

Capturing fisher input on regulatory change in the Turks and Caicos Islands marine  
turtle fishery and assessing the possibility of co-management

By

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## **Abstract**

Within Turks and Caicos Islands (TCI) waters there are two main species of marine turtle that nest and forage: green and hawksbill turtles. Both are listed on the global IUCN Red List as endangered and critically endangered, respectively, but are fished legally in TCI waters. The fishery is mostly unregulated, and the government of TCI and the Marine Conservation Society of the United Kingdom (MCS-UK) have been working with fishers to improve management. Over the past two years, MCS-UK has conducted extensive fisher engagement and research on the nature and scope of the fishery. Based on research and fisher input, MCS-UK will recommend a new management plan in 2011.

Through an extensive literature review and analysis of the TCI turtle fishery, I assess the potential for co-management in the fishery by fishermen and government. Analysis of fisher interviews demonstrates perspectives on management of the turtle fishery in general, and fisher preference for certain management techniques. Coupling my analysis of the fishery and co-management theory with fisher and community member responses leads me to recommend the following management measures: closed areas; protection of nesting females and eggs; a slot size limit; a closed season and some gear restrictions. The analysis also reveals the possibility of co-management in the fishery and I suggest increasing fisher involvement in the decision-making process. After implementing and assessing a co-management plan for the marine turtle fishery in the TCI, it may act as a guide for initiating similar programs for the more economically important conch and lobster fisheries.

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## **Introduction**

Traditionally, fisheries management comes from a top-down, government-centralized approach and researchers have often focused on the means of management, not the institutions of management (Berkes et al. 1991; Noble 2000). However, academics are now observing social institutions and their successes and failures. This, coupled with continued over-exploitation and resistance from fishermen, has led to the government-centralized approach being met with more and more resistance (Jentoft 1989; Pinkerton 1989). One possible option is co-management, in which stakeholders can actively participate in management of the resource, working alongside government officials.

Through an understanding of the marine turtle fishery in the Turks and Caicos Islands (TCI), I explore the possibility of co-management in the turtle fishery. Fishermen and community perspectives on various possible regulations and willingness to participate in management help to assess the prospects of co-management.

## **Objectives**

My objectives in this paper are two-fold: to understand fisher opinions on management to better assess the possibility of co-management and to demonstrate fisher preferences for certain management techniques. I will first provide background information on marine turtles and the TCI turtle fishery including current regulations. Then through an examination of current co-management theory I hope to gain a better understanding of what factors are necessary for co-management and the benefits it can provide. This background research, coupled with an understanding of fishermen and community member interview responses regarding management of the turtle fishery, will allow me to assess whether a centralized management approach from within the TCI government is necessary or if co-management is likely to emerge. Based on conclusions from my analyses, I recommend management measures for the TCI marine turtle fishery and outline the broader implications of this study for the fishery and co-management along with suggestions for future research.

## **Background**

### ***Marine Turtles: A Brief Ecology and Status***

Marine turtles are considered endangered (to some extent) worldwide. There are seven different species of sea turtles: green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), flatback (*Natator depressus*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) and all are listed as either threatened or endangered under the U.S. Endangered Species Act (U.S. Congress 1973).

Similarly, the International Union for the Conservation of Nature (IUCN) lists loggerhead and green turtles as endangered; leatherback, Kemp's ridley and hawksbill turtles as critically endangered; olive ridleys as threatened; and flatbacks as data deficient (IUCN 2010).

Sea turtles are long-lived, late-maturing species that can be found in tropical and sub-tropical oceans throughout the world, often exhibiting trans-oceanic migrations from feeding to breeding grounds. They spend most of their lives in the ocean, except as hatchlings or nesting females on the beach (Lutz et al. 2003). Due to their complex life histories, marine turtles are vulnerable to overexploitation, and their traditional harvest (along with natural and other anthropogenic threats) has led to the endangered species listings provided above. Their long life spans, late maturity and low hatchling survival rates are some causes of this vulnerability. Harvest of turtles and their eggs, as well as predation, increased beach development, fishing gear entanglement and by-catch have contributed to decreased populations. Today there are few legal directed fisheries for sea turtles, but fishing and poaching still occur (both in-water and on nesting beaches). This continued take of marine turtles under their current threatened status makes protection and management both necessary and important.

Sea turtles play important ecosystem and cultural roles. One important ecosystem role of turtles is their diet. For example, green turtles consume sea grasses and are an integral part of maintaining the health of sea grass beds; a decrease in turtles could lead to degradation of sea grass beds, which are important nursery grounds and would have cascade effects on other aspects of the marine system (Lutz et al. 2003). Turtles are also important for nutrient and energy transfer from their rich foraging areas to nutrient poor nesting beaches. Turtles serve as substrate and transport for many species (Lutz et al. 2003). Along with these important ecosystem roles,

marine turtles are often of cultural importance, especially in areas of the world that have traditionally depended on them as a food source (Price 1966). Of increasing importance is the revenue created from ecotourism, where vacationers have the opportunity to witness a turtle nesting or swim with turtles in their natural environment (Tisdell & Wilson 2002; Honey 2008). These varying roles that turtles fulfill create a need for successful management.

### ***Turks and Caicos Islands, British West Indies***



**Fig. 1.** Map of the Turks and Caicos Islands

TCI is a United Kingdom (UK) overseas territory located southeast of the Bahamas and north of Haiti. There are 40 islands, 8 of which are inhabited and over 389 kilometers of coastline (Fig. 1). Thirty-one percent of TCI is currently protected under the National Parks Ordinance. The population of the islands is approximately 35,000, with 20% of the population working in either the agriculture or fishing industries (Central Intelligence Agency 2010). Of the 8 inhabited islands, the main ones include Providenciales (Provo), Grand Turk and South Caicos. Provo is the main tourist islands, while Grand Turk

serves as the administrative capital and South Caicos is populated mainly by TCI residents. South Caicos is the main fishing settlement in the islands, with lobster and conch as the most economically important fisheries (Proctor & Fleming 1999). Turtle fishing occurs across all islands.

The laws of the TCI are based on those in England and Wales, with some adopted from the Bahamas and Jamaica. Within TCI, a governor represents the Queen, and the UK has the right to suspend the TCI government when deemed necessary. For instance, in August 2009, due to reports of corruption, the TCI government was suspended and the British assumed direct rule until order was re-established (Central Intelligence Agency 2010). As a UK overseas territory, the Turks and Caicos government is in charge of internal aspects, while the UK government presides over external affairs (Richardson et al. 2006). These differing roles can overlap. For example, the TCI government, consisting of an Executive Council and elected legislature, is in charge of such things as domestic legislation, including biodiversity conservation and natural resource management in the islands. The UK government, on the other hand, is responsible for

security, defense and international affairs, including multilateral environmental agreements (MEAs), such as the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Migratory Species (CMS). Both of these international agreements deal specifically with the protection of certain species including sea turtles.

Within the TCI government, the Department of the Environment and Coastal Resources (DECR) is in charge of natural resources management. The stated mission of the department is:

To ensure sustainable utilization of the natural resources of the Turks and Caicos Islands, protect and promote biodiversity and economic prosperity through a sustainable fishing industry and a protected areas system (DECR 2010).

The DECR is split into two divisions, the Protected Areas Division and the Fisheries Division, both of which work together to ensure successful management of the marine environment and fisheries (DECR 2010). Due to insufficient funds, monitoring and enforcement is a challenge. Therefore, DECR officials tend to focus their efforts on the two most profitable fisheries: lobster and conch, and there is currently minimal management of the sea turtle fishery.

### ***Marine Turtles in the TCI***

Within Turks and Caicos waters there are two main species of turtles that nest and forage: green and hawksbill turtles, although there are some reports of loggerhead and leatherback turtles as well (Godley et al. 2004). Both green and hawksbill turtles are listed under the IUCN Red List as endangered and critically endangered, respectively. Despite the status of these two species, direct exploitation still occurs in TCI waters, with estimates of 240 to 1130 green turtles and 180 to 900 hawksbill turtles caught per year (Richardson et al. 2009). Though on-going research suggests these numbers are likely overestimates<sup>1</sup>, the harvest is likely the largest legal take of marine turtles in a UK overseas territory (Richardson et al. 2009). The foraging population of both species within TCI waters is considered to be stable or increasing. There is a small nesting population that was once much larger and has likely decreased as a result of overexploitation

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<sup>1</sup> On-going research in TCI by MCS-UK suggests the harvest is lower; daily dockside observations of turtle landings in South Caicos during 2009 revealed 218 turtles were captured over the year, 142 green and 76 hawksbill (Campbell pers. comm. 2011).

(Godley et al. 2004). Previous studies have demonstrated the importance of local nesting populations and note that these populations have increased in areas where exploitation has drastically decreased (Dutton et al. 2005; Hastings 2003). A Cayman Islands study suggests that in a small nesting population any take of turtles may impede local population recovery (Bell et al. 2006). These studies point to the importance of management despite the stable foraging populations.

Exploitation and use of sea turtles in the Turks and Caicos has occurred since the islands were first inhabited in 700 AD (Godley et al. 2004). After discovery in 1492, Europeans continued turtle exploitation on the islands. Passed in 1907, the first Turtle Protection Ordinance prevented turtle take by Bahamians, beginning the management of turtles in TCI waters (Godley et al. 2004). Throughout the 20<sup>th</sup> century the take of turtles in TCI waters has slowed due to a shift in food preferences and slight changes in legislation; however, marine turtles are still targeted for commercial and subsistence use.

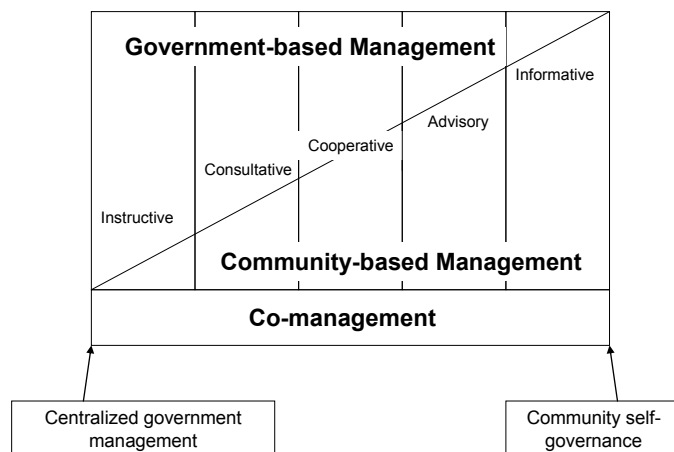
Restaurants and special orders mainly drive today's market for turtles in TCI, with turtle meat being the primary product (Godley et al. 2004). There is a strong tradition of turtle consumption, and a 2003 survey found that of 92 respondents, over 80% either eat or have eaten sea turtle meat (Godley et al. 2004). Despite this demand, the availability of turtle meat has remained stable or decreased, likely due to a decrease in fishing effort and a preference for imported foods such as fried chicken (Godley et al. 2004).

Regulations in the TCI marine turtle fishery are currently not extensive and enforcement has proven to be difficult. There is no fishing season, no quota and no species restrictions. However, there is a minimum size limit of 20 lbs (and 20 inches) for captured sea turtles, and capture of any marine species (including sea turtles) in a national park is prohibited along with the use of a spear gun or Hawaiian sling; collection of nesting females or sea turtle eggs is prohibited (DECR 2010). These minimal regulations, coupled with the lack of sufficient monitoring and enforcement, have made management efforts negligible.

## Co-management in Fisheries

Co-management is not a new and novel idea; instead it has been around for several decades. The 1987 *Brundtland Report* written by the UN World Commission on Environment and Development posed the idea that communities should be directly involved in decision-making regarding the resources they use (UN World Commission 1987). Since the time of this report, there are now many success stories and failures surrounding co-management of natural resources.

Traditionally, fisheries have been managed with a top-down, government-centralized approach where stakeholders are often completely exempt from the decision-making process. However, co-management is a way of decentralizing and improving user participation in resource policymaking. In co-management, a partnership between the government, resource users and other stakeholders is developed and all entities share responsibility for decision-making, authority and monitoring of the resource (Noble 2000; Pomeroy 2001). Carlsson and Berkes (2005) take the definition of co-management further, postulating that co-management is a continuous problem-solving process.



**Fig. 2.** Co-management spectrum adapted from Sen and Nielsen (1996) and Pomeroy (2001).

Based on varying definitions, there is a clear spectrum of co-management that represents varying stakeholder levels of involvement (Fig. 2). Sen and Nielsen (1996) provide a breakdown of this spectrum, which consists of five levels of user involvement. Instructive co-management, as described by Sen and Nielsen (1996) consists of the exchange of information between resource users and government through existing mechanisms

for dialogue, but this dialogue consists largely of government informing users of the resource regulations. Consultative co-management provides a way for government to consult with users on decisions, but the government ultimately makes the decisions (Sen& Nielson 1996). This is

typically what occurs in U.S. fisheries, where management councils are required to hold meetings with fishers and the government must hold a comment period. Cooperative co-management is where government and users equally partake in policymaking. Advisory co-management consists of stakeholders advising the government of their decisions and the government endorses them, while informative co-management is where the government has delegated authority to the users (Sen & Nielson 1996). From these descriptions it is clear that co-management occurs across a broad spectrum of user and government involvement in policymaking, so while informative co-management may not be immediately available in the TCI, some form of co-management is likely to emerge.

Several authors outline factors necessary for co-management to occur. Pomeroy (2001) recognizes that co-management is not good for every community, citing the need of the community to be willing and able to take responsibility. Pomeroy (2001) also suggests that a lack of leadership and incentives, high-risk value and costs and insufficient political determination will make co-management unlikely. Similarly, co-management is unlikely if the government does not recognize local institutions as legitimate and if the government is inaccessible and unwilling to listen to fisher input (Pomeroy 2001). Noble (2000) also describes several key principles that enable cooperative management, including community support, noting that fishers and other stakeholders must agree for co-management to work.

Assuming the necessary factors are present, benefits of co-management abound. These include the promotion of conservation and enhanced fish stocks, improved data quality and analysis, reductions in competitive and destructive gear, increased equity among users, the promotion of community development and decreased conflict among government and resource users (Pinkerton 1989). Further benefits include the ability to exploit the strengths of each partner, increased knowledge of the resource and more effective law enforcement, as rules become locally recognized (Singleton 2000; Carlsson & Berkes 2005; Pomeroy 1995).

Within the TCI marine turtle fishery, there is a lack of government capacity and incentives for top-down management; the fishery is also largely opportunistic and has low commercial value, making it an ideal candidate for co-management. Along with the benefits of co-management, the main motive to reform the existing turtle fishery organization is to resist increased pressure from

outside conservation groups pushing to close the fishery (Campbell pers. comm. 2011). Due to the cultural importance of the fishery in the TCI and stable turtle populations in TCI waters, closure would likely do more harm than good and would be met with resistance. However, co-management has the potential to help the fishery resist closure and would allow for better enforcement, assuming fisher and community support and willingness to participate.

A prior study assessing the potential for co-management of sea turtles in various UK overseas territories indicates that there is potential for cooperation in the Turks and Caicos (Campbell et al. 2009). Researchers found that, of 44 respondents, the majority said the government should regulate turtle fisheries, while approximately half of the respondents felt that fishermen should help with management. TCI respondents also indicated a preference for size limits as the only management measure. Further analysis revealed the lack of perception in crisis in the stocks of marine turtles and the belief that turtle is not as economically important as lobster and conch, which may act as barriers to the formation of a successful co-management plan (Campbell et al. 2009). The following analyses in this paper specifically assess fisher and community perspectives on several management measures, as well as address the willingness to participate in management of the marine turtle fishery.

## **Methods**

Interview data analyzed in this paper are part of a larger investigation undertaken by the TCI government and MCS-UK to better understand, and ultimately improve management of the turtle fishery. The MCS-UK has conducted extensive research on the fishery and on fishermen perspectives, and will recommend a new management plan for the fishery in 2011 (Campbell pers. comm. 2011). Included in this research are interviews with fishermen and other community members.

The first set of interviews (data set A) was conducted by researchers from Duke University and MCS-UK. These interviews were video-recorded and analyzed to inform the making of a research-based documentary film, used as both a tool to return research results to the community and to engage the community in a discussion of those results and what they implied for future management of the turtle fishery. Questions sought to gauge attitudes towards existing fisheries management, importance of the turtle fishery and possible new regulations and management

options. Interviewees included 1 government official, fishermen and general community members. Although respondents signed a release form agreeing to be video-recorded and included in the documentary, in this paper I protect respondent identity by assigning an interview number (A1 through A33). All thirty-three video-recorded interviews were entered and coded in NVIVO 8.0. Results are presented as summary statistics for the relevant criteria and are enhanced by including direct, illustrative quotes.

A second set of interviews (data set B) was conducted with fishermen (in groups or as individuals) following the screening of the documentary film. A total of 38 interviews with over 100 participants were conducted by MCS-UK researchers between 13 July 2010 and 26 December 2010. Despite respondents agreeing to have their name used, their identities were protected and each interview was given a number (A1 through A38). Fishermen were asked questions regarding future catches in the fishery, commercial sale of turtle products, possible regulations and management options that included fisher involvement and self-policing. Detailed notes were recorded and these were typed, entered and coded in NVIVO 8.0. Results are presented as summary statistics and direct quotes.

## Results

Since discussions often occurred in group settings, calculating non-response to questions was difficult. However, many respondents did not respond to certain questions and management prompts. Overall, from data set A, a total of 33 individuals were questioned and over 100 individuals were interviewed in data set B.

### *Current Issues in the Fishery*

While the interviews and discussions did not ask specific questions about current problems with management, several fishermen in data set B voiced their opinions about on-going issues. A total of 12 responses were recorded voicing opinions about current management problems (Table 1). These included lack of enforcement,

**Table 1.** Responses from data set B to current problems in the TCI marine turtle fishery.

<b>Current Problems</b>	<b>N</b>
Law enforcement	1
Don't consult fishermen in law	3
DECR corruption and lack of knowledge	4
Lack of information regarding regulations	1
DECR disrespectful	1
Fishers don't follow laws	2

not consulting with fishermen when laws are made, DECR corruption and lack of knowledge, fishermen lack of information regarding regulations, DECR being disrespectful and fishermen simply not following the laws. Thirty-three percent felt the main problem in fisheries management within the islands is DECR corruption and lack of knowledge. B8 believes that “fishery officers know nothing about the sea” and B30 supports this opinion saying that most fishery officers have never been fishing. B30 stated, “DECR aren’t working with fishermen, they only looking for money,” pointing out the corruption within the department. Fishermen also found DECR officers to be disrespectful, saying “DECR need customer service training” (B15) and “[DECR] should do their job in more legit and respectable way” (B17). Lack of enforcement is also a concern to some fishers.

### ***Need for Management***

Data set A asked respondents about the need for management of the turtle fishery, since it is a largely opportunistic fishery that is not of high economic importance. Thirty respondents indicated a need for turtle management in the TCI for various reasons. “Management will help to protect the species” (A17) so “they won’t become extinct” (A23). As respondent A1 stated, “People tend not to appreciate what they see everyday. You don’t miss it until it’s gone. Of course we need to manage it.” Respondents also prefer management to a complete ban and A33 noted that a “management plan should be tailored to TCI, not just the world view of banning [turtle] fishery.” A few respondents felt that management is not needed for marine turtles in the TCI due to turtles being plentiful in TCI waters and fishermen not catching enough. Respondents A25 and A29 expressed disbelief in biologist assumptions that turtle populations are declining, while A20 simply stated, “turtle is plentiful here.” A15, however, said that “turtles don’t need to be managed, no one is bothering them. Conch and lobster, yes,” implying that not many people are fishing for turtles because they are not as economically important as other species. A15 continued on to say that “control is better than complete ban.” Responses from data set B also indicated a need for management, though response rate was low (5 of 6 responses said management was necessary).

### *Future of Turtle Fishing*

In data set B, fishermen indicated how their catch of turtles would change in the future, specifically if more economically important catches decreased (Table 2). Fifty-four percent of

**Table 2.** Fishermen views on future turtle catches.

<b>Future Turtle Fishing</b>	<b>N</b>
Catch Less	7
Catch More	4
Catch Same	2

respondents felt that their turtle catch would decrease in the future. B9 claimed that they will catch fewer turtles in the future, as “we catching less [turtle] every year.”

“People will move to fish instead of turtle as more money [in fish]” (B27). This lack of economic importance in the turtle fishery is supported by others, along with the idea

that there are shifting food preferences among the TCI population. B13 indicated this food shift, stating, “It’s useless to get turtle as meat be knocking around [in freezer] for months. [Our] favorite is chicken.” The remaining 46% of respondents believe that their turtle catch will increase or remain the same, stating that if “turtles start selling [I’d] catch them up” (B15) and “people do what it takes to make a dollar” (B17). Others still believe catches will remain stable since “only native people eat them” (B21) and turtles are not harvested like conch, lobster and fish.

### *Commercial Sale Ban*

Questions about banning the commercial sale of turtle products were received with mixed reactions in both interview data sets, and several interviewees chose not to respond to questions

**Table 3.** Fishermen views on commercial ban of sea turtle products.

<b>Commercial Sale</b>	<b>N</b>
Against Ban	18
Personal Use Only	5
No Market/No Need	14
Ban Sale	9

*Notes:* Some duplicate responses.

regarding a ban. Only 2 people responded to questions regarding a commercial sale ban in data set A, both agreeing that a commercial ban was okay. A15 stated that there is “no problem not to market it but for personal consumption it should be okay.” A26 supported this measure as well, noting that “restaurants don’t usually order turtle” so a commercial ban would not be a problem.

In data set B, the majority of fishermen responses, approximately 69.5%, were either against a commercial ban or felt there was no need for one due to a lack of market (Table 3). B15 commented that turtle is one of the islanders’ favorite dishes and B29 continued on, “Boy! That’s a bad law you know. People go every Thursday, Friday and Saturday to eat turtle. Even guests, white people, coming down for seafood fest in October where turtle, lobster, fish and conch [is served].” Other opponents of a commercial ban are concerned about the economic impact it would have on restaurants and on

fishermen. B16 makes this clear, stating, “Why you want to stop restaurants selling? Restaurants making money of that. I make money of that.” A large number of respondents were indifferent to the measure, noting that the “market for turtle is insignificant these days” (B13). Proponents of a commercial ban agree that there is no market, but believe that a ban is okay due to this lack of market demand. These fishermen noted that most turtle consumption occurs in private home settings anyways.

**Table 4.** Community member support and disapproval of certain management measures.

<b>Management Prompts</b>	<b>Pro</b>	<b>Anti</b>
Temporary Ban	9	19
Species Ban	15	14
Season	21	7
Nests	4	0
Size Limit (general)	3	0
Minimum Size Limit	2	0
Maximum Size Limit	21	9
Gear Restrictions	0	1
Quota	3	0

*Notes:* High non-response to some prompts.

***Proposed Regulations***

Data set A interview responses regarding management prompts of a temporary ban, species ban, season, nests, general size limit, minimum size limit, maximum size limit, gear restrictions and quota are outlined in Table 4. Most respondents were in favor of a season and a maximum size limit, while individuals were opposed to the possibility of a temporary ban. Data set B similarly assessed fishermen perspectives on numerous proposed regulations. These included closed areas, protection of eggs and nesting females, quota, season, species ban, total ban, temporary moratorium, license, size limit and gear restrictions. Table 5 summarizes fishermen comments to regulation measures.

**Table 5.** Fishermen arguments for and against proposed regulations.

Regulation	Arguments/Comments	N
Closed Areas		
Pro	Shouldn't catch anything in a national park; tourism; let turtles rest; protect sanctuaries; establish for breeding turtles; close areas that are easily accessible	17
Anti	Too many national parks already; DECR can't patrol; no more closed areas needed; turtles move	7
Eggs & Nesting Females		
Pro	Leave eggs alone; good law; sentence people caught with eggs; protect nursery; let turtles reproduce and hatch; wrong to kill female with eggs; altering food chain; may help bring more turtles;	18
Anti	Should be allowed to take 1 or 2 fresh eggs; helpful if sick or weak	2
Turtle License		
Pro	Will deter people from getting turtle; add turtle fee to existing license; people could buy turtle license without needing full fishing license; people won't want to pay; government can make money; easier to manage; only if turtle is being sold	8
Anti	Waste of time; no market for turtle; fishing license is already too expensive; don't have the money; current license covers all marine species; will encourage fishers to catch more	25
Quota		
Pro	Control the amount caught; one turtle per month; have a limit so turtles last longer; limit per boat; need to document landings for a year to determine quota; per day; wouldn't meet the quota anyway; anything over should be a fine	15
Anti	Too hard to enforce; DECR not around to check compliance; no market; plenty of turtles in the waters; have to pay bills; turtles only caught for personal use; if there's a season then no need for quota; insufficient monitoring	15
Season		
Pro	Close season in the summer; all products from the sea should have season; lots of turtles in summer so leave it open; put season on Hawksbill; close during breeding season; should be open when lobster is open; open when other fisheries are closed	10
Anti	Season will create market; don't harvest turtle every day; no need for season if follow size limits; fishermen will do what they want	15
Species Ban		
Pro	No one wants hawksbill; don't catch them that much; hawksbill is limited	12
Anti	Individuals have preference for different species; will wipe out species allowed to fish; turtle is turtle; lots of both species present; people will take illegally	20
Temporary Ban		
Pro	Could do without turtle; increase population; depends on length	5
Anti	Not killing them in abundance; too hard to monitor	2
Total Ban		
Pro	Take is low; no restaurants buy it; leave turtle alone; other fish	3
Anti	People will still fish turtles; don't catch turtle every day; won't work here; manage fishery instead; will have to give fishermen something back; people have been catching turtles for years; it's a delicacy and culture	23
Size Limits		
	Easiest measure to enforce; fishermen would measure, turtles could be butchered at sea; need to kill more small turtles to make same amount of money from one big turtle	
Minimum Limit	Protect young turtles because they're the future; let them grow and catch later; let small ones get big to breed; big turtles had their time	11
Maximum Limit	Protect big breeding turtles; no one wants big turtles; fewer big turtles	13
Slot Limit	Shouldn't take baby turtles or breeders; DECR needs to tell us which ones we can take; medium turtle meat is just right; turtles are just for food	23

A majority of respondents in data set B (70% and 90%, respectively) support closed areas and protection of nests and nesting females.

That could be good. Give turtles [a chance] to recuperate to their grounds. If you catch them out of their town [closed areas], then they lose. –B19

B5 noted that fishers are not supposed to take *anything* from closed areas, stating, “We can’t fish in the national park. If there’s conch there, we shouldn’t get it. If there turtle there, we shouldn’t get it. Whatever is there, we shouldn’t get it.” Several fishermen pointed this out and mentioned that closed areas are for tourists, so taking turtles is rightly prohibited. However, it is important to note that most fishermen in favor of closed areas felt that the existing national parks were sufficient and new closed areas were not needed. Similarly, fishermen opposed to closed areas were largely resisting the addition of new areas to the already extensive national parks system. As B25 said, “All island is [a] park. [We need] no more.” Fishermen also admitted that they occasionally fish illegally in closed areas.

Four respondents from data set A agreed with the protection of nesting turtles and eggs. As one respondent noted, “If [you] eat an egg, how [do you] expect to have turtle in future?” (A32). A total of 18 fishermen in data set B also agreed with the existing protection of nesting females and eggs, believing that this measure protects the population. This belief is reflected in the following two quotes:

If [a turtle] comes to lay, they putting out more turtles. If you take eggs, you killing 50 to 60 turtles and killing ma in one shot. – B17

It’s a breeding turtle laying eggs. That turtle gonna help bring more turtles and get them off the endangered species list. – B23

Only 2 fishermen believed that this regulation is unfavorable due to the number of eggs laid and the perceived health benefits. B36 believed that “You should be able to get eggs if fresh. Your body could be run down...But if late, then leave.” No respondents from data set A were opposed to this measure.

Perceptions on a temporary ban differed greatly in data set B; data set A did not have any responses in favor or opposed to a moratorium. While only two (of seven responses in data set B) disagreed with the temporary moratorium, the remaining five respondents had varying opinions

on how long a ban should last. B15 and B20 agreed that a one-year ban would be sufficient “if you want [populations] to rise up” (B20). B18 recommended a two-year ban, while B19 suggested a five to six-year ban. B23, however, said that a six-month ban would work but that anything longer than a year would be too hard on fishermen.

Twelve of fourteen community members from data set A supported a species ban on hawksbill turtles, though several mentioned the different preferences for green and hawksbill turtles, and A26 added, “Might as well just ban all if you ban one”. In contrast to the differing opinions on a temporary moratorium and community perspectives on a species ban, 62.5% of 32 respondents in data set B were opposed to a species ban and a total ban, respectively. Twenty (of thirty-two) respondents in data set B opposed a species ban due to individuals having different species preferences. B12 believed “All of them is turtle, green and hawksbill...I might like green, you might like hawksbill, he might like loggerhead. Let it be.” As B16 mentioned, “Too much people don’t like hawksbill and too much people don’t like greens. I like both.” ‘Belongers’ typically prefer green turtle and “a hawksbill ban would most affect Haitians and Dominicans” (B1). One fisherman noted that a species ban should only occur if one of the species is endangered. Other fishermen cited abundant turtle populations as reason to object to a species ban: “None (species of turtle) need to be closed as we have vast majority of any kind” (B27). B28 also said that take of hawksbills will still continue illegally: “If you stop hawksbills, people still going to take it. Chop up calipee and [put in bucket in boat when out to sea].”

Interviewees were even more opposed to a total ban. In data set A, 9 respondents supported this measure, noting that no one wants turtle anymore. However, several interviewees suggested that management would be better than a complete ban: “Better managed, better than ban” (A25). However, 19 community members were opposed to a total ban on the fishery citing the historical consumption and admitting that a ban would not be followed. A17 stated, “People on this island won’t go for it, it’s like telling Americans you can’t eat chicken.” Similarly, in data set B, the majority of respondents (88%) were opposed to a total ban. B28 stated, “People still going to eat them. [It’s] not a good thing. [It’s] our delicacy. It’s culture thing”, reasoning that the cultural aspect of turtle consumption would be lost. Many fishermen acknowledged that turtle fishing will continue illegally: “Personally, if you ban turtle you turning me into a criminal” (B5) and “It could happen, but fellas still gonna take them. They not killing on land, kill at sea. Turtle

[carapaces will be] floating all over the place” (B19). The few respondents in support of a total ban cited personal reasons but noted that some people would be against the measure.

Only 3 respondents from data set A responded to the suggestion of a quota, and all supported this measure. The management option of a quota was more split among data set B interviewees, with 50% of thirty respondents opposed to this measure. Several fishermen claimed that a quota would be too hard to enforce while others cited the lack of demand for turtle products. B22 responded saying, “We don’t catch turtles like that to send off to nobody. When people get turtles, get it for their households.” B24, B6 and B36 all agree that “you ain’t getting it [in numbers] to need a quota” (B36). Fishermen and community members from data set A supporting a quota system agreed that the measure was a way to “manage it so [turtle resource] could last” (B11) and to “discourage people who don’t target it” (A33). Some of those in favor of a quota system suggested a limit per boat, such as five turtles per boat per week (B14 and B2), while B8 recommended a quota of one turtle per month per fisherman. Another issue that arose in discussions was the assumption that there is simply not enough turtle fishing to require a quota, as 7 opponents mentioned. Also of concern to some fishermen is the difficulty with monitoring and enforcing a quota: “You’ll never know the amount [of turtles caught] ‘cause we don’t have sufficient people to monitor” (B29). B27 and B9 agreed but noted that if other management measures were in place, such as a season or size limit, a quota would be unnecessary.

Community members in data set A largely supported a season, with only 7 (of 28) respondents opposing the measure. Fishermen in data set B, however, were split on the suggestion of a season, largely due to the opportunistic nature of the fishery. Fifty-four percent of 22 respondents opposed a season, stating that turtle catches are not high enough to warrant a season, and even if a season were in place, “at the end of the day, could catch a whole lot in that season. [A] season doesn’t limit how many [turtles are caught]” (A32). Three respondents suggested that a season would act against management goals, creating a market for turtle: “If close season, turtle going to be more expensive” (B30). B7 believes that we “don’t need season, [we] don’t catch like conch of lobster...we don’t harvest turtle every day”. Other fishermen note that if turtle landings were higher, a season would make sense.

If you getting them like that, then you can have [and open/closed season], but [we] don't get them like that. Sometimes, year-round, [I] don't catch turtle. – B36

Despite these reservations about a season, many individuals do support having a closed season for turtle fishing; where they differ is in when the season should be and how long it should last (Table 6). Three individuals from data set B said that a closed season should occur when turtles are breeding and laying eggs. Several

**Table 6.** Fisher views on an ideal time for an open season.

<b>Time of Season</b>	<b>N</b>
Breeding season	12
Lobster season	7
When other fisheries are closed	3

individuals from both data sets recommended having the turtle season open when the lobster season is closed. As A6 stated, “When the lobster season closes is the best time because no income from lobster”.

Most respondents oppose the suggestion of a turtle-specific fishing license. Of thirty-two responses in data set B, 75% feel that turtles are either already covered under the existing license system or are completely against the suggestion. Reasons include the already hefty price tag of the current fishing license, which is a “license to catch all marine product in the sea” (B12). B24 noted the difficulties most fishermen already face: “We have trouble paying one license. We can't handle another one.” A turtle-specific fishing license was not discussed in data set A.

Community members in data set A agreed with the already existing minimum size limit and many also recommended a maximum size limit. As A30 noted, “If take a big momma, that's a producer. If kill her off destroy a lot of generations...Huge turtles have tough meat anyway.” Most

**Table 7.** Fishermen responses to size limit regulations.

<b>Size Limit</b>	<b>N</b>
Maximum limit	13
Minimum limit	11
Slot limit	23

*Notes:* Some duplicate responses.

fishermen in data set B were in favor of size limits in the turtle fishery, with almost 50% suggesting a slot limit (Table 7). Those in favor of a maximum size limit referred to the importance of large turtles as breeders: “Adult turtles should be illegal. Leave them, they're breeding” (B34). B4 also mentioned that there is no place to sell larger turtles. Advocates for a minimum size limit noted the already existing regulation and the importance of letting smaller turtles grow to breeding size. After discussing minimum and maximum size limits, several

fishers noted that “medium-sized” turtles would be best to target, so to avoid younger turtles and breeding turtles.

Should be the teenage turtles we should catch more. Let babies get bigger, and older ones let produce more. – B15

Several fishermen from data set B further recommended slot sizes to use, with many suggesting a minimum size of 20 inches. The suggested maximum size limit ranged from 25 inches to 40

inches. Several fishermen noticed possible problems with a size limit regulation, such as monitoring. B30 also mentioned the difficulty in deciding on a size limit: “More pounds [a turtle has], more money. Less pounds, more [turtles] got to be killed.”

**Table 8.** Fishermen preferences for gear restrictions.

<b>Gear Restrictions</b>	<b>N</b>
Hand-capture	17
Forbid spears/greens	12
Allow hooking	10
Forbid spears/greens	2
Allow spears/greens	1
Forbid net	2
Forbid hook	2
No restrictions on gear	8

*Notes:* Some duplicate responses.

Respondents from data set A showed no preference for any gear restrictions with only A21 stating that restrictions should depend on “what catching methods fishermen use.” Fishermen from data set B had mixed responses ranging from no restrictions

necessary to hand capture only, with most respondents stating that hand capturing and hooking should be allowed while use of spears and greens (elongated spears) should be illegal (Table 8). Only 14% of respondents said that no gear restrictions are necessary. The suggested prohibition of spears and greens is largely due to the possibility of spears injuring a turtle: “You could injure the turtle and it could get away from you with a spear and catch a disease and die, you know what I mean?” (B11).

### ***Penalties***

Only responses from data set B indicated possible penalties for breaking the law. Penalty suggestions were a fine, imprisonment or fishing license suspension, while others felt that the decision was up to the DECR (Table 9). Of those responding to this question, 11 (46%) felt that a fine was the best

**Table 9.** Fisher penalty recommendations for not following turtle regulations.

<b>Penalties</b>	<b>N</b>
Fine	11
Imprisonment	5
License Suspension	5
DECR Decision	3

penalty. B11 mentioned that fishermen have different incomes and the fine should account for this, allowing those who make less to pay less: “I think a fine, according to what [offense] is and what you [offender] could live with. They gotta look at your income. If I’m making a dollar, you gotta charge me 20 cents. It could be a fine so he could pay it but it will hurt him so he won’t do it again.” Other respondents suggested an initial penalty of a fine and imprisonment for repeat offenders. One fisherman responded that prison is too harsh of a penalty but community service time could suffice (B24). Other fishermen that thought imprisonment and a fine were too harsh recommended a license suspension. These ranged from B21 suggesting a suspension on turtle fishing to “you could take a guy’s license...so he can’t work for a month in the open [lobster and conch] season” (B11).

### ***Possibility of Co-management***

Interviews from data set A and data set B approached the idea of co-management differently, with researchers in data set A asking specifically about co-management while interviewers collecting data set B asked about fisher involvement in management and the possibility of self-policing.

In data set A, a majority of respondents liked the idea of co-management and thought it was possible while some were against it. Community members in support of co-management felt that “it would be better if fishermen have the opportunity to share in decision-making and laws” (A22) and that “fishermen could bring hands-on knowledge to policymaking...hands-on information is more accurate than book knowledge” (A32). Similarly, A30 noted the benefits of fisher involvement and believes the fishermen should welcome co-management: “Some things you have to do yourself to make them better. A lot of fishermen are realizing that...manage for your own future benefit. Fishermen should welcome more management authority.” However, other islanders feel that co-management is unlikely because “humans will break laws” (A27); A28 and A9 agree noting that fishermen are trying to pay their bills.

Don’t leave anything up to fishermen. We’re too greedy. – A28

Fishermen can’t play role because all trying to make a dollar. – A9

Further discussion with community members regarding co-management and fishermen involvement lead to interesting observations. Currently fishermen are not involved much in

management decisions: "... [fishermen] usually don't get consulted on laws...just hear about it on the radio" (A15). While individuals agreed that fishermen views should be accounted for, questions arose about how to include fishermen in the process. A1 said that while "there would be fishermen at meetings...a lot of people would come but not speak up." A17 adds, "public meetings is a problem with fishermen. The way we're doing here is the way to go – in ones or twos. This way, can impart knowledge to them," making it clear that smaller meetings may be the best option. Despite these obstacles, community members are generally advocates for more fisher involvement: "If fisheries is going to make a rule, should involve fishermen and get their opinion. Otherwise, fishers don't agree, run into more obstacles. More participatory better. And better for the environment" (A30).

For their role in management, fishermen in data set B responded that they should be consulted in making laws and should report violations to the DECR (Table 10). B34 recommends a fishermen's board "consisting of young and old fishermen. Old can bring experience, young bring new ideas" to work with DECR and ensure that fishermen views are accounted for in management decisions. However, other responses demonstrated the belief that the DECR will not listen to fisher opinions:

You say something and they [DECR] don't [follow]. [You] have no voice in that... [It's a] waste of time voicing your opinion. – B36

Fishermen opinions on reporting violations varied, with half agreeing that it is their responsibility to report fishermen to the DECR and the other half saying they would not report violators. B11 pointed out the benefit to all fishers in reporting violations: "He could report that this guy is [taking turtles] and the season is closed and it's not right. 'Cause it's gonna hurt me in the long run, and hurt a lot of other people too." Other responses mentioned the difficulties in reporting a fellow fisherman: "I ain't gonna report it to no fishery officer 'cause I'll be snitching on them... We all fishermen, and we all trying to make a dollar. I might be in a jam like him and try and make my dollar the same way. That's why the fishery officer needs to be out there doing their job! I can't be telling [officers] this one catching a turtle in the closed season 'cause I doing their job for them and I ain't getting paid" (B12). Furthermore, some fishermen noted that whether a fisherman gets reported to the DECR or not will depend on personal relationships.

Some guys probably will [report to DECR]. But it will be due to personal issues with fishermen. – B23

**Table 10.** Data set B respondent views on fishermen involvement in management.

Fishermen involvement	Comments	N
Consult when making laws		11
Pro	Fishermen opinions should be accounted for; people who don't work in the sea shouldn't make the laws; fishers know turtles; advisory committee should meet with fishermen; have a fishermen's board of young and old fishers;	
Anti	Fishermen scared to talk; DECR won't listen; waste of time	
Abide by laws	Fishermen should comply with regulations; fishermen can select correct size turtles	6
Report Violations		16
Pro	First time is a mistake, after that you report it; call DECR if fishers don't listen; if you don't report it, it will hurt rest of fishery;	(8)
Anti	Snitching; just trying to make money; I may be in the same situation; not getting paid for it; DECR should be out there; fishers will only report others due to personal issues; some will report and some won't; wouldn't want that to happen to me; DECR won't do anything; not my place as a Haitian	(8)
Fish plants monitor	Plant supervisor could monitor; ensure regulation compliance	2
Self-police		30
Possible	Let's be honest and open; would call DECR if fisher doesn't listen; it's my livelihood too; with more education fishers would manage themselves; should work with DECR; fishers know more about turtles	(9)
Impossible	Would lead to too much conflict; too problematic; Haitians can't tell me what to do; fishers have biases for each other; not getting paid for it; DECR needs to be present to enforce laws; no one can tell someone what to do; will have to pay fishers to let turtle go; people would bring turtles to different dock; make money from turtle; people will break the law	(10)
Maybe	Some will cooperate, some will not; fishermen could use measurement tools if provided; would ask, not tell; law will catch up in the end; still need DECR presence; we can't punish fisher	(11)

When questioned about the likelihood of self-policing, fishermen were more split, with 66% (of 30 responses in data set B) saying it is possible or maybe possible while the remaining 34% do not believe self-policing is likely (Table 10). Some responses appeared positive about the prospect of self-policing: “If you educate people enough, a lot of them [would] help manage [turtles] themselves” (B13) and “Definitely. You breaking the law, people would say something. People keep everything up here to standard” (B27). However, it seems likely that some fishermen will participate in self-policing and self-management while others will not: “You got some [fishers who would say] put back, but majority gonna turn a blind eye” (B23). Of those respondents that believe self-policing is unlikely to occur, reasons included too much conflict

and fisher biases. Fishermen also noted that they would start landing turtle at different docks and that fishermen would not listen to other fishers telling them what they can or cannot do. For example, B36 agrees that self-policing could happen but that other fishermen may not listen him to. Another issue in self-policing is the relationship between “belongers” and Haitian and Dominican fishers: “Ain’t none of these boys [Haitian fishers] tell me to throw [turtle] away” (B6).

## **Conclusions and Recommendations**

The results portray various opinions on marine turtle management and possible regulations among fishermen and TCI community members. There is consensus among fishermen regarding the current problems in the fishery and the community recognizes a need for management. However, there are several differences in opinion regarding possible regulations and the likelihood of successful co-management of the fishery. Despite these differences in opinion, several conclusions and recommendations can be reached from the analyses. I will first provide a brief analysis of the responses to the different regulations before examining the possibility of co-management.

Fisher views on corruption and problems with the DECR have been supported by other outside sources. A previous faculty member at the School for Field Studies (SFS) noted that DECR officers often targeted Haitian and Dominican fishers, confiscating their gear and selling it, while they would turn a blind eye to ‘belongers’ (pers. comm. 2011). However, the foreign DECR officers would penalize local fishers with fines or gear confiscation. The SFS faculty member noted, however, that local fishers would become very aggressive towards DECR officers, which is likely why they avoid confrontations with ‘belongers’ (pers. comm. 2011). This demonstrates that some reorganizing and training of the DECR team may be deemed necessary, but trust needs to be built between fishers and conservation officers. Increased fishermen involvement in management of the fishery may help to address these issues. By including fishers in management decisions, DECR corruption and enforcement may not be as large of an issue because fishers will have taken part in the decision-making process. Also, through educating fishermen, as the TCI Turtle Project has been doing with their documentary, and including fishers in the research,

fishermen will better understand the need to obey the regulations to protect the resource for future use.

In terms of a commercial sale ban, the issue arises when one looks at the wording of the CMS document for Appendix I species, which includes marine turtles. The CMS was signed and ratified by the UK in 1979 and extends to the TCI (CMS 1979). Article 3 of the treaty requires parties to prohibit the take of Appendix I species except under certain circumstances including the accommodation of traditional subsistence users (CMS 1979). This has received wide attention, as conservationists question whether restaurants constitute this “traditional subsistence user” requirement (Richardson et al. 2006). However, given the interview responses to a commercial sale ban, fisher agreement is unlikely. To better assess the impacts a commercial ban would have and to determine fisher and restaurant compliance, I suggest conducting interviews with fishermen and restaurant owners after informing interviewees of the CMS document and its implications. Since most respondents in this analysis indicated a lack of market, perhaps an agreement can be made in which commercial sale only occurs to restaurants with mostly local patrons. One respondent even noted that turtle is only sold in places that tourists don’t frequent: “I’d be against it. Only in certain places [is turtle sold], where no tourists be” (B30).

In response to closed areas, the analyses revealed that fishermen largely support the existing closed area system but seem to be opposed to the addition of more parks. It may be worthwhile to examine the existing national parks to see the benefits that closed areas are providing to turtles and to assess whether there are more valuable areas in need of a closure. For instance, an analysis may find that a sea grass bed important for turtle grazing or a breeding area is not protected and that closing this area would provide refuge for turtles. If more closed areas were needed to protect turtles, there may be some resistance from fishermen. There also may be resistance from the DECR due to low economic resources, which would make monitoring and enforcement of additional closed areas difficult. However, if fishers and community members agree to additional closed areas specifically for turtles, this may be an option to help protect the foraging and nesting populations. Fishers also acknowledged that they occasionally fish illegally in closed areas, but increased fisher education and involvement in management could help in their understanding of the important role closed areas play in sustaining their fish populations

and could result in fisher compliance with the national parks and a decreased need for DECR enforcement and monitoring of parks.

The few fishermen in data set B that responded to the prompt of a temporary moratorium felt that this measure would be beneficial but they disagreed on the recommended length of time for a ban, with suggestions ranging from 6-months to 6-years. Without consensus on a time length for a moratorium, and with many fishers and community members not responding to this prompt, a temporary ban of the marine turtle fishery is an unfavorable solution.

Fishermen and community members disagreed with a species ban, noting different preferences for green or hawksbill turtles. However, the majority of respondents suggested a ban on hawksbill turtles over a ban on green turtles. Hawksbill turtles are globally listed as critically endangered on the IUCN Red List, so a ban on hawksbills may help protect the populations and lighten pressure from outside conservation groups (IUCN 2010). B23, in this case, would support a ban: “I don’t think it should be like that unless one of them is in a shortage, [like an] endangered species.” However, it would be difficult to convince fishermen and community members that hawksbills are endangered, when their populations in TCI waters appear plentiful to many locals. Similarly, a ban on hawksbills may negatively impact the cultural preferences of Haitians and Dominicans. When prompted, one Haitian fisher stated, “No problem if law says [we] cannot catch hawksbills.” However, MCS-UK researchers have found that Haitian fishers prefer hawksbill to green turtles (Campbell pers. comm. 2011). Since a ban on hawksbill turtles is likely to impact Haitian fishers, it is recommended that researchers speak with Haitian and Dominican fisher separately (without TCI ‘belongers’ present) to assess if a hawksbill ban would harm them. Also of concern is the inability of DECR officials to enforce a species ban, and without fisher agreement on this regulation, a ban is unlikely to succeed.

Fishermen and community members were mixed on their views on a quota. However, of those in support of a quota, several suggested a limit. Using the suggestions of 5 turtles per boat per week and 1 turtle per fisher per month, calculations reveal that these are unrealistic suggestions. Assuming a fishing fleet of 30 boats taking 5 turtles per week, this leads to a total take of 7,800 turtles per year. This number is drastically larger than the current estimated landings in the TCI. A similar calculation of 1 turtle per month per fishermen and assuming 2 fishers per boat

produces a total take of 720 turtles. However, on-going research in the TCI revealed that in 2009 only 218 turtles were taken so a quota of this number would drastically increase the total catch (Campbell pers. comm. 2011). As these calculations show us, and B21 mentioned, to instate a quota we would need a better idea of what to set the quota at. B21 suggested documenting turtle landings for a year to better estimate a quota that will fulfill the needs of the islands while sustaining the turtle populations – and MCS-UK researchers are currently recording dockside turtle landings to get a more accurate estimate of turtle takes. Based on the perceived difficulties with enforcement, coupled with mixed fishermen and community member support and insufficient information to determine a suitable quota, having a limit on the number of turtles caught is not currently a viable management option. However, as B27 and B9 said, if other management measures were in place, such as a season or size limit, a quota would be unnecessary.

Fishermen and community members were similarly split on the recommendation of a season for turtle fishing. Of those in agreement, several suggested different times for a season including closure when turtles are breeding and nesting and closure during the lobster season. Based on the best available nesting data for the region, Godley et al. (2004) suggested an ideal closed season would run from the 1<sup>st</sup> of April through the 31<sup>st</sup> of January to encompass the breeding seasons of both hawksbill and green turtles. While this is the best option for the protection of the nesting turtle populations, it may not be ideal for the socio-economic concerns of fishermen and the larger community. Lobster season in the TCI runs from August 1<sup>st</sup> through March 31<sup>st</sup> (DECR 2010). Acknowledging fisher requests for the turtle season being open when lobster season is closed, that would mean having a turtle season running from April through July, precisely when turtles are breeding. To further complicate the determination of a realistic season, MCS-UK researchers have shown that, in 2009, the largest takes of turtles occurred in March, April and June, while there was a steady take throughout the lobster season (Campbell pers. comm. 2011). Further analysis showed that direct take was largely responsible for the peak during the closed lobster season (March, April and June) and that fishers were taking turtles opportunistically throughout the lobster season (Campbell pers. comm. 2011). Coupling this information with fisher and community member views, a season may be possible. Based on this information, I would suggest a closed season from June 1<sup>st</sup> through November 30<sup>th</sup>. This would allow for

fishermen to opportunistically take turtles during the latter portion of lobster season and would also allow for some directed take when the lobster season is closed, while still protecting part of the breeding season.

Fisher opposition to a turtle-specific license cited the already expensive fishing license that is all-inclusive. Coupling this with the low average income in the TCI (\$11,500 in 2002), a turtle-specific fishing license is an unrealistic management measure (Central Intelligence Agency 2010). In terms of a size limit, fishermen were largely in agreement with a slot size limit, recognizing the importance of the nursery and the breeding turtles. Based on available information, hawksbill and green turtles reach sexual maturity around 32 inches carapace length (Chaloupka and Limpus 1997; Casale et al. 2011). This would lead me to recommend a maximum size of 30 inches, coupled with the existing 20-inch minimum size limit.

Support and opposition for various gears used to catch turtles varied. However, most fishermen recognized the potential harm that spears and greens could cause to a turtle. Based on this information, I suggest a ban on spears and greens, while allowing hooking and hand-capture of turtles.

Finally, with respect to co-management, respondents agree that fishers should play a role in the management of the fishery, with most suggesting that fishermen be consulted regarding new regulations. This would fall under Sen and Nielson's (1996) consultative co-management, where officials consult with fishermen regarding regulations but the decision is ultimately up to the government. By including fishers in the management process, trust may be built between fishermen and DECRC officers and there may be increased compliance with regulations. Consulting with fishers and other stakeholders when determining new regulations could be a key first step to a more intensive co-management plan, where fishers and government share equal responsibility for the management of the marine turtle fishery. It is important to note, however, that these data do not include sufficient interview responses from government officials and other stakeholders, such as the tourism industry. Pomeroy (2001) points out the importance of government involvement and willingness to listen to fisher input. Future research to collect this information would be beneficial to the development of a co-management plan, so that all stakeholder perspectives are accounted for.

Through consultation with fishermen on new regulations and incorporating fisher opinions into management decisions, there is potential to increase compliance with fishery laws. Per B34's recommendation, I suggest the creation of a fishermen's board to represent fisher opinions to the DECR. With continued reassessment of fisher involvement, more responsibility for fishers can be added as trust forms between fishermen and officials. Further, co-management in the turtle fishery can be used as a stepping-stone to enable more fisher involvement in the lobster and conch fisheries. While the extreme end of the co-management spectrum, with fishermen largely being responsible for management, is not currently realistic in the TCI marine turtle fishery, small steps to include fishermen and slowly provide more responsibility and authority may lead in that direction.

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