogue. According to FAO (2004), the question of marine turtle conservation and interactions with fishing operations was raised at the 25th Session of the Committee on Fisheries (COFI), which agreed that a Technical Consultation on the topic should be held. An Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context (organized to provide technical input to the Technical Consultation) convened in Rome in 2004, building on the proceedings of several other expert-based fora—including the Second International Fisheries Forum (2002), the US National Marine Fisheries Service International Technical Expert Workshop on Marine Turtle Bycatch in Longline Fisheries (2003), and the Bellagio Conference on Sea Turtle Conservation in the Pacific (2003)—that have recently addressed marine turtle issues, including fisheries interactions, and offered recommendations. An expert-based consultation convened to address—and offer solutions to—these issues from a WCR standpoint would be both timely and useful.

Constraints to management

Governments and other stakeholders in the region describe a range of constraints to more effective management of marine turtles. In addition to the issues discussed above, such as an inadequate legal framework and lack of a coherent, scientifically based, and effective management regime, these constraints include: understaffed and under-resourced fisheries/wildlife/parks offices; insufficient infrastructure for monitoring (e.g. lack of transportation for fisheries/wildlife officers, lack of reporting requirements and/or protocols) and enforcement; unreliable support from law enforcement; lack of trained personnel or training opportunities; limited (but clearly improving) political and public support; gaps in knowledge, such as marine turtle population numbers and critical sites; the absence of a baseline against which to define current population trends; the difficulty in securing funding to undertake long-term studies; and a generally poorly informed citizenry (many jurisdictions nevertheless reported progress based on an increasingly informed public, including more reporting of marine turtle sightings and infractions). Although many of these factors are common throughout the region and in particular in relation to the Small Island Developing States of the insular Caribbean, they vary in their degree of tractability depending on the jurisdiction. It is a noteworthy result of this review that many jurisdictions have reported clear progress in addressing one or more of these constraints.

In many jurisdictions, in particular the Latin American countries reviewed, the socio-economics of marine turtle exploitation present a major management challenge. Much of this exploitation is undertaken by indigenous and/or economically depressed coastal communities with few income-generating alternatives to the marine turtle resource. Improving management of marine turtles in these instances necessitates addressing in a holistic way the larger questions of sustainable livelihoods and rural development.

A final point should be noted regarding the importance of sustained technical assistance and training for individuals and agencies discharging marine turtle management responsibilities or otherwise engaged in marine turtle management efforts. The need for more training opportunities, and funding to take advantage of them, has been highlighted by several governments in the context of this review.

Table 2

Summary findings on management issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Jurisdiction	National Strategy[1]	Management of Exploitation			Population Monitoring		Critical Habitats [7]		
		Sustainable take scientifically determined	Systematic monitoring of legal take	Annual legal take known	Nesting (# sites)	Foraging (# sites)	Major nesting beaches known	Nesting habitats legally protected (# sites) [8]	Foraging habitats legally protected (# sites) [8]
Anguilla (GB)	In review	Moratorium			√ (>1)		√		√ (5)
Sint Maarten (AN)	√	N/A – Complete legal protection					√	[9]	[9]
Saba (AN)	√	N/A – Complete legal protection					√		√ [10]
Sint Eustatius (AN)	√	N/A – Complete legal protection			√ (1)		√	√ (1)	√ [10]
Saint Kitts & Nevis	√				√ (>4)		√		
Antigua & Barbuda	√				√ (1)				√ (1)
Montserrat (GB)	–				√ (>4)		√		
Guadeloupe (FR)	In review [2]	N/A – Complete legal protection			√ (3)		√	√ (>4)	√ (>4)
Dominica	In prep				√ (2)				√ (2)
Martinique (FR)	In review [2]	N/A – Complete legal protection						√ (>1)	
Saint Lucia	√				√ (1)		√	√ (2)	√ (2)
Barbados	√	N/A – Complete legal protection			√ (>2)	√ (>1)	√		
Saint Vincent & the Grenadines	√							√	√ (>1)
Grenada	In prep				√ (>3)		√		
Trinidad & Tobago	In review				√ (>6)		√	√ (3)	√ (1)
Bonaire (AN)	√	N/A – Complete legal protection			√ (>1)	√ (>2)	√	√ (3)	√ [10]
Curaçao (AN)	√	N/A – Complete legal protection					√	√ (7)	√ (1)
Aruba (NL)	√	N/A – Complete legal protection			√ (>2)		√	√ (>2)	
Venezuela	√	N/A – Complete legal protection			√ (>6)		√	√ (>9)	√ (>5)
Colombia	√ [3]				√ (>1)		√	√ (>2)	√ (>5)
Panama	In review				√ (3)	√ (1)	√	√ (1)	√ (2)
Costa Rica	In prep	N/A – Complete legal protection			√ (3)	√ (2)	√	√ (2)	√ (3)
Nicaragua	In prep[4]		√	√	√ (>2)	√ (>2)	√		√ (>1)
Honduras	–							√ (2)	Y (12)
Guatemala	√[5]						√	√ (1)	√ (3)
Belize	√	N/A [6]	N/A [6]	√ [6]	√ (>2)		√	√ (>3)	√ (>10)

KEY: √ = Yes **blank space** = No – = no information available to authors

To emphasize the variability between adjacent range States, insular jurisdictions are listed in geographical order from Anguilla south to Aruba, and the mainland American countries are listed starting with Venezuela, the furthest south-east, and moving north through Colombia and Central America (see **Figure 1**).

Table 2 (continued)

Summary findings on management issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Notes:

1 Unless otherwise specified, reference is to a national Sea Turtle Recovery Action Plan (STRAP) developed under the auspices of WIDECAST and the UNEP Caribbean Environment Programme.

2 *Plan de Restauration des Tortues Marines des Antilles Françaises* (Draft), under the auspices of the *Office National de la Chasse et de la Faune Sauvage* (ONCFS), *Direction Régionale de l'Environnement* (DIREN) (Chevalier, 2003).

3 *Programa Nacional para la Conservación de lasTortugas Marinas y Continentales de Colombia*, under the auspices of *the Dirección General de Ecosistemas Ministerio del Medio Ambiente* (MMA, 2002).

4 Draft Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua, under the auspices of the Wildlife Conservation Society (Lagueux *et al.*, 2002).

5 *Estrategia nacional de manejo y conservación de tortugas marinas, Guatemala*, under the auspices of the *Consejo Nacional de Areas Protegidas* (CONAP) (Sánchez Castañeda *et al.*, 2002).

6 Belize recently (2002) adopted marine turtle regulations requiring issuance, in writing, of a permit by the Fisheries Administrator for the take or use of any marine turtle (other than the Hawksbill Turtle, which is fully protected at all times) for traditional or cultural use, with the permit specifying the "amount and specific purpose for such use". To date (November 2005), no such permits have been issued.

7 Although many countries have reasonable information on the location of major nesting grounds, very little information exists on major foraging grounds or migratory pathways.

8 While in several instances, protected areas have been established specifically to safeguard important marine turtle nesting or foraging area, most protected areas, particularly marine protected areas (including marine reserves), incorporate a wide range of habitats and species; the number of sites refers to the protected areas themselves which, in embracing seagrass, coral, mangrove, or coastal habitats, are presumed to offer protection for marine turtle foraging areas or nesting beaches.

9 Adoption of the marine park ordinance designating the Sint Maarten Marine Park and formalizing its zoning plan are pending; in its current iteration, the Marine Park Ordinance will also provide protection for all seven known marine turtle nesting beaches.

10 A marine protected area surrounds the entire island.

Enforcement issues

Effective law enforcement is about more than a coherent legal framework, effective enforcement protocols and trained personnel. It requires a well-co-ordinated administration, an informed and supportive citizenry and judicial system, credible socio-economic alternatives, and incentives that minimize the attractiveness of illicit activity. A comprehensive review of the state of law enforcement in the region, of incentives that work and of models suitable for replication, would be both timely and useful. In the interim, the following observations are offered based on the results of this analysis.

- **Improving compliance**. The extent of illegal take and trade indicates a clear need to improve compliance with the law. Whether this would be done more effectively through punitive measures (and vigorous enforcement) or incentive-based measures and sustained engagement with communities and relevant sectors clearly depends on the situation. On small islands, for example, there is generally less interest in taking strict enforcement measures against individuals in one's own community, and such measures could be counter-productive. The first step in compliance is informing the public and concerned parties of the regulations in force. This is a recognized problem in a number of jurisdictions. In addition to greater information through a range of media, there appears to be a need for more active extension work with fishers and fishing co-operatives, as well as coastal communities, to consult with them about marine turtle and other relevant regulations (current and proposed) and conservation and management issues. As is suggested by other analyses of illegal wildlife exploitation (e.g. Milner-Gulland and Leader-Williams, 1992), the effectiveness of a mere enforcement presence in deterring poaching should not be under-estimated.

  Along a similar vein, there is a clear need to work with hoteliers and other coastal landowners, as well as with planning authorities, to ensure compliance with conservation regulations, such as setback requirements, armouring and mining statutes, pollution laws, beach-front lighting ordinances, construction and zoning restrictions, etc.

- **Enhancing capacity for monitoring and enforcement**. Whether the object is to pursue violations or monitor fishing activity, there is clearly a need for more patrols at sea and on marine turtle nesting beaches to document legal and deter illegal activity. As highlighted above, illegal exploitation and trade of marine turtles are still common, but a lack of manpower and equipment impedes more effective enforcement. In some instances, this might be as simple as having a reliable boat to enable patrols at sea. That nesting beach monitoring has proved to be a very successful deterrent to poaching should be considered an important added benefit to that type of population monitoring. Similarly, turtle-watching tourism has deterred poaching and stimulated enforcement at sites where the revenue generated by such tourism is valued and fostered by communities, NGOs and governments.

  Improving enforcement of trade controls requires a strengthening of existing efforts and capacities as well. In many jurisdictions in (and outside) the region, the interception of illegal wildlife shipments is not viewed as a priority by government agencies. In addition to regular training and support for Customs officers and other personnel responsible for controlling international trade, greater co-operation between government agencies in-country and between neighbouring jurisdictions is clearly needed.

- **Generating greater political support for environmental enforcement**. In addition to being a material resource constraint, the lower priority afforded marine resource offences as opposed to other criminal offences by enforcement agencies is a problem for marine turtle management. In addition to enforcing controls on the take of marine turtles, there needs to be more effective enforcement of controls on other activities negatively affecting marine turtles, such as sand-mining.

- **Seizures and prosecutions**. Although this information is very incomplete, there appear to be considerably fewer prosecutions than seizures. Whether the seizures are considered a sufficient deterrent or whether the lack of support from law enforcement agencies and the courts is a major factor behind this is not clear.

- **Range in penalties**. Although this information is very incomplete, there appears to be quite a range in penalties for marine turtle violations, including some that would seem to be a very strong deterrent and some that are so punitive that they appear never to be fully enforced. However, with little or no enforcement effort (and, thus, a low risk of apprehension), it is impossible to judge whether the established penalties are an effective deterrent.

- **Stockpiles**. There is no evidence to indicate that stockpiling of marine turtle parts or products is occurring in the vast majority of States participating in this review (see **Table 3**). Governments are making seizures, but how they dispose of the products or whether they maintain an inventory of these could not be documented by any participants in this review. There has been some evidence uncovered of stockpiled Hawksbill shell products (e.g. Chacón, 2002), but the extent of stockpiling appears to be a matter of speculation.

- **Apparent lack of monitoring of enforcement effort**. There appears to be little systematic approach to law enforcement effort as regards marine turtles. With illegal exploitation being a factor in every jurisdiction covered in this study, this should be considered a problem. A more systematic approach, such as is being implemented in Saint Lucia, involving the recording of relevant data—reports from citizens, seizures, etc. and enforcement effort—and the analysis of that information for marine turtle and broader marine resource management purposes would be useful for assessing the enforcement effort required and the effectiveness of that effort.

- **Public awareness and education**. A number of jurisdictions see public awareness and education and training as one of the few viable approaches to stemming illegal exploitation. Echoing the concerns of many countries in the region, the Department of Fisheries in Saint Lucia believes effective enforcement to be "nearly impossible" owing to resource and other constraints and, for this reason, is seeking to expand public awareness efforts. It should be noted that significant advances have been made in many jurisdictions to heighten awareness and appreciation for marine turtle conservation, such as through engaging local communities and the media in satellite-tracking efforts, turtle-watching schemes, marine turtle "hotlines" and workshops and other outreach activities with user communities. There are many very successful approaches being deployed in the region that are being or could be adapted elsewhere. Perhaps one of the most important gaps in information-sharing is with the tourism sector (e.g. hotels, yachters, dive and tour operators), which would appear to have little awareness of the widespread effect of beach-front development and marine recreation on the survival of marine turtles.

  Addressing continued marketing and trade of marine turtle products will also require more extensive public awareness efforts, including more targeted information for the travelling public.

Table 3

Summary findings on enforcement issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Jurisdiction	Reports of illegal exploitation and/or sale at nat'l level	Recent [1] reports of illegal int'l trade [2]	Stockpiles reported	Recent [1] seizures and/ or arrests	Recent [1] prosecutions and/ or penalties	Citizen reports of offenses	General public awareness of laws	Adequate enforcement[3]	Penalties adequate deterrent[3]
Anguilla (GB)	√	?		√		√	√		√[6]
Sint Maarten (AN)	√	√		√	√	–	√		√
Saba (AN)						–	√		√
Sint Eustatius (AN)	√				–	–	√	√	√
Saint Kitts & Nevis	√	√		√	–	√	√		√
Antigua & Barbuda	√	√			–	–	–	?	√
Montserrat (GB)	√				–	–	?		
Guadeloupe (FR)	√			√	√	√	√	?	√
Dominica	√	√		√	√	√	√		
Martinique (FR)	√	?				–	√		√
Saint Lucia	√	√		√	–	√	–[5]		√
Barbados	√	√				√	√		√[6]
Saint Vincent & the Grenadines	√	√	?	–	–	–	√		√
Grenada	√	√		–	–	√			√
Trinidad & Tobago	√	√		√	√	√			
Bonaire (AN)	√	?[4]		–	–	√	√		√
Curaçao (AN)	√	?[4]		–	–	√	√		√
Aruba (NL)	√	√		√	√	√	√		√
Venezuela	√	√		√	√	√			√
Colombia	√	√		√	–	–			–
Panama	√	√	–	√	√	√			?
Costa Rica	√	√	√	√	√	√			√
Nicaragua	√	√	√	√	–	–			√[6]
Honduras	√	√	–	√	–	–			–
Guatemala	√	√	–	√	√	–			√
Belize	√	√		√	–	–			√

KEY: √ = Yes **blank space** = No **?** = available information is unclear or contradictory – = no information available to authors

To emphasize variability in enforcement issues between adjacent range states, insular jurisdictions are listed in geographical order from Anguilla south to Aruba, then across to Venezuela and moving north again through Central America (see **Figure 1**).

Table 3 (continued)

Summary findings on enforcement issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Notes:

[1] "Recent" indicates since 1992

[2] Recent reports derive from CITES annual report statistics (1992-2004) or from other sources examined for this report, including published reports and reports from knowledgeable persons in-country. For the insular countries of the Caribbean, the data typically document seizures in foreign ports of entry of usually small numbers of specimens, usually imported for personal use. In no insular country do available data indicate directed commercial trade. Conversely, in Latin America, although not readily discernible from CITES statistics, there is evidence of transboundary trafficking in significant volumes (e.g., Chacón, 2002).

[3] Fully recognizing the subjective nature of 'adequate', the authors felt, nevertheless, that it was useful to make a first attempt to organize this information on a regional scale; our determinations were made from explicit information provided from in-country experts or inferred from the existing literature.

[4] Undocumented marine turtle parts and products, especially eggs, arrive informally and presumably at low volumes aboard boats from Venezuela.

[5] Saint Lucia recently lifted an 8.5-year (1996-2004) moratorium on the capture of marine turtles, and, pending the adoption of draft revised regulations, the 1994 *Fisheries Regulations* are in effect; the extent to which the public are aware of the most recent regulatory change could not be assessed within the time frame of the current analysis.

[6] Some participants in this review have suggested, or a reading of the legislation suggests, that monetary fines imposed by law may be too high to serve as an "adequate deterrent;" the extremely punitive nature of these fines gives rise to concern that enforcement officers would not pursue marine turtle infractions or such infractions would not be prosecuted in the courts.

RECOMMENDATIONS

This study has identified a wide range of problems with marine turtle management in the region examined and documented a similarly wide range of innovative approaches to addressing these problems. That some of these management problems persist after decades of discussion (cf. Bacon *et al*., 1984; Ogren, 1989; Eckert and Abreu Grobois, 2001; IUCN, 2002) is testament to their complexity and the need to harness a broader pool of expertise and capacities than has heretofore been brought to bear on behalf of marine turtles. In some instances, there is clearly a need for greater political will.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), which states that "the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources", the management of marine turtles should seek to maintain the availability of the resource "in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development". Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

1. In the light of the recognized depleted status of marine turtles in the WCR and in most of the jurisdictions reviewed for this study (the status in some jurisdictions is unknown or, in the absence of objective data, subject to differing views), and in the light of the potential for continuing declines resulting from the legally mandated exploitation of large juvenile and adult turtles or the lack of meaningful controls on marine turtle exploitation, governments allowing legal exploitation of marine turtles should move expeditiously to review and revise comprehensively the legal framework and the broader institutional mandates and priorities that provide for marine turtle management. In so doing, they should clarify their national policy regarding marine turtles.

   In addition to measures governing exploitation, including exemptions for subsistence and indigenous use and for the collection of eggs, this review should address the marketing and trade, both internal and international, of marine turtles and turtle products and enforcement of legal provisions, including appropriate penalties and capacities for enforcement. Revised legislation should allow for flexibility in the implementation of effective management regimes and ensure that the competent authorities have the powers to amend relevant regulations in a timely fashion in order to implement management changes. Finally, this review should include the necessary provisions to enable full implementation and enforcement of CITES.

   Consideration should be given as to whether this review can be effectively undertaken while hundreds and thousands of marine turtles continue to be exploited, uncounted thousands more drown in indiscriminate fishing gear every year and, in at least some jurisdictions, the majority of eggs laid are collected for sale and consumption. With these challenges apparently in mind, a moratorium on the capture of marine turtles, seen as a useful interim step to enable national stock assessments, was recommended more than a decade ago by the harmonized fishery regulations of OECS (FAO, 1993), a recommendation that was never realized.

2. In support of a comprehensive review and revision of the legal framework for marine turtle management, a comprehensive frame survey (marine turtle catch and use assessment) should be undertaken to quantify and characterize exploitation and use of marine turtles at the national level, including:
   - the landing of turtles at sea and hunting on nesting beaches;
   - exchange and marketing of turtles and turtle products;
   - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
   - processing and marketing patterns; and
   - the importance to livelihoods of the products and income derived from marine turtle exploitation.

   This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products, and the extent to which they may negatively impact marine turtle populations and compromise marine turtle management.

3. If legal exploitation of marine turtles is to continue, the restrictions on this exploitation must reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regime promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:

   A. Bringing exploitation in line with biological principles, including:
      - complete protection of nesting females at all times;
      - complete protection of all species during the primary nesting season, 1 March to 30 November;
      - complete protection of the Leatherback, which occurs in the region only as an adult, and typically an egg-bearing female;
      - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
      - a conservative limit on the numbers of animals and/or eggs that may be exploited, such as through quotas and/or licences; and
      - a requirement that capture quotas be based, if not on a stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographical ranges.

   B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
      - the number of fishers taking marine turtles and by what means;
      - the number, size and species distribution of the marine turtles landed;
      - the locality where the animals were taken;
      - catch-per-unit-effort; and
      - the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In support of reliable monitoring of the fishery, the following should be required:

- that ownership identification tags be installed on approved gear (e.g. nets);
- that turtles be landed alive or intact, prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Establishing a systematic marine turtle monitoring programme that will:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

4. Mechanisms to quantify levels of incidental mortality of marine turtles, arguably the largest single sources of mortality in some jurisdictions, should be developed. Drawing on examples from within the region (e.g. from Trinidad and Guadeloupe) and beyond, measures to reduce or eliminate the incidental capture and mortality of marine turtles, such as through stakeholder-led processes, incentives packages, time-area closures and/or alternative types of gear or fishing methodology, should be researched, evaluated, and implemented.

5. Critical habitats, both terrestrial and marine, for marine turtles should be identified and protected and incorporated into broader biodiversity management programmes. The identification of critical habitats should occur over the range of the population, taking into account that foraging habitats for seasonally encountered breeding animals may be located in distant range States. It is noted that new governance regimes may be necessary to safeguard marine turtles in international waters, including high-seas migratory corridors, and to protect highly mobile life stages adequately.

6. Increased efforts should be made to engage rural communities and fishers in marine turtle conservation and management. Fisheries and rural development extension efforts should be implemented that involve regular exchanges with fishers and hunters regarding marine turtles and their conservation and management needs and their participation in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle management. Support directed toward sustainable fishery practices and/or alternative livelihoods, including but not limited to non-extractive use of marine turtles, should be provided, as relevant and necessary, to assist fishers and hunters meaningfully in their efforts to comply with revised marine turtle regulations.

   Recognizing the range of negative impacts of coastal development (e.g. sand-mining, destruction of vegetation, beach construction and armouring, beach-front lighting, vehicular use of nesting beaches) on marine turtles and turtle habitat and the increasing role of marine turtles in the "tourism product" of many countries in the WCR, increased efforts should likewise be made to engage the tourism sector in comprehensive efforts to manage and conserve marine turtles and their habitats.

7. A greater investment of resources—human, financial, logistical—in marine turtle management is clearly needed if these species are to recover. Financial, logistical and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, co-ordination with other jurisdictions sharing the same turtle stocks, enforcement capacity and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Sustained technical assistance, including training and other forms of professional development, is essential if these efforts are to succeed.

   In this context, it should be noted that substantial financial, technical and infrastructural investments are being made in the region in the form of fisheries development and management. By and large, these investments appear to be focused on maximizing catches and economic returns rather than fostering sustainability. Government budgetary appropriations, overseas development assistance and private-sector investment must recognize that there can be no such thing as fisheries "management" if there is no baseline stock assessment or trend data, no monitoring of fisheries landings, no enforcement presence at sea and no underlying legal or regulatory framework that supports controls and their enforcement in relation to marine resource use. Similarly, the development of tourism infrastructure should more effectively address impacts on biodiversity and marine turtles. Both private and public foreign investment in the fisheries and tourism sectors should take account of the increased responsibilities—and costs—of the relevant government agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.

8. The essential role of the non-government sector, in some instances including universities, research institutions and other agencies, as well as NGOs and CBOs, in partnering (including through co-management arrangements) with governments to undertake marine turtle conservation and management should be enhanced through the provision of financial, logistical and political support by governments and the donor community, in particular in the development of partnerships, including co-management arrangements, to meet mutually agreed objectives.

9. Due recognition should be afforded the socio-economic circumstances, in particular in the Latin American countries reviewed, that drive much of marine turtle exploitation. There is a clear need for a multi-sectoral, integrated approach that brings marine turtle exploitation in line with the principle of sustainability and finds solutions that enhance rather than depress livelihoods and quality of life, especially for the most vulnerable of human populations. Donor and technical assistance agencies with capacities in rural development should be encouraged to engage in efforts to improve the balance between marine turtles and coastal communities.

10. Effective management of marine turtles at the national level necessitates a regional approach to management, in the collection and recording of data on marine turtles and in the design of management regimes aiming at the sustainability of marine turtle populations.

    Greater emphasis, including by donor agencies, should be given to identifying the boundaries of shared stocks, such as through telemetric and/or genetic studies. In addition, range States should be afforded greater access to the research tools necessary for a modern understanding of stock origin, movement and home range. Data should be collected and analysed to contribute not only to national stock assessments, but to provide a scientific basis for co-ordinated responses to shared marine turtle management issues.

11. Along the same vein, mechanisms must be developed and implemented that provide not only for co-operation but also for co-ordination in implementing management measures between countries that share management responsibility for marine turtle stocks. Developing a scientifically based regime for exploiting marine turtles at the "national" level will focus exploitation on foraging populations which, in most instances, comprise stocks of mixed origin. There is a need for management measures to factor in exploitation and other impacts outside "national" jurisdictions, as well as the management objectives of jurisdictions that are placing a priority on the recovery of marine turtle populations.

    Many contributors to this review noted the importance to their national management efforts of a regional management plan and of funding to support the co-operative efforts needed to implement such a plan. The WCR benefits from two regional treaties relating to marine turtles: the SPAW Protocol, which entered into force in 2000, and IAC, which entered into effect in 2001. Comprehensive membership by the countries of the WCR will greatly enhance the effectiveness of these instruments in serving as a regional forum for collaboration and co-operation in marine turtle management. Serious consideration should be afforded to how these agreements could provide the political apparatus for multilateral decision-making on specific management measures as well as how they can facilitate the process and assist in providing for the technical and institutional infrastructure that will be required if the process is to be successful.

12. There is a need for greater international co-operation in stemming illegal international trade in marine turtle products. Existing efforts to address regional wildlife trade issues in Central America, in particular, should be strengthened through increased financial, logistical and political support and expanded to support necessary bilateral and multilateral efforts in other jurisdictions in the region.

REFERENCES

Abreu Grobois, F.A., V. Guzmán, E. Cuevas and M. Alba Gamio (Compilers). (2005). *Memorias del Taller Rumbo a la COP 3: Diagnóstico del estado de la tortuga carey* (Eretmochelys imbricata) *en la Península de Yucatán y determinación de acciones estratégicas.* SEMARNAT, CONANP, IFAW, PRONATURA–Península de Yucatán, WWF, Defenders of Wildlife.

Aiken, J.J., B.J. Godley, A.C. Broderick, T. Austin, G. Ebanks-Petrie and G.C. Hays. (2001). Two hundred years after a commercial marine turtle fishery: the current status of marine turtles nesting in the Cayman Islands. *Oryx* 35:145–152.

Bacon, P., F. Berry, K. Bjorndal. H. Hirth, L. Ogren and M. Weber (Eds). (1984). *Proceedings of the Western Atlantic Turtle Symposium*, *17–22 July 1983, San José, Costa Rica*, I. RSMAS Printing, Miami. 306 pp.

Bass, A.L. (1999). Genetic analysis to elucidate the natural history and behaviour of hawksbill turtles (*Eretmochelys imbricata*) in the wider Caribbean: a review and re-analysis. *Chelonian Conservation and Biology* 3(2):195–199.

Bjorndal, K.A. (1982). The consequences of herbivory for the life history pattern of the Caribbean green turtle, *Chelonia mydas*. Pp. 111–116. In: K.A. Bjorndal (Ed.). *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, DC.

Bjorndal, K.A. and A.B. Bolten. (2003). From ghosts to key species: restoring sea turtle populations to fulfill their ecological roles. *Marine Turtle Newsletter* 100:16–21. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)

Bjorndal, K.A. and J.B.C. Jackson. (2003). Roles of sea turtles in marine ecosystems: reconstructing the past. Pp. 259–273. In: P.L. Lutz, J.A. Musick and J. Wyneken (Eds). *The Biology of Sea Turtles*, II. CRC Press, Boca Raton, Florida.

Bjorndal, K.A., A.B. Bolten and H.R. Martins. (2000). Somatic growth model of juvenile loggerhead sea turtles: duration of the pelagic stage. *Marine Ecology Progress Series* 202:265–272.

Bjorndal, K.A., A. Carr, A.B. Meylan, J.A. Mortimer. (1985). Reproductive biology of the hawksbill *Eretmochelys imbricata* at Tortuguero, Costa Rica, with notes on the ecology of the species in the Caribbean. *Biological Conservation* 34:353–368.

Bolten, A.B. (2003). Introduction: The loggerhead sea turtle—a most excellent fishe. Pp. 1–3. In: A.B. Bolten and B.E. Witherington (Eds). *Loggerhead Sea Turtles*. Smithsonian Books, Washington, DC.

Bouchard, S.S. and K.A. Bjorndal. (2000). Sea turtles as biological transporters of nutrients and energy from marine to terrestrial ecosystems. *Ecology* 81:2305–2313.

Boulon, R.H., P.H. Dutton and D.L. McDonald. (1996). Leatherback turtles (*Dermochelys coriacea*) on St. Croix, U.S. Virgin Islands: fifteen years of conservation. *Chelonian Conservation and Biology* 2(2):141–147.

Bowen, B.W. (2003). What is a loggerhead turtle? The genetic perspective. Pp. 7–27. In: A.B. Bolten and B.E. Witherington (Eds). *Loggerhead Sea Turtles*. Smithsonian Books, Washington, DC.

Bowen, B.W. and S.A. Karl. (1997). Population genetics, phylogeography, and molecular evolution. Pp. 29–50. In: P.L. Lutz and J.A. Musick (Eds). *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.

Bowen, B.W. and W.N. Witzell. (1996). *Proceedings of the International Symposium on Sea Turtle Conservation Genetics.* NOAA Technical Memorandum NMFS-SEFSC-396. US Department of Commerce.

Byrne, R. (2004). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Rowan Byrne, RoSTI Project Manager. Dated 8 June 2004.

Campbell, C.L. (2003). Population assessment and management needs of a green turtle, *Chelonia mydas*, population in the western Caribbean. Ph.D. dissertation, University of Florida. 124 pp.

Canin, J. (1991). International trade aspects of the Japanese Hawksbill shell ('Bekko') industry. *Marine Turtle Newsletter* 54:17–21. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)

Carr, A. (1955). *The Windward Road: Adventures of a Naturalist on Remote Caribbean Shores*. The Florida State University Press, Tallahassee. 258 pp.

Carr, A. (1967). *The Sea Turtle: So Excellent a Fishe*. University of Texas Press, Austin. 280 pp.

Carr, A., M.H. Carr and A.B. Meylan. (1978). The ecology and migration of sea turtles, 7. The West Caribbean green turtle colony. *Bulletin of the American Museum of Natural History* 162(1):1–46.

Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.

Chacón, D. (2001). Cultural and economic roles of sea turtles. Pp. 18–23. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management*, *Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. Available at www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish).

Chacón, D. (2002). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica.

Chaloupka, M.Y. and J.A. Musick. (1997). Age, growth, and population dynamics. Pp. 233–276. In: P.L. Lutz and J.A. Musick (Eds). *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.

Chevalier, J. (2003). Plan de restauration des tortues marines des Antilles Françaises. Document de Travail. Septembre 2003. Office National de la Chasse et de la Faune Sauvage (ONCFS), Direction Régionale de l'Environnement (DIREN). www.martinique.ecologie.gouv.fr/rapports.html

Chevalier, J. and M. Girondot. (2000). Recent population trend for *Dermochelys coriacea* in French Guiana. Pp.56–57. In: Abreu Grobois, F.A., R. Briseño-Dueñas, R. Márquez, and L. Sarti (Compilers). *Proceedings of the 18th International Sea Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFSC-436. US Department of Commerce. Available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm

CICTMAR (Centro de Investigación y Conservación de Tortugas Marinas). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Hedelvy J. Guada, Directora Ejecutiva. Dated 17 August 2002.

Crouse, D.T., L.B. Crowder and H. Caswell. (1987). A stage-based population model for loggerhead sea turtles and implications for conservation. *Ecology* 68:1412–1423.

Crowder, L.B., D.T. Crouse, S.S. Heppell and T.H. Martin. (1994). Predicting the impact of turtle excluder devices on loggerhead sea turtle populations. *Ecological Applications* 4:437–445.

Delcroix, E. (2003). Etude des captures accidentelles de tortues marines par la pêche maritime dans les eaux de l'archipel guadeloupéen. Maîtrise des Sciences et Techniques Aménagement et Environnement à Metz. Rapport AEVA. 85 pp. Unpublished.

Díaz-Fernández, R., T. Okayama, T. Uchiyama, E. Carrillo, G. Espinosa, R. Márquez, C. Diez and H. Koike. (1999). Genetic sourcing for the Hawksbill Turtle, *Eretmochelys imbricata*, in the northern Caribbean region. *Chelonian Conservation and Biology* 3(2):296–300.

Donnelly, M. (1991). Japan bans import of hawksbill shell effective December 1992. *Marine Turtle Newsletter* 54:1–3. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)

Dutton, D.L., P.H. Dutton, M. Chaloupka and R.H. Boulon. (2005). Increase of a Caribbean leatherback turtle *Dermochelys coriacea* nesting population linked to long-term nest protection. *Biological Conservation* 126:186–194.

Dutton, P.H., B.W. Bowen, D.W. Owens, A. Barragan and S.K. Davis. (1999). Global phylogeography of the leatherback turtle (*Dermochelys coriacea*). *Journal of Zoology, London* 248:397–409.

Eckert, K.L. (1987). Environmental unpredictability and leatherback sea turtle (*Dermochelys coriacea*) nest loss. *Herpetologica* 43(3):315–323.

Eckert, K.L (1995a). *Draft General Guidelines and Criteria for Management of Threatened and Endangered Marine Turtles in the Wider Caribbean Region*. UNEP(OCA)/CAR WG.19/INF.7. Prepared by WIDECAST for the 3rd Meeting of the Interim Scientific and Technical Advisory Committee to the SPAW Protocol. Kingston, 11–13 October 1995. United Nations Caribbean Environment Programme, Kingston, Jamaica. 95 pp.

Eckert, K.L. (1995b). Leatherback Sea Turtle, *Dermochelys coriacea*. Pp. 37–75. In: P.T. Plotkin (Ed.). *National Marine Fisheries Service and U. S. Fish and Wildlife Service Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973*. US National Marine Fisheries Service, Silver Spring, Maryland. www.nmfs.noaa.gov/pr/readingrm/statrvws/Sea_Turtle_Status_Reviews.pdf

Eckert, K.L. (2001). Status and distribution of the leatherback sea turtle, *Dermochelys coriacea*, in the Wider Caribbean Region. Pp. 24–31. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management*, *Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)

Eckert, K.L. and F.A. Abreu Grobois (Eds). (2001). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. xx + 154 pp. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish).

Eckert, K.L. and A.H. Hemphill. (2005). Sea turtles as flagships for protection of the Wider Caribbean Region. *MAST* 3(2) and 4(1):119–143. www.marecentre.nl/mast/MASTturtleissue.html

Eckert, K.L., S.A. Eckert, T.W. Adams and A.D. Tucker. (1989). Inter-nesting migrations by leatherback sea turtles (*Dermochelys coriacea*) in the West Indies. *Herpetologica* 45(2):190–194.

Eckert, S.A. (1998). Perspectives on the use of satellite telemetry and electronic technologies for the study of marine turtles, with reference to the first year-long tracking of leatherback sea turtles. Pp. 44–46. In: S.P. Epperly and J. Braun (Compilers). *Proceedings of the 17th Annual Sea Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFSC-415. US Department of Commerce. Available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm

Eckert, S.A. (2002). Distribution of juvenile leatherback sea turtle, *Dermochelys coriacea*, sightings. *Marine Ecology Progress Series* 230:289–293.

Eckert. S.A. (2006 [in press]). Dive behavior, internesting and post-nesting movements of leatherback sea turtles (*Dermochelys coriacea*) from Trinidad nesting beaches. *Marine Biology*.

Eckert, S.A., D. Bagley, S. Kubis, L. Ehrhart, C. Johnson, K. Stewart and D. DeFreese. (2006 [in press]). Internesting, post-nesting movements and foraging habitats of leatherback sea turtles (*Dermochelys coriacea*) nesting in Florida. *Chelonian Conservation and Biology*.

Ehrhart, L.M., D.A. Bagley and W.E. Redfoot. (2003). Loggerhead turtles in the Atlantic Ocean: geographic distribution, abundance, and population status. Pp. 157–174. In: A.B. Bolten and B.E. Witherington (Eds). *Loggerhead Sea Turtles*. Smithsonian Books, Washington, DC.

Encalada, S.E., K.A. Bjorndal, A.B. Bolten, J.C. Zurita, B. Schroeder, E. Possardt, C.J. Sears and B.W. Bowen. (1998). Population structure of loggerhead turtle (*Caretta caretta*) nesting colonies in the Atlantic and Mediterranean as inferred from mitochondrial DNA control region sequences. *Marine Biology* 130:567–575.

FAO. (1993). Marine fishery resources of the Antilles. *FAO Fisheries Technical Paper* 326:1–235. Food and Agriculture Organization of the United Nations, Rome.

FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp

FAO. (1996). Precautionary approach to capture fisheries and species introductions. Elaborated by the Technical Consultation on the Precautionary Approach to Capture Fisheries (including Species Introductions). Lysekil, Sweden, 6–13 June 1995. *FAO Technical Guidelines for Responsible Fisheries. No. 2*. Food and Agriculture Organization of the United Nations, Rome. 54 pp. www.fao.org/fi/eims_search/advanced_s_result.asp

FAO. (2004). *Report of the Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context*. Rome, Italy, 9–12 March 2004. *FAO Fisheries Report No. 738*. Food and Agricultural Organization of the United Nations, Rome. 37 pp.

FFWCC (Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission). (2004). Feature: Loggerhead Nesting in Florida. research.myfwc.com/features/view_article.asp?id=2411.

Fleming, E. (2001). *Swimming Against the Tide: Recent Surveys of Exploitation, Trade, and Management of Marine Turtles in the Northern Caribbean*. TRAFFIC North America. Washington, DC. 161 pp.

Frazer, N.B. (1986). Survival from egg to adulthood in a declining population of loggerhead turtles, *Caretta caretta*. *Herpetologica* 42(1):47–55

Frazer, N.B. (1989). Management options: a philosophical approach to population models. Pp. 198–207. In: L. Ogren (Ed.-in-Chief). *Proceedings of the Second Western Atlantic Turtle Symposium.* NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce.

Frazer, N. B. and R. C. Ladner. (1986). A growth curve for green sea turtles, *Chelonia mydas*, in the US Virgin Islands, 1913–14. *Copeia* 1986:798–802.

Frazier, J. (2001). General natural history of marine turtles. Pp. 3–17. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management*, *Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)

Frazier, J. (2003). Prehistoric and ancient historic interactions between humans and marine turtles. Pp. 1–38. In: P.L. Lutz, J.A. Musick and J. Wyneken (Eds). *The Biology of Sea Turtles*, II. CRC Press, Boca Raton, Florida.

Frazier, J. (2005a). Marine turtles: the role of flagship species in interactions between people and the Sea. *MAST* 3(2) and 4(1):5–38. www.marecentre.nl/mast/MASTturtleissue.html

Frazier, J. (2005b). Flagging the Flagship: Valuing Experiences from Ancient Depths. *MAST* 3(2) and 4(1):273–303. www.marecentre.nl/mast/MASTturtleissue.html

Fuller, J.E., K.L. Eckert and J.I. Richardson. (1992). *WIDECAST Sea Turtle Recovery Action Plan for Antigua and Barbuda*. CEP Technical Report No. 16. UNEP Caribbean Environment Programme, Kingston, Jamaica. 88 pp.

Girondot, M. and J. Frétey. (1996). Leatherback turtles, *Dermochelys coriacea*, nesting in French Guiana, 1978–1995. *Chelonian Conservation and Biology* 2(2):204–208.

Godley, B.J., A.C. Broderick, L.M. Campbell, S. Ranger, P.B. Richardson. (2004). An assessment of the status and exploitation of marine turtles in Anguilla. Pp. 39–77. In: *An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean*. Final project report for the Department of Environment, Food and Rural Affairs (Defra) and the Foreign Commonwealth Office. www.seaturtle.org/mtrg/projects/tcot/finalreport

Grazette, S. (2002). Saint Vincent and the Grenadines. Pp. 45–63. In: Harvest and national trade of sea turtles and their products in the Eastern Caribbean. MSc. thesis, Natural Resource Management Programme, University of the West Indies, Barbados.

Grazette, S. (In press.) An assessment of the sea turtle fishery in Grenada, West Indies. *Oryx*.

Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade.* Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.

Hays, G.C., J.D.R. Houghton and A.E. Myers. (2004a). Pan-Atlantic leatherback turtle movements. *Nature* 429:522.

Hays, G.C., J.D.R. Houghton, C. Isaacs, R.S. King. C. Lloyd and P. Lovell. (2004b). First records of oceanic dive profiles for leatherback turtles, *Dermochelys coriacea*, indicate behavioural plasticity associated with long-distance migration. *Animal Behaviour* 67:733–743.

Heppell, S.S., L.B. Crowder and T.R. Menzel. (1999). Life table analysis of long-lived marine species with implications for management. Pp. 137–148. In: J.A. Musick (Ed.). *Life in the Slow Lane: Ecology and Conservation of Long-Lived Marine Animals*. American Fisheries Society Symposium 23. American Fisheries Society, Bethesda, Maryland.

Heppell, S.S., D.T. Crouse and L.B. Crowder. (2000). Using matrix models to focus research and management efforts in conservation. Pp. 148–168. In: S. Ferson and M. Burgman (Eds). *Quantitative Methods for Conservation Biology*. Springer-Verlag, Berlin.

Heppell, S.S., M.L. Snover and L.B. Crowder. (2003). Sea turtle population ecology. Pp. 275–306. In: P.L. Lutz, J.A. Musick and J. Wyneken (Eds). *The Biology of Sea Turtles*, II. CRC Press, Boca Raton, Florida.

Heppell, S.S., D.T. Crouse, L.B. Crowder, S.P. Epperly, W. Gabriel, T. Henwood, R. Márquez and N.B. Thompson. (2004). A population model to estimate recovery time, population size and management impacts on Kemp's ridley sea turtles. *Chelonian Conservation and Biology* 4(4):767–773.

Hernández, P., S. (2002). Sistema de Aprovechamiento Sostenible de la tortuga verde (*Chelonia mydas*), la tortuga carey (*Eretmochelys imbricata*), la tortuga caguama (*Caretta caretta*), y la tortuga canal (*Dermochelys coriacea*). Presentación general, 11 de diciembre de 2002. Programa Uso y Valoración, Instituto Alexander von Humboldt.

Hilterman, M.L., E. Goverse and C.J. de Bres. (2001). *The Sea Turtles of Suriname, 2000*. Biotopic Technical Report, commissioned by World Wildlife Fund—Guianas Forests and Environmental Conservation Project (GFECP), Paramaribo, Suriname.

Horrocks, J.A. (2001). Reducing threats on foraging grounds. Pp. 121–126. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management*, *Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index .htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)

Horrocks, J.A., L.A. Vermeer, B. Krueger, M. Coyne, B. Schroeder and G. Balazs. (2001). Migration routes and destination characteristics of post-nesting hawksbill turtles satellite-tracked from Barbados, West Indies. *Chelonian Conservation and Biology* 4(1):1–7.

Instituto Alexander von Humboldt. (2000). El uso de la fauna silvestre como estrategia de conservación. Convenio de Cooperación Técnica y Científica 043. Ministerio del Medio Ambiente, Colombia. Anexos.

IUCN. (2002). *Hawksbill Turtles in the Caribbean Region: Basic Biological Characteristics and Population Status.* Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Background Paper. www.cites.org/eng/prog/HBT/intro.shtml

IUCN. (2004). *2004 IUCN Red List of Threatened Species*. www.iucnredlist.org.

Jackson, J.B.C. (1997). Reefs since Columbus. *Coral Reefs* 16, Suppl.: S23–S32.

James, M.C., S. A. Eckert and R.A. Myers. (2005). Migratory and reproductive movements of male leatherback turtles (*Dermochelys coriacea*). *Marine Biology* 147(4):845–853.

King, F.W. (1982). Historical review of the decline of the green turtle and the hawksbill. Pp. 183–188. In: K.A. Bjorndal (Ed.). *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, DC.

Krueger, B., J. Horrocks and J. Beggs. (2003a). Increase in nesting activity by hawksbill turtles (*Eretmochelys imbricata*) in Barbados. P. 149. In: J.A. Seminoff (Comp.). *Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. US Department of Commerce. (All proceedings available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm)

Krueger, B. K., J. A. Horrocks and J. Beggs. (2003b). International Movements of Adult Female and Juvenile hawksbill Turtles, *Eretmochelys imbricata*, from Barbados, West Indies. Paper presented at the 23rd Annual Symposium on Sea Turtle Biology and Conservation, Kuala Lumpur, Malaysia, March 2003.

Lagueux, C.J. (1998). *Marine Turtle Fishery of Caribbean Nicaragua: Human Use Patterns and Harvest Trends*. Doctoral dissertation. University of Florida, Gainesville. 215 pp.

Lagueux, C.J., C.L. Campbell and L.W. Lauck (Eds). (2002). Draft Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua. Project #99-033-001, National Fish and Wildlife Foundation, Washington, DC. 113 pp. Unpublished.

Laurent, L., R. Charles and R. Lieveld. (1999). The Guianas: Sea Turtle Conservation Regional Strategy and Action Plan 2001–2006. Fishery Sector Report, commissioned by World Wildlife Fund—Guianas Forests and Environmental Conservation Project (GFECP), Paramaribo, Suriname.

Lee Lum, L.M. (2003). *An assessment of incidental turtle catch in the gillnet fishery in Trinidad and Tobago.* Research Report. Institute of Marine Affairs, Trinidad and Tobago. 38 pp.

León, Y.M. and K.A. Bjorndal. (2002). Selective feeding in the hawksbill turtle, an important predator in coral reef ecosystems. *Marine Ecology Progress Series* 245:249–258.

Lewis, C.B. (1940). The Cayman Islands and marine turtle. *Bulletin of the Institute of Jamaica Science Series* 2:56–65.

Lohmann, K.J., B.E. Witherington, C.M.F. Lohmann and M. Salmon. (1997). Orientation, navigation, and a natal beach homing in sea turtles. Pp. 107–135. In: P.L. Lutz and J.A Musick (Eds). *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.

Long, E. (1774). *The History of Jamaica, or General Survey of the Ancient and Modern State of that Island.* T. Loundes, London.

Luke, K., J. Horrocks, R. Leroux and P. Dutton. (2004). Origins of green turtle feeding aggregations around Barbados, West Indies. *Marine Biology* 144:799–805.

Mack, D., N. Duplaix and S. Wells. (1982). Sea Turtles: Animals of Divisible Parts: International Trade in Sea Turtle Products. Pp. 545–563. In: K.A. Bjorndal (Ed.). *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, DC.

Marcovaldi, M.A. (2001). Status and distribution of the olive ridley turtle, *Lepidochelys olivacea*, in the Western Atlantic Ocean. Pp. 52–56. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management*, *Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)

Marcovaldi, M.A and A. Filippini. (1991). Trans-Atlantic movement by a juvenile hawksbill turtle. *Marine Turtle Newsletter* 52:3. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)

Márquez-M., R. (1994). *Synopsis of Biological Data on the Kemp's Ridley Turtle,* Lepidochelys kempi *(Garman, 1880)*. NOAA Technical Memorandum NMFS-SEFSC-343. US Department of Commerce.

Márquez, R., J. Díaz, M. Sánchez, P. Burchfield, A. Leo, M. Carrasco, J. Peña, C. Jiménez and R. Bravo. (1999). Results of the Kemp's ridley nesting beach conservation efforts in México. *Marine Turtle Newsletter* 85:2–4. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)

Meylan, A.B. (1988). Spongivory in hawksbill turtles: a diet of glass. *Science* 239:393–395.

Meylan, A.B. (1999a). Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):177–184.

Meylan, A. (1999b). International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):189–194.

Meylan, A.B. and M. Donnelly. (1999a). Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals. *Chelonian Conservation and Biology* 3(2):200–224.

Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.

Milner-Gulland, E.J. and N. Leader-Williams. (1992). Illegal exploitation of wildlife. Pp. 195–213. In: T.M. Swanson and E.B. Barbier (Eds). *Economics for the Wilds: Wildlife, Wildlands, Diversity and Development*. Earthscan Publications, London.

MMA (Ministerio del Medio Ambiente, Colombia). (2002). *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia*. Dirección General de Ecosistemas. 63 pp.

NRC. (1990). *Decline of the Sea Turtles: Causes and Prevention*. National Research Council. National Academy Press, Washington, DC. 259 pp.

Ogren, L. (Ed.-in-Chief). (1989). *Proceedings of the Second Western Atlantic Turtle Symposium.* NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce

Ordoñez, C., A., Ruiz, S., Troëng, A. Meylan and P. Meylan (2005). *Final Project Report—2004 Hawksbill Turtle* (Eretmochelys imbricata) *Research and Population Recovery, at Chiriquí Beach and Escudo de Veraguas Island, Ñö Kribo region, Ngöbe-Buglé Comarca, and Bastimentos Island Marine National Park.* Prepared for ANAM, Ngöbe-Buglé Comarca and APRORENANB. Gainesville, Florida.

Parsons, J. (1962). *The Green Turtle and Man*. University of Florida Press, Gainesville. 121 pp.

Parsons, J. (1972). The hawksbill turtle and the tortoise shell trade. Pp. 45–60. In: *Études de géographie tropicale offertes à Pierre Gourou.* Mouton, Paris.

Petersen, J.B. (1997). Taino, Island Carib, and Prehistoric Amerindian Economies in the West Indies: Tropical Forest Adaptations to Island Environments. Pp. 118–130. In: S.M. Wilson (Ed.). *Indigenous Peoples of the Caribbean.* University Press of Florida, Gainesville.

Pritchard, P.C.H. (1973). International migrations of South American sea turtles (Cheloniidae and Dermochelyidae). *Animal Behaviour* 21:18–27.

Pritchard, P.C.H. and P. Trebbau. (1984). *The Turtles of Venezuela*. Contributions to Herpetology No. 2. Society for the Study of Amphibians and Reptiles, NY. 401 pp. + plates and maps.

Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn.. University of Miami Press, Coral Gables. 250 pp.

Reichart, H.A. (1989). Olive ridley turtle (*Lepidochelys olivacea*): status report. Pp. 175–188. In: L.H. Ogren (Ed.-in-Chief). *Proceedings of the Second Western Atlantic Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce.

Reichart, H.A. (1993). *Synopsis of Biological Data on the Olive Ridley Sea Turtle,* Lepidochelys olivacea *(Eschscholtz, 1829), in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFSC-336. US Department of Commerce.

Richardson, J.I., R. Kerr Bjorkland, P. Mason, D.B. Hall, Y. Cai, K. Andrews and R. Bell. (2004). Seventeen years of saturation tagging data reveal a significant increase in nesting hawksbill turtles (*Eretmochelys imbricata*) on Jumby Bay, Long Island, Antigua, West Indies. Poster presented at the 24th Annual Symposium on Sea Turtle Biology and Conservation, San José, Costa Rica, February 2004.

Rondón M., M.A., H.J. Guada and R.A. Hernández S. (2004). Research and conservation of sea turtles in the Paria Peninsula, Venezuela: Results of the 2003 nesting season. Poster presented at the 24th Annual Symposium on Sea Turtle Biology and Conservation, San José, Costa Rica, February 2004.

Ross, J.P., S. Beavers, D. Mundell and M. Airth-Kindree. (1989). *The Status of Kemp's Ridley*. Center for Marine Conservation, Washington, DC. 51 pp.

Sánchez Castañeda, R., M.R. Jolon Morales, C. González Lorenzana, J.C. Villagrán Colón, J.L. Boix Morán and H. Dieseldorff Monzón. (2002). *Estrategia nacional de manejo y conservación de tortugas marinas*: *Guatemala*. Consejo Nacional de Areas Protegidas-CONAP/FONACON/CBM/EPQ/UNIPESCA. 112 pp.

Searle, L.A.W. (2001). A Brief History of Sea Turtle Communities, Conservation and Consumption in Belize. Paper presented at the 21st Annual International Symposium on Sea Turtle Biology and Conservation, Philadelphia, USA, February 2001.

Schroeder, B.A. (2001). Reducing threats at nesting beaches. Pp. 115–120. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management*, *Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)

Seminoff, J.A. (2004). *Red List Assessment of the Green Sea Turtle (*Chelonia mydas*) using the 2001 Red List Criteria*. IUCN-SSC Marine Turtle Specialist Group. 34 pp. www.iucn-mtsg.org/red_list/cm/MTSG_Chelonia_mydas_assessment_expanded-format.pdf

TEWG (Turtle Expert Working Group). (2000). *Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic*. NOAA Technical Memorandum NMFS-SEFSC-444. US Department of Commerce. www.nmfs.noaa.gov/pr/readingrm/Turtles/tewg2000.pdf

Troëng, S. and C. Drews. (2004). *Money Talks: Economic Aspects of Marine Turtle Use and Conservation*. WWF-International, Gland, Switzerland. www.panda.org

Troëng, S. and E. Rankin. (2005). Long-term conservation efforts contribute to positive green turtle *Chelonia mydas* nesting trend at Tortuguero, Costa Rica. *Biological Conservation* 121:111–116.

Troëng, S., D. Chacón and B. Dick. (2004). Possible decline in leatherback turtle *Dermochelys coriacea* nesting along the coast of Caribbean Central America. *Oryx* 38(4):395–403.

Troëng, S., P.H. Dutton and D. Evans. (2005). Migration of hawksbill turtles *Eretmochelys imbricata* from Tortuguero, Costa Rica. *Ecography* 28(3):394–402.

Vera, V. (2004). Proyecto de seguimiento y conservación de la población de tortuga verde (*Chelonia mydas*) en el Refugio de Fauna Silvestre Isla Aves (Dependencias federales). Pp. 55–61. In: *Tortugas Marinas en Venezuela: Acciones para su Conservación*. Oficina Nacional de Diversidad Biológica, Dirección de Fauna, Ministerio del Ambiente y de los Recursos Naturales, Venezuela (MARN).

Versteeg, A.H., J. Tacoma and P. van de Velde. (1990). Archaeological Investigations on Aruba: The Malmok Cemetery. *Publication of the Archaeological Museum Aruba* 2.

Witherington, B.E. and C.M. Koeppel. (2000). Sea turtle nesting in Florida, USA, during the decade 1989–1998: An analysis of trends. Pp. 94–96. In: H. Kalb and T. Wibbels (Compilers). *Proceedings of the 19th Annual Symposium on Sea Turtle Conservation and Biology*. NOAA Technical Memorandum NMFS-SEFSC-443. US Department of Commerce. Available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm

Witherington, B.E. and R.E. Martin. (2000). *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches* (*Revised Edition*). Florida Fish and Wildlife Conservation Commission, FMRI Technical Report TR-2. Tallahassee, Florida. 73 pp. www.nests-certified.org/pdf/LightingTechReport.pdf

Zug, G.R., H.J. Kalb and S.J. Luzar. (1997). Age and growth in wild Kemp's ridley sea turtles (*Lepidochelys kempii*) from skeletochronological data. *Biological Conservation* 80:261–268.

Aruba

Introduction

The island of Aruba is located ca. 30 km off the coast of Venezuela and 67 km west of Curaçao; it is the westernmost island of the Dutch Caribbean. Small and flat, Aruba covers a total land area of 193 km^2 and is semi-arid in climate and vegetation type. It was one of six islands comprising the Netherlands Antilles until 1986, when it became a separate, autonomous entity within the Kingdom of the Netherlands.

Until recently, very little was known about the distribution and abundance of marine turtles in Aruba, other than that their numbers were very low and appeared to have been so for a long time. According to Zeinstra (2002), Aruba's human history dates to 2500 BC and is "interwoven with sea turtles". Citing Rooze and Kristensen (1977) and Versteeg *et al.* (1990), she reviews historical evidence that Green Turtle shields (shells) were found in archeological excavations near Malmok and that the shields were used at funerals for leaders of pre-ceramic indigenous societies.

All marine turtle species have been protected by law in Aruba since 1987 and their eggs have been protected since 1980. However, formal data-collection on nesting and other activities did not begin until 1992, through a formal partnership between the *Directie Landbouw, Veeteelt en Visserij* (LVV—the Directorate of Agriculture, Husbandry and Fisheries) and the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) (T. Barmes, LVV, *in litt*., to K. Eckert 8 September 1992).

A Sea Turtle Recovery Action Plan (STRAP) for Aruba, developed and published under the auspices of WIDECAST and the United Nations Caribbean Environment Programme (Barmes *et al*., 1993), reviewed available information on the status and trends of marine turtles in Aruba and the threats they faced. Although the STRAP noted concerns with respect to continued, low-level illegal exploitation of marine turtles, particularly in relation to the very small numbers of animals believed to occur there, it identified habitat issues, largely associated with the high levels of tourism on the island, as the major problems to be addressed. These included: loss and degradation of nesting habitat from tourism infrastructure and recreational equipment; destruction of nests from vehicles driving on the beach; and the effects of beach-front lighting on females coming to shore to nest and on hatchlings, who were often disoriented from reaching the sea.

In the decade that has followed publication of the STRAP, a great deal has been achieved in terms of data-gathering, awareness, and improvements in the laws affecting marine turtles. However, not only has the lighting problem not been solved, it has exacerbated during this time, owing to a doubling of the human population and the infrastructural and other developments and increase in human activities that have ensued (van der Wal and van der Wal, 2004). On the north-east coast, the main threat is from motorized vehicles driving on the beaches, the "large amounts" of inorganic waste that accumulate on the coast and, in recent years, the proliferation of "weekend houses" illegally constructed on the beach and in marine turtle nesting zones (Zeinstra, 2002).

Summary of the status of marine turtles in Aruba

Four species of marine turtle nest on the beaches of Aruba: the Loggerhead, Green Turtle, Leatherback and Hawksbill Turtle (van der Wal and van der Wal, 2003; see table overleaf). There is no indication that

Loggerheads or Leatherbacks are present outside the nesting season. Intriguing is the lack of evidence for Leatherbacks nesting on the island at the time of van Buurt's writing (1984), as later reports note that this is the primary species nesting on Aruba: he reported nesting along "various beaches on the north coast", but that only Hawksbill Turtles had been positively identified.

Occurrence of marine turtles in Aruba

English common name	Scientific name	Occurrence
Loggerhead	*Caretta caretta*	N, F?
Green Turtle	*Chelonia mydas*	N, F
Leatherback	*Dermochelys coriacea*	N
Hawksbill Turtle	*Eretmochelys imbricata*	N, F
Kemp's Ridley	*Lepidochelys kempii*	A
Olive Ridley	*Lepidochelys olivacea*	A

Key: N=nesting; F= foraging; A=absent

Barmes *et al*. (1993) considered it likely that the total number of marine turtle nests laid per year—for all species—in Aruba was fewer than 30 and that the number of nesting females—which evidence at that time suggested were mainly Leatherbacks—might be fewer than 10. Van der Wal and van der Wal (2003) summarized census data for the period 1999–2002. They documented, definitively, 0 (1999), 0 (2000) and 34 (2001) Leatherback nests, as well as nesting by Loggerheads, Hawksbill and Green Turtles, based on daily nest counts on 2700 m of sandy beaches on the western shore of Aruba, during the morning hours, from 1 March to 1 August. Further efforts documented seven, 47 and 24 Leatherback nests on the west coast, in 2002, 2003, and 2004, respectively, and 12 more in Arikok National Park, suggesting that perhaps 140 or more Leatherback nests were laid in Aruba during the period 1999–2004 (E. van der Wal and R. van der Wal, Turtugaruba Foundation, *in litt*., 27 October 2004) and offering hope that reproductive activity by this species is increasing on the island. Van der Wal and van der Wal also report, based on beach monitoring, that nesting by species other than Leatherbacks fluctuates and is "very small": 5–20 Hawksbill Turtle nests, 2–20 Green Turtle nests and 0–12 Loggerhead nests, annually.

Credit: WWF-Canon/Roger LeGuen

Nesting Leatherback

Information collected in the past decade or so has documented the relative importance of the various nesting beaches. The island's primary nesting grounds are: for Leatherbacks, Eagle Beach (from Amsterdam Manor to Tamarijn) on the west coast and Dos Playa Grandi and Dos Playa Chikitu (Arikok National Park) facing the

north-east; for Loggerheads, Malmok on the west coast; for Hawksbill Turtles, Arashi Beach near the western point of the island; and, for Green Turtles, very low-density nesting is reported at several locations around the north-eastern coast from California to the Pet Cemetery (van der Wal and van der Wal, 2002).

Although Green and Hawksbill Turtles of varying sizes are present in Aruba year-round and presumed to feed in the island's waters, the extent to which Loggerheads and Olive Ridleys forage is unknown. Van Buurt (1984) reported foraging (observed by divers) along the "north coast of Aruba" but provided no further details. Barmes *et al.* (1993) summarized the distribution of living coral reef and seagrass and recommended that an assessment of the importance of these habitats as foraging grounds for marine turtles be undertaken, with the resulting baseline data centrally compiled and archived. To date, the major foraging areas around the island remain unknown.

Because there is no local tagging of nesting or foraging turtles, no international tag returns are available to indicate the full geographic range of Aruba's marine turtle stocks.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Aruba enjoys a unique status as part of the Kingdom of the Netherlands. It is not automatically covered by the membership of the Netherlands in international agreements, nor is it covered by commitments made on behalf of the Netherlands Antilles since its change of status in 1986. See table below.

Membership of Aruba in multilateral agreements relating to marine turtles

Convention	Aruba
Cartagena Convention	01.01.1986 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	17.06.2000 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	30.03.1986 (E)
Protocol Concerning Pollution from Land-based Sources and Activities	06.10.1999 (S)
Convention on Biological Diversity (CBD)	04.06.1999 (E)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	29.03.1995 (E)
Convention on Migratory Species (CMS)	01.01.1986 (E)
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	Yes
MARPOL 73/78 (Annex I/II)	01.01.1986 (Ap)
MARPOL 73/78 (Annex III)	19.04.1988 (S)
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	19.04.1988 (S)
Convention on Wetlands of International Importance (Ramsar)	23.09.1971 (E)
UN Convention on Law of the Sea (UNCLOS)	Yes (R)
Western Hemisphere Convention	No
World Heritage Convention	16.03.1993 (E)

Key: Date of: Signature (S); Ratification (R); Entry into force (E); Approval (Ap)

Laws and regulations relating to marine turtles

Marine turtle nests and eggs have been protected in Aruba since 1980 through the *Marien Milieuverordening Aruba* (Marine Environment Ordinance of Aruba) *AB 1980, No. 18*. Article IV stipulates that it is illegal to disturb marine turtle nests, or to remove, destroy, possess, deliver, transport, buy or sell marine turtle eggs. In addition, Article V stipulates that it is prohibited to kill animals and/or plants from the waters of Aruba if such animals and/or plants are listed by subsequent decree. In addition, it is prohibited to sell, purchase, deliver, import, export, or possess such animals and/or their parts or products (living or dead). It is similarly prohibited to use their products for making goods—such as tortoiseshell earrings, for example. All Atlantic/Caribbean species of marine turtle—the Loggerhead, Green Turtle, Leatherback, Hawksbill Turtle, Olive Ridley and Kemp's Ridley—were listed under this law by *Decree No. 51 of 1987*. Barmes *et al.* (1993) noted that the maximum penalty for violation of the Ordinance was one month in prison and/or a fine of 2500 Aruban guilders (AWG2500), as well as confiscation of the equipment used in committing the violation. A repeat offence within a year doubled the penalty due. They recommended that these penalties be increased in order substantially to exceed product value. The recommendation was achieved with the *Natuurbescherming Beschermingsverordening* (Nature Conservation Ordinance) *AB 1995, No. 2*, under which the penalties for killing a protected species, such as a marine turtle, are at most two years in prison and/or a fine of AWG100 000.

Provisions for implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) were included in the *Landsbesluit in-en Uitvoerverbod Bedreigde Dieren en Planten* (Import and Export of Animals and Plants Decree)*, AB 1991, No. 102*, but the Decree was withdrawn from consideration with passage of the *Natuurbescherming Beschermingsverordening* of 1995, which made it possible to: protect indigenous fauna and flora; designate nature reserves; and prohibit trade, import, export, possession (dead or alive), killing or wounding of species listed in the Appendices of CITES or the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention. Aruba's CITES-implementing legislation is under review as part of the CITES National Legislation Project (dependent territories have recently been included in the Project). The deadline for having adequate CITES-implementing legislation enacted in the case of Aruba is 30 September 2006 (Anon., 2004; S. Nash, Chief, Capacity Building Unit, CITES Secretariat, *in litt.* to J. Gray, TRAFFIC International, 21 September 2005) It is expected that at some point the *Natuurbescherming Beschermingsverordening* will replace the *Marien Milieuverordening Aruba*, but at present both remain in force (E. van der Wal and R. van der Wal, *in litt*., 28 October 2004).

There is no legislation in place in Aruba for coastal zone management, including for the designation of marine protected areas. Two decrees are in process, however, under the aegis of the *Natuurbescherming Beschermingsverordening* of 1995: the *Landsbesluit Parke Marino Aruba* and the *Landsbesluit Parke Natural Spaans Lagoen*, intended to designate the waters entirely surrounding Aruba as a marine park (using the Bonaire Marine Park as a model) and, independently, to confer protection to the unique ecosystem of Spaans Lagoon, a designated Ramsar Convention site since May 1980. These decrees also provide a national coastal zone management framework, including a coastal zone management authority. These decrees were expected to be finalized and adopted by Parliament before the end of the legislative session in September 2005 (B. Boekhoudt, Ministry of Labour, Culture and Sports, pers. comm., 18 November 2004). Pending their enactment, an inter-agency task force has been co-ordinating relevant activities and making recommendations.

The *Landsverordening openbare wateren en stranden* (Public Waters and Beaches Ordinance), *AB 1987, No. 123*, prohibits, *inter alia*, driving on beaches and disposal of solid waste materials on beaches and in public waters.

Responsible authorities

LVV (part of the Ministry of Labour, Culture and Sports) has primary conservation and management authority over marine turtles. The same ministry has jurisdiction over protected areas, although, in practice, protected areas are managed as a partnership between the government and two national NGOs: FANAPA (the Aruba Foundation for Nature and Parks) and StimAruba. The Ministry of Public Health and Environment includes veterinary services and, in that context, is responsible for the implementation of CITES (CSA, 2004; B. Boekhoudt, pers. comm., 18 November 2004).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Marine turtle exploitation was entirely unregulated—and, it would appear, unmonitored—at the time of van Buurt's (1984) writing; he could find no information on landing sites, species landed, fishing gear used, months of landing, or numbers of fishers or turtles involved. Similarly, other than abattoir records from 1977 to 1986 (31 turtles processed in 1977; only four in 1983; and a total of 127 processed over the 10-year period), Barmes *et al*. (1993) could find no data on historical exploitation of marine turtles in Aruba. The consumption of marine turtle meat, considered a delicacy (Barmes *et al*., 1993), and the sale of marine turtle meat in restaurants and hotels were known but had never been documented or quantified. Barmes *et al.* (1993) reported that the extent of collection of eggs (prohibited since 1980) was unknown, but no evidence of poached nests or sale of eggs had been recorded by the local authorities.

Barmes *et al*. (1993) concluded that there were no turtle fishers in Aruba, nor had there been in recent memory, and that any catch of marine turtles was opportunistic. Local fishers participated in a multi-species fishery and occasionally brought turtles to shore that had been ensnared in seine nets drawn in shallow, nearshore waters. Many of the turtles killed in the abattoir (as required by law until full protection went into effect in September 1987) were known to have been imported from Venezuela and, to a lesser degree, Colombia. These imports apparently diminished in the late 1980s, presumably as a result of the 1987 legal protection measures.

Recent (since 1992) exploitation

Barmes *et al*. (1993) reported evidence of continued exploitation and trade in marine turtles, despite the legal protections in place at the time. In addition to marine turtles taken incidentally by local fishers, meat was still being imported on Venezuelan fishing boats and sold in the floating market in Oranjestad Harbour. Marine turtle carapaces were also imported from Venezuela and sold in gift shops catering to tourists. Finally, there was a low level of illegal trade in tortoiseshell jewellery, also sold in gift shops; total numbers and volumes were unknown. Today, when tortoiseshell-like jewellery appears in local gift shops there is usually an enquiry by informed residents; regarding the last such report (2002), examination by the local CITES Authority indicated that "the suspicion was false" (E. van der Wal and R. van der Wal, *in litt*., 12 November 2004).

Contemporary levels of poaching appear to be extremely low. In an incident described by informed observers as "unique and opportunistic" (E. van der Wal and R. van der Wal, *in litt*., 12 November 2004), a Leatherback was killed and offered for sale in June 1999. The carcass was confiscated and the three offenders fined AWG150 each.

Although there was no shrimp trawling in Aruba at the time of their writing (Venezuelan trawlers having been prohibited from Aruba's waters by the *Algemene Visserij Verordening* (General Fisheries Ordinance) of 1993), Barmes *et al*. (1993) noted that a feasibility study for a domestic longline fishery was under way and expressed concern that if this fishery were expanded, it would be likely to result, based on evidence from elsewhere in the region, in the incidental take and mortality of Leatherbacks and Loggerheads. Today there is no evidence that the fleet has undergone a significant expansion, or that longlining is a marine turtle management issue in Aruba (E. van der Wal and R. van der Wal, *in litt*., 10 April 2005).

International trade

Historical perspective

International trade in marine turtles involving Aruba is thought to have been limited to the import of live marine turtles and turtle meat from Venezuela and Colombia, mostly adult Green Turtles but also some Hawksbill Turtles, for sale on the domestic market. There are no data on the numbers involved. However, Barmes *et al.* (1993) cite the report of Guada and Vernet (1988) of the killing of Green Turtles along the east coast of the Paraguana Peninsula of Venezuela for black market export to Aruba and Curaçao. This trade was more lucrative for the fishers than sale on the domestic market.

In addition to reports of continued imports of marine turtle meat via Venezuelan fishers, Barmes *et al.* (1993) provided details of illegal sale of marine turtle meat and carapaces and Hawksbill jewellery. The latter appear to have been directed at the tourist market, thus suggesting that additional illegal international trade was occurring through these channels. At the time of their writing, restaurants still purchased "some if not most of the turtle meat" purchased from the floating market, but public awareness of the ban on marine turtle products was growing. In one case (May 1993), a restaurateur advertised a "Mother's Day Special" that included turtle meat and "several residents" contacted authorities to request enforcement action; the proprietor willingly agreed to dispose of 10 kg of meat and not to purchase it again and no further action was necessary (Barmes *et al*., 1993).

The only marine turtle exports from Aruba reported to CITES, as required under the Convention, from 1975 to 1992, inclusive, were of two Cheloniidae carapaces, presumably transported by tourist(s), seized upon entry into the Netherlands in 1989. There are no other records of international trade in marine turtles or turtle products involving Aruba, including in Japanese Customs statistics for Hawksbill shell imports into Japan up to 1993, after which such imports were illegal.

Recent (since 1992) international trade

There is little evidence of international trade in marine turtles involving Aruba since 1992: there are no records of such trade reported in CITES trade statistics derived from the UNEP-WCMC CITES Trade Database for the period 1993–2004, inclusive. According to the Aruba CITES Scientific Authority (CSA, 2004), there is "no trade of importance" from Aruba, for which the Authority credits local turtle watches for generating "an appreciation for these animals" that has led to increased awareness and responsibility.

With regard to marine turtle imports, Aruban Customs "regularly seizes spurs for cockfighting, which, upon investigation or acknowledgement by the importing individual, were produced from [Hawksbill] sea turtle shell"; on average, ca. 100 pairs of spurs are confiscated per year, originating in Colombia (CSA, 2004). Despite the fact that cockfighting is illegal in Aruba, the spurs are clearly intended for local use; there are no indications of re-export (CSA, 2004).

In the view of the CITES Scientific Authority, there are fewer CITES infractions today than a decade ago when the *Natuurbescherming Beschermingsverordening* came into force, and Customs officials are described as having "awareness and preparedness" when CITES-listed species enter the country. The import of cock spurs, identified upon entry by x-rays of luggage, is a perpetual challenge and one that recently resulted in a fine of AWG1000 for 24 tortoiseshell spurs (P. Barendsen, CSA, *in litt*., 12 April 2005).

No stockpiles, registered or otherwise, of marine turtle materials are known to exist in Aruba (van der Wal and van der Wal 2002; CSA 2004). While carapaces are still observed as wall decorations in some restaurants and private homes, van der Wal and van der Wal (2002) offer their impression that these were obtained prior to the 1987 ban and that such displays have not increased in recent years.

Enforcement issues

Barmes *et al*. (1993) reported that enforcement of marine turtle protections were carried out by the police in the absence of fisheries or conservation/natural resource enforcement personnel. Although they noted that there had never been an arrest for a marine turtle violation, the police did confiscate 15 carapaces from a gift shop in September 1993 (but levied no fine).

In June 1999, as reported in the national newspaper *Dario*, three offenders were fined AWG150 each in connection with the killing and attempted sale of an adult Leatherback turtle (E. van der Wal and R. van der Wal, *in litt*., 27 October 2004). In general, however, the conclusion of Barmes *et al.* (1993) that enforcement agencies are "over-extended and under-staffed, and crimes against wildlife are not viewed as priorities" appears as true today as it was a decade ago. This would appear to be particularly the case in relation to cockfighting and the apparently persistent demand for Hawksbill shell spurs that sustains an illegal trade into the island from Colombia.

Marine turtle management

Management of exploitation

Marine turtles have been protected from exploitation, including international trade, in Aruba since 1987; hence, any such exploitation is illegal. Continued illegal exploitation appears to be sporadic and at low levels (as in the example of the gravid Leatherback turtle killed in 1999), although the illegal import of Hawksbill shell spurs for illegal cockfighting appears to be persistent and to warrant targeted enforcement effort.

Species research and conservation

There has been no stock assessment in the usual sense for any species of marine turtle in Aruba. However, some population assessment data are available. Foot surveys of primary nesting beaches began in 1993 and are continuing. Eagle Beach on the west coast is the most important site for Leatherbacks and has been monitored since 1993; in 1999, these surveys were upgraded to comprehensive daily morning nest and track counts and regular night patrols. The beaches of Arikok National Park have been patrolled daily by Park Rangers and twice-weekly by local biologists since 2000 (Zeinstra, 2002; E. van der Wal and R. van der Wal, *in litt*., 12 November 2004). No tagging programmes have yet been initiated.

Credit: Edith van der Wal

***In situ* beach protection for turtles on Aruba; barricades are placed around nesting sites.**

In addition to protection with beach patrols, turtle nests at Eagle Beach are protected *in situ* during incubation and hatching. Immediately after nesting, four barricades are placed around the nesting site to reduce human interference (such as driving, digging, littering). After 60 days a wooden enclosure is made on the sand with an additional four barricades. During the day the ocean-facing side of this square is open and hatchlings can find their way to the sea. Just after sunset the enclosure is shut, but re-opened the next morning at daybreak. Without such efforts, the hatchlings invariably crawl to the public road. Some, but not all, hotels are willing and able to turn off lights on the night of an emergence. If photo-pollution is present at the time of an emergence and likely to cause disorientation, a special controlled release method is necessary. Volunteers use dark screens for shading the hatchlings, to allow them to locate the sea. Typically, however, ambient photo-pollution on Eagle Beach necessitates a commitment by hundreds of volunteers each year to participate in "shading" the hatchlings as they emerge and orient to the sea. To re-establish any possibility for "natural and independent" nesting, hatching and reaching the sea, much effort is still needed to achieve acceptable levels of lighting control (cf. Witherington and Martin, 2000), as well as elimination of beach driving (motorized police, transporting of watersports equipment, beach clean-up) (E. van der Wal and R. van der Wal, *in litt*., 27 October 2004).

The recent establishment of a local NGO, Turtugaruba Foundation, aims at institutionalizing and expanding these volunteer activities, in particular in relation to the need for better regulation and mitigation of beach-front lighting (van der Wal and van der Wal, 2004). Success has already been demonstrated in that two more nesting areas now co-operate in turning off street illumination during the hatching season. These efforts are undertaken both by the government (at Fishermans Huts Beach) and by the private sector (Arashi Beach) (E. van der Wal and R. van der Wal, *in litt*., 12 November 2004); see **Habitat conservation** below.

Threats to nesting on the more remote north-eastern coast of Aruba include the illegal construction of "weekend houses" (temporary structures typically sited on the beach), illegal but uncontrolled vehicle-driving in nesting habitat, and threats posed by human presence, including beach fires, lights, and general activity, often at night. In response, Zeinstra (2002) has urged "rigorous supervision" of the driving prohibition on beaches and dunes, emphasized by signage and boulders placed to block beach access points; she notes that in some places, including Arikok National Park (Boca Prins and Andicuri beaches), this type of mitigation appears to be working.

Habitat conservation

Since 1963, administration and management of protected areas in the Netherlands Antilles has been the responsibility of the Netherlands Antilles National Parks Foundation, a government-funded non-profit foundation better known by its Dutch name and acronym *Stichting Nationale Parken Nederlandse Antillean:* STINAPA. Since 1983, Aruba has had an independent STINAPA, now officially known as FANAPA, the aim of which is to promote nature conservation through acquisition of land, establishment of parks and education (UNEP, 1996).

The Turtugaruba Foundation has, with permission from local authorities, blocked vehicular access to several of the island's key marine turtle nesting beaches, including Arashi Beach and the Fishermans Huts area, by strategically placing natural rocks and boulders at access points. A start has now (2005) been made on replacing these boulders by a wall. In the case of Arikok National Park, large pieces of driftwood have been used in place of boulders. The Foundation also participates in several annual beach clean-ups, e.g. with Reef Care, Aruba Hotel and Tourism Association, and others (E. van der Wal and R. van der Wal, *in litt*., 12 November 2004).

Government entities, including the police, LVV and the *Dienst Openbare Werken* (DOW—Department of Public Affairs), are also involved in various ways in the protection of turtle nests. Police officers on the scene of a turtle nesting at Eagle Beach call the local Sea Turtle Hotline and then proceed to inform onlookers to keep a distance, not to use light or flash photography, etc.; they remain on the scene until a Turtugaruba Foundation representative or volunteer arrives. In 2001, permission was granted by the police to extinguish street lights in two areas (Fishermans Huts, Arashi) where the disorientation of Loggerhead and Hawksbill hatchlings was a persistent threat to their survival. In 2003, in response to security concerns along the shoreline and on tourist beaches, a special "*warda nos costa*" division (supervised by the Police Department) has been patrolling selected beaches day and night; following negotiations with the Turtugarguba Foundation, they agreed to minimize their use of light and alert the Sea Turtle Hotline when signs of marine turtle activity were noticed (E. van der Wal and R. van der Wal 2002, *in litt*., 12 November 2004).

Until 2002, LVV supplied the road barricades used to protect Leatherback nests at Eagle Beach; subsequently, these were donated by DOW, which is also involved in the placement of boulders at nesting beach access points to discourage vehicular traffic. Finally, the rangers that patrol the beaches of Arikok National Park (and who are

employed by LVV) co-operate in monitoring and protecting the nests in that area (E. van der Wal and R. van der Wal 2002, *in litt*., 12 November 2004).

Education and public awareness

Barmes *et al.* (1993) recommended that "concerted efforts" be made on the part of both the government and the non-governmental conservation community to provide residents, resource users (such as fishers) and other "audiences" (including schools and tourists) with relevant conservation material.

Today, the Turtugaruba Foundation is the most active entity in implementing this recommendation. The Foundation interacts regularly with the media (including by providing press releases at the beginning of the annual nesting season); routinely gives public lectures; participates in local "open days" and civic events in order to share information broadly with the general public; distributes WIDECAST materials, such as "Watch Where You Drive" bumper stickers, to influence public behaviour; creates original posters and flyers for sharing with both residents and tourists; provides expertise and support for students conducting projects on marine turtles; and contributes to CITES and wildlife trade awareness by sharing information (E. van der Wal and R. van der Wal, *in litt*., 27 October 2004).

Heightening "awareness and light management" are considered the most serious needs at the present time, as disorientation of nesting females and emergent hatchlings along the well-developed west coast is pervasive (van der Wal and van der Wal, 2002).

Constraints to marine turtle conservation and management

The usual suite of constraints to optimal marine turtle conservation apply to Aruba, including: insufficient compliance with existing regulations; lack of visibility (and therefore deterrence) on the part of law enforcement; incomplete legislation on coastal zone management and protected areas ("still in process"); inadequate funding and trained personnel (within the hotel community, as well as within the government) to address the considerable beach-front lighting problem; and a lack of consensus between NGOs, environmentalist groups and the government on the definition of sustainable development (E. van der Wal and R. van der Wal 2002, *in litt*., 27 October 2004).

Summary and recommendations

The STRAP for Aruba (Barmes *et al*., 1993) set forth the following priorities for recovery of the marine turtles of the island: strengthening public awareness initiatives; encouraging greater activism on the part of law enforcement officials in the confiscation of contraband and prosecution of offenders; determining the distribution and timing of the breeding effort; eliminating illegal vehicle traffic on nesting beaches; and promoting full involvement of all beach-front hoteliers in reducing beach-front lighting on the nesting beaches and rescuing (and releasing to the sea) disoriented hatchlings.

An active coalition of governmental and non-governmental entities in Aruba, initiated during the process of developing the STRAP, has an impressive record of effort and achievement in the management of marine turtles and these efforts offer an example for countries in similar circumstances to consider. Among the measures that

the government has taken are: a prohibition on marine turtle exploitation, implemented in 1987; development of CITES-implementing legislation; and development and enactment of laws and regulations regarding designation of protected areas and the mitigation of potentially negative impacts (such as beach driving) on marine turtle habitats. In addition, systematic monitoring has been under way since 1999 and has resulted in a national database on the distribution and abundance of the annual nesting effort.

With these successes in mind, there is progress to be made to correct deficiencies in the overall framework for managing marine turtles in Aruba, and to promote sustained recovery in local stocks. Recommendations to these ends are set out below.

1. Habitat issues constitute the primary threats facing marine turtles in Aruba. There is a need for improved regulations to address human activities, construction and access around nesting beaches and to provide for mitigation of beach-front lighting during the nesting and hatching season. Similarly, there is a need for more public awareness of marine turtle habitat issues coupled with changes in behaviour (e.g. reducing vehicular driving on active nesting beaches and littering of beaches with plastic and other solid waste).

2. Greater enforcement effort, through an increase in directed effort by relevant government agencies or through expanded public awareness activities, should be directed at the persistent illegal use of vehicles on marine turtle nesting beaches and illegal cockfighting, which sustains the demand for illegal imports of Hawksbill shell spurs.

3. Identification and protection of critical habitats, both terrestrial and marine, for marine turtles should be incorporated into broader biodiversity management efforts.

4. Legislation currently under development for the designation of national marine parks and a comprehensive coastal zone management authority should proceed expeditiously.

5. Based on demonstrated successes and existing partnerships between the government, NGOs, local communities and the commercial (e.g. hotel) sector, increased efforts should be made to engage coastal hoteliers and other beach-front establishments, tourists, marine resource users (fishers, divers, yachters) and local communities in marine turtle conservation and management.

6. The dedicated work of the Turtugaruba Foundation and its local partners, together with relevant government agencies, should be encouraged and facilitated with support (financial, logistical, political support), training, and institutional strengthening sufficient to fulfill existing mandates towards marine turtles and their habitats.

References

Anon. (2004). CITES Decision 13.81. Decision of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.

Barmes, T., K. Eckert, and J. Sybesma. (1993). *WIDECAST Sea Turtle Recovery Action Plan for Aruba*. CEP Technical Report No. 25. UNEP Caribbean Environment Programme, Kingston, Jamaica. *xiv* + 58 pp.

van Buurt, G. (1984). National Report for the Netherlands Antilles. Pp. 329–333. In: P. Bacon *et al*. (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.

CSA (CITES Scientific Authority). (2004). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Theo Wools, DVM (Director, Veterinary Service) and Pieter Barendsen, DVM (Subst. Head of Service), Barcadera, Aruba. Dated 5 November 2004.

Guada, H. J. and P. Vernet (1988). Informe del proyecto situación actual de las tortugas marinas en la costa Caribeña de Venezuela. Estado Falcón: Costa Oeste y Peninsula de Paraguaná. Informe interno de FUDENA. 25 pp.

Rooze, V. and I. Kristensen. (1977). Onze schildpadden verdwijnen. In: *Aruba, zijn voorgeschiedenis met zijn dieren*. STINAPA Newsletter No.14:43–48.

UNEP. (1996). *Status of Protected Area Systems in the Wider Caribbean Region*. CEP Technical Report No. 36. UNEP Caribbean Environment Programme, Kingston, Jamaica.

Veersteeg, A.H., J. Tacome and P. van de Velde. (1990). The archaeological investigation on Aruba: the Malmok cemetery. Pp. 14–18. In: *Publications of the Archaeological Museum Aruba 2*. Oranjestad, Aruba.

van der Wal, E. and R. van der Wal (Turtugaruba Foundation). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Dated 25 September 2002.

van der Wal, E. and R. van der Wal. (2003). Monitoring the west coast of Aruba. Pp. 170–171. In: J.A. Seminoff (Compiler), *Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. US Department of Commerce.

van der Wal, E. and R. van der Wal. (2004). Aruba Country Report. Invited Oral Presentation to WIDECAST Annual Meeting, 21 February 2004, San José, Costa Rica.

Witherington, B.E. and R.E. Martin. (2000). *Understanding, assessing, and resolving light-pollution problems on sea turtle nesting beaches*. Second Edition, revised 2000. FMRI Technical Report TR-2. Florida Marine Research Institute, St. Petersburg, Florida. 73 pp.

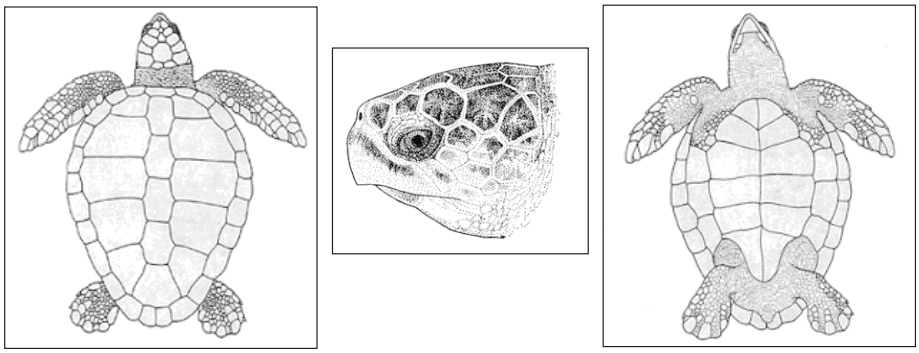
Zeinstra, L.W.M. (2002). Census of sea turtle nests on Aruba, specifically on the northeast coast. Prepared by CARET: Conservation and Research of Sea Turtles on Aruba. Oranjestad, Aruba. 27 pp.

APPENDIX I

CARIBBEAN MARINE TURTLES: SPECIES SUMMARY

Loggerhead *Caretta caretta*

General description: The Loggerhead has a bony, slightly tapered, reddish-brown carapace covered with non-overlapping scutes. The carapace has five pairs of lateral scutes and is often encrusted by a heavy growth of invertebrate fauna, such as barnacles. The plastron is cream-yellow in colour. The triangular-shaped head is disproportionately large for the body size and may grow to 25 cm (10 inches) in width in adults. A variable number of prefrontal scales are located between the eyes. Each front and back flipper has two claws. While hatchlings typically range from 44–48 mm (1.7–1.8 inches) in carapace length, adults may grow to 120 cm (47 inches) in carapace length and 200 kg (440 lb) in weight. Hatchlings are uniform in colour, usually above and below red-brown or grey-black.



Drawings by Tom McFarland, reprinted with permission.

Nesting distribution and behaviour: Loggerheads prefer to nest on sub-tropical and temperate beaches. The largest concentration of nesting females in the Wider Caribbean Region (WCR) is found on the south-eastern Atlantic coast of the USA. Lower-density nesting is documented on beaches along the Gulf and Caribbean coasts of Mexico, Belize, Honduras, Colombia and Venezuela; the primary nesting season is from May to August. Loggerheads prefer to nest on continental beaches, and mating is believed to occur off nesting beaches. A typical nesting beach is backed by a low, vegetated dune. Nesting Loggerheads create asymmetrical tracks measuring 90–100 cm (35–39 inches) across. Females typically nest every two to three years, depositing an average of four nests (at 13–15-day intervals) per breeding season. The female excavates a nesting cavity 43–80 cm (17–31 inches) deep where she deposits ca. 100–120 golf ball-sized eggs. The nests are dug well above the high-tide line to prevent inundation by sea water over the incubation period, which lasts seven to 11 weeks.

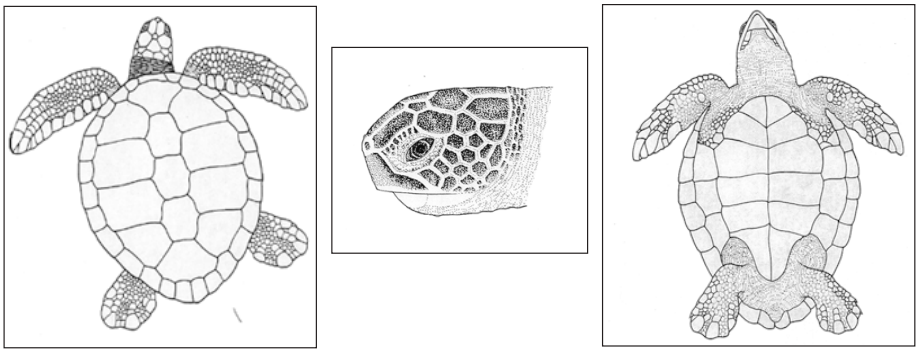
Diet: Adult Loggerheads are benthic feeders on the continental shelf. A large head and powerful jaws are well suited to their omnivorous diet. They eat a variety of hard-shelled molluscs (such as conches and whelks) and crustaceans (such as crabs) and also feed on fish, jellyfish, and seaweeds.

Conservation status: Classified as Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention; Appendix I (full protection) of the Convention on Migratory Species (CMS); Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (no reservations are currently entered with respect to this species); included in the annexes to the Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere, or Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance".

Green Turtle *Chelonia mydas*

General description: The Green Turtle, or Green-back, has an oval, bony carapace covered with smooth, non-overlapping scutes. Like the Hawksbill Turtle, the Green Turtle has four pairs of lateral scutes. The carapace of the adult varies from light to dark greenish-brown in colour with patterns of radiating wavy or mottled markings, while the plastron (bottom shell) is white to yellowish in colour. From an average hatchling length of 49 mm (two inches), adults are generally 95–120 cm (36–40 inches) in carapace length and weigh up to 230 kg (500 lb). Green Turtles are herbivorous and the biting edge of the lower jaw is serrated. Between the eyes there is one pair of enlarged prefrontal scales, a feature unique to Green Turtles. Each front and back flipper has a single claw. Hatchlings are "counter-shaded"—black above, white below.



Nesting distribution and behaviour: Major nesting colonies are found at Tortuguero (Costa Rica) and Aves Island (Isla de Aves, Venezuela). Smaller numbers of Green Turtles nest on the majority of islands and mainland territories of the WCR. The peak breeding season occurs between July and September. The nest site is characterized by a deep body pit, well above the high water mark. Symmetrical tracks in the sand 100–130 cm across (40–52 inches) indicate that a turtle has come ashore to deposit her eggs. A female will nest two to six times per breeding season, typically depositing 110–115 golf ball-sized eggs per egg clutch. The incubation period is approximately eight to nine weeks. After breeding, two to three years will elapse before the female breeds again. Like all marine turtles, Green Turtles have remarkable navigational skills which enable them to travel great

distances between preferred nesting and non-nesting (foraging) grounds. Juveniles spend the first several years in the open sea, before returning to shallow coastal waters to complete their development stages. Age at maturity is estimated at 25–40 years.

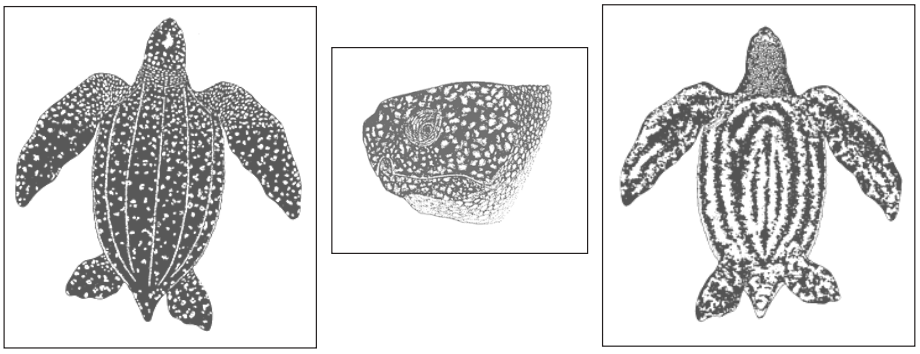
Diet: Adult Green Turtles are herbivores and eat seagrasses, especially Turtle Grass *Thalassia testudium* and algae. Green Turtles typically forage in shallow, nearshore waters throughout the Caribbean Sea. Their herbivorous habits result in a mild-tasting meat that is savoured in the Caribbean region and beyond and that was the impetus for a centuries-long, unsustainable trade that severely depleted some of the largest nesting colonies known to science and all but extirpated the rookeries of the Cayman Islands.

Conservation status: Classified as Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (within the wider Caribbean, Cuba and Suriname maintain a reservation with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance".

Leatherback *Dermochelys coriacea*

General description: The Leatherback, also known as the Leathery Turtle or Trunkback, is the largest and most distinctive turtle. The Leatherback is the only marine turtle that lacks a hard, bony carapace, scutes and claws. Instead, the Leatherback has a rubbery "shell" that is strongly tapered and characterized by seven prominent (streamlining) ridges. The back, head and flippers are often marked by irregular blotches of white or pale blue. The plastron ranges from white to grey/black. The dark upper and lighter lower surfaces, in combination with the mottled coloration, are effective camouflage for this open-ocean inhabitant. While hatchlings are ca. 60–65 mm (2.4–2.6 inches) in carapace length, adult females grow to 130–165 cm (55–71 inches) and weigh 260–500 kg (573–1102 lb); males can weigh 916 kg (2015 lb). The Leatherback has a deeply notched upper jaw. Its bones and "shell" contain large quantities of oil which was used, historically, in the Caribbean for engine lubrication and is still used for medicinal and other applications.



Nesting distribution and behaviour: Leatherbacks are the most migratory of all marine turtles. They are globally distributed, feed in temperate waters and nest on tropical shores. The major nesting beaches in the WCR are in Trinidad and French Guiana/Suriname. Other important nesting beaches are in Costa Rica/Panama, the Dominican Republic, Puerto Rico, and the US Virgin Islands; the primary nesting season is from March to July. Leatherbacks prefer beaches with deep, unobstructed access and avoid abrasive rock or coral. The nesting track width is 150–230 cm (60–92 inches). Leatherbacks nest every two to three years or more, laying an average of five to seven egg clutches per nesting season at 9–10 day intervals. Typically, 70–90 fertile (yolked) eggs are laid, as well as a variable number of smaller, infertile (yolkless) eggs. After about nine weeks of incubation, the hatchlings emerge and crawl to the sea. The carapace is mostly black and the ridges along its surface are visible even at this young stage. Very little is known about the juvenile stages of this species; age at maturity is unknown.

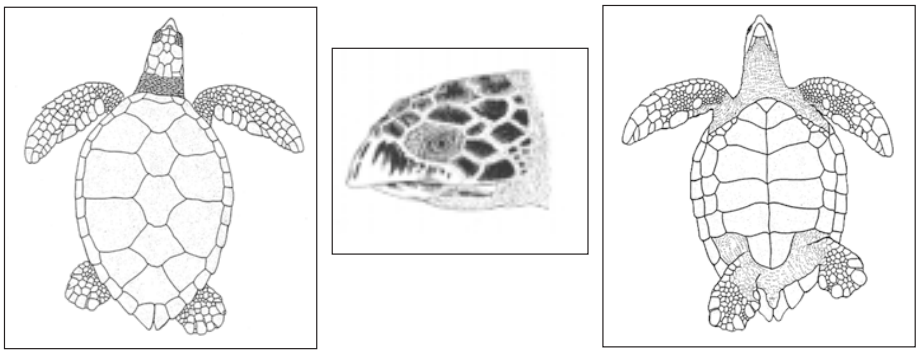
Diet: Leatherbacks forage in temperate waters and sometimes venture into sub-arctic latitudes. The mouth and throat of Leatherbacks are lined with backward-facing spines that help keep their primary food, jellyfish and other soft-bodied invertebrates, from escaping. Highly venomous jellyfish, including the Portuguese Man-O-War *Physalia physalis*, are considered a delicacy.

Conservation status: Classified as Critically Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (Suriname maintains a reservation with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance".

Hawksbill Turtle *Eretmochelys imbricata*

General description: The Hawksbill Turtle is easily identified by its strikingly beautiful carapace—a mosaic of brown, gold, orange and red-speckled scutes that overlap each other like shingles on a roof. The oval carapace is posteriorly serrated. There are two pairs of scales, called prefrontal scales, between the eyes and two claws on each front flipper. Hatchlings are 40–45 mm (1.6–1.8 inches) in carapace length; adult Hawksbill Turtles grow to 70–95 cm (27.5–37.5 inches) and weigh 60–80 kg (132–176 lb). Hatchlings are uniform in colour, usually grey or brown, above and below.



Nesting distribution and behaviour: Hawksbill Turtles nest in generally low densities throughout the wider Caribbean, with the largest nesting populations found on the shores of the Yucatán Peninsula, Mexico. Important nesting colonies are also located in Antigua and Barbuda, Barbados, Belize, Cuba, Panama, Puerto Rico, Saint Vincent and the Grenadines, and the US Virgin Islands. Hawksbill Turtles nest at night, often on beaches flanked by coral reefs and rocks, and mainly between June and October. Females breed every two to three years or more, and typically nest four to five times at 14–15 day intervals. An egg clutch generally consists of ca. 150 golf ball-sized, white eggs. The female Hawksbill Turtle carefully selects her nesting site well above the high water mark where the eggs will remain dry for the next eight to nine weeks until they hatch. The asymmetrical track that the female leaves behind is 70–85 cm across. Hawksbill Turtles often nest amongst vegetation; the nest is quite shallow, and vegetation may assist in moderating the tropical sun (shallow nests are also more vulnerable to predators, such as the mongoose). As is the case with other marine turtles, hatchlings emerge at night and use natural light to find their way to the sea.

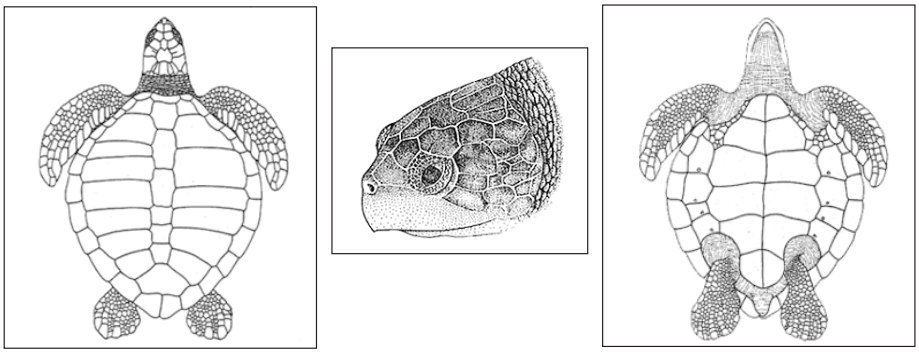
Diet: As their name suggests, Hawksbill Turtles have a narrow, pointed head and a "beak", which is used to pry prey from reef crevices. They specialize on sponges in the wider Caribbean and, to a much lesser degree, will also eat hydrozoans, crabs, clams, gastropods, tunicates, and plants.

Conservation status: Classified as Critically Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (within the wider Caribbean, Cuba and Saint Vincent and the Grenadines maintain a reservation with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance".

Olive Ridley *Lepidochelys olivacea*

General description: The Olive Ridley, one of the smallest of the marine turtles, may have been named for the olive-green colour of its carapace. Olive Ridleys can grow to 64–72 cm (25.6–28.8 inches) in carapace length and weigh up to 45 kg (100 lb). The carapace is nearly circular, with six to nine pairs of lateral scutes. The plastron is yellowish-white in colour and has small pores around the edges. The Olive Ridley has a small, narrow



head and a finely serrated horny beak. Between the eyes there are a variable number of prefrontal scales. There is one claw on each flipper. Hatchlings are uniformly greyish-black in colour.

Nesting distribution and behaviour: In many parts of the world, the Olive Ridley comes to shore to nest in synchronized emergences of large numbers of turtles, an event known as an *arribada* (Spanish for "arrival"). On a global scale, the Olive Ridley is the world's most abundant marine turtle. However, Atlantic populations are severely depleted (having declined by nearly 95% in Suriname, once the region's largest nesting colony). Remnant nesting colonies still occur, mainly in Suriname, French Guiana and Brazil. The nesting season is from April to August, peaking in May–July in the Guianas. Females prefer gently inclining beaches and typically emerge from the sea at night to lay their eggs in the warm sand. The female's track is asymmetrical and ca. 70–80 cm (29–32 inches) in width. Nesting appears to be affected by weather conditions; therefore, there is no predictable inter-nesting interval, although females tend to nest one to three times during a breeding year. Females deposit an average of 100–120 eggs per nest, and the incubation period is approximately eight weeks long. Age at maturity is estimated at 12–15 years.

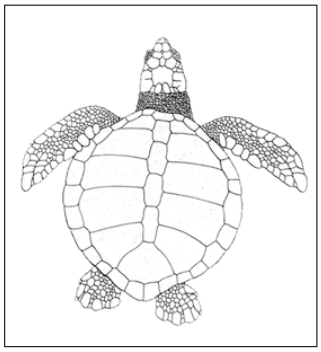
Diet: Olive Ridleys forage both in shallow coastal waters and open sea, where they have been known to dive to depths greater than 150 m (500 ft). They are primarily carnivorous and feed on a variety of food items, such as shrimp, crabs, sea urchins, jellyfish and gastropods (snails). They are also known to eat algae and seagrasses.

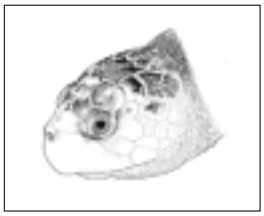
Conservation status: Classified as Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (no nation currently holds a CITES reservation on this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance".

Kemp's Ridley *Lepidochelys kempii*

General description: Numbering an estimated 6000 adults, the Kemp's Ridley is the most endangered marine turtle in the world. It is a small marine turtle, ranging from 58 to 76 cm (23–30 inches) in carapace (top shell) length and from 27–40 kg (60–90 lb) in weight. Kemp's Ridleys have a bony carapace covered with non-overlapping scutes, including five pairs of lateral scutes. The carapace is almost round in shape, and dark-green to grey in colour. The plastron (bottom shell) is yellowish in colour and has small pores around the edges. Between the eyes there are a variable number of prefrontal scales. There are two claws on each flipper, although some adults lose the secondary claw on their front flippers. Hatchlings are uniformly greyish-black in colour and typical carapace length is 42–48 mm (1.7–1.9 inches).





Nesting distribution and behaviour: The existence and whereabouts of Kemp's Ridley nesting beaches remained a mystery to the scientific community until 1947, when a Mexican engineer filmed an estimated 40 000 females emerging to nest on an isolated beach at Rancho Nuevo, Mexico. As the breeding season approaches, males and females gather off the nesting beach to mate. Unlike other marine turtle species, Kemp's Ridleys are typically daytime nesters. The Kemp's Ridley crawl is asymmetrical, measuring 70–80 cm (29–32 inches) across. Females nest annually, generally two to three times per season (April–July), depositing ca. 100 eggs per nest. Incubation lasts seven to eight weeks.

Diet: Kemp's Ridleys are carnivorous. Scientists once believed the species to be confined to the Gulf of Mexico, but its range is now known to extend north along the US continental shelf with occasional sightings in European Atlantic waters. Crabs and shrimps are the main food items, but jellyfish, sea urchins, star fish, clams, mussels and fish are also eaten.

Conservation status: Classified as Critically Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (no reservations are currently entered with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance".

APPENDIX II

MULTILATERAL ENVIRONMENTAL AGREEMENTS RELATING TO MARINE TURTLES OF THE WIDER CARIBBEAN REGION

Global treaties

United Nations Convention on the Law of the Sea (UNCLOS) signed at Montego Bay (Jamaica), 1982; entered into force in 1994

"Prompted by the desire to settle, in a spirit of mutual understanding and co-operation, all issues relating to the law of the sea", UNCLOS created a new legal regime for the seas and oceans. Its environmental provisions aim to establish rules concerning environmental standards and enforcement of provisions dealing with pollution of the marine environment. It also includes an Annex of highly migratory species, thus providing the possibility that marine turtles could receive some protection under this convention.

Convention on Biological Diversity (CBD) signed at Rio de Janeiro (Brazil), 1992; entered into force in 1993

The CBD has as its objective the conservation, as well as the equitable and sustainable use, of biological diversity for present and future generations. It binds nations to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity; to identify and monitor the status of components of biological diversity; and to develop and manage protected areas and other areas of importance for biodiversity. It addresses sustainable use, incentives, research and training, public education and awareness, impact assessment and mitigation, access to genetic resources, technology transfer, information exchange, technical and scientific co-operation, and biotechnology, and establishes a funding mechanism, the Global Environment Facility.

Convention on the Conservation of Migratory Species of Wild Animals (CMS) signed at Bonn (Germany) 1979; entered into force in 1983

The Convention on Migratory Species, or Bonn Convention, incorporates two appendices that list migratory species that would benefit from concerted conservation measures. Endangered species, listed in Appendix I, are fully protected. This includes all marine turtles, with the exception of the endemic Australian Flatback *Natator depressus*. Member States with Appendix I species are to endeavour to conserve their habitat, to counteract factors impeding their migration, and to control other factors that might endanger them. In general, Parties are obliged to prohibit the hunting, fishing, capturing, or harassing of these species. Numerous subsidiary agreements have been adopted under the auspices of the treaty, two of which relate directly to marine turtles: **Understanding concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa (Abidjan, 1999)** and the **Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats in the Indian Ocean and South East Asia (Manila, 2001)**.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) signed at Washington, DC (USA), 1972; entered into force in 1975

CITES was established to protect wild species from the threat of over-exploitation by means of a system of import and export controls. The Convention regulates international trade in animals and plants, whether dead or alive, and any recognizable parts or derivatives thereof. Appendix I lists threatened species (including all marine turtle

species), in which international commercial trade is, with few exceptions, prohibited. Appendix II lists species that may become threatened unless trade is controlled. Appendix III lists species that any member State wishes to control in trade and for which that control requires international co-operation. International trade in Appendix I and II species operates by way of permits issued on the basis of a scientific finding that the export (and in the cases of Appendix I species, import) will not be detrimental to the survival of the species. CITES does not regulate or control the exploitation and trade of listed species, including marine turtles, within the borders of individual States; the establishment of such controls are the responsibility of national governments.

Convention on Wetlands of International Importance especially as Waterfowl Habitats signed at Ramsar (Iran), 1971; entered into force in 1975

Commonly referred to as the Convention on Wetlands or Ramsar Convention, this treaty provides for the protection and management of wetland habitats that are inscribed by individual member States on the international "Ramsar List". A broad approach is taken in determining the definition of the wetlands that fall under the treaty's aegis, such that they may "incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands". This definition incorporates a range of habitats that are important for nesting and foraging of marine turtles.

Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) signed at Paris (France), 1972; entered into force in 1975

The World Heritage Convention is one of the most widely accepted international legal instruments for the protection of cultural and natural heritage. Administered by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the convention provides for member States to nominate specific sites that may be approved for inclusion on the World Heritage List. Inclusion on the list obligates the country concerned to develop a management plan for the site and to provide regular reports on the status of the site and the measures being taken to preserve them. UNESCO maintains a List of World Heritage in Danger, designed to call the world's attention to sites whose character is threatened by natural or anthropogenic factors.

International Convention for the Prevention of Pollution from Shipping, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) signed in 1978; entered into force in 1983

MARPOL is an important treaty for the conservation of the marine habitat necessary for the survival of marine turtles. Its objective is "to preserve the marine environment by achieving the complete elimination of international pollution by oil and other harmful substances". The Convention has five Annexes (for oil, chemicals in bulk, packaged chemicals, liquid sewage, and garbage) to regulate discharge and to minimize accidents. Under Annex V (garbage), the Caribbean Sea has been declared by the International Maritime Organization (IMO) as a "Special Area". This proposal has been accepted but can only come into force when requisite facilities are installed to receive garbage on shore.

Regional treaties

Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) signed at Caracas (Venezuela) 1996; entered into force in 2001

The Inter-American Convention, or IAC, seeks "to promote the protection, conservation and recovery of marine turtle populations and of the habitats on which they depend, based on the best available scientific evidence, taking

into account the environmental, socioeconomic and cultural characteristics of the Parties". Under Article III, the Convention applies to coastal habitat in the Americas, as well as maritime areas for which the Parties exercise sovereignty under the United Nations Convention on the Law of the Sea (i.e. up to 200 miles from shore), thereby covering a significant portion of the ranges of marine turtles in the Western Hemisphere. The treaty requires Parties to protect and conserve marine turtle populations and their habitats; reduce the incidental capture, injury and mortality of marine turtles associated with commercial fisheries; prohibit the intentional take of, and domestic and international trade in, marine turtles, their eggs, parts and products; and foster international co-operation in the research and management of marine turtles. In addition, the treaty specifically obligates Parties to require the use ofTEDs by commercial shrimp trawling fleets.

Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region signed at Cartagena (Colombia), 1983; entered into force in 1986

Commonly referred to as the Cartagena Convention, this treaty sets forth a number of responsibilities of Contracting Parties in protecting and managing the Caribbean Sea, including to "prevent, reduce and control" pollution from a variety of sources (i.e. pollution from ships, from at sea dumping of waste, from landbased sources, from seabed activities, and from airborne sources) and to "individually or jointly, take all appropriate measures to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened or endangered species, in the Convention area". In 2000, the Convention's **Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol)** came into force, thereby providing a mechanism through which species of wild fauna and flora could be protected on a regional scale. Annex I of SPAW includes species of plants to be protected from all forms of destruction or disturbance. Annex II provides for total protection and recovery to listed species of animals. Specifically, Annex II listing prohibits: (a) the take, 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, and (b) to the extent possible, the disturbance of such species, including all Caribbean marine turtles. Other Convention protocols, including the **Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region** (the Oil Spills Protocol) and, more recently, the **Protocol Concerning Pollution from Land-based Sources and Activities** (the LBS Protocol), provide important safeguards for marine turtle habitat and certain types of crisis response.

Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere signed at Washington, DC (USA), 1940; entered into force in 1942

Commonly known as the Western Hemisphere Convention, this treaty's stated objective is to preserve all species and genera of native American fauna and flora from extinction, and also preserve areas of wild and human value. Provisions include the establishment of national parks and reserves (article 2), strict wilderness areas to remain inviolate (article 4), protection of species listed in the annexes which are declared to be of "special urgency and importance" (article 8), and controls on trade in protected fauna and flora and any part thereof (article 9). Five species of marine turtle are listed.

Cooperative Agreement for the Conservation of Sea Turtles of the Caribbean Coast of Costa Rica, Nicaragua, and Panama (Tri-Partite Agreement) signed at San José, 1988; not in force

This agreement provides a formal basis for co-operation in the management and conservation of marine turtles and their habitats through a regional management plan.

APPENDIX III

CITES review of exploitation, trade and management of the marine turtles of the Lesser Antilles, Central America, Colombia and Venezuela

**** REQUEST FOR INPUT—*PLEASE REPLY BY 1 AUGUST 2002*****

TRAFFIC International has been commissioned by the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to undertake a review of the current status of exploitation, trade and management of marine turtles in the Lesser Antilles, Central America, Colombia and Venezuela. This review has been initiated by the CITES Secretariat in response to the First Wider Caribbean Hawksbill Turtle Range State Dialogue, which was held in Mexico City in May 2001. The present review complements the TRAFFIC North America marine turtle study, *Swimming Against the Tide: Recent Surveys of Exploitation, Trade and Management of Marine Turtles in the Northern Caribbean*, published in April 2001. For each of the countries and territories covered, this study aims to:

1. document current legislation governing exploitation, trade, and management of marine turtles;
2. document—and quantify where possible—levels of legal and illegal exploitation and trade in marine turtles and their products;
3. document the existence and status of stockpiles of marine turtle products;
4. document management initiatives being undertaken and the constraints to conservation and management of marine turtles; and
5. provide recommendations for improving the management of trade in marine turtles at the local, national and regional levels, in order to assist marine turtle conservation initiatives and law enforcement efforts.

For this study, TRAFFIC International is seeking input and information from CITES Management and Scientific Authorities; fisheries departments; national co-ordinators of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST); local NGOs and other stakeholders.

Please assist us in providing information on these marine turtle management issues in COUNTRY X through completing the questionnaire set forth in the following pages. In order to facilitate your response, including reducing the amount of information that we are requesting, we have enclosed a brief summary of our knowledge of the laws governing marine turtle management in COUNTRY X, as well as tabulated historical trade data from the CITES database held at the UNEP-World Conservation Monitoring Centre in the UK. Please correct and augment, as necessary, this information in order that we may have a current and complete record of the situation in COUNTRY X.

If any of the information that we are requesting is already compiled in a report or reports that you can make available to us, we would be most grateful to receive a copy.

In order to have a summary report available in time for the 12th meeting of the Conference of the Parties to CITES in November, we wish to have a draft available for review by the end of August. We are, therefore, requesting that information be provided to TRAFFIC International by the end of July. We very much regret the tight timeline and hope you will nevertheless be able to assist us on this project. For further information on this project, please contact: Steven Broad, Executive Director, TRAFFIC International, at: traffic@trafficint.org.

PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE—BY EMAIL OR TELEFAX—to:

Ms. Amie Bräutigam, Project Coordinator
email: thomsen.brautigam@prodigy.net
3626 Warren Street, NW
Washington, DC 20008
USA
telefax: 1/202.362.7893

CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela

** **QUESTIONNAIRE** **

Completed by: _____

Position/Title: _____

Agency: _____

Address: _____

Phone: _____ Fax: _____

Email: _____

Date: _____

I BASIC INFORMATION/BACKGROUND

A. What marine turtle species are known to occur in Country X (check all that apply)?[ ] Loggerhead *Caretta caretta*
[ ] Green *Chelonia mydas*
[ ] Leatherback *Dermochelys coriacea*
[ ] Hawksbill *Eretmochelys imbricata*
[ ] Kemp's Ridley *Lepidochelys kempii*
[ ] Olive Ridley *L. olivacea*

B. What marine turtle species have been documented to NEST in Country X?
[ ] Loggerhead *Caretta caretta*
[ ] Green *Chelonia mydas*
[ ] Leatherback *Dermochelys coriacea*
[ ] Hawksbill *Eretmochelys imbricata*
[ ] Kemp's Ridley *Lepidochelys kempii*
[ ] Olive Ridley *L. olivacea*

C. What are the major (highest density) known foraging grounds (by species) in Country X?

D. What are the major (highest density) known nesting areas (by species) in Country X?

E. Are data (e.g. from flipper tagging, satellite-tracking, or genetic analysis) available to indicate which range States share marine turtle stocks with Country X?

F. Are population monitoring studies—facilitated by systematic tagging or regular morning nest counts at Index beach [or Index foraging ground] sites—underway to determine long-term population trends in Country X? ____ YES ____ NO
IF YES, at what sites are these studies ongoing?

II LEGISLATION

According to our information, the legislation governing the exploitation, trade and management of marine turtles in COUNTRY X is:

A. Please provide (or simply confirm, based on the paragraphs above), the title, date and provisions of the legislation currently in effect that governs the exploitation, trade, and management of marine turtles. Please provide copies for our analysis and file.

Specifically, what are the legal provisions currently in effect in COUNTRY x relating to:

- exploitation of marine turtles (e.g. complete protection, time/area closures, size limits; quotas);
- trade in marine turtles (e.g. non-commercial vs. commercial, local vs. for export; certain products prohibited from sale; seasonal restrictions; permit requirements);
- enforcement, including penalties for violations of harvest or trade prohibitions and confiscation of marine turtle products by government agencies;
- registration of stockpiles and movement of turtle products from such stockpiles;
- conservation and management, including protection of nesting beaches or other important habitats or other such measures.

B. Through what legislation are wildlife trade controls, such as those required by CITES, implemented and enforced in COUNTRY X? Does this legislation prohibit the export of marine turtles and turtle products?

C. Which government agencies have authority for which aspects of the management of marine turtles, such as exploitation, trade, conservation, and enforcement?

D. What revisions to current legislation relating to the management (specifically exploitation, trade, conservation, and enforcement) of marine turtles are being discussed—or have been proposed — and when is it expected that such changes will be adopted?

III DOMESTIC EXPLOITATION AND USE

A. Does a legal fishery for marine turtles currently operate in COUNTRY X? ___YES ___ NO

1. If NO:
   - When was the prohibition enacted, and does it apply to all species of marine turtles at all times and sites?
   - Is this prohibition indefinite or for a fixed period? If for a fixed period, when is the moratorium scheduled to end? If indefinite, on what basis may the fishery be reinstated?
   - Are records available for landings prior to the prohibition? If so, could you please provide them or direct us to who can provide them.

2. If YES:
   - For which marine turtle species does a legal fishery operate?
   - Are records maintained of where the fishery operates, quantities of turtles landed and products taken? Which agency maintains these records, and how are they compiled (e.g. by actual documentation at landing sites or other means)? If no records are kept, are estimates available, and on what basis are they made?
   - If records do exist, please provide details of the quantities recorded, by species, site and year and products derived from the turtles.
   - Is there an estimate of the number of fishers involved and how often they operate? For any fishers, is this a major source of sustenance or income?
   - Are all species of marine turtles targeted equally, or are some more sought-after than others?
   - What products (and from what species, if known) appear to be more in demand (e.g. eggs, Hawksbill shell, green turtle meat)?
   - What is the market for a legally acquired product? Is it shared among family and friends, or more likely to be commercially sold?
   - If the product is commercially sold, who is most likely to make the final sale (e.g. fisher/fish market, restaurant, tourist shop)?
   - Who is the most likely consumer (e.g. rural resident, urban resident, tourist)?
   - Is the sale of marine turtles or turtle products regulated? Monitored?
   - Are statistics available on the numbers of marine turtles or marine turtle products marketed on an annual basis?

If so, through what agency are they collected?
- If possible, please provide any statistics that may be available on turtle products marketed commercially.

3. How is the legal fishery managed to ensure that it is not reducing population numbers? For example:
   - Are quotas set and reviewed periodically? On what basis are they set and reviewed?
   - Are specific age-groups of marine turtles, such as breeding females, protected in order to conserve the most valuable segment of the population?
   - Are specific nesting or foraging areas set aside as reserves to conserve animals there?
   - Are there monitoring programmes in place to: 1) record turtle landings; 2) ensure compliance with restrictions; and 3) identify trends in turtle numbers that might reflect an effect on populations?
   - Are management and monitoring of the legal fishery sufficient to ensure that the fishery does not result in a reduction of marine turtle numbers? Are any actions currently being taken to review the management program?

4. What are the constraints to strengthening the framework for marine turtle management (e.g. shortcomings in the legal/regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding, lack of public support)? What are the prospects that these will be resolved in the next few years?

B. Is there illegal exploitation of marine turtles in COUNTRY X?

1. What is the extent of illegal exploitation, and how is it documented?
   - On what basis is this problem believed to exist (e.g. documented evidence, anecdotal evidence, seizures of marine turtle products)?
   - Is it local or foreign fishers pursuing such a fishery? Is there an estimate of the number of fishers involved and how often they operate? For any fishers, is this a major source of sustenance or income?
   - Are all species of marine turtles targeted equally, or are some more sought-after than others?
   - What products (and from what species, if known) appear to be more in demand (e.g. eggs, Hawksbill shell, green turtle meat)?
   - What is the market for these illegally acquired products? Are they shared among family and friends, or more likely to be commercially sold?
   - If the product is commercially sold, who is most likely to make the final sale (e.g. fisher/fish market, restaurant, tourist shop)?
   - Who is the most likely consumer (e.g. rural resident, urban resident, tourist)?
   - Do estimates exist of the number of marine turtles—in total or by individual species—taken illegally per year?
   - Please provide any statistics that may be available on illegal exploitation of marine turtles in COUNTRY X.

2. Is the illegal exploitation of marine turtles in COUNTRY X considered a problem? a severe problem? If so (in either case), is it broadly recognized to be such a problem? What efforts are being made to reduce illegal exploitation?

3. What are the constraints (e.g. shortcomings in the legal/regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding, lack of public support) to effective enforcement to reduce illegal exploitation, and what are the prospects that these will be resolved in the next few years?

IV INTERNATIONAL TRADE

A. Export of marine turtle products from COUNTRY X

The attached tables present imports of marine turtles from COUNTRY X as reported to CITES and as registered by Japanese Customs for imports of hawksbill shell, or *bekko*, into Japan prior to Japan's prohibition on hawksbill shell imports.

1. To your knowledge, how accurately do the attached statistics reflect true levels of exports of marine turtles from COUNTRY X?

2. If the export of marine turtles or marine turtle products from COUNTRY X is legal or has been until recently:
   - How are these exports regulated?
   - Are statistics available on export levels? If so, can you please provide these statistics.

3. If the export of marine turtles or marine turtle products is prohibited, are illegal exports being made?
   - Are there any estimates of the extent of illegal export? the quantities and products involved?
   - What is the destination—known or presumed—of illegal exports of marine turtle products?

4. Is illegal export of marine turtle products considered a problem for the conservation and management of marine turtles in COUNTRY X? If so, what are the constraints to reducing this illegal trade?

B. Import of marine turtle products into COUNTRY X

1. Is the import of marine turtles or marine turtle products into COUNTRY X legal or illegal?

2. If the import of marine turtles into Country X is legal or has been until recently:
   - How are these imports regulated?
   - Are statistics available on imports, such as quantities, products, species, and export countries involved? If so, can you please provide these statistics.
   - What is the known or presumed destination (e.g. domestic use or re-export) of marine turtles or marine turtle products imported into Country X?

3. If the import of marine turtles or marine turtle products into Country X is prohibited, are illegal imports being made?
   - Are there any estimates of the extent of illegal import, such as quantities, products and species involved?
   - What is the origin—known or presumed—of illegal imports of marine turtle products?
   - What is the known or presumed destination (e.g. domestic use or re-export) of marine turtles or marine turtle products imported into Country X?

4. Is illegal import of marine turtle products considered a problem for the conservation and management of marine turtles in COUNTRY X? If so, what are the constraints to reducing this illegal trade?

V STOCKPILES OF MARINE TURTLE PRODUCTS

A. Are there stockpiles of marine turtle products in existence in COUNTRY X, and are such stockpiles legal and/or illegal?

B. Regarding existing legal stockpiles:

1. Are these stockpiles privately owned or owned by government? Are the latter solely from confiscations?

2. How are the stockpiles regulated? For example:
   - Has an inventory been undertaken of these stockpiles? If so, when, and what were the quantities held?
   - How are the stockpiles monitored? Are inventories undertaken on a periodic basis, or are periodic reports required of holders of stockpiles?
   - What are the limits to the movement or sale from these stockpiles?
   - What is the current status of the stockpiles in terms of quantities of products, derived from what species, and the physical condition of the products held?

3. Are the legal stockpiles being held indefinitely? If not, when and how are they intended to be disposed of?

C. What is known of illegal stockpiles of marine turtle products in COUNTRY X?

VI MARINE TURTLE MANAGEMENT PLANNING

A. What is the status of implementation of your national marine turtle action plan? OR is a national marine turtle action plan currently being developed in your country?

B. What are the constraints to development or implementation of your national marine turtle action plan; for example shortcomings in the legal/regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding, and/or lack of public support?

C. What, in your view, is the most important ingredient/resource for effective marine turtle management at the national level, and is this ingredient/resource available to you?

D. Would the existence of a Caribbean regional marine turtle management plan be useful to you in your national management planning efforts?

VII OTHER COMMENTS

Please provide here any other information or commentary than that requested above regarding the exploitation, trade and management of marine turtles that you believe is of relevance to this study and of which CITES should be aware.

VIII OTHER CONTACTS

We are sending this questionnaire to the following agencies and individuals in COUNTRY X:

If there are other individuals in relevant government agencies or NGOs who may be able to assist TRAFFIC International in the compilation of information on exploitation, trade, and management of marine turtles in COUNTRY X, please provide their names and contact details below.

1. Name: _____
Agency: _____
Address: _____
Phone: _____ Fax: _____
Email: _____

2. Name: _____
Agency: _____
Address: _____
Phone: _____ Fax: _____
Email: _____

THANK YOU FOR YOUR KIND CO-OPERATION AND YOUR VALUABLE CONTRIBUTION TO THIS IMPORTANT ASSESSMENT. AGAIN, PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE—BY EMAIL OR TELEFAX—TO:

Ms. Amie Bräutigam, Project Co-ordinator
email: thomsen.brautigam@prodigy.net
telefax: 1/202.362.7893
3626 Warren Street, NW, Washington, DC 20008, USA

TRAFFIC, the wildlife trade monitoring network, works to ensure that trade in wild plants and animals is not a threat to the conservation of nature. It has offices covering most parts of the world and works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

For further information contact:
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TRAFFIC
the wildlife trade monitoring network

is a joint programme of

WWF IUCN The World Conservation Union

SEPTEMBER 2006