CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Fourteenth meeting of the Conference of the Parties
The Hague (Netherlands), 3-15 June 2007

REPORT OF THE REGIONAL WORKSHOP ON THE MONITORING AND MANAGEMENT OF QUEEN CONCH, *STROMBUS GIGAS* KINGSTON, JAMAICA, 1-5 MAY 2006

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FAO Fisheries Report No. 832 **FIMF/R832 (En)**

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Cover photograph: Queen conch, *Strombus gigas*. Courtesy of the Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, United States of America.

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PREPARATION OF THIS DOCUMENT

The decreasing abundance of the queen conch in the Caribbean region has caused concern both for the status of the species and over the livelihoods of those who depend on it for income and protein. The population decline has largely been attributed to overfishing, a lack of adequate enforcement, and poaching according to a review by the seventeenth meeting of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Animals Committee (2001). Because of concerns that the levels of authorized exports might not be sustainable, the species was reintroduced into the CITES Review of Significant Trade in 2001. As a follow up to this process the CITES Secretariat convened a technical workshop, held in Santo Domingo, from 13 to 15 December 2005, where decisions and recommendations were made with respect to the implementation of CITES regulations by the 16 range States included in the Review of Significant Trade.

Recognizing the importance of the queen conch fisheries for Caribbean countries and the need for urgent action to improve the situation of the resource, the FAO Western Central Atlantic Fishery Commission (WECAFC), in its twelfth Session (2005), noted the importance of regional cooperation and support through relationships among regional and international institutions in developing better management of the resource.

Building on the recommendations and decisions described above, a Regional Workshop on the Monitoring and Management of Queen Conch, *Strombus gigas*, was held in Kingston, Jamaica, from 1 to 5 May 2006. This report describes the results of the workshop which was aimed at assisting Caribbean countries in the development of effective management plans for queen conch fisheries and, consequently, to improve their capacity to implement regulations and obligations under CITES and the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) of the regional Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention).

The workshop was jointly organized by FAO WECAFC and the Caribbean Environment Programme administered under the United Nations Environment Programme (UNEP-CEP) and sponsored by the FAO Project GCP/INT/987/JPN “CITES and Commercially-exploited Aquatic Species, including the Evaluation of Listing Proposals”, the Caribbean Fishery Management Council (CFMC) and the Caribbean Regional Fisheries Mechanism (CRFM).

Distribution:

Participants in the Workshop
FAO Fisheries and Aquaculture Department
FAO Fisheries Officers, Regional and Subregional Offices

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ABSTRACT

This document contains the report of the Regional Workshop on the Monitoring and Management of Queen Conch, *Strombus gigas*, held in Kingston, Jamaica, from 1 to 5 May 2006. The purpose of the workshop was to assist Caribbean countries in the development of effective management plans for queen conch fisheries and, consequently, to improve their capacity to implement regulations and obligations under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) of the regional Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention). The workshop addressed issues related to: policies and legislation; management objectives, indicators and reference points; management controls; and enforcement and compliance. These issues were addressed at the national level, through the preparation of Draft Fisheries Management Plans by the participating countries, and at regional level through working groups formed during the workshop. Results from the workshop led to recommendations aimed at improving queen conch fisheries management at national and regional level.

CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AC	CITES Animals Committee
Cartagena Convention	The Regional Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
CFMC	Caribbean Fishery Management Council
CFRAMP	The Caribbean Community and Common Market (CARICOM) Fisheries Assessment and Management Programme
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COFI	FAO Committee on Fisheries
CPUE	Catch per unit effort
CRFM	Caribbean Regional Fisheries Mechanism
EEZs	Exclusive Economic Zones
FAO	Food and Agriculture Organization of the United Nations
HP	Horse Power
IUU	Illegal, Unreported and Unregulated
MCS	Monitoring, Control and Surveillance
MPA	Marine Protected Area
NPOAs	National Plans of Action
OSPESCA	Organización del Sector Pesquero y Acuícola del Istmo Centroamericano
SPAW	Protocol Concerning Specially Protected Areas and Wildlife of the Cartagena Convention
TAC	Total Allowable Catch
TCI	Turks and Caicos Islands
UNEP	United Nations Environmental Programme
UNEP-CEP	UNEP Caribbean Environment Programme
WECAFC	FAO Western Central Atlantic Fishery Commission

INTRODUCTION

The queen conch, *Strombus gigas*, is one of the important fishery resources in the Caribbean in terms of its annual landings and its social and economic importance. Queen conch is an edible marine gastropod of the Caribbean Region that has been listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Annex III of the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) of the regional Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention). In recent years, high levels of Illegal, Unreported and Unregulated (IUU) fishing and declines in the stocks have been reported in the region.

At the seventeenth meeting, in 2001, the CITES Animals Committee (AC) decided to reintroduce the queen conch into the Review of Significant Trade. In 2003, the AC concluded that:

- the exploitation of deeper stocks, the shift in local harvesting areas and low population densities reported from several countries indicates that several populations are overfished and that there is a potential for local fishery collapse;
- primary causes for population declines were:
  –overfishing for domestic and international meat markets; and
  –lack of enforcement of existing regulations and large-scale poaching; and
- of particular concern: high exports reported from countries with only little information on their stocks, or where available information suggest depleted and overfished populations, with signs of potential recruitment failure.

The Review of Significant Trade resulted in the following AC categorisation: three range states where conch was a “Species of urgent concern”; thirteen range states where conch was a “Species of possible concern”; and twelve range states where conch was a “Species of least concern”.

The Food and Agriculture Organization of the United Nations (FAO) Western Central Atlantic Fishery Commission (WECAFC) noted that the queen conch fishery, which was once abundant throughout the Caribbean region, has been fished to such low levels in many localities that a viable fishery for this species no longer exists in certain areas. The Commission also noted that regional co-operation was essential for the management of the queen conch fisheries of the WECAFC region and that such co-operation should be strengthened by closer working relationships among regional and international institutions.

The low abundance of queen conch in many parts of the Caribbean is cause for concern and urgent steps are required to protect the resource and the livelihoods of those who depend on it. In welcoming the FAO publication, Manual for the Monitoring and Management of Queen Conch (FAO Fisheries Circular No. 1012, 2005), the twelfth session of WECAFC, October 2005, supported the holding of the workshop and noted the offer of UNEP-CEP in collaborating with WECAFC on the implementation of the workshop. The workshop was included in the Commission’s 2006–07 work programme.

The Regional Workshop on the Monitoring and Management of Queen Conch, *Strombus gigas*, was held in Kingston, Jamaica, 1–5 May 2006. The workshop was jointly organised by FAO WECAFC and UNEP Caribbean Environment Programme (UNEP-CEP) and sponsored by the FAO Project “CITES and Commercially-exploited Aquatic Species, including the Evaluation of Listing Proposals”, UNEP-CEP, the Caribbean Fishery Management Council (CFMC) and the Caribbean Regional Fisheries Mechanism (CRFM). The government of Japan is thanked for contributing funds for the FAO project.

OPENING CEREMONY

At the opening ceremony the participants were welcomed by Mr Andre Kong, Director of Fisheries; Ms Alessandra Vanzella-Khouri, SPAW Programme Officer, UNEP-CEP; Dr Dunstan Campbell, FAO Representative; and Mr. Donovan Stanberry, Permanent Secretary, Ministry of Agriculture and Land. In welcoming the participants, the speakers coincided in highlighting the social and economic importance of the queen conch fisheries to the countries of the region and its contribution to food security. In noting that queen conch was listed in Annex II of CITES and Annex III of the SPAW Protocol of the Cartegena Convention, the speakers emphasized the need for proactive management and conservation of this fishery resource in order to secure sustainable benefits of the conch fishery. They also expressed their hope that the outputs of the meeting should contribute significantly to regional cooperation in the management of the region's fisheries.

PARTICIPATING COUNTRIES

All the queen conch range states in the Wider Caribbean were invited to participate. Participants from Antigua and Barbuda, the Bahamas, Barbados, Belize, Cuba, Dominica, Guatemala, Haiti, Honduras, Jamaica, Netherlands Antilles–Curacao, Nicaragua, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, and the United States (state of Florida) attended the workshop. Although participants from Colombia, the Dominican Republic, and Venezuela confirmed their attendance, just prior to the start of the workshop they informed the organisers that they were unable to attend due to reasons beyond their control. A list of participants can be found in Appendix I.

WORKSHOP OBJECTIVES

The objective of the workshop was to assist Wider Caribbean countries in the development of effective management plans for queen conch fisheries and, consequently, to improve their capacity to implement CITES regulations concerning exploitation and international trade of queen conch, as well as the obligations under SPAW of the regional Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention).

WORKSHOP PROGRAMME

The workshop covered the main topics of a fisheries management cycle through presentations and practical work with the participating countries. A considerable part of the workshop was devoted to assisting countries in developing/improving elements of their management plans for their queen conch fisheries through group and individual work. The workshop agenda is attached as Appendix I.

It was anticipated that would participants produce a draft outline of the key operational elements of a management plan for their queen conch fishery during the workshop. These draft management plans are included in Appendix IV of the workshop report.

NATIONAL REPORTS

Participating countries presented an overview of the situation of queen conch fisheries in their respective countries. Trinidad and Tobago arrived late and did not make or submit a presentation, thus there will be no summary. A presentation by Gabriel Delgado, on the situation of queen conch conservation and management in Florida, United States, was also included in the programme for the regional relevance of the biological data on queen conch and the results of local strategies for stock recovery. The following are concise summaries of the background and situation of queen conch fisheries in each country. More detailed descriptions of the fisheries and their management are included in the draft management plans prepared by some participating countries (Appendix IV).

Antigua and Barbuda

In 2004, there were seven active conch-fishing vessels in Antigua and Barbuda (2.5 percent of the active fishing fleet of 276 vessels). Vessels range from 16 to 40 feet and include small pirogues to large fibreglass launches, equipped with global positioning systems and hydraulic haulers. Fishers who target conch in Antigua reside mainly in the southern villages of Urlings and Old Road, and comprise some 40 individuals (including 20 SCUBA divers). Over the past decade fishing effort has remained relatively stable ranging from five to eight vessels. For Barbuda, the conch fishery is basically subsistent due in part to the absence of onshore infrastructure (e.g. cold storage) and limited demand (two seasonal hotels and a resident population of 1 400). In Barbuda the spiny lobster is the primary species of commercial interest (mainly for export to the French territories in the region).

In 2004, the conch fishery was valued at XCD1.3 Million (US$0.48 Million), emphasising its importance to residents of Urlings and Old Road. This is approximately XCD2 060 (US$763) per annum for each private household in the villages or a production value of XCD$32 500 (US$12 037) per fisher.

With respect to trade, conch exports in 1997 plummeted to zero due to the stringent harmonised food safety regulations for Member States of the European Union. Directive 91/492, of the European Economic Community, lays down the health conditions for the production and the placing on the market of bivalve molluscs. Despite the title, the Directive covers marine gastropods such as the queen conch. Prior to 1997, as much as 23.5 percent of the conch landings were exported to the French territories in the region. Presently, only Antigua and Barbuda have approval for export of fresh fish (including live lobster) to the European Union.

The *Fisheries Regulations*, *No. 10 of 1990*, prohibits the harvesting of immature conch. This is conch with a shell smaller than 18 cm (7 inches) or which does not have a flared lip. For conch out of the shell, the meat weight must not be less than 225 grams (8 ounces), after removing the digestive glands or “guts”. The Regulations also make provisions for a closed season. In terms of implementation of legislation, the Fisheries Division and the local coast guard conduct routine checks of fishing vessels. After a process of consultation with all relevant government authorities and stakeholders, a Draft Fisheries Act was developed and proposed in 2006. The Draft is an improvement to the current legislation in that it would require fishers of conch and spiny lobster to hold a special permit thereby improving control of fishing effort.

Results of a conch abundance survey conducted in a traditional area of commercial exploitation (i.e. the south-west coast of Antigua) in 1999 indicated that present overall densities of adults (3.7 conch/ha) were well below that which is required for effective reproductive encounters (i.e. 50 conch/hectare). A study of the morphology of two stocks from the west coast was conducted the same year due to concerns about adult “stunting” and its implications for size-based management measures. Both studies were limited by financial constraints to properly achieve their objectives.

In response to the results of the conch abundance survey and the need to protect critical habitats, the Cades Bay Marine Reserve was established in 1999. The area (approx. 1 943 ha) includes Cades Reef and extends landward to include critical nursery areas ranging from mangroves to seagrass beds. In January 2006, a similar marine reserve (North East Management Area) of about 3 100 ha was established for the north eastern side of Antigua, including mangroves, reefs, seagrass beds and six uninhabited islands.

In order to assess the status of the resource, a data collection programme was initiated in 1995. This includes monitoring the catch of fishing vessels as well as measuring samples of the catch. Based on the fact that current production, which ranges from 35 to 74 metric tons of marketable meat (digestive glands removed), is considerably less than maximum sustainable yield (MSY) estimates extrapolated for the area, and production has been sustained at these levels for a decade without showing negative trends in catch per unit effort (cpue), depth dived or biological data, it can be concluded that the

current level of production is sustainable. However, exploitation that is significantly above the current level should not be encouraged until a comprehensive abundance survey of the entire shelf is conducted.

Other issues of concern for queen conch fisheries management in Antigua and Barbuda include:

- In 1999 CITES trade sanctions were imposed on Antigua and Barbuda.
- Since the change in the European Community food safety regulations and CITES sanctions there has been an increase in the number of reported cases of alleged illegal trade with neighbouring French territories.
- The present limitations of the Fisheries Division and the coast guard (in terms of manpower and finance) have hampered enforcement.

Bahamas

Problems faced in the management of queen conch fisheries in the Bahamas arise out of the Bahamas having vast and multiple conch fishing grounds. Although having such extensive fishing grounds is good in terms of resistance to overfishing it is a nightmare in terms of providing proper management in relation to enforcement and accuracy of stock assessments. Because of this, the management approach has been largely precautionary.

Specific enforcement problems that exist include restrictions on the harvesting of juveniles, use of compressors without a license, use of the air compressor at depths outside of the stipulated range and poaching by foreigners. While progress has been made in these areas they still remain the object of much of the Department's enforcement activities.

A specific problem with regard to the accuracy of stock assessment is that the resources are not available to collect the ideal data that would be required to fully inform management decisions. The unavailability of these resources is not necessarily because of the government's lack of concern about the fishery; it is largely related to the tremendous amount of resources required to assess the fishery. The Bahamas is forced to utilize innovative ways of assessing the fishery and outside assistance.

An additional management issue is that the conch fishery cannot be considered in isolation. While the Department of Marine Resources would like to institute a closed season throughout the duration of peak spawning, it must be considered that the peak spawning period of conch is inclusive of the four months that the spiny lobster fishery and turtle fisheries are closed which would thus leave very few alternatives to fishers.

Benefits to be gained from improved enforcement and stock assessments include a decrease in the chance that overfishing will occur and an improvement in the overall health of the fishery and the ecosystem. In addition, improved accuracy of stock assessments would help to ensure that the fishery is not unnecessarily limited as could occur with precautionary management measures.

Barbados

Barbados does not have a commercial conch industry. Consequently, no resources have been allocated to this resource. The status of the resource is largely unknown. Local conch populations are believed to be typically much smaller than those of neighbouring islands. Anecdotal information suggests the following:

- Small quantities of queen conch are harvested opportunistically. Conch is mainly harvested in Barbados for their shells, which are polished and sold as curios mostly to tourists. The meat is usually consumed by the harvester or sold privately and not openly at markets.

- Both established souvenir retail stores and itinerant salesman are involved in the sale of conch shells which tend to be imported.
- There are no known harvesters who depend mainly on harvesting conch for a livelihood.

Belize

The conch fishery has been open access to all Belizeans since the inception of the sector in the early 1970s. In 2004, the Fisheries Regulation on licensing was amended to allow legal residents of Belize to obtain a fishing licence and to fish for conch. Although conch production over the last 14 years has shown an increasing trend, fishers' interviews reveal lower production on an individual basis. Economic difficulties in other productive sectors of the national economy, such as the sugar industry, have led many young sugarcane farmers to turn to fishing. The imminent loss of the preferential sugar markets in Europe and United States may create additional difficulties for sugarcane farmers and there is no doubt that many more will become fishers.

Even though it is considered that the majority of conch harvested in Belize is sold to the fishing cooperatives in Belize, there are a small number of independent fishermen and unlicensed fishers that sell conch directly to restaurants and hotels. This information is difficult to gather and is not reported in the statistical records held at the Fisheries Department. Another problem in the conch fishery is the illegal fishing done principally in southern Belize. The amount of conch illegally harvested by fishers from Guatemala and Honduras is unknown and the product is normally sold outside of Belize. The present data collection program has limitations in accurately capturing the catch and effort data produced at the fishermen cooperatives. It has been observed that, many times, the purchase slips at the fishing cooperatives are not completely filled out or the information does not reflect an accurate interview. Consistency of the situation could significantly affect the data used to assess the health of the fishery.

Cuba

La pesca se realiza en siete regiones de la plataforma cubana. Opera solamente una embarcación en cada región, compuesta por una patrón y tres pescadores. Las capturas se realizan por buceo en apnea y la carne se extrae en la propia embarcación. La forma de conservación es en hielo y se desembarca con un 60 por ciento de limpieza primaria. La limpieza final con fines de comercialización se realiza en la planta de procesamiento industrial por personal especializado. Toda la captura se destina a las exportaciones con ingresos anuales del orden de los US$300 000 como apoyo a la gestión de las empresas involucradas y al sector pesquero del país.

La pesca de caracol se lleva a cabo con un criterio precautorio en el sentido del uso responsable y el mínimo de impacto negativo sobre las poblaciones naturales y el ecosistema. Todo el procedimiento, desde la captura hasta la comercialización, se realiza sobre la base del estricto cumplimiento de normas técnicas (Documento facilitado por Cuba a este Taller). Toda la actividad relativa al caracol reina se enmarca dentro de un programa integral de manejo que contempla las investigaciones, la producción, las regulaciones y el mercado externo bajo las reglas de la CITES.

La limitante con esta especie es su inclusión en el Apéndice II de la CITES, y de hecho, en Cuba se prohibió su pesca en 1998 dada la imposibilidad de comercialización en el mercado externo sin la correspondiente licencia o permiso (Dirección de Regulaciones Pesqueras del MIP, com. personal). Por otra parte, se conoce por experiencia, que la Oficina Nacional de Inspección Pesquera del MIP (ONIP) y sus delegaciones provinciales (OPIP) ejercen un serio trabajo preventivo ante las ilegalidades sobre esta especie. Para su explotación con fines exportables deberá presentar niveles de abundancia que demuestren que es factible abrir la pesquería en nuestras aguas sin afectar las poblaciones. Existe otra limitante para la evaluación de la pesquería, que consiste en que no se registran los niveles de esfuerzo dirigidos a la misma, los desembarques de carne limpia necesarios para la aplicación de modelos de evaluación.

Referente a la información disponible, ésta resulta suficiente y actualizada en la biología, las pesquerías, y la comercialización para muchas zonas de la región. En Cuba existen trabajos de evaluación poblacional sobre la especie y la estadística pesquera debe mejorarse con su reapertura escalonada. Por interés del Ministerio de la Industria Pesquera de Cuba, el Grupo Empresarial PESCACUBA y sus empresas extractivas, se pretende lograr el uso sostenible de esta especie sobre la base de un programa de manejo de la pesquería, fundamentadas científicamente por la evaluación del estado del recurso y los estudios biológico-pesqueros requeridos para este fin, enmarcados en el Programa Ramal "Estudio integral para el desarrollo y manejo de peces y otros recursos marinos de interés comercial".

La moratoria total de la pesquería en 1998 tuve también el objetivo de facilitar la recuperación de la abundancia en los bancos de cobo en algunas zonas del país. El Centro de Investigaciones Pesqueras inició en 1999 un Proyecto de Investigación de alcance nacional. En todos los casos ha quedado demostrado el buen estado de la abundancia poblacional que soporta una captura máxima sostenible acorde a los intereses actuales de Cuba, tanto en la actividad pesquera, como en la conservación del ambiente.

La pesca de este recurso se realiza de forma organizada, controlada y legislada. En estos momentos Cuba tiene bien organizada esta pesquería y solamente se trabaja en el mejoramiento de los métodos de evaluación poblacional y en el conocimiento de los aspectos biológicos.

Dominica

The submarine topography of Dominica is very similar to that on the land. It consists of a very narrow continental shelf around the island which drops very quickly into submarine valleys and canyons. In some cases the 100 m contour is within 20 m of the mean high water mark. Therefore Dominica experiences very deep water in what could be considered inshore waters. The nature of the seabed limits the size of the continental shelf. This in turn limits the availability of coral reefs, seagrass beds and habitat necessary for growth and development of the queen conch, at depths that are easily accessible. As a result a conch fishery has never developed in Dominica. Conch is caught as an incidental catch in gill nets in shallow waters from time to time but not to an extent significant enough to warrant a fishery. In addition to the limited habitat range, it is believed that populations have been affected by sedimentation of the inshore areas from erosion caused by poor land management practices, aided by runoff from heavy rainfall and compounded by the steep terrain of the island.

Conch populations are thought to occur at greater depths than are accessible with gill nets and by free diving. However, no studies have been done to quantify this assumption. Over 15 years ago most of the conch on the island used to be landed by a few individuals (3-5 individuals) with SCUBA gear, who operated in the Portsmouth area. These individuals did occasional sporting dives for capturing conch but again there was no significant fishery in that area. Secondly the filling of SCUBA tanks are controlled by the Fisheries Division and individuals could not readily obtain air fills to pursue this activity.

In the absence of adequate information on the status of the conch population in Dominica, the Fisheries Division decided to adopt a precautionary approach policy towards the exploitation of conch and placed a ban on the use of SCUBA gear for the purposes of exploiting conch. In addition, a closed season was put in place as a precautionary principle and for effective management of the resource. This further ensured that conch populations which existed in deeper waters were protected. This also probably further prevented a fishery from developing in regard to this species. The Atlantic side of the island is very rough and inhospitable for carrying such activities therefore the very little activity which existed occurred on the west coast in the Caribbean Sea which was more accessible

Presently there is no fishery in Dominica for the queen conch. Correspondingly there is no significant local market for the product. Conch consumed on the local market is usually imported in small quantities of less than 100 lbs for individual personal use but not for commercial purposes.

There is no significant trade in *Strombus gigas* in Dominica. There are not any known consignments of conch exported to any country nor is there any information available of any country receiving conch imports from Dominica. The status of the conch population in Dominican waters is presently unknown due to the fact that there is no fishery, no significant landings or catch and effort data for conch.

Dominica possesses a Fisheries Data Collection and Information System. There is no record of any significant conch landings to begin to warrant any assessment. During a conch population study conducted under the CARICOM Fisheries Assessment and Management Programme (CFRAMP), Dominica was bypassed since there was no significant conch fishery on the island.

Guatemala

Uno de los principales problemas de ordenación que existen en Guatemala es la falta de una regulación especifica para la especies, sin embargo en el reglamento de pesca contempla a la Familia Strombidae como una especie objetivo de pesca para las actividades del Atlántico del país.

La comercialización de caracol reina en Guatemala es producto de pescadores que poseen una doble nacionalidad: guatemaltecos y beliceños. Quienes venden su producto a comerciantes locales, en la comunidad de Puerto Barrios, es claro que las capturas de caracol se realizan en la zona sur de Belice. Sin embargo los pescadores tienen los permisos respectivos del país para la pesca, no obstante el ingresos a aguas guatemaltecas lo circunscribe como un trafico ilegal el cual debe ser ordenado, al menos en las regulaciones que respectan a tallas mínimas y respeto a las épocas de veda del país de origen.

La pesquería de caracol se realiza en forma conjunta con la captura de langosta, siendo ambas influenciadas por los vientos y la temperatura según la opinión de los pescadores, por lo cual las faenas de pesca son variables, aunque reconocen que se realizan durante todo el año.

La pesquería de caracol es poco importante desde el punto de vista en pescadores involucrados (60 pescadores, quienes representan el 0.03 por ciento de los 2 615 pescadores del Atlántico del país) sin embargo, desde el punto de vista comercial, son los proveedores de la materia prima para platos típicos de la región para satisfacer las necesidades del turismo; actividad muy importante en el área, la cual muestra un crecimiento constante.

La actividad de pesca de caracol genera utilidades entre pescadores, comercializadores, restaurantes entre el orden de los US$406 000 y US$676 000 dólares anuales según estimaciones en conversación con los usuarios realizadas durante el mes de abril del 2005.

La sustentabilidad de la pesquería en el país redunda en una utilización sustentable de recursos pesqueros como lo son langosta y caracol los cuales son parte de las comidas típicas de la región que son un atractivo turístico. La ordenación permitirá una recuperación de las poblaciones de caracol, las cuales no muestran un nivel de colapso o disminución actual del recurso, sin embargo los vacíos en la aplicación de las regulaciones podrían permitir un serios daños a la pesquería. Se considera de interés el monitoreo de las tallas mínimas de captura en el ancho del labio así como un peso mínimo de la carne, la cual pueda ser comercializada en los restaurantes locales.

La armonización regional de las medidas de ordenación es algo que fortalece a la región Centroamérica por medio de entidades como Sistema de la Integración Centroamericana (SICA)/Organización del Sector Pesquero y Acuícola del Istmo Centroamericano (OSPESCA) lo cual permite establecer niveles de negociación internacional en conjunto.

La responsabilidad con las generaciones futuras es un compromiso institucional y personal dentro de las entidades de administración pesquera, la cual no posee valores tangibles pero si morales con el medio ambiente y nosotros mismos.

Haiti

Queen conch, *Strombus gigas* is one of the most important fisheries in Haiti, providing employment and income for thousands of fisherman. Little is known about the conch resources in Haiti. However, there are about 312 conch fishers, 112 boats and 16 exporters of conch shells and meats. The main gears used in conch fishing are bottom gillnets (*folle a lambi*); free diving; gillnets; compressors (hookah gear); snorkelling; scuba; and also dynamite fishing.

The conch exporters (shells and meat) are currently in the process of setting up an association. One of the main aims of the association will be to produce conservation guidelines regarding CITES recommendations and also to promote and protect the conch trade industry.

Like many other countries in the Caribbean, Haiti has long had regulations on paper to control conch fisheries. The decree of 1978 covered fisheries and marine resources and presented the following regulations: a) a closed season from 1 April to 30 September; b) fishing with scuba, dynamite and compressor is illegal; and c) siphonal length of 25 cm as a legal minimum size. Since September 2003, queen conch fisheries have been closed in Haiti in compliance with CITES recommendations.

The problems faced in the management of queen conch include:

- financial constraints due to Government focus on other priority issues;
- limited surveillance capacity of the Department of Fisheries;
- overfishing and collection of juveniles have both been identified as serious problems. In certain localities conch is seriously over exploited, but has viable populations in others;
- a range of types of vessels and engine capacity (artisanal, small scale operations);
- sedimentation and a reduction in water quality in some areas affect conch populations, particularly through degradation of nearshore seagrass bed nursery sites; and
- a specific problem with regard to stock assessment is that the resources are not available to collect the ideal data that would be required to fully inform management decisions.

Honduras

La pesquería se encuentra en veda permanente o moratoria hasta cuando no existan las evidencias científicas que permitan la definición y justificación de una cuota anual. La industria pesquera ha cooperado significativamente con este proceso de ordenación y contribuye en la realización de los cruceros de evaluación temporal-espacial de las densidades de cada banco de pesca y con la colección de datos biológicos que están siendo utilizados para evaluar el estado del recurso en cuanto se refiere a abundancia latente. Al mismo tiempo Honduras esta realizando esfuerzos mayores para desarrollar metodologías de evaluación de estoques que sean mas adecuadas a la dinámica poblacional del caracol para así poder justificar el dimensionamiento de capturas biológicamente aceptables que se pudieran aplicar a la pesquería cuando ésta se reincorpore al sistema de producción nacional.

La situación de veda permanente ha creado condiciones críticas de orden socio-económico en el sector pesca. Sin embargo, se espera que las medidas tomadas lleven a un futuro en que el recurso e caracol *Strombus gigas* sea explotado de forma sostenible con controles sobre las capacidades de pesca.

Jamaica[1]

The history of the development of conch management in Jamaica has been a very dynamic process influenced by a series of local and international events. When one traces the history, several phases may be identified each with key "turning points" that impacted significantly on the Jamaica's conch management regime. Three phases can be highlighted. The *no management phase* (pre-1993), during

[1] This summary was prepared based on the presentation given by Mr Andre Kong, Director of Fisheries, during the workshop.

which there was a rapid expansion of industrial fishery, reaching unsustainable yields (6 000 tonnes). The *informal management (no legal framework) phase* (1993–1999), following the inclusion of *Strombus gigas* on Appendix II of CITES (1992). During this phase a total "buy-in" by conch industry members facilitated a successful management of the conch fishery without specific legislation in place. A preliminary assessment of the conch fishery was also carried out during this period. And lastly, the *formal management phase* (1999 to present), during which legal action was brought against agencies of Government by industry members. During this period there were also changes in export market requirements and the development of key legislation – primary production, food safety and bio-security and export.

Although Jamaica's conch management system was influenced by several factors, both internal and external, great care was taken to ensure that the response to these factors complimented the then existing management systems and, in so doing, resulted in a more robust, enhanced overall system. Notwithstanding the relative dynamic nature of the development of the Jamaica's conch management system, the process was always driven by the overarching objective of ensuring sustainable management and development of the conch resource for the benefit of Jamaica using the precautionary principle.

The current management regime is in essence a three tiered system. Each tier is under the auspices of discrete legislation administered by three separate Government Agencies. The main focus of each is different, and each has aspects that strengthen monitoring and compliance of key elements of the conch management system. The Fisheries Division is responsible for management and development of the primary production. The National Environmental & Planning Agency (NEPA) is the CITES Authority and is responsible for setting export quotas and issuing CITES export permits. The Veterinary Services Division is responsible for controlling that export of fish and fish products are in compliance with food safety and bio-security requirements. Other key agencies responsible for monitoring and enforcement are the JCF Marine Police, the JDF Coast Guard and the Jamaica Customs Department.

The queen conch fishery is managed based on Conch Fishery Management Areas (CFMAs). Seven CFMAs have been defined: Island Shelf, Pedro, Morant, Formigas, Henry Holmes, Albatros and Grappler Banks. The Minister must declare CFMA open to conch fishing and may prohibit fishing for any time period and implement measures to conserve and manage conch in any CFMA. At the present moment only two CFMA are declared open for fishing: the Pedro Bank and the Island Shelf (closed to all industrial fishing). The other CFMAs are considered closed areas.

Management is complemented by a quota system where a national catch quota is declared annually by the Minister of Agriculture. The National Catch Quota is determined by the Fisheries Department and endorsed by the CITES Scientific Authority. Local trade Artisanal Quota may also be determined. Based on the national quota, Individual Quotas are issued annually, being determined by the Conch Quota Committee. Individual quotas are not transferable and valid for specific time. A National Export Quota, declared under the Endangered Species Act, may be equal to or less than the National Catch Quota. An Individual Export Quota is issued by NEPA only to persons who have been issued a Catch Quota by the Fisheries Division.

In addition to the quota system, the harvesting of queen conch is managed by limiting access – only conch catch quota holders can fish or cause conch to be fished; fishery specific licence (fisher and vessel); requirements of fishers and vessels (linked to export requirements of food safety and bio-security); protection of juveniles (flared lip, 22 cm shell length); reporting requirements (log for vessel and processing plant); five months conch close season (1 August–5 January), during which license holders are required to declare conch in possession, processing and trade is prohibited (except first 21 days) and importation is strictly prohibited.

The main problems and issues affecting the sustainability of conch fisheries are IUU fishing (especially by foreign nationals), the need to strengthen the legislative framework and to refine the

catch quota allocation system. The way forward to address some of these issues will involve fostering collaboration with neighbors in regional assessments, establishing and strengthening regional, sub-regional and bi-lateral management strategies, and mobilizing resources (international, etc.) to improve data collection programmes, conduct fishery independent research, etc.

Netherlands Antilles

The Netherlands Antilles consists of five islands: two in the south of the Caribbean, Curacao (472 km^2) and Bonaire (272 km^2); and three in the northeast, St Maarten (86 km^2), St Eustatius (21 km^2) and Saba (13 km^2). Within the fisheries zone of the Netherlands Antilles lies the Saba Bank (2 200 km^2). The Netherlands Antilles are party to both CITES and SPAW. Legislation for the management of conch fisheries is on an island-by-island basis.

The inshore shelf of Curacao and Bonaire is very narrow providing very little area for conch. More conch is available in some of the lagoons, particularly Lac on Bonaire and in the slightly deeper waters (around 50 m). Conch fisheries on these islands are only for the personal use of fishers. In the past there was a reasonable fishery in the Lac Lagoon on Bonaire, evident in the historical shell mounds. Presently the stock is very low and only occasionally do fishers add some juvenile conch on the mounds (for tourists). There was a replenishment programme in the first half of the 1980s. Juveniles were produced and seeded, but lack of subsequent management made this effort useless.

St Maarten is on the Anguilla Bank and should have more area for conch, however, some transects around St Maarten show an extremely low density. St Eustatius has more conch, but still not enough for more than a subsistence type of fishery. The only area where some commercial level conch fisheries could be possible is Saba Bank.

In the past, before the Coast Guard became operational in 1999, there seemed to have been considerable conch fisheries on Saba Bank by several foreign fishing vessels. Presently the fishers from Saba with a permit to fish on the Saba Bank only fish for lobster and occasionally for finfish. Now and again some conch may enter the lobster pots, but they are not really targeted. Saba Bank is now being surveyed for habitat type and general biological diversity. In the future a more quantitative conch survey may be executed, based on which limited commercial fisheries can be developed.

Curaçao and Bonaire do provide a large conch market. Most of the conch is imported, both legally (Jamaica, Colombia) and illegally (Venezuela).It seems that the illegal trade is slowly decreasing.

Nicaragua

En Nicaragua el caracol *S. gigas* no es sujeto de una pesquería dirigida y los volúmenes permitidos de exportación son bajos comparados a los de otros países de la región y a la extensión de su plataforma continental, por lo que se ha argumentado que es un recurso que puede ser explotado aún más.

En Nicaragua no existe un sistema de evaluación pesquera para conocer el estado del recurso caracol, a como se ha implementado para los camarones y langostas. Sin embargo, es evidente la falta de datos, sistemas de evaluación y monitoreo que generen información que pudieran ayudar a definir más apropiadamente algunos puntos de referencia para el manejo de la actividad (i.e. criterios que definan el concepto sobrepesca, estimación de biomasas o densidades, tasas de mortalidades por pesca sobre el recurso, coeficientes de capturabilidad). Se desconoce el esfuerzo de pesca que se aplica, sólo se conocen los volúmenes totales de carne que se acopia en las plantas pesqueras y la carne procesada que se exporta amparada en una cuota. La ausencia de datos implica la no aplicación de algunos modelos de evaluación pesquera que pudieran ayudar a definir los puntos de referencia para el manejo de este recurso.

Los beneficios que resultarían del ordenamiento pesquero del caracol del caribe de Nicaragua, mediante la realización de estudios que consideren criterios que definan el concepto de sobrepesca,

estimación de biomasas o densidades, tasas de mortalidades por pesca sobre el recurso y coeficientes de capturabilidad, serian de mucha importancia ya que permitirían la realización de una explotación sustentable de este recurso. Además, para el caso de Nicaragua en donde se considera que el recurso esta sub-explotado, los estudios permitirían definir los niveles de capturas o cuotas que sean biológicamente aceptables. Esto ultimo serviría como soporte científico para la solicitud de ampliación de cuotas de exportación a CITES.

Saint Kits and Nevis

The fishery for queen conch involves less than twenty vessels, ranging in size from 16 – 20 feet and powered by 40 – 65 hp engines. The conch is fished by divers using SCUBA gear in the deep areas (over 60 – 120 feet) while free divers fish the shallower waters. The crew normally consists of two divers and a "bagman" whose major responsibility is to control the vessel while divers are in the water and retrieve the bags loaded with conch. Usually, only one diver is in the water at a time. The number of fishers involved in this fishery is about 20.

The main landing area in St. Kitts, which is known as Newtown (East Basseterre), represents 90 percent of the conch fishery for St. Kitts, the Public Market (West Basseterre) 8 percent (conch landed by Nevis fishers), and Old Road 2 percent. For Nevis most conch is landed in Charlestown. Most of the catch is exported or sold locally to restaurants and hotels. The landings of conch in 1995 were 29 000 pounds (valued at XCD145 000 or US$54 717) and increased to about 150 000 in 2005 (valued at XCD1.1M or US$415 094).

Stock assessments done around 1989 gave some management guidance, though a thorough review of the status of the stock is now needed.

Conch populations have been heavily exploited within the nearshore, particularly in the areas between Nags on the South East Peninsular and the Fort Point in Basseterre on the leeward side of the islands. This resulted in fishers for conch going into deeper waters. However, conch are beginning to reappear in nearshore areas in response to the concentration of fishing effort in deeper waters. In addition, some habitats near to Newcastle in Nevis appear to be a regional settlement area for larval conch.

The problems faced at present in the management of queen conch fishery are:

- inadequate monitoring, control and surveillance;
- dependence on the Coast Guard (we are currently talking to Coast Guard on ways we can improve on this);.
- lack of a regional approach to the management of the fishery;
- inadequate information on the current status of the conch stocks; and
- lack of resources. [However, CRFM is currently assisting St. Kitts and Nevis with acquiring the necessary resources to carry out stock assessment studies on conch.]

Saint Lucia

Conch is commercially exploited by over 40 fishers in depths ranging from 11 m to 43 m. Fishers mainly operate out of fibreglass pirogues ranging in length from 7.02–8.45 m, powered by outboard engines of 115–250 hp. While conch are targeted commercially by some fishers throughout the year, other fishers focus their efforts on this resource during the low period for "offshore" pelagic species for, on average, five months. Fishers of this resource can be divided into part-time and full-time. Full-time fishers conduct dives on an average of four times each week alternating harvesting and rest days, whilst part-time fishers operate twice each week. The majority of divers conduct greater than three dives per trip and approximately 100–500 individual conch are landed per trip. The quantity of conch landed per trip is dependent on the number of divers and the number of dives conducted during the trip. Subsistence exploitation in shallower areas occurs, but the extent is unknown.

Due to the nature of the fishery, the marketing system and an informal policy of the Department of Fisheries, the majority of conch harvested are landed whole (live) and then sold immediately or stored in wire-meshed cages in shallow areas close to shore until sale is obtained.

Fisheries legislation includes management measures such as closed seasons, size limits and licensing systems. The fisheries legislation is currently being reviewed and national enabling legislation is also being drafted.

The following summarises the information on demand, market and other issues affecting the conch fishery.

- Currently, the major market for conch meat is the local market, which serves both the tourism sector and nationals. Over the past three years, there has been a growing demand for conch meat as a result of activities such as seafood festivals, developed in several communities to stimulate economic development in these communities.
- Morphological differences among various conch populations in Saint Lucia have implications for management measures, e.g. especially for those relating to shell length and weight.
- Information on stocks is still scarce, especially information on density, abundance and distribution. This scarcity of information limits informed management decisions.
- Although stocks are thought to be sustaining the current level of fishing pressure (based on catch and effort data), fishers are moving into deeper waters.
- In general, fisheries management and enforcement agencies have limited surveillance and enforcement capacities.
- Limited funds for resource management have prevented adequate implementation of fishery management plans.

Saint Vincent and the Grenadines

The conch fishery of Saint Vincent and the Grenadines is based mainly in the Grenadines. It is considered to be moderately important to the fishers in the Grenadines and is mainly carried out during the lobster closed season. The fishery is mainly export driven with only about 15–20 percent of total harvest being consumed locally. Regional markets such as St. Lucia, Anguilla and other Leeward Islands are the main destinations for conch exports. In the past significant quantities were also exported to Martinique, however, this has ceased since the European Union ban on fish and fishery products from St. Vincent and the Grenadines into that territory in 2000. An estimated average of 25 000 lbs is landed annually with a corresponding value of US$46 500. However, in recent years this average figure has been increasing. About 150 fishers are involved in the harvesting of conch. Small outboard powered vessels less than 25 feet in length, equipped with 45–100 hp engines are used as the fishing platform. The fishing operation generally lasts for 4–5 hours in the early morning.

Catch and export data for conch is collected at the various landing sites and fish markets in the Grenadines. Because of the pooling of catches before they are landed and the landing of the conch without the shell, it has been difficult to institute a proper catch and effort and biological sampling programme for this species. The archipelagic nature of the Grenadine Islands also makes this an especially challenging undertaking. Nonetheless, some limited catch and effort data exists and there are plans to collect biological data for this species and to conduct abundance surveys where possible. Some traditional knowledge exists with respect to the distribution and nursery grounds of the species. It is known that the species is mainly concentrated on the Grenadine bank.

Current management regulations for the conch include size limits and protected fishing areas. The Minister of Fisheries also has the authority to implement closed seasons and other appropriate management regulations if it becomes necessary to do so. While these regulations exist, inadequate enforcement and the lack of human and financial resources hamper the effective management of the resource. There is need to develop and implement an effective management programme for sustainable development of the conch fishery.

Some of the main challenges preventing the sustainable management of the resource include:

- improving enforcement at the local level;
- improving level of compliance in reporting to CITES;
- improving local and regional communication and action;
- development and implementation of management plan for conch;
- the multi-island state;
- anecdotal evidence seem to indicate that stocks may be decreasing (apparent reduction in distribution, fishers having to go deeper);
- implementation of a useful and non-detrimental quota system;
- to what extent other anthropogenic and other natural factors; external to fishing, are impacting the conch resources; and
- implementation of commensurate and cost-effective sustainable management plans for the resource.

Turks and Caicos Islands

The Turks and Caicos Islands (TCI) fishery is based on the use of small retrofitted open V-hull vessels ranging in length from 5.5-6 meter (18 ft–20 ft) with 85–115 hp outboard engines. Conchs are hand collected by fishers free-diving to depths of 3.0–9.1 m (10–30 ft) aided by the use of mask, fins and snorkel. In 2004/2005 fishing season, there were 366 licensed commercial fishers and 154 licensed vessels. The landings have fluctuated from 2 619 metric tons (mt) (5 773 906 lbs) in 1943 to an all time low of 16.4 mt (36 155 lbs.) following Hurricane Donna in 1960. The fishery rebounded and has remained relatively stable at the current Maximum Sustainable Yield (MSY) level of 760 mt (1 674 990 lbs).

Economically, the queen conch is the second most valuable fishery in the TCI, with export levels of approximately 272 mt (600 000 lbs) of clean conch meat, 86 mt (190 000 lbs) of conch trimmings, 3.2 mt (7 100 lbs.) of maricultured conch meat, 1 800 mariculture live conch and 13 000 conch shells and shell derivatives. Even though the queen conch is fished extensively throughout TCI, the stocks are still considered to be stable.

CITES has listed queen conch on Appendix II to ensure the sustainability of this important resource. To satisfy CITES requirements, the modified version of the Schaefer model is being utilized in the Turks and Caicos Islands since 1993/1994 licensing year to model historical catch and effort data, estimate catch per unit effort (cpue), and provide the basis for an annual total allowable catch (TAC). However, since 1994 the model has consistently underestimated cpue. To cross-check yield estimates derived from the modified Schaefer model, a visual assessment of queen conch stocks across the Caicos Bank was conducted in 2000–2001. The results indicated that the yield estimate derived using the modified Schaefer model is very close (i.e. within <1%) to those generated using the biomass estimate from the visual surveys, and within 10 percent of those estimated using the standard Schaefer and Fox surplus production models. As such, it was concluded that the modified Schaefer model is producing reasonable yield estimates.

A visual assessment of the queen conch stocks was also conducted between October 2001 and June 2002 for the Turks Bank, in order to estimate an exploitable biomass. The results indicated a much lower density figure in comparison to the Caicos Bank.

Furthermore, in an effort to increase the robustness of the Schaefer Model, local consumption information was collected and incorporated into the model in 2006. The results produced showed a high correlation of between 60 and 70 percent between observed and expected catch rates (cpue). The model seemed to fit better when information on local consumption is added.

Although modelling has shown that the fishery is stable and not threatened with collapse, the TCI Government has adopted as part of its management strategy to use the calculated MSY as a limit reference point. This is because at MSY there is a high probability (56.5 percent) of overfishing. The Government has therefore used a fraction of the MSY as the Target Reference Point for the setting of the TAC. Targeting catch at 90 percent of the MSY has a lower probability (27.4 percent) of overfishing. Similarly, at 85 percent and 75 percent of the MSY the probability of overfishing is 16.6 percent and 4.5 percent respectively.

United States of America – Florida Keys[2]

The Florida Keys once had commercial and recreational queen conch fisheries. In 1975, the commercial fishery was closed. The recreational fishery followed suit in 1985 at the behest of the public concerned over the declining conch population. On its own, the conch population was slow to recover (Glazer and Berg 1994[3]; Berg and Glazer 1995[4]); therefore, we began seeking a proactive restoration strategy. After evaluating releases of hatchery-reared juveniles (Delgado et al 2002[5]; Glazer and Delgado 2003[6]; Glazer 2005[7]), we adopted a translocation approach based upon research that demonstrated that non-reproductive conch inhabiting nearshore areas began reproducing when translocated into the offshore spawning aggregations (Delgado et al 2004[8]). To maximize the contribution these conch make to the recovery of the local stock, it is critical to translocate them into areas where the larvae will have a high probability of being retained in the Keys. Therefore, we examined the origin of larvae recruiting to the Keys by conducting a drift vial study and plankton tows. We found that very few larvae enter the Keys from upstream sources and hypothesize that local breeding aggregations are the source of recruitment. From our yearly monitoring of the breeding aggregations, we estimated that there were approximately 35 000 adults in breeding aggregations in 2003 (Glazer and Delgado 2003[5]). We also evaluated existing Sanctuary Preservation Areas (SPAs) to determine if they would adequately protect spawning aggregations, if a recreational fishery reopens. We found that some SPAs are probably too small to adequately protect spawning aggregations from future exploitation and that most aggregations are located outside of SPA boundaries (Glazer et al 2003[9]). Therefore, existing SPAs would not achieve the goals of maintaining ecosystem health and enhancing the fishery. A successful management strategy must integrate reproductive biology and hydrodynamics to maximize the probability that progeny produced from an enhanced spawning stock will recruit back to the source population. Taken together, an approach that combines translocations with metapopulation theory, spawning stock protection, and is implemented with the assistance of local volunteers appears to be an effective strategy for restoring Florida's queen conch population.

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[2] This summary was drafted by Robert A. Glazer and Gabriel A. Delgado, Florida Fish and Wildlife, Conservation Commission, Fish and Wildlife Research Institute, 2796 Overseas Highway, Suite 11, Marathon, Florida 33050 USA, bob.glazer@myfwc.com, gabriel.delgado@myfwc.com

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GROUP REPORTS

Subregional management structure

Given the existence of key uncertainties in existing knowledge, the workshop decided that queen conch populations in the major fishing areas and grounds should be treated as if they are stocks in themselves and each unit managed on a sustainable basis. In addition, local stocks may transcend national boundaries and states sharing the same shelf/stock could manage the stock jointly. On this basis, the workshop agreed that it was necessary to divide the states in the queen conch range into sub-groups in order to facilitate and promote regional co-operation in addressing issues of common concern, such as IUU fishing, implementation of National Plans of Action (NPOAs) on fishing capacity, harmonisation of fishing regulations and conversion factors and monitoring, control and surveillance (MCS). Based on existing information on the biology and ecology of the queen conch, on general and localised current patterns (gyres) and on the juxtaposed nature of the Exclusive Economic Zones (EEZs) in the region, the workshop agreed that, for working purposes, the queen conch range should be divided into the following three management zones (Figure 1) to cover hypothetical stock complexes for:

Northern Zone: The Bahamas, Cuba, Dominican Republic, Haiti, Turks and Caicos Islands, and the United States (Florida).

Eastern Zone: Lesser Antilles, Netherlands Antilles, Puerto Rico, and Venezuela.

South Central Zone: Belize, Colombia (San Andres Archipelago), Guatemala, Honduras, Jamaica, Mexico (Yucatan), and Nicaragua.

The workshop employed this hypothetical stock structure for group sessions as per the workshop programme. Group sessions focused on i) policies and legislation; ii) management objectives, indicators and reference points; and iii) management controls.

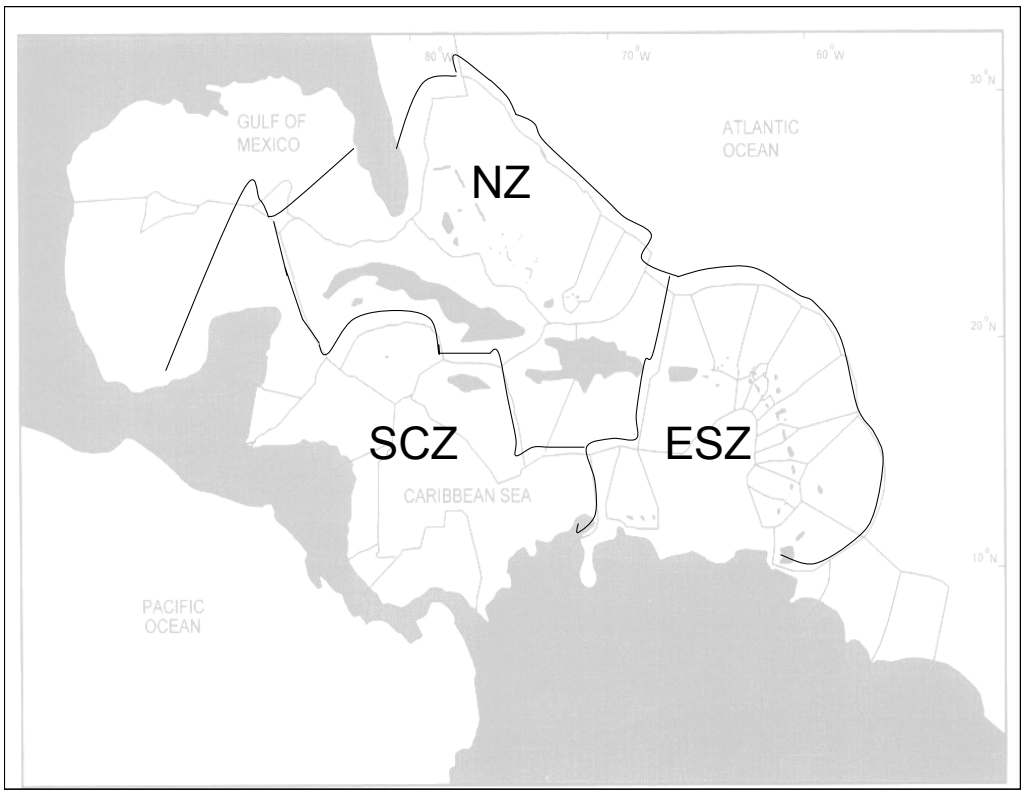

Figure 1 – The three management zones that cover hypothetical stock complexes.

POLICIES AND LEGISLATION

The Secretariat introduced the topic discussing policy and management principles for sustainable queen conch fisheries. The presentation proposed the use of sustainable development and the precautionary approach as guiding principles for responsible fisheries management. A review of the current international and regional institutional frameworks for sustainable use of aquatic resources was presented and a proposal for a subregional management discussed based on available biological and ecological information.

During the group session, groups were asked to address the following questions:

1) *What are the main weaknesses/problems in national policies/legislation that are negatively affecting the management of queen conch fisheries? What are possible solutions?*
2) *What are the main weaknesses/problems in regional policies and arrangements that are negatively affecting the management of queen conch fisheries in the Caribbean region? What are possible solutions?*

The workshop split into three working groups based on the agreed hypothetical 'stock' structure of conch in the region i.e. Eastern, South Central and Northern Zones.

Eastern zone

The working group of the eastern zone reported that they faced a number of problems in relation to policies and management regimes. These included that the national policies on fisheries were frequently unclear and that there was a lack of specific policies on conch. Some countries did not have CITES enabling legislation. Lack of Statutory Instrument regulations was also recognized as a problem.

Most countries did not have sufficient ability to enforce fisheries regulations through existing mechanisms (e.g. police force and coast guard). A lack of coordination between the CITES management authority and the fisheries management agency in countries and regulations that do not allow for flexibility especially in regards to management measures were also common problems.

In order to facilitate improvement of legislation, it was suggested that the provision to countries of guidelines for policy formulation and a model of the necessary CITES legislation would be useful. The use of model Statutory Instrument regulations was also suggested as way to overcome weaknesses at national level. To improve enforcement, it was recognized that improving compliance through participatory management would be helpful, and that the end-users (e.g. the buyers) could be made more accountable for any encouragement or facilitation of illegal practices. Implementation of CITES regulations could be improved if the fisheries agencies were designated as additional CITES Management Authorities and if coordination between agencies was mandated.

A number of regional problems were also identified, including a lack of awareness on regional policies and arrangements on fisheries and of harmonization of policies, the absence of a regional policy on IUU fishing, and insufficient coordination among regional agencies. It was also suggested that the priorities of international funding agencies are sometimes at variance with national priorities and that this should be improved. There was a need to develop NPOAs and regional policies and agreements on IUU fishing. Additional possible solutions to the issues mentioned would be to formalize regional cooperation through memorandums of understanding (MOUs); to encourage regional organizations to reach out to Members; and for regional and international organizations to reflect and address national priorities.

South central zone

The south central zone adopted a different work dynamic from the other two, and focused discussions on the problems associated with the specific legislation of each country. Results are very informative of the type of operational problems faced by countries when trying to implement regulations for queen conch. Below is first a summary of the issues discussed with a table focusing on the specific national issues following.

The south central countries reported a number of difficulties that included an absence of legislation aimed specifically at queen conch fisheries in some countries. Problems with the legislation and enforcement for minimum shell thickness and conch size were also reported, brought about by the fact that divers remove the conch meat from the shells underwater which makes it hard to determine their original size. Enforcement of closed seasons, and of regulations in general, was also a problem, brought about by a shortage of resources and equipment for effective patrolling of jurisdictional waters. Illegal fishing from neighbouring countries was a major problem in the sub-region. Another problem reported was that in at least one country, the environmental agency delegates the management of protected areas to local NGOs, which do not have the capacity for the task.

	Legislation	**Closed seasons and other management measures**	**Additional problems to be addressed**
Nicaragua	Minimum shell length of 200mm and 9.5 mm lip thickness, but these regulations are very difficult to enforce because divers take out conch meat from shell underwater.	1 June to 30 September has been established as a closed season, but there is weak monitoring/surveillance and enforcement during the closed season and illegal fishers from neighbouring countries.	There is a lack of a pubic awareness/educational program to make fishers aware of the resource management measures that have been established. Medium scale illegal fishing by foreigners. There is no major fishery for conch and there is little knowledge of current fishing effort.
Guatemala	There are no fisheries regulations specifically for conch, but the species is included in a general list of targeted species which allows the fishery to exist.	The Environmental Entity delegates the management of protected areas [one of the tools for queen conch management] to local NGOs, which do not have the necessary management capacity.	
Belize	The Fisheries Regulations establish minimum shell length and minimum weights of unprocessed, partially processed and fully processed conch.	Fisheries regulations also establish a closed season, a TAC, restriction of fishing methods (fishing is done only by free diving and the use of SCUBA gear for commercial fishing is prohibited) that make deepwater conch stocks inaccessible, and a coastal network of marine reserves.	Weak institutional capacity and enforcement capability due to lack of adequate economic and human resources.

	Legislation	Closed seasons and other management measures	Additional problems to be addressed
Honduras	There is a lack of formal laws or by-laws designed to cover both industrial and artisanal conch fishing.	A general Fisheries Law is in discussion at the National Congress and Ministerial agreements are in place restricting captures and declaring closed season.	Low capability of enforcement of regulations due to shortage of resources and equipment for better patrolling of jurisdictional waters.
Jamaica	Regulations established for minimum shell length (22 cm).	There is a closed season (1 Aug to 5 Jan), TAC of 690 mt and regulations on the landing of conch with flared lip. A three-tiered management system by 3 government agencies is in place (Fisheries, NEPA and Veterinary Services).	Conch meat is taken out of the shell underwater making it difficult or almost impossible to monitor the minimum size and flared lip regulations.

Northern zone

The participants from the northern countries were of the view that, in their countries, there was either a lack of any national policy on queen conch or, if there was a policy, it was very general (e.g. fisheries are for local consumption and once that market is saturated they can export in the Bahamas, or stock exploitation not to surpass MSY in the Turks and Caicos Islands (TCI)). In addition, there were concerns that the existence of a policy does not mean that it will be put into effect. One means of trying to encourage implementation would be to make it a part of the legislation that management should be based on the best available science. This would imply that, if fishing was going to be allowed, then data reporting, data collection, monitoring, etc. would all have to be compulsory. The working group was of the view that CITES provided a good incentive for countries to manage their fisheries for queen conch properly, in part because the concept of CITES is easy for politicians to understand.

The northern group also agreed that there are weaknesses in the educational policies in the countries. These should be addressed because fishers and policy makers need to be knowledgeable about fisheries. For example, fishers should be educated about the implications of overfishing and the benefits that could be obtained from co-management. In addition, policy makers must be informed about the social and economic impacts of their legislative decisions, both in the short and long-term. There was therefore a need for training programmes and workshops for these purposes.

At the regional level, the working group was of the opinion that there is often a lack of cooperation between governments at the ministerial level, although not necessarily at the scientific level. Some solutions to this problem were put forward including the exchange of manpower and expertise between countries and reciprocal aid in conducting surveys. It was also agreed that individual countries should not need to repeat basic research when relevant and directly applicable information was already available in other countries and that there was a need for all countries to build on a common knowledge base for science. Another regional problem was the failure of the countries to standardize or harmonize regulations and definitions (e.g. a regional definition of clean weight should be agreed upon and defined for CITES reporting). Harmonized regulations, which would require compromises between neighbouring countries, would help the countries to combat poaching. For example, standardised closed seasons would mean that poachers had nowhere to land their catches. It would be important to take into account the social and economic impacts when standardizing regulations.

It was also stated that there is a need to improve the regional coordination among the different international organizations in order to optimise use of resources and to avoid duplication efforts. A queen conch management plan formalised at the international level through the relevant international organizations (FAO, OSPESCA, CRFM, CFMC, etc.) would be a step towards achieving this.

In the general discussion, it was reported that Organización del Sector Pesquero y Acuícola del Istmo Centroamericano (OSPESCA) was working towards a common closed season for its member countries. In this context it was seen as being essential for countries to cooperate and to reach formal agreement on a strategy or strategies to combat IUU fishing. Effective enforcement is essential and this requires patrolling of national waters. Assistance from external agencies is needed to assist countries in strengthening national and regional enforcement. There was also widespread agreement that countries needed to try to encourage greater stakeholder participation in enforcement and that this was often more effective and cost-effective than attempting to apprehend fishers for illegal fishing. An additional means of increasing enforcement and compliance is for Fisheries Departments to apply pressure on end-users such as restaurants and hotels to ensure they purchase only legally obtained animals.

It was also proposed that the region needs to ensure, through effective coordination and representation, that its needs are taken into account when priorities are decided by international organizations (e.g. at meetings of FAO's Committee on Fisheries (COFI)).

MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

The Secretariat introduced the topic highlighting the importance of developing functional management systems to achieve the overall goal of sustainable queen conch fisheries management. The key elements of a functional management system were introduced, with emphasis on the development of operational objectives, indicators and reference points for issues considered of high priority for management.

During the group session, participants in each group were initially asked to identify issues affecting the sustainability of a queen conch fishery, focusing on the issues affecting the ecological well-being of the fishery, including those related to the impact of the fishery on the stock (e.g. distribution, abundance, population structure, discards or shells) and those related to external impacts on stock originated from other activities and/or natural processes (e.g. impacts on water quality, habitat, climate effects). Groups were then asked to develop a sample of issues considered of high priority, operational objectives, indicators and reference points. A list of suggested indicators and reference points for queen conch is included in Appendix III.

Eastern zone

Issues affecting the sustainability of queen conch included:

- the depletion of conch resources in certain areas/ranges;
- the lack of or inadequate Integrated Coastal Zone Policy to address issues such as pollution, watershed management, land use practices, beach/mangrove protection and coastal development;
- the discard of conch shells on land; and
- the negative impact natural phenomenon, such as hurricanes/storms, climate change, drought and volcanic activity.

The following sample of operational objectives related to the depletion of conch resources and also to socio-economic concerns was proposed:

- rebuild stocks above 50 percent of unexploited level;
- maintain stocks above 50 percent of unexploited level;

- sustainable use of stocks; and
- maintain income above national minimum wage.

The indicators for the above operational objectives include the current level of stocks as determined by appropriate model and the current wages of conch fishers. As reference points, the 50 percent unexploited level and the national minimum wage were proposed.

South central zone

The group identified the following issues affecting the sustainability of queen conch fisheries:

- overfishing, with associated problems in different dimensions such as: high fishing effort, over-sized fishing fleet, fishers' lack of knowledge of species biology, the need for subsistence living by artisanal fishers, the lack of alternative livelihoods, family occupational tradition, high income generation, illegal fishing and poaching;
- global warming and the consequent increase in sea temperature impact on queen conch habitat;
- natural disturbances from environmental changes and hurricanes;
- the impact of fishing gears;
- pollution; and
- habitat alteration, caused for instance by old discarded shells, shrimp trawling and coastal developments.

Among the above list of issues, overfishing, illegal fishing and poaching, and habitat alteration were considered of high priority. An operational objective and a sample of indicators and reference points were elaborated for the issue of overfishing. As an operational objective the group proposed to reduce fishing effort to allow natural recovery of stock. As indicators, the use of size of fishing fleet, stock density and shell size were suggested. As reference points, it was suggested to maintain the current fishing fleet size as maximum and to maintain the current production volume and shell size.

Northern zone

The group defined as an overall management objective the sustainable use of the fishery and proper management of the resource. Issues affecting the sustainability of the fishery were identified and a sample of indicators and reference points was defined for some of the issues. The group noted that indicators and reference points can be revised over time as more or better data become available, but that a common base of scientific knowledge could be used to start with. The following sample of issues was analyzed.

Issue	Indicator	Reference point
Density overfishing affecting successful reproduction (i.e. Allee effects or depensation).	➢ no. of adult conch per hectare linked to habitat or location (e.g. percentage of original habitat).	➢ 50 adults per hectare (as suggested by Stoner and Ray-Culp, 2000[10]) and/or 200 adults per hectare (as estimated for Florida stock).

[10] Stoner, A.W. and M. Ray-Culp. 2000. Evidence for Allee effects in an over-harvested marine gastropod: density-dependent mating and egg production. Marine Ecology Progress Series 202:297-302.

Issue	Indicator	Reference point
Overfishing affecting the size structure of the population (e.g. fishery may select for smaller individuals if all the large ones are removed).	➢ shell length of landed or harvested animals.	➢ not discussed.
Marketing as a positive influence (e.g. successful marketing can yield more profit with less effort for a limited access fishery).	➢ use of value added products and/or derivative products (e.g. shell, trimmings).	➢ not discussed.
Increase in effort (e.g. more fishers, increase in gear efficiency).	➢ change in gear type over time.	➢ not discussed.
Unaccounted catch (e.g. local consumption) {also an issue for internal national security}.	➢ product price (as local demand increases, price may increase as well).	➢ not discussed.
Poaching and illegal fishing.	➢ no. of poachers caught.	➢ not discussed.
Recruitment overfishing when countries share fishery resources.	➢ decrease in the no. of juveniles, decrease in landings.	➢ not discussed.
People moving into the fishery from other industries.	➢ increase in effort.	➢ not discussed.
Coastal development causing habitat destruction and water quality problems.	➢ acreage lost to development, degradation in water quality (e.g. water clarity).	➢ not discussed.
Fishery interactions (e.g. lobster are a predator on juvenile conch, so if conch populations are reduced it may negatively affect the lobster fishery.	➢ not discussed.	➢ not discussed.

MANAGEMENT CONTROLS

The Secretariat introduced the topic highlighting the linkages between management controls and management objectives. The advantages and disadvantages of the main types of controls for queen conch fisheries were reviewed, including closed seasons, protected areas, catch quotas, effort control, gear restrictions and minimum size/weight. With regards to the use of minimum weight as a management measure, the difficulty of using minimum weight to protect spawning stock was noted. Because of the very limited growth in weight after maturity, and the consequent difficulty to differentiate adults and juveniles based on the weight of the meat, setting a minimum weight as the only measure to protect spawning stock was considered particularly risky. A separate group of presentations focused on the use of marine protected areas (MPAs) as management tools for queen conch fisheries. It was noted that presently there are too few and too small MPAs implemented to evaluate their potential benefits, including spillover effects. MPAs were considered ecosystem oriented measures, because they protect habitat, multiple species and biodiversity. However, it was noted that MPAs provide spatial protection at a limited scale, and have to be used in combination with other management controls. Case study examples of the implementation of MPAs were presented by representatives from Belize, Bahamas, Jamaica, Turks and Caicos, St. Kitts/Nevis, Florida, St. Lucia and Antigua and Barbuda. Presentations concluded that a combination of controls would be advisable for queen conch fisheries management, including measures such as limited entry (e.g. through licensing and effort control), catch quota, minimum size and closed areas.

During the group work session, groups were asked to consider whether the management controls currently used in their countries were sufficient and suitable to achieve the objectives of (a) guarantee of the survival of the stock, and (b) to obtain and maintain catch rates. The groups were also asked to recommend what additional controls (or strengthening of existing controls) are necessary to achieve these objectives.

Eastern zone

The group discussed the advantages and limitations of management controls to achieve a set of operational management objectives: rebuild stocks above 30 percent of unexploited level; maintain stocks above 30 percent of unexploited level; sustainable use of stocks; and maintain income above national minimum wage.

In terms of management controls to rebuild/maintain stocks the group concluded that the success of measures such as the control of effort, closed seasons and marine reserves depend on an effective system of MCS, and for this reason can be expensive. Likewise measures such as size limits and gear restrictions need enforcement to be effective. Catch quotas could prove difficult to set up in small scale fisheries. Establishing landed conditions, such as requiring the landing of conch with the shell, was considered to be logistically difficult in some cases. The use of culturing for restocking was considered an expensive measure of conservation and stock rebuilding, with unpredictable outputs. Difficulties in limiting or removing concessions offered to fishers were also discussed.

In terms of management controls to maintain income level the group concluded that measures that restrict access should be accompanied by alternative livelihood programmes for fishers. Research on diversification of the fishery and on the better (full) utilization of captured animals was suggested as a way forward. The group also considered that the provision of concessions could be problematic to implement.

South central zone

Countries in this group reported the use of minimum size, closed seasons, control of fishing effort, catch quotas and protected areas as management measures for queen conch fisheries. The group agreed that closed seasons, quotas (monitored by National Fisheries Divisions and CITES controls - certificates) and MPAs are excellent management controls for achieving the objectives of guaranteeing the survival of the stock, and to obtain and maintain catch rates of the queen conch. Additional controls may be added by individual countries according to their fishery characteristics.

It was also agreed that fishing effort and minimum size limits (shell length, meat weight) are important management controls. As more information becomes available it will be possible to determine the most appropriate level and adjust these controls accordingly.

Northern zone

Countries in the northern zone discussed their experiences with the application of different management controls.

TCI controls include a quota system, closed season (most people comply, small scale poaching), closed areas (believe they work, but are conducting studies to determine if effective) and minimum shell length. The problem with the latter is that the shells are not landed, and therefore it is hard to enforce. However, it was noted that fishers are probably not targeting undersized individuals because it is not economically feasible. TCI is considering switching to use lip thickness as a management control as it is a better indicator of maturity. TCI felt that their management controls are effective in achieving their management objectives.

Bahamas' controls include size limit (i.e. flared lip), closed areas, export quotas and gear restrictions (no Scuba, and hooka only between 30 and 60 feet). A problem with the size limit regulation is that a portion of the fishery does not land the shell (not much of a market for the shell), therefore it is a hard measure to enforce. But like the TCI, fishers are probably not targeting undersized individuals because it is not economically feasible. A possible strengthening of this control measure is to land the meat uncleaned. This way the animal can be examined for signs of sexual maturity. The effectiveness of closed areas in achieving the country's management objectives is unknown. With regards to export quotas, one of the management objectives of the Bahamas is to export only when the local market is saturated. Defining what the level of local consumption is a potential problem because of the lack of information. One possible solution to estimate consumption is to license restaurants, hotels, etc. that buy and serve conch and make reporting a condition of the license. The problem with gear restrictions is that they are not enforceable and no one has ever been prosecuted.

In Haiti there is currently a total harvest ban. However, when the fishery was open the only management measure was a closed season (April 1 – September 30) and it was unknown if the closed season was meeting the country's management objectives.

In Florida there is also currently a total harvest ban. Previous management measures (e.g. bag limits, minimum shell length) were ineffective which led to the closure of both commercial and recreational fisheries. The management objective in Florida is to protect and restore the remaining population. Restoration strategies are being investigated. For instance, the use of hatchery-raised conch was deemed too expensive and would not maintain the genetic integrity of the population. Another measure under investigation is the use of translocations to boost reproductive output in protected breeding aggregations (i.e. marine reserves) with concern for retention.

Cuba has implemented different types of controls, such as export quotas (essentially no local consumption), closed areas (20 percent of the shelf is protected), a closed season (May 1 to September 30), gear restrictions (no Scuba), depth restrictions (can only fish between 3 to 10 meters) and size limits (lip thickness must be >10 mm). These management controls are considered effective in achieving the country's management objectives.

ENFORCEMENT AND COMPLIANCE

A number of matters relevant to this agenda item were discussed under the agenda item on 'Policies and management regimes for sustainable queen conch fisheries' and are reported under that item.

National enforcement

The effectiveness of enforcement varied substantially between different countries with some, such as Belize and the Turks and Caicos Islands, having relatively effective regulatory and enforcement capabilities while some other countries were weak in this regard. There was considerable discussion about the merits of including an enforcement arm within the fisheries departments or delegating this task to another agency such as the national coastguard. Examples of both options occur within the region. A potential disadvantage, referred to by several participants, of delegating enforcement to an agency outside of fisheries was that fisheries tended to have only a low priority in relation to other responsibilities of such agencies.

Where enforcement is undertaken by the fisheries departments, a number of participants referred to the problems of mixing enforcement and extension or monitoring responsibilities. Where there is a mixing of responsibilities, the officers involved tend to be seen by fishers primarily as enforcement officers, which can compromise their relationship with fishers and therefore their ability to fulfil other duties properly.

The level of punishment for offences varies between countries. It was pointed out that a general principle is that if the chance of catching the perpetrator of a crime is low, then the punishment needs

to be proportionally higher so that it still acts as a deterrent. However, this is not always possible and one participant reported that, at least in that country, punishment for crimes in fisheries needs to be consistent with comparable crimes in other activities. Weak fisheries laws, with major loopholes, and difficulties in successfully securing prosecutions were described by some participants. The high cost of effective enforcement was referred to but it was agreed that enforcement and compliance are so critical that a lot of effort needs to be put into addressing it.

Attention was drawn to the Lacey Act in the United States which, it was suggested, could be useful to some of the conch exporting countries. The Lacey Act allows for the United States government to prosecute under United States laws for illegal fishing taking place outside the United States but where the product of that fishing is destined for US domestic ports.

There was unanimous agreement that it is essential to work closely with the fishers and fishing communities to try to increase voluntary compliance. The general view was that the fishers knew the fishery laws but did not always understand the principles of sustainable use and why the laws were necessary. Education and training programmes are urgently needed to work with fishers and their families to educate them in responsible and sustainable use of living marine resources. Building on the experiences of several countries in the region, the importance of involving the wives and children in these educational programmes was stressed. Such programmes should be systematically designed and implemented and should include monitoring indicators to see whether the intended messages have been understood by the audience. Fishers should also be encouraged to help with monitoring, control and surveillance, for example by looking out for and reporting poachers.

The need for greater cooperation at the regional level was emphasised. Such cooperation could range from bilateral cooperation, to small groups linked by geographical proximity or trade-links (e.g. exporting countries and importing countries), to wider scale regional cooperation. The role of regional organizations such as CRFM, FAO/WECAFC and OSPESCA was stressed and participants requested that these organizations should take the initiative in fostering greater intra-regional cooperation in enforcement. The potential role of the FAO International Plan of Action (IPOA) on IUU fishing in addressing the problems of the region was raised. Some countries stressed the need to work together with the French territories in the region in order to improve enforcement.

FISHERIES MANAGEMENT PLANS

Following the group work presentations on each section, participants were asked to develop or improve their country draft management plans, building upon the group and plenary discussions and with the assistance of the Secretariat. The draft management plans, found in Appendix IV of this report, represent the opinion of workshop participants only. As discussed during the workshop, these draft management plans should viewed as living documents that could be used by countries as a basis to develop/improve effective management and action plans for queen conch fisheries, with proper consultation and involvement of fishery stakeholders.

MAIN RESULTS OF THE WORKSHOP

Results from the workshop discussions led to several recommendations to be taken into consideration in queen conch fisheries management at the national and regional level. These recommendations are summarized below under different aspects of fisheries management.

Precautionary approach

In the case of queen conch, a considerable amount is known about its general biology and ecology. There have been a number of good studies on the species in general, and on its occurrence, dynamics and fisheries in specific areas. However, despite this progress, and in keeping with many fish stocks in the region, there are still several key uncertainties in the existing knowledge of the resource, which need to be considered in its management, and which require the employment of the precautionary

approach to the management of queen conch fisheries. Some of the most important uncertainties are: detailed stock structure, actual fishing mortality and effort, inter-relationship between shallow-water and deep-water components, and the distribution of larvae and origin of recruits.

The workshop suggested that improvements on the quality and accessibility of research are needed. Given the fragile nature of the conch resource and the importance of sound and robust scientific information for management decisions, a suitable mechanism within the region to facilitate and ensure the needed scientific review and evaluation of the data used to decide on and establish key reference points used in the management of queen conch should be established and made available to all countries.

Policies and management regimes for sustainable queen conch fisheries

It was recognised that resource use varied among participating countries. Due to limited human and financial resources those countries with insignificant fisheries expressed the view that it is not cost-effective to implement the stringent measures recommended for those countries with commercial fisheries. However, the need to conserve biodiversity was recognised, therefore steps will be taken to collect preliminary information on the conch.

There were differences of opinion on the role and value of CITES interventions on queen conch. Some participants thought that CITES had no role to play in fisheries management and that management of commercial fisheries was the responsibility of national fisheries agencies and that FAO was the global organization with a mandate for fisheries. Other participants thought that the listing of conch on CITES Appendix II provided a good incentive to manage the resource and its use properly. It was suggested that a positive contribution was that CITES actions and requirements were easy for politicians to understand and thereby helped to generate political will to seriously tackle the problems.
A widely recognised problem is the lack of standardization and/or harmonization in regulations and definitions across the region and that this must be improved. For example, the definition of clean weight needs to be defined for CITES reporting and should be consistent over time. This would also standardise the reporting to FAO, which currently differs from country to country. Greater harmonisation would also help address the problem of poaching and, where possible, compromises should be sought across the region and between neighbouring countries on, for example, adopting similar closed seasons (keeping socioeconomic impacts in mind), so that poachers have nowhere to land their illegal catch.

IUU fishing in the region is a major problem in sustainable use of queen conch and could undermine national attempts to implement effective management plans. Regional, sub-regional and bilateral cooperation, at both the formal and informal levels, to combat IUU fishing is essential and urgent. It was also stressed that where they have not already done so, countries should develop and implement NPOAs on IUU fishing in accordance with the FAO International Plan of Action on IUU fishing.

In a number of countries there was a lack of national policy, or if there was a national policy it was very general. A further problem was that having a policy does not necessarily mean that there is governmental or political will or resources to put that policy into effect. Policy makers need to be made aware of the social and economic importance of fisheries for conch and the requirements for effective management.

It was unanimously agreed that there is a need for greater regional coordination among the relevant regional and international organizations operating in the area. With scarce human and financial resources available it was important to optimise cooperation to ensure efficient use of those scarce resources. In relation to queen conch, it was proposed that FAO-WECAF, UNEP-CEP, CFMC, CRFM, OSPESCA, and any other relevant regional or international governmental organization should work together in order to formalize a queen conch management plan at the international level, to facilitate its implementation, and to provide additional support needed to effectively manage queen

conch resources. The need for regional and international organisations to reflect and address national priorities was also raised.

The role of fishers in the implementation of responsible fishing was discussed and emphasised. It was recognised that, given the limited capacity and resources for management and enforcement in most countries, that cooperation with and participation by fishers in efforts to ensure responsible utilisation of queen conch is absolutely essential. In order to facilitate such cooperation, fishers need to be made aware of the implications of overfishing and the benefits of co-management, therefore making dedicated awareness building programmes necessary. In addition, policy makers are also sometimes not aware of the issues and must be made to understand the socio-economic impacts of their legislative decisions (e.g. short-term versus long-term objectives). Hence, education programmes aimed at policy makers are also required.

Management objectives, indicators and reference points

Many countries indicated that the main focus of conch management should not be seen as the need to comply with CITES regulations but as building and implementing a management plan for the sustainable use of the queen conch stocks for the benefit of the conch producing countries.

It is essential to have clear, agreed upon operational objectives in place for each national queen conch fishery. Operational objectives should be measurable, achievable and linked to a time frame so that the effectiveness of the management controls in achieving the objectives can be readily monitored. The clearer the objectives are the better indicators and control rules can be identified. This is perhaps the most essential step in the management cycle as the following steps are based on the set of objectives.

A number of different indicators for assessing the status of the stocks, including scientific indicators and 'softer' indicators are described in Appendix III (stock status checklist).

Concerns were expressed over setting regional standards for minimum density values, establishing regional vs. local density reference limits, and the dangers of not recognizing that density varies across islands, habitats, and depths.

Diverse indicators and reference points can be developed to monitor the performance of fisheries management in addressing issues of high priority. The choice of indicators and reference points will depend on data availability and the particular operational objectives selected. At a minimum there should be operational objectives for ensuring the survival of the stock, restoring it to, or maintaining it at, productive biomass levels and allowing for acceptable levels of fishing.

Lack of complete and ideal information about the status of the fishery, stock, habitats, etc. should not preclude the development and implementation of operational management systems with objectives, indicators and reference points. Cost-effectiveness is an important factor to be considered in implementing operational management systems, especially for smaller countries with subsistence fisheries.

While recognizing the usefulness of stock density (linked to habitats) as an indicator of stock status, the cost of conducting surveys and maintaining a monitoring system based on density indicators is prohibitive for many countries. The monitoring of catch and effort statistics is particularly useful because it provides information about different biological and socio-economic indicators of a fishery and is relatively cost-effective to achieve. When applicable, the definition of minimum densities as reference points should take into account the available scientific information about density-dependent reproductive success, but should also be adapted to the specific characteristics of individual stocks and their habitat.

A number of important issues related to the sustainability of queen conch fisheries were identified. Several were related to environmental effects on the habitat and on the conch populations themselves; others to socio-economic conditions of the people involved in the fishery. Finally, great attention was

given to the problems associated with the operation of the conch fishery and associated fisheries, and to the particular problems observed in conch stocks and habitats.

In general, given that the management objectives may not have been very well understood by participants, the list of indicators may not have been adequate for the true objectives pursued. It is important to think of indicators as the means to measure the problem or prioritize issue, and most importantly, as the way to measure the effects of management controls.

The groups, in general, identified limit reference points linked to some extent to their objectives. The group realized that target reference points may be more difficult to define. However, the link between objectives, indicators, and reference points was somewhat vague. There appeared to be some confusion between indicators, reference points, and the methods to obtain or estimate either. A better understanding of reference points may be needed to proceed into a management program.

Recommendations for a better understanding of reference points are to:

- extract each objective from the overall policy and goals for the fishery;
- select a good, simple, straightforward, and inexpensive indicator of the state of the problem that the (management) objective wants to solve; and
- find a level of the indicator that management wants to achieve (target reference point) or that has to be avoided (limit reference point).

While these steps of the management cycle are designed or implemented, it is important to keep in mind the realities of the region/country where the management plan is to be put in place. As the groups repeatedly pointed out, it is important to consider the costs and methods to obtain the supporting information, to monitor the stock, and the fishery, and the costs and realities of enforcement. Illegal fishing/poaching is a prevailing issue over which no simple solution has been provided due to its complexity both at the national and regional level. Therefore, it is recommended to include it as an important source of additional – and possibly significant — impact to the fisheries and the stocks.

Management controls

Management controls need to have a clear link to management objectives and the link should be specified in the management plan.

A key element for establishing export quotas that comply with CITES provisions is to show that the level of fishing is commensurate with the productive capacity of the stock. To this end countries should demonstrate that management plans and measures are in place and enforced to ensure the sustainability of the stock, and use the best available information to demonstrate that overfishing is not occurring and/or that the stock is at levels consistent with biological reference points.

Considering the uncertainties in data and ecological processes and the limited enforcement capacity, the best strategy to ensure the sustainability of stocks is to employ a combination of management controls.

Countries should consider, if appropriate, limited entry by, for example, regulating the number of conch fishing licences. Policies allowing open access are not consistent with sustainable fisheries and maintaining open access will almost certainly lead to declining benefits for all participants in the fishery.

A necessary objective in many countries was to control and, frequently, to reduce fishing effort but this would be difficult because of the impacts on livelihoods. An operational strategy is necessary to reach the objective effort over time. This plan of action must be in the management plan, for example in the form of a percent reduction of fishing effort through either or both of a reduction in the fishing

fleet and the number of fishers that participate in the fishery. Given the social difficulties of reducing effort, a necessary first step could be to cap effort at its present level.

A further control is to develop a procedure for setting export quotas based on passive controls and allocation between domestic and export markets.

Minimum size limits (shell length, lip thickness, meat weight) are management controls that, if appropriately defined and enforced, can effectively protect the spawning stock but their effective implementation becomes difficult when shells are not landed, as there is only limited information about the relationships between meat weight, shell size and lip thickness and there are not always good correlations. While improving the information basis for defining appropriate values for minimum meat weight, countries should find alternative strategies to effectively protect juvenile conch, including the protection of habitat and adoption of mechanisms for improving awareness of fishers and encouraging a more selective fishery. Controls based on shell length are unlikely by themselves to achieve management objectives related to protecting the stock from overfishing or promoting the stock recovery. Limits based on lip thickness are much more likely to protect the spawning stock. Enforcing these limits is difficult in many countries because the meat is extracted at sea.

The available information indicates that the cleaned weight does not increase significantly from late juveniles and throughout adulthood. Setting a suitable minimum mean weight is therefore important to ensure that fishing on juveniles is restricted, but it is not sufficient on its own to ensure protection of the spawner biomass and needs to be used in conjunction with other controls such as effort controls or closed areas. Enforcing the landing of uncleaned meat will allow better enforcement of size limits.

Sexual dimorphism and differential growth (stunting) could have an impact on the effectiveness of size-based controls and those impacts need to be checked where the phenomena are known to occur.
MPAs have been shown to work well in some member states, but enforcement costs are potentially high and need to be considered prior to implementation. At least one country has found maintenance of its conch closed area onerous compared to other controls. Careful consideration needs to be given to the design and placement of MPAs, to impacts on communities and community attitudes, the costs and feasibility of enforcement and other factors when MPAs are being considered as management tools for queen conch.

While opinions on the benefits of the Appendix II listing of queen conch differed, some countries were of the opinion that the listing had provided a lever to obtain support for fishery controls.

Where possible, support should be obtained for controls from fishers. This will be facilitated by a properly monitored education and awareness programme, including explanations to justify changes in management.

“Passive management” only (such as size limits) may be appropriate for some small scale fisheries. Some monitoring will still be necessary, but controls need only be changed infrequently.

Within each state controls need to be consistent, so that they do not make legal fishing impossible.

Responsible use could be encouraged through the development of a market and methods to give value to landing the shell. This could allow better enforcement of shell based controls as well as improve returns to the fishery. Other uses of shells could be to fill land line areas, for sale as souvenirs, or as artificial reefs.

Enforcement and compliance

It is alleged that foreign vessels from different countries are involved in poaching throughout the region and there is a need for greater regional cooperation in terms of IUU fishing: in some cases this

could be handled informally while in other cases there could be advantages in establishing more formal bilateral or multilateral regional policies and agreements.

There would be benefits to regional standardization and harmonization for regulations and definitions such as for closed seasons and clean weight, which should be consistent.

There is often weak enforcement capability at the national level due to lack of adequate economic and human resources, shortage of resources and equipment for patrolling. Greater cooperation between different national management agencies (e.g. fisheries and coast guard) is needed. There is also a need for greater support from regional and international organizations and the donor community for capacity building.

Comparisons between legal regimes and enforcement practices in different countries were done to identify good examples. TCI and Belize were recognised as having good enforcement systems in place.

There was unanimous agreement regarding the necessity for greater involvement of fishers and fishing communities, in regard to all aspects of enforcement, but specifically education and consultation. Outreach to the families, wives and children, was also discussed as a way to improve education and voluntary compliance. There is also a need to make it worth the while of fishers to comply with regulation: in this regard, incentives for sustainable use and addressing the reasons and incentives for unsustainable use would be useful. Lessons learned in other areas/regions can be useful in informing methods to improve enforcement and compliance (e.g. Integrated Pest Management (IPM) in rice/fish systems.

APPENDIX I

Agenda

Monday 1 May – Introduction and Country Reports

Morning **Registration**

1. Opening of the Workshop
2. Adoption of Agenda
3. Workshop Background and Objectives

The principles of sustainable use of fisheries resource - K. Cochrane

The SPAW Protocol – A.Vanzella-Khouri

Afternoon **Country reports**: Issues faced by Caribbean countries in the management of queen conch fisheries

Tuesday 2 May – The Fisheries Management Cycle: Policies and Management Objectives

Morning **CITES regulation concerning the exploitation and trade of listed aquatic species. –** E. Fisher

Example of successful local management regime: Jamaica – A. Kong

Policies and management regimes for sustainable queen conch fisheries - Moving towards regional management – B. Chakalall and K. Cochrane.

Group work – Analysis of strengths and weaknesses of national policies, legislation and management regimes for queen conch.

Afternoon **- Plenary discussions**
- Individual work – Policies and management regimes.

Fisheries management objectives, indicators and reference points – M. Vasconcellos

Group work – Analysis of management objectives and possible indicators, reference points and decision rules

- Plenary discussions
- Individual work – Management objectives, indicators and reference points

Wednesday 3 May – The Fisheries Management Cycle: From Indicators and Reference Points to Data Collection and Analysis

Morning **Data collection and analysis and the relationship with indicators and reference points** – P. Medley

Assessment methods and overview of data needs for queen conch fisheries – M. Valle

Survey design to estimate queen conch densities – G. Delgado

Strategies for monitoring of catch and effort statistics – P. Medley

Group work – Analysis of data available, identification of information gaps and assessment of queen conch

Afternoon **Individual work –** Analysis of data available, identification of information gaps and assessment of queen conch

Report back of individual work – Preliminary assessment, data availability and information gaps

Thursday 4 May – The Fisheries Management Cycle: Management controls

Morning **Fisheries management controls in queen conch fisheries** – P. Medley and M. Vasconcellos.

The use of marine protected areas (MPAs) as a management control: the criteria used to establish and evaluate the impacts\benefits of protected areas – M. Valle.

Case study examples of the implementation of MPAs presented by representatives – from Belize, Bahamas, Jamaica, Turks and Caicos, St. Kitts/Nevis, Florida, St. Lucia and Antigua and Barbuda.

Example of a simulation model to test the effectiveness of alternative management strategies in overexploited queen conch stocks – M. Valle

Group work – Analysis of strengths and weaknesses of management controls in relation to objectives

Afternoon **Individual work—** Management controls

Report back of individual work – Management controls

Friday 5 May — The Fisheries Management Cycle: Enforcement, decision making and review

Morning **Enforcement and Compliance** – K. Cochrane.

- Plenary discussions
- Individual work – Enforcement capacity and compliance

Decision Making – K. Cochrane.

- Plenary discussions
- Individual work – Decision Making

Afternoon **Feedback and review: completing the management cycle** – P. Medley

Report back of individual work – Presentation of draft management plans and evaluation of the exercise

Workshop closure and follow-up

APPENDIX II

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APPENDIX III

Stock status checklist: sample of biological indicators and reference points for queen conch

Indicator[1]	Cause for concern	Yes/No	Limit reference point	Yes/ No	Comments
Abundance					
➢ Biomass	Ongoing decrease.		< 30% of unexploited biomass.		
➢ cpue	Ongoing decrease.		< 30% of cpue at start of fishery.		
➢ Unplanned trend in landings	Ongoing increase.		n/a		
➢ Mean density of stock.#			Uncertain and likely to vary from locality to locality depending on e.g. habitat, depth and region.[2]		
➢ Fisher opinion of trends in stock availability (broad-based and representative)#.	Fishers report declining availability.		TBD (to be determined)		
➢ Trend in market prices that is unrelated to production costs.	Increase in price over time.		TBD		
Distribution					
➢ Changes in fishing grounds (e.g. increasing depth).	i) Depleted inshore resources /progressive shift towards deeper fishing grounds; ii) Fishing further and further from port (e.g. increased use of petrol).		n/a		
➢ Fisher opinion/reliable anecdotal information#.	Disappearance or reduced abundance in areas previously found.		TBD		
Size Structure					
➢ Change in mean length of population in relation to unexploited mean or relative to	Ongoing reduction in mean length.		TBD		

[1] The indicators marked with a # do not require a long time series of data.

[2] In Florida, USA, a limit reference point of < 200 adults/ha over at least 50% of natural range has been established, based on observations. The authorities there have also set a target reference point of 600 adults/ha. It should be noted that these values are considered to be relevant only to Florida and should not be assumed to be valid in any other area or country.

mean size at the start of the monitoring programme.					
➢ Changes in relative occurrence of a particular size group (e.g. juveniles in shallow water, adults in spawning ground).	Noticeable reductions in occurrence of one or more size groups over time.		TBD		
➢ Changes in mean shell-length (e.g. in discards, in markets).	Noticeable reduction in mean shell length over time or reduction in relative occurrence of smaller or larger shells over time.		TBD		
➢ Change in ratio of flared to unflared lip (surveys, shell discards, etc.).	Noticeable change in ratio over time.		TBD		
Habitat					
➢ Proportion of effective MPAs including conch habitat#.	Absence of effective protection of at least 30% of conch habitat, including nursery and spawning grounds.		< 30% of conch habitat (if no other suitable controls in place).		
➢ Loss of habitat due to land-based or other activities (including natural causes).	Ongoing destruction of nursery or spawning grounds.		TBD		
➢ Changes in water quality.	Changes in water quality in relation to pristine conditions (pollution, turbidity, warming, heavy metals etc).		TBD		
Exploitation/mortality					
➢ Fishing effort	Unplanned growth.		Established based on biological carrying capacity and societal goals.		
➢ Fishing gear and fishing tactics	Unevaluated changes in fishing gear and/or tactics indicating increased fishing power.		TBD		
➢ Exploitation rate[3]	Unevaluated and unplanned increases.				

[3] Exploitation rate can be calculated as e.g. catch/abundance; fraction of tags recovered in tagging programme; survival estimated from two recruit surveys (Nrecr,2/(Nrecr,1+Nprec,1)); the ratio of discarded shells and live animals on a survey may provide a means of estimating exploitation rate if accumulation of shells over time is taken into account.

APPENDIX IV

National draft management plans[1]

ANTIGUA AND BARBUDA

Ian Horsford[2]

1. BACKGROUND

❖ Description of the fishery

In prehistoric time, the meat of the queen conch was an important source of protein for the early Amerindians. The shells were used to manufacture chisels, knives, spear tips, as well as adornments such as necklaces. Conch shells were also used as "trumpets" and ritual items. As late as the 1950s and 60s, fishers would announce their arrival from sea by "blowing" the conch shell.

In 2004, there were seven active conch-fishing vessels in Antigua and Barbuda (2.5 percent of the active fishing fleet of 276 vessels). Vessels range from 16 to 40 feet and include small pirogues to large fibreglass launches, equipped with global positioning systems and hydraulic haulers. Fishers who target conch in Antigua reside mainly in the southern villages of Urlings and Old Road, and involve some 40 individuals (including 20 SCUBA divers). Over the past decade fishing effort has remain relatively stable ranging from five to eight vessels.

For Barbuda, the conch fishery is basically subsistent due in part to the absence of onshore infrastructure (e.g. cold storage) and limited demand (two seasonal hotels and a resident population of 1,400). In Barbuda the spiny lobster is the primary species of commercial interest (mainly for export to the French territories in the region).

In 2004, the conch fishery was valued at XCD (East Caribbean Dollar)1.3 Million (US$0.48 Million), emphasising its importance to residents of Urlings and Old Road. This is approximately XCD$2 060 (US 763) per annum for each private household in the villages or a production value of XCD$32 500 (US$12 037) per fisher.

With respect to trade, conch exports in 1997 plummeted to zero due to the stringent harmonised food safety regulations for Member States of the European Union. Directive 91/492, of the European Economic Community, lays down the health conditions for the production and the placing on the market of bivalve molluscs. Despite the title, the Directive covers marine gastropods such as the queen conch. Prior to 1997, as much as 23.5 percent of the conch landings were exported to the French

[1] This draft Management Plan was prepared for the Regional Workshop on the Monitoring and Management of Queen Conch, *Strombus gigas* in Kingston, Jamaica, 1-5 May 2006.
Please note that issues from the Draft Management Plan Template distributed at the Worksop that were not addressed in the report do not appear in the text.

[2] This draft management plan represents only the opinion of the author, Ian Horsford, Fisheries Officer, Stock Assessment/Research, Antigua and Barbuda.

territories in the region. Presently, Antigua and Barbuda only have approval for export of fresh fish (including live lobster) to the European Union.

The Fisheries Regulations, No. 10 of 1990, prohibits the harvesting of immature conch. This is conch with a shell smaller than 18 cm (7 inches) or which does not have a flared lip. For conch out of the shell, the meat weight must not be less than 225 grams (8 ounces), after removing the digestive glands or "guts". The Regulations also make provisions for a closed season. In terms of implementation of legislation, the Fisheries Division and the local coast guard conduct routine checks of fishing vessels.

In 1999, the Fisheries Division, with assistance from CARICOM Fisheries Unit and the Antigua and Barbuda Defence Force Coast Guard, conducted a conch abundance survey of the traditional area of commercial exploitation (i.e. the south-west coast of Antigua). The results of the survey indicated that present overall densities of adults (3.7 conch/ha) were well below that which is required for effective reproductive encounters (i.e. 50 conch/hectare). A study of the morphology of two stocks from the west coast was conducted the same year due to concerns about adult "stunting" and its implications for size-based management measures. Both studies were limited by financial constraints to properly achieve their objectives.

In response to the results of the conch abundance survey and the need to protect critical habitats, the Cades Bay Marine Reserve was established in 1999. The area (approx. 1,943 ha) includes Cades Reef and extends landward to include critical nursery areas ranging from mangroves to sea-grass beds. Through the OECS-NRMU Small Projects Facility the Fisheries Division was able to establish a draft management plan for the area. A similar marine reserve (North East Management Area) of about 3,100 ha was established for the north eastern side of Antigua in January 2006; it includes mangroves, reefs, seagrass beds and six uninhabited islands.

❖ **Description of the resource**

In order to assess the status of the resource, a data collection programme was initiated in 1995. This includes monitoring the catch of fishing vessels as well as measuring samples of the catch. The data obtained from this process allows fishery managers to track the changes in the fishery (whether stocks are decreasing or increasing in the relative sense) and assess the effectiveness of management measures.

Based on the fact that current production, which ranges from 35 to 74 metric tonnes of marketable meat (digestives glands removed), is considerably less than MSY estimates extrapolated for the area, and production has been sustained at these levels for a decade without showing negative trends regarding the CPUE, depth or biological data, can only conclude that the current level of production is sustainable. However exploitation that is significantly above the current levels should not be encouraged until a comprehensive abundance survey of the shelf is conducted.

❖ **Analysis of the situation and any problems faced at present in the management of queen conch fisheries**

Due to a growing demand for conch meat within the French territories the Fisheries Division has become aware of an upsurge in the illegal trade of conch to neighbouring French oversees territories. The department is very concerned about this trade and has begun to take measures to curb this problem.

2. POLICIES AND LEGISLATION

❖ Policies that set out the principles on which the fishery for queen conch is managed

General Policy
The Government of Antigua and Barbuda is committed towards ensuring sustainable utilisation of its natural resources, while protecting and promoting biodiversity and economic prosperity through a sustainable fishing industry and protected areas system.

❖ Legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch

Legislative Framework
Until recently the Fisheries Act, No.14 of 1983, and the Fisheries Regulations, No.10 of 1990, were the primary legislative basis for fisheries management and development. Both of these have since been updated in order to meet the challenges posed by globalisation, trade liberalisation, multilateral environment agreements and international fisheries instruments. In 2003, the Fisheries Division sought assistance from the Food and Agriculture Organization of the UN to bring the Fisheries Act (1983) and the Fisheries Regulations (1990), in line with development in current international fisheries law and related environmental agreements. Consultation with all relevant government authorities and stakeholders on the draft legislation took place in May 2004. The Fisheries Bill had its first reading before the House of Representative on the 25th of January 2006. In November 2006 the Act was passed in both the upper and lower houses. The Fisheries Regulations will be gazetted once the department has completed the necessary consultations with various stakeholders.

The Act, applies to: an Exclusive Economic Zone (EEZ) and a fisheries zone (of 200 nautical miles); a territorial sea (of 12 nautical miles); archipelagic waters and internal waters as defined in the Territorial Waters Act (1982); as well as any other waters over which Antigua and Barbuda claims fisheries jurisdiction. The full extent of the EEZ is unknown since negotiations with neighbouring states have yet to be completed.

The Act and Regulations make provision for: the establishment of a fisheries advisory committee; fisheries access agreements; fishing licensing (local and foreign); fisheries research; fish processing establishments; fisheries enforcement; and the registration of fishing vessels. Also conservation measures such as: closed seasons; gear restrictions; and the creation of marine reserves. Under the Act, the Minister responsible for Fisheries has the authority to create new regulations for management and conservation as and when necessary.

With the recent passage of the new Fisheries Act the following are the main issues that have been updated:

- the guiding principles for fisheries management (e.g. sustainable development, responsible fisheries, the precautionary approach, the ecosystem approach);
- provisions on registration, construction, certification and inspection of fishing vessels (including vessel hygiene);
- prohibited conduct in fisheries;
- power of authorized officers with respect to enforcement;
- aquaculture (at present there is no legal framework);
- record of authorisations, permits and licences (the introduction of provisions on the keeping and the use of information kept in such records);
- provisions for fish processing establishment;
- provisions on the introduction of non-indigenous fish; and
- marine reserves and conservation measures.

Other relevant fisheries-related legislation includes:

- the Barbuda Local Government Act (1976) – which gives the Barbuda Council (local governing body of no less than nine elected and two ex officio members) authority over its fisheries including the right to retain taxes on exported seafood;
- the National Parks Act (1984) – for the designation of any land area or water as a national park; and
- the Marine Areas (Preservation and Enhancement) Act (1972) – for the declaration of marine protected areas.

Queen Conch Regulation
Section 22 of the Fisheries Regulations, No.10 of 1990, states:

(1) No person shall take, sell, purchase or have in his possession any immature conch.
(2) The Minister may by Notice published in the Gazette declared any period as a closed season for conch.
(3) No person shall fish for conch during a period of a closed season for conch.
(4) For the purposes of this regulation –
    a. "immature conch" means a conch the shell of which is smaller than 7 inches (18 centimetres) in length; or
    b. a conch the shell of which does not have a flared lip; or
    c. a conch with a total meat weight of less than 8 ounces (225 grams) after removal of the digestive glands.

Proposed Upgrade to Current Queen Conch Regulations
In addition to the current regulations, Section 32 of the Draft Fisheries Regulation (2004) states:

a) no commercial fishing vessel shall fish for or land any lobster or conch unless it holds a special permit for these species. The Chief Fisheries Officer may limit the number of permits in order to give effect to any management programme to limit fishing effort as specified in the fisheries plan.

❖ **International Conventions and Agreements ratified by the country that are of direct relevance to the fishery**

Antigua and Barbuda acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1997. The Environment Division of the Ministry of Public Works and Environment is the National CITES Management Authority. The Fisheries Division, the Forestry Division, the Plant Protection Unit, and the Veterinary Division of the Ministry of Agriculture, Lands, Marine Resources and Agro Industry, are the National Scientific Authorities. The Fisheries Division is responsible for non-detrimental findings as required for international trade in marine species covered by CITES.

International Conventions of significance that are directly relevant to the queen conch fishery of Antigua and Barbuda

Title	Objectives	Comments
Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES) -Opened for signature 3 March 1973. -Entered into force 1 July 1975.	To ensure that the international trade in specimens of wild plant and animals does not threaten their survival.	-Antigua and Barbuda acceded 8 July 1997. -Entered into force 6 October 1997. Standing Committee recommended suspension of imports of *Strombus gigas* (queen conch) from Antigua and Barbuda in February 1999 for failure with respect to proving annual reports and enacting CITES-enabling legislation.
Convention on Biological Diversity -Opened for signature 5 June 1992. -Entered into force 29 December 1993.	To develop national strategies for the conservation and sustainable use of biological diversity.	-Antigua and Barbuda signed 5 June 1992. -Ratified 9 March 1993.
Protocol Concerning Specially Protected Areas and Wildlife (SPAW) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region -Opened for signature 18 January 1990. -Entered into force 18 June 2000.	To protect and, as appropriate, to restore and improve the state of ecosystems, as well as threatened and endangered species and their habitats in the Wider Caribbean Region by, among other means, the establishment of protected areas in the marine areas and their associated ecosystems.	-Antigua and Barbuda signed 18 January 1990.
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar) -Opened for signature 2 February 1971. -Entered into force 21 December 1975.	To stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.	-Antigua and Barbuda is a contracting party.
United Nations Convention on the Law of the Sea -Opened for signature 10 December 1982. -Entered into force 16 November 1994.	To set up a comprehensive new legal regime for the sea and oceans. To include rules concerning environmental standards as well as enforcement provisions dealing with pollution of the marine environment.	-Antigua and Barbuda signed 7 February 1983. -Ratified 2 February 1989.

Title	Objectives	Comments
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal -Opened for signature 22 March 1989. -Entered into force 5 May 1992.	To reduce transboundary movements of wastes subject to the Convention to a minimum consistent with the environmentally sound and efficient management of such wastes. To minimize the amount and toxicity of wastes generated and ensure their environmentally sound management as closely as possible to the source of generation. To assist LDCs in environmentally sound management of the hazardous and other wastes they generate.	-Antigua and Barbuda signed 5 May 1993.
Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (London Convention) -Opened for signature 29 December 1972. -Entered into force 30 August 1975.	To control pollution of the sea by dumping and to encourage regional agreements supplementary to the Convention.	-Antigua and Barbuda is a contracting party.
Kyoto Protocol to the United Nations Framework Convention on Climate Change -Opened for signature 16 March 1998. -Entered into force on 16 February 2005	To further reduce greenhouse gas emissions by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries.	-Antigua and Barbuda signed 16 March 1998. -Ratified 3 November 1998.
Protocol of 1978 Relating to the International Convention for the Prevention of Pollution From Ships, 1973 (MARPOL) -Opened for signature 17 February 1978. -Entered into force 2 October 1983.	To preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge of such substances.	-Antigua and Barbuda is a contracting party.
United Nations Framework Convention on Climate	To achieve stabilization of greenhouse gas concentrations	-Antigua and Barbuda signed 4 June 1992.

Change -Opened for signature 9 May 1992. -Entered into force 21 March 1994.	in the atmosphere at a low enough level to prevent dangerous anthropogenic interference with the climate system.	-Ratified 2 February 1993.

Adapted from: http://www.wifak.uni-wuerzburg.de/fact98/appd.html
http://www.cep.unep.org/law/cartstatus.html

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ Operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation

The operational objectives:

- To maintain CPUE at a level that is not significantly different than the previous 10 year average until further scientific info is available on the status of the resource (Note: turnover time for the conch resource is three years).
- To maintain capture production at a level that is not significantly different than the previous 10 year average until further scientific info is available on the status of the resource.
- To maintain depth dives at a level that is not significantly different than the mean depth of the Antigua and Barbuda shelf.
- To reduce the risk associated with decompression sickness associated with SCUBA diving through certification of all divers over five years.
- To maintain the mean five-year production value (in constant prices) per fisher at a level that is not significantly less than the previous 10 year average until further scientific info is available on the status of the resource.
- To maintain marketable meat weight at a level that is not significantly different than the previous 5 year average until further scientific info is available on the status of the resource (Note: only 5 years of data is available).
- To maintain non-compliance levels with respect to the marketable meat weight at a level at or below 15 percent.
- To ensure certain critical habitats for conch is protected from exploitation and degradation until further scientific info is available on the status of the resource and the environment (total area of marine reserves to be declared as info on habitat become available – possibly 5 percent due to the fact that other management measures are employed).

❖ Indicators that are or could be used to measure the performance of the fishery management relative to the objectives

The indicators that are used:

- annual CPUE;
- annual production;
- annual mean depth dived by SCUBA divers;
- percentage of diver holding PADI Certification;
- number of fishers reporting with decompression sickness;
- mean five-year production value (in constant prices) per fisher;
- annual production;

- mean annual marketable meat weight;
- percentage of the marketable meat weight below the legal requirement (225 grams);
- habitat map and monitor change and habitat area and quality; and
- area of marine reserve declared relative to the total availability of the various type of habitat (e.g., sea grass beds, algal plains).

The indicators that could be used:

- Indicators of quality of reserve – recreational water quality parameters; sea grass densities; conch densities; etc.

❖ **Reference points that are/could be used to define acceptable and unacceptable performance of the fishery (i.e. target and limit reference points where applicable)**

Reference points could be based on historical levels, and be estimated using information derived from fisher interviews and/or past 10 year average of available data.

4. DATA REQUIREMENT AND MONITORING SYSTEM

❖ **Type of data collected and the characteristics of the monitoring system**

Description of Data	**Unit of Measurement**	**Years available***	**Sampling procedure (including frequency of sampling, percentage coverage, raising procedures, etc.)**
Landings	Grams of marketable meat (digestive gland removed).	Prior to 1995 the quality of data uncertain.	Sampling programme for active conch fishing vessels. Target at least 5% of the estimated total number of trips. In 2004, 15.7% of the estimated total number of trips sampled. Total landings determined by using raising factors.
Fishing effort	No. of vessels. No. of SCUBA divers. No. of tanks used. No. of dives.	Data from 1995 to present.	Sampling programme for active conch fishing vessels. Target at least 5% of the estimated total number of trips. In 2004, 15.7% of the estimated total number of trips sampled.
Mean meat weight	Grams of marketable meat (digestive gland removed).	Data from 1995 to present.	Sampling programme for biological data. Target at least 5% of the estimated total number of trips.
Size frequency (weight)	Yes.	Data from 1995 to present.	Sampling programme for biological data. Target at least 5% of the estimated total number of trips.

Stock densities estimated by surveys	No. of individuals/ha.	1999 (but only for a very limited area of the shelf).	Belt transect – 34 sites randomly sampled from 4 zones (sand/algal; coral rubble; sand and reef). Area sampled: 0.05%.
Trade - mass - value	-Yes. -Yes.	Fairly good data prior to 1997 – the European Community harmonisation of their food safety legislation and CITES trade sanctions resulted in an increase in the number of alleged case of illegal trade.	Export warrant and health certificate have to be signed by the CFO.

Landings data for queen conch is available digitally up to the year 2004.

5. DATA ANALYSIS

❖ **Types of assessment models or other approaches used to evaluate the status of the resource and to assess the impact of harvesting strategies**

Year	Model or method used	Data used	Summary of Results and conclusions (include references to reports and document)
1999	1. Cadima Model. 2. Schaefer Model. 3. Fox Model. 4. Next Fully. Recruited Year Class.	-----	Overall densities of adults (3.7 conch/ha) was low in study area – Cades Bay Marine Reserve was established as a result (CARICOM Fishery Report No. 7, 2001).
1999	Morphometric analysis of two stocks using simple linear regression, t-test for difference of means, Chi-square Goodness-of-fit test.	-----	Horsford (1999).
2004	Trend analysis/ANOVA: mean CPUE, mean depth dived, mean marketable meat weight.	Catch and effort and biological data.	No significant negative trend regarding CPUE, depth dived or meat weight (Horsford, 2004).

❖ **Consideration of major uncertainties in data and assumptions**

Because of financial constraints the 1999 conch abundance study took a "worst-case" scenario (i.e. focused on an area that has been traditional fished) hence if area-based extrapolation was to be used it would provide the most conservative estimate of the potential yield.

❖ **Who the reports were prepared for and whether and how they have been used to assist in management of the fishery**

Trend analysis data is prepared routinely for the department in order to monitor levels of harvest for the species. This data is also made available to the Food and Agriculture Organisation (FAO) to be added to their database as well as the Caribbean Regional Fisheries Mechanism (CRFM) offices. Both the morphometric analysis and conch abundance studies were completed as part of a CRFM funded conch assessment program.

❖ **Proposed alternative assessment methods (where necessary) that could be used to provide better information on the status of the resource or performance of the fishery and the data that would be needed for the alternative and what collection of the data it would entail**

In order to improve the management of queen conch stocks in the waters of Antigua and Barbuda it is necessary to repeat abundance surveys and morphometrics studies to cover a more representative area of the insular shelf.

6. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery**

Type of Control	Years Implemented	Description of i) the rationale for the control ii) the details of the control and iii) current level of restriction	Estimated effectiveness of control
Effort control (e.g., number of boats, number of gears, days fishing, etc.)	Not implemented (provision in draft regulations – Draft Fisheries Act had its first reading in the House of Representative in Jan. 2006).	i) To limit fishing effort; and ii) Special permits required to fish for conch and spiny lobster.	Efficient.
Export quotas (TAE)	Not implemented.	Can be an effective control of fishing effort if production is driven by export – prior to 1997, as much as 23.5% of the conch landings were exported to the French territories in the region.	-----
Minimum size/weight in the catch.	1990 – present.	i) To allow the juvenile at least one opportunity to reproduce; ii) Minimum length (18 cm), minimum weight (225 grams), + flared lip.	Very efficient, mean non-compliance (2001 – 2004) was 11.8%.
Gear specifications and restrictions	Not implemented (provision in draft regulations).	Sec. 52 (1d) of Draft Fisheries Regulation (2004) ban the use of hookah rig.	Efficient.
Seasonal (time) closures	Not implemented (provision in regulations); Implementation was agreed upon during the 2004 national fisheries consultation.	To protect spawning individuals – will probably coincide with Guadeloupe close season to reduce illegal trade.	Efficient.

❖ **Particular problems being experienced with the controls and any additional management controls that could be used in this fishery to achieve the fishery objectives**

Discuss with counterparts in neighbouring French territories ways in which we can collaborate to reduce illegal trade and the wider IUU fishing issues associated with other species (also incorporate strategy in NPOA to address IUU fishing).

7. ENFORCEMENT AND COMPLIANCE

❖ **Surveillance and monitoring systems in place to ensure that the requirements of the management system are in place, including methods used to enforce CITES regulations concerning exports of queen conch**

Surveillance and monitoring systems in place:

- scheduled patrols and inspections;
- monitoring of non-compliance using the existing biological data collection programme;
- database on breaches of the fisheries legislation (data analyse to maximize enforcement efforts);
- export warrants and health certificates have to approved by the CFO;
- CITES certificate have to be approved by local CITES Management Authority.

All of the above is coupled with education of fishers on the requirements of the fisheries legislation. Presently the programme is *ad hoc*; the Division hopes to have a formal programme as one of the requirements for registration of commercial fishers.

❖ **The types of sanctions and penalties that can be applied in case of non-compliance with the management control**

In general, offences are compounded, if there is no resolution using this avenue the alleged offender is taken to Court.

Compounding of Offences in Antigua and Barbuda

Offences	Fines	Repeated Offences	Sec. of Regulation	Maximum Fines
Take, sell, purchase or have in possession immature conch	XCD 20 (US$7.41) each	Taken to Court	Sec. 22 (1)	XCD 5 000 (US$1 852) or imprisonment of 12 months

❖ **Current limitations of the enforcement system**

The major limitations of the enforcement system are mainly budgetary and manpower. With respect to the new ISPS Code much of the resources of the coast guard are geared toward meeting these requirements and drug interdiction. A formal MOU is probably needed between the Fisheries Division, coast guard and customs as well as having the cooperatives participate in the process. Education of fishers is also important to improve compliance.

❖ **Available information on the nature and extent of illegal harvest and trade**

The following summarises the level of non-compliance with respect to landing of queen conch (Note: the year with the lowest level of non-compliance corresponds with the year that the Fisheries Division

and the coast guard had the most patrols and inspections). Data is also collected on breaches of the fisheries legislation to improve enforcement efforts.

Estimates of the level of non-compliance with respect to queen conch landings in Antigua and Barbuda.

Year	Sample Size	Meat Weight (grams)		Minimum Legal Weight (grams)	Percentage of Sample Below Legal Weight
		Average	**Standard Deviation**		
1999	**155**	**348.3**	**60.7**	**225**	**1.3%**
2001	**73**	**294.8**	**73.2**	**225**	**16.4%**
2002	**176**	**309.2**	**80.0**	**225**	**11.9%**
2003	**246**	**288.6**	**72.0**	**225**	**20.7%**
Oct. 2004	**434**	**317.6**	**74.9**	**225**	**8.5%**

❖ **Comments on whether the fishery could be considered consistent with the national legislation and international agreements**

The latest update of the Fisheries Act and Regulations brings the fishery in line with national legislation and international agreements. There has been a shift in policy from one of "open access" to "limited access" to ensure the long term sustainability of resources. Ecosystem-based approaches to fisheries management as well as the "precautionary principle" are cornerstones of the revised legislation. These changes also bring the fishery in line with other subregional initiatives aimed at ensuring a "sustainable approach" to development of the economies of OECS Member States (The St. George's Declaration).

8. DECISION –MAKING

❖ **Departments or institutions with management responsibility in this fishery, area of responsibility and interactions**

The Fisheries Division is responsible for managing all aspects of the resource (from managing production to the issuing of health certificates and approval of export warrants). The Division is also the local Scientific Authority for CITES.

The Environment Division is the local CITES Management Authority.

❖ **The use of scientific information in decision-making**

The latest review of the Fisheries Act and Regulations took into account results from the department's monitoring programmes.

❖ **Existing decision-rule or procedure for establishing how harvesting should be modified in light of monitoring results**

The Fisheries Advisory Committee as legislated in Fisheries Regulations is the body responsible for advising on fisheries management and development in Antigua and Barbuda. The Act also outlines the

need to develop fisheries management and development plans for each fishery in Antigua and Barbuda.

❖ **Reviews and adjustments of management controls**

The newly completed Fisheries Act and revised regulations have placed the provision for allowing effort control to the conch fishery.

❖ **Mechanisms in place for consultation with stakeholders**

The Fisheries Act and Regulations make provision for the establishment of a Fisheries Advisory Committee by the Minister with responsibility of Fisheries. This committee should be comprised of representatives of fishermen's organisations as well as Chief Fisheries Officers and other appointed officers. The Fisheries Division also conducts large stakeholder consultations at such time when this is deemed necessary for gathering stakeholder views on developing issues in the Fishery sector. Such consultations were conducted during the revision of the Fisheries legislation and during the establishment of Marine Protected Areas.

❖ **Mechanisms for resolution of disputes within the fishery**

Fishers seeking dispute resolution may approach the Chief Fisheries Officer who would then work towards reaching a settlement.

9. FEEDBACK AND REVIEW

❖ **Procedures for undertaking regular reviews of management systems**

Such reviews of the management system would fall under the purview of the Fisheries Advisory Committee which is expected to advise on a range of matters including:

- The plan for the management and development of fisheries in Antigua and Barbuda waters and on each review of the plan
- The need for amendment to the Act or any regulations
- The coordination of the policies and activities of Government Departments and ministries with respect to such matters

❖ **Mechanisms used for consultation to receive feedback from and consult with stakeholders**

Current mechanisms for stakeholder consultation are done as need arises when there are new developments in the Fisheries sector. At such time the department organises stakeholder meetings.

❖ **Use of scientific information in management reviews**

The latest review of the Fisheries Act and Regulations took into account results from the department's monitoring programmes.

❖ **Information on last review of regulations**

The Fisheries regulations were reviewed in 2003 and 2004 with the cooperation of the FAO. With the passage of the Fisheries Act in November 2006 the Fisheries Division will undertake a second round of consultations with stakeholders to look a the Fisheries Regulations before they are formally gazetted.

❖ **Research planned or undertaken to improve management of the fishery for queen conch or to meet specific requirements of the management plan**

Antigua and Barbuda has signed on to be part of a CRFM initiative for the conduct of conch abundance surveys throughout the region.

❖ **Use of external reviewers in the review of the management system**

Antigua and Barbuda routinely participates in regional meetings organised by the CRFM to review and assess the status and management of fishery resources throughout the region.

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COMMONWEALTH OF THE BAHAMAS

Lester Gittens and Edison Deleveaux[1]

1. BACKGROUND

❖ Description of the fishery

The conch commercial fishing industry is based primarily on the Little Bahama Bank and areas found in the northern and central sections of the Great Bahama Bank. Cay Sal Bank is also beginning to emerge as a major conch fishing ground. Within these areas, fishing, which is primarily done with the aid of the air compressor, takes place between the depth range of 30 ft – 60 ft due to the use of the device being prohibited at depths outside of this range. SCUBA diving is outlawed for commercial fishing.

A fisheries census conducted in 1995 showed that there were approximately 9 300 fulltime fishers and over 4 000 small boats and vessels. The dinghy is the main type of vessel used in the conch fishery. In some instances these small vessels (< 20 ft long) work in conjunction with a larger motorized vessel that acts as a base for operations.

Due to the low monetary value of conch (approximately US$3/lbs) compared to spiny lobster (approximately US$15/lbs), fishing effort for conch is relatively low for the eight months of the year that the spiny lobster fishery is open. Conch is targeted mainly during the seasonal closure of the spiny lobster fishery with over 2/3 of conch landings taking place during this four month period.

The queen conch is primarily collected by hand while diving (air compressors and free diving) and is landed in the shell or as frozen meat in bags.

The conch fishery is of great socioeconomic importance. It helps to provide employment especially during the seasonal four month closure of the lobster and turtle fisheries and helps to provide much needed low fat protein in the diet of Bahamians. The vast majority of the conch which is landed is consumed locally. The total monetary value of conch meat landings has increased gradually since 1978 while total export value has fluctuated without an obvious trend since commercial exports were first allowed in 1992 (Figure 1).

Significant external impacts on the fishery have resulted from the activities of foreign commercial and recreational poachers. Significant amounts of conch are lost to poachers annually. Efforts are being made to increase the monitoring, control and surveillance (MCS) capabilities of the Royal Bahamas Defence Force, the country's primary marine interdiction agency as well as the Department of Marine Resources to combat this circumstance.

[1] This draft management plan represents only the opinion of the authors: Lester Gittens and Edison Deleveaux Dept. of Marine Resources, Bahamas.

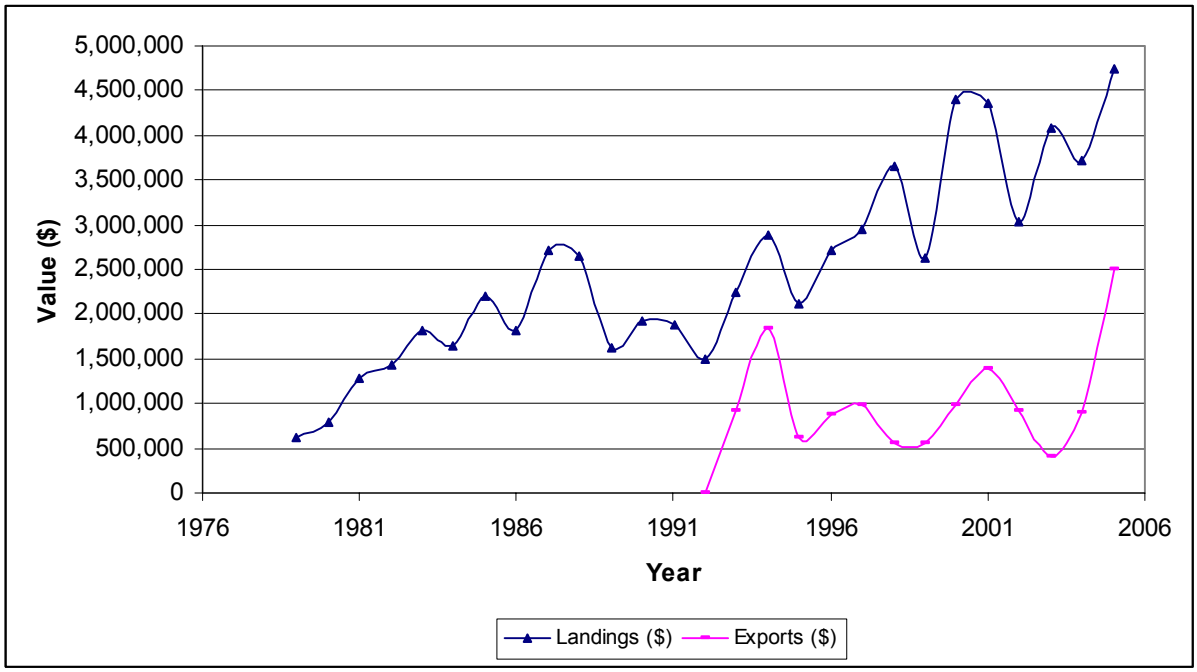


Figure 1 – Total Value of Conch Meat Landings and Exports in the Bahamas (Bahamian Dollars (BS$))

❖ **Description of the resource**

The queen conch grows in length, meat weight and shell thickness until it reaches sexual maturity. At the onset of sexual maturity it stops growing in length and meat weight however, the lip of the shell starts to develop. The presence of a flared lip indicates that a queen conch is mature.

In the Bahamas the mean meat weight of adult conchs is not larger than that of juvenile conchs in the size range that fishers seek to harvest. In general, the queen conch is known to reproduce during the warmer months of the year.

In 1997 and 1998 conch were abundant in three of the major conch fisheries. Levels of abundance were also similar among the fisheries (Ehrhardt and Deleveaux 2000).

Up to 2004, the fishery as a whole is considered stable based on landings and catch per unit effort. However, there are signs of localized depletions near population centres (Gittens and Hoenig in press).

❖ **Analysis of the situation and any problems faced at present in the management of queen conch fisheries**

Problems faced in the management of queen conch fisheries in the Bahamas arise out of the Bahamas having vast and multiple conch fishing grounds. Although having such extensive fishing grounds is good in terms of resistance to overfishing it is a nightmare in terms of providing proper management in relation to enforcement and accuracy of stock assessments. Because of this, the management approach has been largely precautionary.

Specific enforcement problems that exist include the harvesting of juveniles, use of compressors without a license, use of the air compressor at depths outside of the stipulated range and poaching by foreigners. While progress has been made in these areas they still remain the object of much of the Department's enforcement activities.

Specific problems with regards to accuracy of stock assessment are that the resources are not available to collect the ideal data that would be required to fully inform management decisions. The unavailability of these resources is not necessarily because of the government's lack of concern about the fishery; it is largely related to the tremendous amount of resources required to assess the fishery. The Bahamas is forced to utilize innovative ways of assessing the fishery and outside assistance.

An additional management issue is that the conch fishery cannot be considered in isolation. While the Department of Marine Resources would like to institute a closed season during the duration of peak spawning, it must be considered that the peak spawning period of conch is inclusive of the four months that the spiny lobster fishery and turtle fisheries are closed which would thus leave very few alternatives to fishers.

Benefits to be gained from improved enforcement and stock assessments include a decrease in the chance that overfishing will occur and an improvement in the overall health of the fishery and the ecosystem. In addition improved accuracy of stock assessments would help to ensure that the fishery is not unnecessarily limited as could occur with precautionary management measures.

2. POLICIES AND LEGISLATION

- **Policies that set out the principles on which the fishery for queen conch is managed**

The overall management goal for Bahamian fisheries is to ensure that Bahamian fisheries resources are utilized to provide the maximum socio-economic benefit for Bahamians without negatively impacting fishery stocks on which the fisheries are based. Only Bahamian citizens can take part in commercial fishing unless the individual is in possession of a spousal permit or a work permit that specifically allows fishing.

The management objective for the conch fishery is to ensure that conch is harvested in a sustainable manner while attempting to meet local demand firstly and foreign demand secondly. Expansion of the fishery to supply the export market is desirable; however, this is only to be done when it has been scientifically shown that exports will not diminish long-term availability on the local market especially with regards to food security needs.

- **The legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch**

Bahamian legislation affecting conch fisheries include the Fishery Resources (Jurisdiction and Conservation) Act 1977, the Wildlife Conservation and Trade Act 2004, and the Archipelagic Waters and Maritime Jurisdiction Act 1993. The Wildlife Conservation and Trade Act 2004 was enacted to further incorporate CITES into local law.

With regards to the Fishery Resources (Jurisdiction and Conservation) Act 1977 and the Wildlife Conservation and Trade Act, enforcement is the responsibility of the Department of Marine Resources, The Royal Bahamas Defence Force, The Royal Bahamas Police Force and The Customs Department. In addition, Agricultural officers are empowered to conduct enforcement according to The Wildlife Conservation and Trade Act 2004. The Department of Marine Resources is the scientific authority in relation to CITES whereas the Department of Agriculture is the Management Authority.

- **International Conventions and Agreements ratified by the country that are of direct relevance to the fishery how they affect the management of the fishery**

International Conventions and Agreements ratified by the Bahamas that are of direct relevance to the conch fishery include CITES. CITES affects the management of the fishery through the Wildlife Conservation and Trade Act 2004. In addition, the recommendations promulgated by the CITES

Animals Committee in Notification 2003/057 have resulted in greater emphasis being placed on the proper management of the fishery. This has resulted in improved documentation and control of queen conch export products as well as a greater sense of urgency with regards conducting stock assessments and enforcement activities.

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **Operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

a) Monitor and control the landing of conch.
b) Ensure that enough conch is available to supply the local market.
c) Ensure that fishers are able to live at an acceptable standard based on fishing for conch.
d) Ensure that recruitment overfishing and growth overfishing do not take place.
e) Ensure that appropriate habitat abundance and quality are available.
f) Ensure long-term survival; maintain genetic diversity.

❖ **Indicators that are or could be used to measure the performance of the fishery management relative to the objectives**

1. Total landings.
2. Total consumption.
3. Earnings by fishers.
4. Densities by habitat or CPUE or landings (ideally by fishing ground) or harvest per hectare.
5. Quality and quantity of conch habitat.
6. Flare of the lip, Lip thickness, maturity based on uncleaned meat.

❖ **Reference points that are/could be used to define acceptable and unacceptable performance of the fishery**

The reference points below are listed according to the indicators in the latter statement. For example 1 in the latter statement corresponds to 1 below, while 2 above corresponds to 2 below.

1. 100 percent coverage.
2. 100 percent of the local market is satisfied.
3. 100 percent of the local market is satisfied.
4. Average annual earnings over the last 10 years.
5. Density > 50 – 200/ha, 80-100 percent of CPUE in the late 1980s.
6. 100 percent of conch habitat protected from coastal developments and other fisheries.
7. 15 percent of catch consists of juveniles.

4. DATA REQUIREMENTS AND MONITORING SYSTEM

❖ **Type of data collected and the characteristics of the monitoring system**

Description of Data	Unit of measurement	Years available*	Sampling procedure (including frequency of sampling, percentage coverage, raising procedures, etc.)
Landings	Pounds of meat.	1979-2005 (digitised).	Data accumulated from processing plants purchase reports and also interviews and inspection of landings of fishers. Fishers sometimes estimate their landings or the

			interviewer estimates that large conchs are 0.5 lbs whereas small ones are 0.25 lbs. Much of the landings are not captured but this is not quantified.
Fishing effort	Days fishing, number of men, number of boats.	1988-2005 (digitised).	Collected during interviews mentioned in **Landings** above. Total effort is unknown, however, for up to 30% of landings the effort data is available.
Mean meat weight	Pounds of partly processed and unprocessed meat weight.	1997-1998 for 3 major landing sites (digitised). 1999-2001 for one major landing site (digitised). 2003-2005 for one major landing site (digitised).	Inspection of landings. Percentage coverage is unknown but is known to be low in terms of the entire fishery for 1999-2001 and 2003-2005.
Size frequency	Lip thickness and shell length.	1997-1998 for 3 major landing sites (digitised). 1999-2001 for one major landing site (digitised). 2003-2005 for one major landings site.	Inspection of landings. Percentage coverage is unknown but is believed to be representative of the fishery in 1997-1998. There was low coverage in 1999-2001 and 2003-2005.
Trade - mass - value	Pounds of meat for local market; Pounds of meat and number of shells for export market; Value of trade in BSD (Bahammian Dollar) also recorded.	1978-2005 (digitised).	Collected by interview of fishers and processing plant purchase reports.
No of fishers - full-time - part-time	Total in Bahamas.	1995.	Interviews.

❖ **Other data that should be collected to monitor the status of the resource or performance of the fishery**

1. Improved estimates of local consumption are needed. This includes what is sold to hotels, what is consumed for subsistence.

2. Information on the state of the habitat including the amount of degradation allowed for development purposes.
3. Earnings from hotels, restaurants and sales other than processing plants.

5. DATA ANALYSIS

❖ **Types of assessment models or other approaches are used to evaluate the status of the resource and to assess the impact of harvesting strategies**

Year	Model or method used	Data used	Summary of Results and Conclusions (include references to reports and document)
1997-1998	Tuned weight based cohort analysis.	Mean meat weight.	Conch is abundant on the 3 major conch fisheries analyzed. Analysis of fishing grounds on an individual basis is best (Ehrhardt and Deleveaux, 1999).
1988-2004	Catch per unit effort and landings trends.	CPUE and landings.	Fishery is stable as a whole with localized depletions (Gittens and Hoenig, *In press*).

❖ **Comments on how the assessments take into account major uncertainties in data and assumptions**

For Gittens and Hoenig (*in press*), total fishing effort was unknown. Estimates of effective effort were used instead.

❖ **Who the reports were prepared for and whether and how they have been used to assist in management of the fishery**

The report by Ehrhardt and Deleveaux was prepared for the Department of Fisheries. This report helped to refocus the Department's efforts with regards to preventing the harvest of juveniles.

The report by Gittens *(in press*) has not been used to inform management decisions as yet. This is mainly due to the conclusions on the research still being finalized.

❖ **Proposed alternative assessment methods (where necessary) that could be used to provide better information on the status of the resource or performance of the fishery and the data that would be needed for the alternative and what collection of the data it would entail**

Use of a composite surplus production dynamic model is an alternative that seems possible for the fishery. Data needed includes total landings and effort data specific to each fishing ground. Collection of the data would entail interviewers or inspectors being present at a much greater proportion of landing sites than at present. This would entail the hiring of new staff. The staff would also need to be competent in the collection of data.

6. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery**

Type of Control	Years implemented	Description of i) the rationale for the control ii) the details of the control and ii) current level of restriction	Estimated effectiveness of control
Minimum size/weight in the catch	1977-present.	Presence of a well defined flared lip indicates maturity has been attained; Easy for fishers to utilize in the field.	Fairly effective.
Gear specifications and restrictions	1. SCUBA banned 2.compressors only between 30ft and 60ft in depth and not during April 1st- July 31st.	SCUBA: If allowed would make it easier to overfish the resource due to high efficiency. Compressors: Below 30 ft not necessary because of free diving ability and greater likelihood of encountering juveniles in lobster fishery. Resources over 60ft in depth would be largely protected. Banning during April – July. Arose because lobster fishery is closed during that time and this gear was initially introduced to harvest lobster.	SCUBA: Very effective Compressors: problematic in terms of monitoring and prosecution.
Protected areas (indicate the percentage of the stock area under protection)	1986 – present. Percentage of stock unknown.	Implemented to protect a number of coastal and marine of commercial and non-commercial value.	Very effective within the boundary but too small in relation to entire Bahamas.
Export Quota	1993 – present.	Implemented to discourage and control growth of the fishery to supply the export market.	Effective.
CITES Permit for exports of conch and its by-products	2004- present.	Improves monitoring and control of the fishery.	Effective.

❖ **Comments on any particular problems being experienced with the controls and any additional management controls that could be used in this fishery to achieve the fishery objectives**

With regards to gear restrictions, it has been particularly challenging to limit the maximum depth for use of compressors to 30-60 ft. The manpower is not available to effectively accomplish this task. It is also problematic to prosecute.

Concerning the harvesting of juveniles, a portion of the conch fishery does not land conch in the shell. Inspectors are therefore unable to determine if the conchs concerned had a flared lip.

Additional management controls that could be used for the fishery include:

1. Implement a closed season.

2. Impose a complete moratorium on the harvesting of queen conch by all foreign sport/recreational fishers unless it can be shown that their harvests are sustainable.
3. Increase the number of protected areas.
4. Do not allow compressors to be used to harvest conch throughout the year.
5. Do not allow the harvest of conch around major population areas.
6. Conch meat is only to be cleaned on shore to allow for maturity to be determined.
7. Control coastal development that negatively affects conch habitat especially those that directly affect it.
8. Implement a closed season during the same time as countries that poach in Bahamian waters
9. Only allow the export of conch meat when the local market is satisfied.
10. Eliminate duty free imports for fishers.
11. Introduce educational programmes targeting fishers that target specific problems.

Problems with implementing a selection of the additional management measures:

1. The main pillar of the Bahamian economy is tourism. It would be difficult to decide not to allow foreign recreational fishers to harvest conch while they are present in the country.
2. It needs to be borne in mind that the presence of meat from an individual conch does not mean that the conch it was harvested from did not have a flared lip. This is because a percentage of conchs with flared lips may not be mature.
3. Would require a paradigm shift because fishing is still viewed by many as an area to seek employment if all else fails.

7. ENFORCEMENT AND COMPLIANCE

❖ **Surveillance and monitoring systems in place to ensure that the requirements of the management system are in place, including methods used to enforce CITES regulations concerning exports of queen conch**

Surveillance near major population centres for enforcement purposes is largely done by the Department of Marine Resources by way of patrol crafts and automobiles. In more remote areas where there is no or limited presence by the Department there is greater reliance on police officers, customs officers and defence force officers. This is especially so in the southern Bahamas where the Defence Force has been responsible for apprehending virtually all foreign poaching vessels.

❖ **Types of sanctions and penalties that can be applied in case of non-compliance with the management controls**

Non-compliance with management controls can result in fines not exceeding BSD3 000 or imprisonment not exceeding one year or both under the Fisheries Act. Contravening the Wildlife Conservation and Trade Act 2004 can result in a fine up to BSD100 000 and imprisonment up to one year.

❖ **Comments on the current limitations of the enforcement system (budgetary and other factors) and on the potential measures that could be used to improve compliance**

A major limitation with the enforcement system is that there is limited manpower within the Department of Marine Resources. In addition the Defence Force has placed higher priority on other issues such is illegal migration and the illegal drug trade.

However, improvements are expected in both agencies in the near future. The Department of Marine Resources will soon acquire additional staff. Both agencies are in the process of acquiring additional patrol crafts.

The challenge with implementing the ideal closed season is that the peak in conch spawning overlaps with the closed season for turtle and lobster thus leaving fishers with little alternatives if the conch fishery is closed as well. In addition, fishers in general have had to deal with the hardships of recently implemented closed grouper seasons and the devastation resulting from a number of hurricanes.

- **Information that is available on the nature and extent of illegal harvest and trade and the best estimates of the extent of illegal harvest and trade**

Information available on the nature and extent of illegal harvest is limited to information gleaned during individual arrests and prosecutions. There are no estimates of total illegal harvests.

- **Comments on whether the fishery could be considered consistent with the national legislation and international agreements**

The precautionary management measures and assessments of the fishery completed make it likely that the fishery is being managed in a sustainable manner as is called for by local legislation and international agreements. However, there is much room for improvement. Additional precautionary measures would help to further ensure the long-term viability of the commercial fishery.

8. DECISION-MAKING

- **The departments or institutions with management responsibility in this fishery, described also by their area of responsibility and interactions**

The Department of Marine Resources, the Department of Agriculture, the Royal Bahamas Defence Force, the Royal Bahamas Police Force and the Customs Department are all mandated to manage the fishery in terms of enforcement.

In relation to other aspects of management in relation CITES, the Department of Marine Resources has the role of the scientific authority whereas the Department of Agriculture is the Management Authority.

The Dept of Marine Resources is responsible for the other aspects of management not related to CITES.

- **The extent of and the way in which scientific information is used to help in decision-making**

The best information available is considered and incorporated into recommendations put forward to the Permanent Secretary and to Cabinet by The Department of Marine Resources. As a part of this process The Department considers the most practical way to make use of the scientific information, for example, if conch are known to spawn from April through October and it is deemed necessary to have a closed season to enhance spawning activities then a recommendation The Department may put forward would be for the closed season to encompass August September and October because the closed season for lobster and turtle is in place from April through July.

Most decisions made to date have been precautionary because of the general lack of detailed scientific information in such a vast and complex fishery.

- **Existing decision-rule or procedures for establishing how harvesting should be modified in light of monitoring results**

No decision rules are employed.

- **The frequency of review of management controls and adjustments considered, and which Departments or institutions are doing the review.**

Management controls are constantly being reviewed by the Department of Marine Resources. Adjustments are also constantly being considered by the Department of Marine Resources, the Permanent Secretary under which the Departments falls. With major adjustments such as the new implementation of a closed season Cabinet makes the final decision, however, few recommended adjustments receive Cabinet's attention.

- **Mechanisms in place for consultation with stakeholders**

Consultations with stakeholders usually take the form of a workshop or town meetings.

- **Mechanisms for resolution of disputes within the fishery**

There is no hard and fast mechanism for resolution of disputes other than the court system. An avenue that is sometimes effective is for a stakeholder or stakeholders to write too or visit one of the decision makers within the Ministry.

9. FEEDBACK AND REVIEW

- **Procedures for undertaking regular reviews of management systems**

Regular reviews take place but not on a particular schedule. They are done at different levels involving varying participation levels of the Minister responsible, the Permanent Secretary, the Director of Marine Resources and technical staff.

- **Mechanisms used for consultation to receive feedback from stakeholders, and stakeholders consulted**

Town Meetings and Workshops are used to receive feedback from stakeholders. Stakeholders consulted usually include prominent fishers, processing plant owners, NGOs, higher education institutions and other government agencies that manage other aspects of the environment.

- **Use of scientific information in management reviews**

The majority of management recommendations take scientific information into account. Depending on the matter being considered and the technical knowledge of the reviewers, a scientist familiar with the latest scientific information available may present the scientific information.

- **Information on last review of regulations**

The last change in policy to take place occurred in December 2005 when the need to have a CITES Export permit was extended to include all non-commercial exports of conch meat. The last review took place in April 2006.

- **Research planned or undertaken to improve management of the fishery for queen conch or to meet specific requirements of the management plan**

A conch abundance survey is planned in order to determine densities at major conch fishing grounds.

The most recent research to be completed took place at the 2nd Annual CRFM Scientific Meeting in March 2006. The aim of the research was to explore what could be done with data already collected by The Department of Marine Resources especially with regards to determining the status of the fishery.

In 2003 and 2004, research was undertaken to determine whether meat weight could be used as a management tool from a biological point of view. Meat conversion factors were also determined.

- **External reviewers used in review of the management system (in addition to CITES authorities under the Review of Significant Trade)**

The Caribbean Regional Fisheries Mechanism is usually consulted during reviews of the management system.

REFERENCES CITED

Deleveaux, V., Ehrhardt, N. 1999. Report on Assessment and management of the Queen Conch, *Strombus gigas*, fisheries in the Bahamas.

Gittens, L. & Hoenig, J. *In press*. The Caribbean spiny lobster (*Panulirus argus*) fishery of the Bahamas. Proceedings of the 2nd Annual CRFM Scientific Meeting.

BARBADOS

Stephen Willoughby[1]

1. BACKGROUND

Barbados does not have a commercial conch fishery; consequently, many of sections in the "Template of the Conch Management Plan" are not applicable.

❖ Description of the fishery

Anecdotal information and local knowledge suggest that:

1. Small quantities harvested opportunistically. Conch is mainly harvested in Barbados for their shells, which are polished and sold as curios mostly to tourists. The meat is usually consumed by the harvester or sold privately and not openly at markets.
2. There are not known harvester who depends mainly no harvesting conch for a livelihood.
3. Harvesting is mainly opportunistically.

Both established souvenir retail stores and itinerant salesman are involved in the sale of conch shells which tend to be imported.

❖ Description of the resource

Local conch populations are believed to be typically much smaller that those of neighbouring islands.

❖ Analysis of the situation and any problems faced at present in the management of queen conch fisheries

Since Barbados has no commercial conch fishery. Consequently, no resources were allocated to this resource in the past. The status of the resource is largely unknown.

2. POLICIES AND LEGISLATION

❖ Policies that set out the principles on which the fishery for queen conch is managed

The general policy for shell fisheries is the "optimum annual harvest to earn maximum economic benefits while conserving the resource in the waters of Barbados" – according to the 2004-2006 Barbados Fisheries Management Plan.

We recognized the importance of the conservation of the conch, that is why it was included in the Fisheries Management Plan and have committed some of our limited resources to:

a) The production of brochures and public awareness activities

b) Surveys to:
   - identify and map conch grounds;
   - determine stock densities; and
   - identify stakeholders and effort.

[1] This draft management plan represents only the opinion of the author: Stephen Willoughby, Chief Fisheries Officer, Fisheries Division, Ministry of Agriculture and Rural Development.

This information will inform decision-making on a strategy to deal with conch.

❖ **Legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch**

The Fisheries Act 1993-6 provides the making of management regulations and development of any fishery in the waters of Barbados.

A permit is required for export of conch shells to CITES member countries. The Ministry of the Environment is responsible for the issue of export permits.

❖ **International Conventions and Agreements ratified by the country that are of direct relevance to the fishery**

Barbados is signatory to the following relevant international instruments:

- 1982 United Nations Convention on the Law of the Sea (UNCLOS);
- The SIDS Plan of Action, Convention on International Trade in Endangered Species (CITES);
- Convention on Biological Diversity (CBD);
- Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartegna Convention; and
- International Convention on the Prevention of Marine Pollution from Ships (MARPOL).

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **The operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

Since there is no commercial conch fishery in Barbados, the objective for this fishery is different from those regional countries with commercial conch fisheries.

The immediate goal is determine the status of conch including location of resources and the level of the effort, market demand, export and imports. This work is in progress.

BELIZE

Mauro Gongora and Ramon Carcamo[1]

1. BACKGROUND

The queen conch (*Strombus gigas*) is a commercially-valuable fisheries resource, second only to the Spiny lobster (*Panulirus argus*) fishery in Belize. The conch has been Belize's second largest marine export commodity over the last three decades. The harvesting of this species has contributed significantly to the well-being of many fishermen and to the country's economy. The status of the queen conch in Belize is similar to the situation found in many countries in the region. The resource in the region has been reported as overexploited to the extent that many stocks have been depleted (CITES Report, 2003).

Conch production in Belize has been not stable but production records also show a gradual increasing pattern over the past 17 years from 245 000 lbs in 1989 to 633 000 lbs in 2005. The conch fishery is vibrant and still growing but management measures are being put in place to avoid over fishing of this resource. The growth pattern in the production volume is coherent with the results of a field survey carried out in 2003 when it was observed an increase of three (3) times the total abundance found in a similar study carried out in 1996. It must be noted that a large adult conch stock is found in deep water (>75ft) areas where the fishermen do not have access because of the prohibition of use of SCUBA gear for commercial fishing. Also, in 2003 a higher conch density was observed in fishing areas adjacent to the marine reserves in comparison with other areas located further away from the marine reserves boundaries showing that the coastal network of marine reserves is showing good results by helping to increase the abundance of conch in Belize .

On 10 August 2005, senior officials of the Ministry of Agriculture and Fisheries, Fisheries Department and representatives of the five fishing cooperatives met to discuss the conch quota for Belize for fishing season 2005/06. The fishing cooperatives' historical production volumes were reviewed and analysed over the last ten years. It was unanimously agreed that since conch production had shown a consistent yearly growth over the ten year period and that in 2003 the conch stock assessment report produced by Dr R. Appeldoorn (2003) showed that the Maximum Sustainable Yield (MSY) was between 600 000 and 700 000 pounds (the MSY using the Schaeffer Model was estimated at 324 metric tonnes or 712 601 lbs) then it was recommended that the production (catch quota) volume should be increased to 295.45 tonnes (650 000 pounds), representing an increase in the production volume of 23 percent compared to 2003. The meeting participants fully embraced and adopted the recommendations. As a result the Belize Fisheries Department increased the catch quota to 295.45 tonnes for the conch fishing season 2005/06. A conch production monitoring system was put in place to ensure that fishing cooperates comply with the agreement.

In 2005, almost 288 metric tonnes (633 070 lbs) were produced. This production level represented an increase of 1.7 percent compared to 2004 and is well below the established catch quota. The conch production volume represented 48.5 percent of the total production volume of the capture fisheries sector.

❖ Description of fishery and fleets

The queen conch fishery is still a commercially valuable resource second only to the lobster fishery. This species has been fished for over forty years for local sale and for the export market. Prior to the commercial harvesting, the queen conch was fished for subsistence only and today the fishery is classified as an advanced artisanal fishery in Belize. The increasing demand for the queen conch has

[1]This draft management plan represents only the opinion of the authors: Mauro Gongora and Ramon Carcamo, Belize Fisheries Department Belize City, Belize.

caused the over-exploitation of the fishery in many Caribbean countries. The fishery is seasonal and fishing is undertaken in all six fishing areas in Belize for nine months of the year (October 1 to June 30). Conch is harvested along the fore-reef, and the inner lagoons, and is fished exclusively by free diving. Divers harvest the conch at depths ranging between five (5) feet to seventy five (75) feet. Wooden sailing sloops measuring up to 30 feet are used in the conch fishery. These are equipped with sails and auxiliary engines (15–40 HP). They carry up to eight small canoes and as many as 11 fishermen and remain out at sea for 6 to 12 days.

Presently there are five fishermen cooperative operating in the country. These cooperatives are owned by Belizeans and employ about 123 employees who are responsible for processing, packaging and administration. In 2004, the fishing cooperatives exported 594 836 lbs. of conch meat to the USA. valued at US$ 2.9 million. This showed an increase in earnings of 40.4 percent compared to 2003. Tremendous fishing pressure has been placed on the conch fishery due to rising prices on the international market. Presently, there are over 1 800 registered part-time and full-time fishermen and 669 registered fishing vessels that are involved in the fishing industry.

❖ **Description of the resource**

In 1996, a queen conch abundance survey was conducted. The general objectives of that survey were to estimate conch abundance in the commercially important fishing grounds, to identify juvenile conch grounds for protection and to construct a baseline biological database. From the1996 survey it was determined that the population of legal size conch in Belize was 2 259 000 individuals (95% C.I. =1 570 000–3 760 000) at a mean weigh of 170 grams (6oz) per individual. The Maximum Sustainable Yield (MSY) was estimated to be approximately 190 000 kg (420 000 lbs). It was recommended that a conservative management approach be applied and that further studies be undertaken. It was also determined that the population was dominated by juveniles (approximately 70 percent) greater than 10 cm in length and that adults made up 20 percent of the population. The interpretation made at the time was that the there was the possibility that the population of queen conch in Belize is overexploited and running the risk of stock collapse due to poor spawning rates (Appeldoorn, 1996).

Another field survey of the queen conch population was carried out in 2001 at Glover's Reef Marine Reserve, Lighthouse Reef Natural Monument and the South Water Caye Marine Reserve. This consisted of quarterly population surveys in the no-fishing areas and in areas that area fished. The objectives of the investigation were to assess and monitor population dynamics, density distribution, population size and structure, and to determine habitat requirements of the queen conch. It was concluded from this investigation that the changes in population size and structure over time was an indication that a large number of juveniles continues to be taken from the fishery. This included both undersize juveniles and juveniles that are of legal size but are still sexually immature as was indicated by the shell lip thickness of the individuals. It was determined that at the Glover' Reef Marine Reserve from 1998 to 2001 the density of large adult queen conch in the protected area had increased by 200 percent and the exploitable biomass had increased by over 300 percent. It was further observed that the adult queen conch population in the fished areas had declined by 58 percent in the same period. This indicated that Marine Reserves are effective management tool for the protection, conservation and sustainable use of the queen conch (Acosta, 2001).

In 2003, the Belize Fisheries Department conducted a national assessment of the queen conch population in Belize. One of the conclusions was that the population of conch in Belize had increased by three times when compared to the results from the 1996 population assessment. This increase in abundance was significant in the Northern and Central fishing zones of Belize. It was also concluded that the no-take areas and deep water areas consisted of higher densities of conchs as compared to shallow fished areas. Another important result of the assessment was that it was demonstrated how the marine reserves were effective management tools because the marine reserves had higher abundance of adult conchs as compare to fished areas. The Maximum Sustainable Yield was calculated to be 712 601.1 lbs (range: 633 278–959 241 lbs).

❖ **Problems faced at present in the management of queen conch fishery**

The conch fishery has been open to access to all Belizeans since the inception of the sector in the early 1970s. In 2004, the Fisheries Regulation on licensing was amended to allow legal residents of Belize to obtain a fishing license and to fish for conch. Although conch production over the last 14 years has shows increasing trend, fishers' interviews reveal lower production in an individual basis. Economic difficulties in other productive sectors of the national economy, such as the sugar industry, have led many young sugarcane farmers to turn to fishing. The imminent loss of the preferential sugar markets in Europe and United States may create additional difficulties for sugarcane farmers and there is no doubt that many more will become fishers.

Even tough it is considered that the majority of conch harvested in Belize is sold to the fishing cooperatives in Belize there is a small number of independent fishermen and unlicensed fishers that sell conch directly to restaurants and hotels. This information is difficult to gather and is not reported in the statistical records held at the Fisheries Department. Another problem in the conch fishery is the illegal fishing done principally in southern Belize. The amount of conch illegal harvested by fishers from Guatemala and Honduras is unknown and the product is normally sold outside of Belize. The present data collection program has limitations in accurately capturing the catch and effort data produced at the Fishermen cooperatives. It has been observed that many times the purchase slips at the fishing cooperatives are not completely filled or the information does not reflect an accurate interview. Consistency of the situation could significantly affect the data used to assess the health of the fishery.

2. POLICIES AND LEGISLATION

❖ **Policies that set out the principles on which the fishery for queen conch is managed**

The National Agriculture and Food Policy Document 2002–2012 is the principal policy directive established by the Government of Belize in regards to agriculture and food issues. The national policy is directed at ensuring a sustainable supply of marine products, particularly, lobster, conch and shrimp. The present policy measures include minimum size, closed season and licensing requirements. It is acknowledged that the traditional fisheries have reached their maximum levels and alternative resources have to be revised so as address the economic lost from the traditional species. The major policy objective for the fishery sector is to maintain a sustainable yield of the fisheries resources while continuing to contribute to food production, foreign exchange earnings and to improved nutritional status in the long term.

❖ **The legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch**

The Fisheries Act Chapter 210 and Chapter 210s Revised Edition 2000 and subsequent statutory instruments constitute the principal Fisheries Laws and Regulations for the management of the fisheries of Belize including the conch fishery. The specific conch fishery regulations establish a minimum shell length of 7 inches, a minimum weight of partially processed ("market clean") conch meat of 3 ounces, a minimum weight of fully processed (filleted) conch meat of 2.75 ounces, a closed season extending from July 1 to September 30 inclusive in any year, diced conch is prohibited and recently a conch quota of 195 tonnes (650 000 pounds) per year was established. The same Fisheries Laws provide for the establishment of marine protected areas in which marine species are fully protected in conservation and preservation zones.

❖ **International Conventions and Agreements ratified by the country that are of direct relevance to the fishery**

Belize is a signatory and has ratified the following international conventions and agreements:

1 Convention for International Trade of Endangered Species (CITES) of flora and fauna.
2. Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartagena Convention.
3. Belize is also a member of the Caribbean Regional Fisheries Mechanism (CRFM) and OSPESCA (Spanish acronym for Central American Organization for Fisheries and Aquaculture Sector).

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **Operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

In December 2005, a National Plan of Action for the Management of Fishing Capacity (NPOA-Fishing Capacity) was prepared with the assistance of the Food and Agriculture Organization (FAO) of the United Nations (UN) and the Organization for the Fisheries and Aquaculture Sector of Central America (also known by its Spanish acronym as OSPESCA). The NPOA-Fishing Capacity focuses on the management of the commercially important fisheries resources including the queen conch. The Plan is currently being reviewed by the Ministry of Agriculture and Fisheries before its adoption and implementation.

The operational objective in the present plan for the management of the queen conch is to reduce or maintain the current fishing effort to allow maximum utilization of the conch stock of Belize. The implementation of the plan seeks to achieve the sustainable use of the resource to ensure a constant supply, maintain high biomass to produce high production volume and high economic benefits for the present and future generations of Belizean conch fishers. Neither indicators nor reference points are clearly articulated in the national policy but the enabling Fisheries Regulations establish a minimum shell length, minimum unprocessed, partially processed and fully processed conch meat weights in addition to a closed season and prohibition of use of SCUBA gear and possession of diced conch meat and a conch quota.

❖ **Indicators that are or could be used to measure the performance of the fishery management relative to the objectives**

Considering the serious lack of adequate resources to conduct costly field surveys to detect timely changes in the performance of the conch fishery, indicators such as average weight over time of partially processed conch (as delivered by fishers to fishing cooperatives' processing plant) and monthly or annual production volume could be adopted if funding was available as a guide of conch fishery performance.

Also, the establishment of a limit or total number and or a reduction in the number of fishers and size of the fishing fleet, an increase in the density and by extension an increase in the abundance of conch (in consideration of stable annual production volume assuming maintenance of current fishing efficiency and fishing effort) as well as an increase in the minimum legal size of the conch shell length are suitable indicators that should be adopted to monitor the performance of the conch fishery. These activities should be undertaken on an annual basis to identify any differences per year.

An increase or decrease in the average weight of partially processed conch meat and annual (or monthly) production volume could be used an indicators of the performance of the fishery management strategy. It is clear that a reduction in the average meat weight and decline in the production volume indicate overfishing of the resource. This information can be easily sourced both from data collected from landing sites and through field surveys carried out periodically to determine population structure, density, distribution and abundance should provide adequate information to monitor the status of the stock.

Considering the historical production volume over the last ten years should provide a good measure of average annual production. Any significant change in the average production should give an indication of stock situation. The conch quota (derived from scientific determination of Maximum Sustainable Yield estimate) has now been established at 650 000 lbs for Belize.

While it is still under revision, the intention of the NPOA-Fishing Capacity is to put a limit on the number of fishers and boats that can participate in the conch fishery. This is especially important in consideration of a possible shift in the labour force as a result of economic difficulties in other productive sectors of the national economy. The present plan also addresses those same issues and integrates the aforementioned suitable indicators.

❖ **Reference points that are/could be used to define acceptable and unacceptable performance of the fishery (i.e. target and limit reference points where applicable)**

The reference point in regards to fishing effort should be to maintain or reduce the maximum number of fishers to 2 200 and the maximum number of boats to 800 to participate in the conch fishery per fishing season per year.

The reference point in regards to abundance assuming that this is indicated by annual production volumes, considering the assumptions in the Indicators Section, should be set to a maximum production of 295 tonnes (650 000 pounds) of partially processed conch meat per year.

The reference point in regards to conch shell length should be to maintain or increase the legal minimum shell length to 17.8 cm or 7 inches.

4. DATA REQUIREMENT AND MONITORING SYSTEM

❖ **Type of data collected and the characteristics of the monitoring system**

The table below shows the type of conch data sets collected in Belize on a regular basis.

Description of data	Unit of measurement	Years available	Sampling procedure
Landings at Cooperatives	Pounds of market clean conch meat(>3 oz individuals).	1977–2005.	Monthly reports are gathered from five cooperatives.
Landings at Cooperatives	Pounds of fillet conch meat (>2.75 oz individuals).	2005–present.	Monthly reports are gathered from two main cooperatives.
Catch and effort data	Pounds of market clean conch(>3.0 oz). Days fished number of fishers & fishing zone.	2000–2005.	Monthly amassed from each cooperative.
Export quality data	Random sample of conch exported (> 3.0 oz).	2005–present.	Periodic inspection conducted at the two main cooperatives.
Annual underwater survey	Number of conchs and length found in MPAs.	2000–2005.	Survey conducted before and after the conch fishing is opened.

** All the data collected has been digitized in an Excel spreadsheet.*

❖ **Other data that should be collected to monitor the status of the resource or performance of the fishery (e.g. in order to provide an indicator for a particular operational objective)**

- Data should be collected from restaurants and hotels so to account for the unreported conch landed.
- Also it is important to gather socio-economic data on the importance of the conch fishery to fishers, their families, coastal communities and the nation.

It is recommended that more data collectors should be hired to increase the efficiently of the data collection program.

5. DATA ANALYSIS

❖ **Types of assessment models or other approaches used to evaluate the status of the resource and to assess the impact of harvesting strategies.**

Year	Model or method	Data used	Summary of results
1996	Logistic population model.	Underwater survey: Density, length, lip thickness and others.	MSY = 190 000kg (420 000 lbs), overexploited.
2003	Logistic population model.	Underwater survey: Density, length, lip thickness and others.	Population increased by three fold. MSY = 712 601.1 lbs (range: 633 278 – 959 241 lbs).

❖ **Consideration of major uncertainties in data and assumption**

It must be recognized that the visual under water assessment conducted in 1996 was restricted to the inner shallow reef system and the abundance quantification was also limited to those areas under investigation. It has been observed that a large number of conch inhabit waters greater than 200 ft (Alamia per comms).

However, the survey that was undertaken in 2003 was conducted during the open season and the data used to assess the population did not consisted of data taken from the closed season. This probably could have contributed to some results being biased.

❖ **Use of the assessment reports**

The stock assessment conducted in 1996 provided quantitative information about the conch abundance in the commercially important fishing grounds, identified juvenile conch grounds for protection and assisted in the construction of a baseline biological database.

In 2003 the Belize Fisheries Department conducted a national assessment of the queen conch population in Belize. It was also concluded that the no-take areas and deep water areas consisted of higher densities of conchs as compared to shallow fished areas. Another important result of the assessment was that it was demonstrated how the marine reserves are effective management tools, because it determined how marine reserves consisted of higher abundance of adult conchs as compared to fished areas. The data analysis was done in 2004 with the assistance of Richard Appeldoorne of the University of Puerto Rico and Susan Singh-Renton of the Caribbean Regional Fisheries Mechanism.

A full technical report was prepared and submitted to the Convention for International Trade of Endangered Species (CITES) of flora and fauna through the CITES Authority of Belize. The results

obtained and comparisons made to results of a similar survey done in 1996 are important because it helps to understanding of whether the resource management strategy has worked or not. In this case it was very clear that the resource status was in excellent condition and this was confirmed by the increasing pattern in annual conch production since the early 1990s. Those results obtained will be used again in 2006 after the completion of a national field survey for conch. The study will start in June 2006 and will run for four months.

❖ **Alternative assessment methods that could be used to provide better information on the status of the resource or performance of the fishery**

An alternative assessment model that should be used to assess the fishery would be Yield -Per-Recruit assessment. Yield per-recruit assessments focus on fishing mortality as the main indicator and control variable. In yield-per-recruit the aim is to find a fishing mortality level to achieve a particular level of yield for each conch recruited to the fishery. The yield can be adapted to convert to processed meat yield or value. This method allows size selectivity to be addressed. In general estimates of current fishing mortality and the size at first capture (or a full selectivity function) are required. Initial size is easy to obtain, but generally fishing mortality and selectivity can be difficult. Fishing mortality is usually related to fishing effort.

6. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery**

Type of control	Years implemented	Description of i) the rationale for the control ii) the details of the control and iii) current level of restriction	Estimated effectiveness of control
Catch quota (TAC)	2005 – present.	i) A TAC is established to maintain stock above the biomass of maximum sustainable yield; ii) TAC of 650 000 lbs (295 mt). This TAC will be maintained for 2006 but will vary depending on conch abundance resulting from future field surveys and estimates of MSY.	Efficient, but problems with illegal catch. The annual TAC will vary according to bi-annual MSY estimates from conch surveys.
Access control (e.g. limit number of licenses)	Proposed to be implemented through the National Management Plan proposed to start in 2007.	A maximum of 2 000 licensed fishers will be allowed to participate in the conch fishery. This will be done also to satisfy fisher's request.	The issuing of these licenses is strictly monitored and implemented but there is no guarantee that more fishers will not enter the fishery illegally.
Effort control (e.g., number of boats, number of gears, days fishing, etc.)	Proposed to be implemented. through the National Management Plan proposed to start in 2007.	A maximum of 800 licensed boats will be allowed to participate in the conch fishery. This will be done also to satisfy fisher's request.	The issuing of these licenses is strictly monitored and implemented but there is no guarantee that more fishers will not enter the fishery illegally.

Minimum size/weight in the catch	1977. 2005.	Partially processed conch meat – 3.0 ounces. Fully processed conch meat (fillet) – 2.75 ounces.	Will continue.
Gear specifications and restrictions	1977.	No SCUBA gear allowed for fishing.	Will continue.
Seasonal (time) closures	1977.	1 July to 30 September.	Occasional illegal fishing during closed season.
Protected areas (indicate the percentage of the stock area under protection)	1987.	First marine reserves established in 1987. Since then another 7 marine reserves with a total area of 150,839 ha have been established along the Belize barrier reef and in the atolls.	Conch resource is protected in 8 marine reserves, of which 5 are under direct management of the Belize Fisheries Department.
Diced conch meat	2005.	Prohibition of possession of conch diced meat will continue.	This measure discourages fishers from harvesting under-sized conch and selling on local market as legal conch.

7. ENFORCEMENT AND COMPLIANCE

❖ **Surveillance and monitoring systems in place to ensure that the requirements of the managements system are in place**

The Conservation Compliance Unit (CCU) is the law enforcement arm of the Belize Fisheries Department. The CCU carries out routine inspections of boats and fishers at sea and at restaurants, hotels and other business establishments on land. The Officers are lawfully authorized to enforce the Fisheries Laws and Regulations (Chapters 210 and 210s Revised Edition 2000) and any other legal binding legislation in the management of the marine resources.

In regard to conch exports, the Capture Fisheries Unit (CFU) of the Belize Fisheries Unit is responsible with the support of the CCU, to monitor all conch exports from Belize. The monitoring is done through inspections of all conch export shipments. The Belize Fisheries Department developed a conch inspection protocol that is followed during inspection process. In the inspection process of conch destined for export, officers attached to the CFU are required to randomly select and to open from 5 to 10 percent of all master boxes (boxes containing 10 – 50 lbs boxes of conch meat) and 1- 5lb box is taken out from each master box for detailed inspection. The frozen conch is allowed to thaw in order to gather weight measurements of all conch pieces in each box. The weight measurements are loaded on an Excel sheet, processed and analyzed.

The fishing cooperatives fully cooperate with the Fisheries Department. Conch shipments should not have more than 5 percent of partially processed conch weighing less than 3.0 ounces. So far, no conch shipment has ever been denied a CITES export certificate by the Fisheries Department but cooperatives are fully aware that if and whenever it happens an export certificate will be denied and the product will be confiscated and the cooperatives will be charged with possession of undersized conch meat.

A similar inspection protocol has been developed by the Fisheries Department for ground conch exports. Fishing cooperatives need to follow strict procedures before any conch fillet is ground in the processing plant. A Fisheries Officer is posted at the cooperatives during the entire grinding process to ensure full compliance with the newly established conch regulations. No problems have been encountered so far.

❖ **Types of sanctions and penalties that can be applied in case of non-compliance with the management control**

In the case that offenders are caught breaking the Fisheries Regulations, the Officer arrests the person(s) and charges them. The case is then presented in a Magistrate's Court, where fines and/or confiscation of products and equipment used to catch the fisheries product is decided. Normally, if the individual is found guilty then they are given a penalty fee as stipulated in the Fisheries Regulations. Some of the usually penalties are confiscation of products, gears and boat, as well as serving prison time.

A fisher found in possession of undersize conch meat could be fined BZD20- 30 per conch and is dependent on the discretion of the Magistrate. In addition, all fishing boats, gear, equipment and conch can be confiscated by the Magistrate Court and handed over to the Fisheries Department.

❖ **Current limitations of the enforcement system**

Presently, the current limitation that exists is the limited funding available to purchase fuel for the patrol vessels so to conduct patrols at the different fishing zones. But even with severe budgetary constraints the Department is able to execute fisheries law enforcement in a strategic manner both at sea and on land.

❖ **Information available on the nature and extent of illegal harvest and trade**

There is no available data on the extent of illegal harvest and trade in conch. This information is difficult to obtain since there are few resources available for monitoring and surveillance of this activity. In 2003, it was estimated that approximately 6 175 lbs of conch meat was confiscated and a total of 47 fishers were arrested. Also in 2004 it was estimated that 2 655 lbs of conch was confiscated and arrested 67 fishers. In 2005 an estimated 2 787 lbs of conch meat was confiscated.

❖ **Comment on whether the fishery could be considered consistent with national legislation and international agreements**

The management of the conch fishery is consistent with national legislation and in par with international agreements such as CITES.

8. DECISION-MAKING

❖ **Departments or institutions with management responsibility in this fishery, area of responsibility and interactions**

The Belize Fisheries Department is the government institution responsible for the management of the conch fishery. The Forestry Department is the CITES focal point. The CITES authority is comprised of officers from both Forestry and Fisheries Departments and other organizations. The Fisheries Department liaises very frequently with CITES authority regarding conch matters.

❖ **The use of scientific information in decision-making**

The information gathered from field surveys is critical for decision-making in regards to conch management. For example, the current conch TAC is based on scientific data produced from the MSY estimate derived from the field survey carried out in 2003.

❖ **Existing decision-rule or procedure for establishing how harvesting should be modified in light of monitoring results**

The conch (*Strombus gigas*) catch quota for Belize is set on an annual basis by the Minister and shall not exceed 70 percent of the Maximum Sustainable Yield based on a Fisheries Regulation established in 2005. Also, the conch meat export quota is set on an annual basis by the Minister and shall not exceed 95 percent of the catch quota. A conch survey is carried every two years by the Belize Fisheries Department to determine the status of the conch stock and is based on the results obtained from this survey that the Minister establishes the conch catch and export quota.

❖ **Reviews and adjustments of management controls**

Every two years the Belize Fisheries Department review the management controls in plan and make an evaluation of its contribution towards the sustainable management and to ensure continued catches and catch rates of the queen conch.

❖ **Mechanisms in place for consultation with stakeholders**

The Belize Fisheries Department has traditionally maintained excellent communication with fishers and fishing cooperatives on all fisheries related matters. The consultation process is well established and works effectively. The Belize Fisheries Advisory Board (FAB) is a body of people who are either involved or have interests in the fisheries sector and is the principal advisor body to the Minister of Fisheries. The primary function of this body, which even though it is not legally constituted, is to review and consider all fisheries related matters and make recommendations to the Minister of Fisheries. The Minister generally adheres to the recommendations of the FAB.

The Belize Fisheries Department also holds regular meetings but can also call special meetings if required to discuss specific issues regarding the conch fishery. The Department has been able to maintain good communication and excellent working relationship with all five fishing cooperatives. In recent times, the Department has been able to sign two Memoranda of Understanding on the conch quota and on a conch educational program for fishers with the five fishing cooperatives. As a result of this memoranda the fishing cooperatives funded the execution of a small survey to determine standard conch processing weights and a large poster showing the conch processing terms, processed conch presentation and minimum weights was produced, printed and distributed in the fishing communities and fishing cooperatives.

❖ **Mechanisms for resolution of disputes within the fishery**

Resolution of disputes would be done through the Fisheries Advisory Board (comprised of several representatives from all fishing cooperatives, Belize fishermen Cooperative association, Belize Audubon Society, Forestry Department, Fisheries Department, private sector representatives and government representatives), which is responsible for providing advice and recommendations on conch management issues to the Minister of Agriculture and Fisheries. This has not occurred as yet mainly because of close working relationship of the fishing cooperatives and the Fisheries Department.

9. FEEDBACK AND REVIEW

❖ Review of management system

The regular review of the management system in place is done by the Fisheries Advisory Board (FAB). Special meetings called by the Fisheries Department on short notice to discuss conch issues have always had good participation by FAB members and representatives of the fishing cooperatives. Special meetings could be called anytime but FAB meetings are scheduled every month.

❖ Mechanisms used for consultation to receive feedback from and consult with stakeholders

Conch issues are explained to fishers frequently through various meetings and consultations done through public community meetings held in the coastal fishing villages with fishers in addition to other consultations with the FAB.

❖ Use of scientific information in management reviews

Scientific information derived from results of field surveys are presented to FAB members at special meetings or in regular meetings of the FAB. The Fisheries Department prepares Power Point presentations and provides hard copies to FAB members. The FAB is asked to provide input and to make suggestions and recommendations, which are incorporated in management system in a timely manner.

❖ Information on last review of regulations

There were no changes in policy, only new regulations introduced to define conch processing terms and standard meat weights (unprocessed, partially processed and fully processed conch meat) , and to prohibit possession of diced conch and establishment of a conch quota.

❖ Research planned or undertaken to improve management of the fishery for queen conch or to meet specific requirements of the management plan

Adequate funding to carry out fisheries research is always a major constraint in Belize fisheries. However, over the years the Fisheries Department has been able to successfully source small amounts of monies almost just enough to undertake short conch term field surveys but identification of alternative funding sources is important for the continued execution of this important fisheries research. A conch field survey is scheduled to start in June 2006. This survey will cover all conch fishing areas along the coast and will include data collection in the eight marine reserves as well.

❖ Use of external reviewers in the review of the management system

No external reviewers were employed except for international consultants contracted to conduct data analysis of field surveys.

CUBA

Mario Formoso[1]

1. ANTECEDENTES

Por interés del Ministerio de la Industria Pesquera de Cuba, el Grupo Empresarial PESCACUBA y sus empresas extractivas, se pretende lograr el uso sostenible de esta especie sobre la base de un programa de manejo de la pesquería, fundamentadas científicamente por la evaluación del estado del recurso y los estudios biológico-pesqueros requeridos para este fin, enmarcados en el Programa Ramal "ESTUDIO INTEGRAL PARA EL DESARROLLO Y MANEJO DE PECES Y OTROS RECURSOS MARINOS DE INTERES COMERCIAL".

La limitante con esta especie es su inclusión en el Apéndice II de la CITES, y de hecho, en Cuba se prohibió su pesca en 1998 dada la imposibilidad de comercialización en el mercado externo sin la correspondiente licencia o permiso (Dirección de Regulaciones Pesqueras del MIP, com. personal). Por otra parte, se conoce por experiencia, que la Oficina Nacional de Inspección Pesquera del MIP (ONIP) y sus delegaciones provinciales (OPIP) ejercen un serio trabajo preventivo ante las ilegalidades sobre esta especie. Para su explotación con fines exportables deberá presentar niveles de abundancia que demuestren que es factible abrir la pesquería en nuestras aguas sin afectar las poblaciones. Existe otra limitante para la evaluación de la pesquería, que consiste en que no se registran los niveles de esfuerzo dirigidos a la misma, los desembarques de carne limpia necesarios para la aplicación de modelos de evaluación.

Referente a la información disponible, ésta resulta suficiente y actualizada en la biología, las pesquerías, y la comercialización para muchas zonas de la región. En Cuba existen trabajos de evaluación poblacional sobre la especie y la estadística pesquera debe mejorarse con su reapertura escalonada.

La pesca de este recurso se realiza de forma organizada, controlada y legislada.

❖ Descripción de la pesquería

La pesca se realiza en 7 regiones de la plataforma cubana. Opera solamente una embarcación en cada región, compuesta por una patrón y 3 pescadores. Las capturas se realizan por buceo en apnea y la carne se extrae en la propia embarcación. La forma de conservación es en hielo y se desembarca con un 60% de limpieza primaria. La limpieza final con fines de comercialización se realiza en la planta de procesamiento industrial por personal especializado.

Toda la captura se destina a las exportaciones con ingresos anuales del orden de los 300 000 USD como apoyo a la gestión de las empresas involucradas y al sector pesquero del país.

La pesca de caracol se lleva a cabo con un criterio precautorio en el sentido del uso responsable y el mínimo de impacto negativo sobre las poblaciones naturales y el ecosistema.

Todo el procedimiento, desde la captura hasta la comercialización, se realiza sobre la base del estricto cumplimiento de normas técnicas. (Documento facilitado por Cuba a este Taller)

[1] Este modelo de Plan de Ordenación Provisional representa solo la opinión del autor: Mario Formoso, Centro de Investigaciones Pesqueras, Cuba.

Toda la actividad relativa al caracol reina se enmarca dentro de un programa integral de manejo que contempla las investigaciones, la producción, las regulaciones y el mercado externo bajo las reglas de la CITES.

❖ **Descripción del recurso**

Distribución geográfica y hábitat:
La especie está presente en toda la cuenca del Caribe y Golfo de Méjico, Antillas Mayores y Menores y países ribereños a estos mares. Vive en la plataforma, desde la franja costera hasta un máximo de 70 m, según reportes. En Cuba esta presente en todas las zonas de la plataforma insular.

Habita en substratos arenosos con abundantes fanerógamas marinas y macroalgas. También se observan en fondos de arena gruesa, restos de corales, arenas con corales blandos y en playas areno-rocosas. Los individuos jóvenes se encuentran en fondos someros, con frecuencia en menos de 1 m de profundidad.

Hay reportes de la presencia de adultos de esta especie hasta profundidades de 70 m, aunque sus concentraciones poblacionales aparecen en menos de los 30 m (Randall, 1964). Los juveniles pequeños (menos de 8 cm de longitud sifonal) suelen estar enterrados en la arena durante las horas de iluminación, y por tanto, difíciles de detectar por observación visual. Desde el punto de vista comercial la pesca se realiza entre los 3-16 m cuando la inmersión es por buceo en apnea.

Alimentación natural:
La dependencia de su alimentación lo sitúa en un hábitat donde existe vegetación con epifitismo, ya que la especie es herbívora por excelencia. La mayor actividad alimentaría de los individuos inmaduros se produce de noche, pues permanecen enterrados la mayor parte del día.

Reproducción:
Una vez que se alcanza la talla de la primera maduración, entre los 3 y 3,5 años de vida, la reproducción ocurre todo el año por su condición de especie tropical, pero sin lugar a dudas, es mucho más intensa durante los meses cálidos (Brownell y Stevely, 1981). La larva es planctónica y luego de 17-22 días se fija en el fondo y a las cuatro semanas de la eclosión en dependencia de la abundancia de fitoplancton, la metamorfosis es completa (Brownell y Stevely, 1981). Después de ésta, ya inicia su definitiva vida bentónica.

Estado de las poblaciones:
A partir de 1998 se declaró una moratoria total en la pesquería, con el objetivo de facilitar la recuperación de la abundancia en los bancos de cobo en algunas zonas del país.

Con la adhesión de Cuba en la «Convención sobre el Comercio Internacional de Especies amenazadas de la Flora y la Fauna» conocida por sus siglas en inglés CITES, surge la necesidad de realizar una evaluación de este recurso que fundamente científicamente ante sus Autoridades para las especies contempladas en el Apéndice II, que existe en la Plataforma una abundancia que soporte una explotación sostenible, a la vez de preservar la especie como parte de la fauna bentónica marina y de la biodiversidad de nuestros ambientes costeros.

El Centro de Investigaciones Pesqueras inició en 1999 un Proyecto de Investigación de alcance nacional. En todos los casos ha quedado demostrado el buen estado de la abundancia poblacional que soporta una CMS acorde a los intereses actuales de Cuba, tanto en la actividad pesquera, como en la conservación del ambiente.

❖ **Problemas enfrentados actualmente en el ámbito de la ordenación de la pesquería del caracol**

En estos momentos Cuba tiene bien organizada esta pesquería y solamente se trabaja en el mejoramiento de los métodos de evaluación poblacional y en el conocimiento de los aspectos biológicos.

2. POLÍTICAS Y LEGISLACIÓN

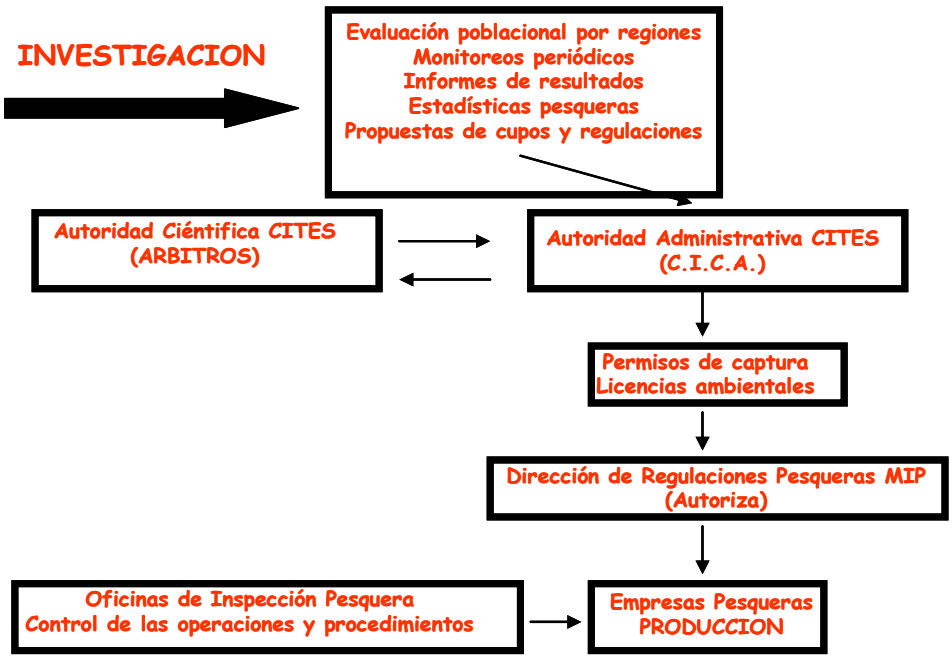
❖ **Las políticas que establecen los principios de ordenación de la pesquería del caracol**

REGULACIONES PARA LA PESCA DE CARACOL REINA:

- declarar veda total reproductiva el 1ro de mayo hasta el 30 de Septiembre;
- los niveles de captura no deben exceder de 30 TM mensuales por localidad (Peso entero);
- pesca bajo Permisos CITES y Autorización de Pesca por el MIP;
- capturar cobo sólo con inmersión libre. Prohibición de SCUBA o Compresores;
- valorar La talla mínima comercial por el grosor del labio externo (10 mm) y no por la longitud de la concha;
- limitar la pesca a un rango de profundidad entre los 3-10 m;
- no arrojar en la zona de pesca conchas muertas;
- mantener un estricto control por parte de las oficinas provinciales de Inspección Pesquera sobre los niveles de captura, áreas de operación y el uso del cobo como carnada;
- pesca limitada por cupos según los resultados de los monitoreos anuales; y
- las capturas de esta especie se limitan al mercado externo en divisas.

❖ **La estructura jurídica que estipula la ordenación, el seguimiento, el control y el cumplimiento en el ámbito de la pesquería del caracol**

PROYECTO PARA EL MANEJO PESQUERO DEL CARACOL (*Strombus gigas Linné, 1758*) EN LA PLATAFORMA CUBANA



❖ **Las convenciones internacionales y los acuerdos ratificados por el país que tengan una relevancia directa para la pesquería**

CITES: Cuba no tiene dificultades relacionadas con el manejo integral de esta pesquería ni con los cupos (cuotas).

3. OBJETIVOS, INDICADORES Y PUNTOS DE REFERENCIA EN LA ORDENACIÓN

❖ **Los objetivos operacionales de la pesquería del caracol, según lo indicado por los planes de ordenación, las políticas y la legislación disponibles**

El Centro de Investigaciones Pesqueras viene desarrollando un proyecto de investigación cuyo principal objetivo es la evaluación poblacional y la estrategia de manejo para un uso sostenible de este recurso renovable. Hasta el momento se han obtenido Licencias ambientales para este recurso en la totalidad de la plataforma cubana.

Las investigaciones se basan en la metodología propuesta por Grau y Alcolado, (1984, MS) y recomendada por las Autoridades Científicas de CITES en Cuba (Hernandez-Corujo *et al*., 1997, Comunicación escrita), que consiste en realizar por buceo transeptos lineales, perpendiculares a la costa, cubriendo una anchura de 1m y de distancia variable que responde a la presencia de individuos en la observación. Todos los conteos y muestreos *in situ* se realizarán mediante buceo en apnea y buceo autónomo con escafandra SCUBA.

En cada transepto se cuantifican los individuos adultos y juveniles para lograr estimados de la densidad (individuos/m^2) como índice de abundancia. Como información adicional se realizaron muestreos al azar para conocer la composición etárea (juveniles, adultos y seniles) de la población y sus relaciones morfométricas aplicadas a la gestión comercial.

Se toman muestras de entre 100–200 ejemplares en cada viaje para efectuar observaciones biológicas, composición etárea y mediciones para el estudio de las relaciones alométricas entre longitud, peso entero, peso de carne total, peso de carne limpia, peso de las carne con el grado de limpieza en la industria y grosor del labio como indicador de la talla de madurez reproductiva.

Con los resultados de cada zona se proponen las estrategias de manejo para el uso racional del recurso, incluyendo las medidas de regulación necesarias.

❖ **Indicadores que son o podrían ser utilizados para evaluar el desempeño de la ordenación de la pesquería en relación a los objetivos**

Densidades poblacionales en lo sitios de captura [vea mas abajo].

❖ **Los puntos de referencia que son/podrían ser usados para definir un desempeño de la pesquería aceptable e inaceptable (por ejemplo, puntos de referencia objetivo y límite, cuando corresponda)**

Las estimaciones de las CMS se basan en las densidades poblacionales en los sitios de captura. El indicador mínimo considerado es una abundancia igual o mayor de 1 500 individuos por hectárea. Los barcos que operan están limitados a uno por empresa y sus desembarques se limitan a no más de 5 toneladas métricas de carne por embarcación.

4. DATOS REQUERIDOS Y SISTEMA DE MONITOREO

❖ **Tipo de datos recopilados y las características del sistema de monitoreo**

Descripción de los datos	Unidad de medida	Años disponibles*	Procedimiento de muestreo (incluyendo la frecuencia de muestreo, la cobertura en porcentaje, los procedimientos de expansión, etc.)
Desembarques	61 400 kg de carne.	1999-2005.	-----
Esfuerzo de pesca	6 barcas.	-------	-------
El peso de carne medio	144 g.	-------	-------
Frecuencia tamaño	Adultos promedios 20.3 cm.	------	-------
Densidad de población de peces estimado por encuesta	1500 to 2 000 ind/ha.	-------	-------
Numero de - tiempo completo - tiempo parcial	Tiempo parcial.	------	------

❖ **Otros datos que deberían ser recopilados para el seguimiento del estado del recurso o del desempeño de la pesquería**

- Se necesita información biológica;
- Seguimiento de las estadísticas pesqueras (capturas, esfuerzos);
- Mercados y precios;
- Seguimiento anual de las regulaciones CITES;
- Conocimiento de las políticas de MPA en el país;
- Costos de producción.

5. ANÁLISIS DE DATOS

❖ **Tipos de modelos de evaluación u otros enfoques son utilizados para evaluar el estado del recurso y estimar el impacto de las estrategias de explotación**

Año	Modelo o método utilizado	Datos utilizados	Resumen de los resultados y conclusiones (incluir referencias a informes y documentos)
1999 hasta el presente	Evaluación de la abundancia por transeptos de conteo visual.	Evaluaciones y monitoreo de la pesca comercial.	MSY between 15-20% of the biomass.

❖ **Métodos alternativos de evaluación (cuando sean necesarios) que podrían ser utilizados para proporcionar una mejor información acerca del estado del recurso o del desempeño de la pesquería**

Considero que se deben aplicar métodos alternativos basados en modelos dinámico-poblacionales, simulación, Surplus, etc. Debe tenerse en cuenta que esta especie tiene características en cuanto a edad, crecimiento, reclutamiento, etc. Por tanto, deben enriquecerse los estudios dirigidos a este fin.

6. CONTROLES

❖ **Las medidas de ordenación (controles) actualmente utilizados para alcanzar los objetivos de esta pesquería**

Tipo de control	Años de implementación	Descripción i) del fundamento del control ii) de los detalles del control y ii) del nivel de restricción actual	Efectividad estimada del control
Control del acceso (por ejemplo, número limitado de licencias)	Todo normal.	-----	-----
Control del esfuerzo (por ejemplo, número de barcos, número de artes, días de pesca, etc.)	6 barcos. 7 meses. 20 días/mes.	-----	-----
Talla/peso mínimo de los individuos en la captura	10 mm grosor de labio.	-----	-----
Especificaciones y restricciones en materia de artes de pesca	Solo inmersión en apnea.	-----	-----
Temporadas de veda (duración)	5 meses.	-----	-----
Zonas protegidas (indique el porcentaje de la área de la población en zona protegida)	20% de la plataforma insular.	-----	------

7. APLICACIÓN Y CUMPLIMIENTO

❖ **Los sistemas de vigilancia y seguimiento implementados para asegurar el cumplimiento de las exigencias del sistema de ordenación**

Todo se desarrolla según lo establecido por las autoridades cubanas del medio ambiente y las regulaciones de la CITES.

❖ **Tipo de sanciones y penalidades que se pueden aplicar en caso de incumplimiento de los controles de la ordenación**

En Cuba se aplican multas y a veces separación del empleo en dependencia del tipo de violación del manejo y la legislación vigente.

❖ **Las limitaciones del sistema de aplicación (presupuestarias y otros factores) y las posibles medidas que se podrían tomar para mejorar el cumplimiento**

Cuba no tiene limitaciones de interés para poder continuar la pesquería.

❖ **Comente acaso la pesquería se puede considerar coherente con la legislación nacional y los acuerdos internacionales**

Es consistente pues esta organizada por el estado, financiada por el estado, controlada por el estado, legislada por el estado y se cumplen a cabalidad los acuerdos internacionales.

8. LA TOMA DE DECISIONES

❖ **Los ministerios o las instituciones con responsabilidades de ordenación de la pesquería**

La responsabilidad del manejo responsable de recurso en Cuba es del Ministerio de la Industria Pesquera y del Ministerio de Ciencia, Tecnología y Medio Ambiente, como autoridad administrativa de la CITES en Cuba.

❖ **El alcance y la forma en que la información científica es utilizada para ayudar en la toma de decisiones**

Todas las decisiones en Cuba se respaldan obligatoriamente en la información científica, especialmente en el sector pesquero. En el caso del caracol es una exigencia de la CITES que sea así.

❖ **Las reglas o procedimientos existentes en materia de decisiones para establecer de qué forma la explotación debería ser modificada en función de los resultados del seguimiento**

Hasta el momento no se ha observado que las poblaciones estén deprimidas en Cuba. Todas las solicitudes de comercialización de caracol presentadas por CITES han sido aprobadas y concedidas.

❖ **Frecuencia con que se examinan los controles de la ordenación y se contemplan ajustes**

En Cuba se monitorea la pesquería anualmente por parte del Centro de Investigaciones Pesqueras. Por los resultados observados es posible hacer ajustes al programa de manejo.

❖ **Los mecanismos de resolución de conflictos en el ámbito de la pesca**

Para ello existe una Dirección Jurídica en el Ministerio de la Industria Pesquera que atiende todos los asuntos legales, tanto dentro del país, como los que tienen implicación internacional.

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GUATEMALA

Manuel de Jesús Ixquiac Cabrera[1]

1. ANTECEDENTES

❖ Descripción de la pesquería

La pesquería de Caracol Reina se realiza por medio de una flota de dieciséis embarcaciones tipo tiburoneras y cayucos, con motor fuera de borda. Cada embarcación esta conformada por cinco tripulantes que realizan la captura de caracol buceando sin equipo, lo que se conoce como apnea. La captura de caracol se da simultáneamente a la captura de langosta siendo estas dos, las especies objetivo de la faena de pesca.

Las tallas de captura están comprendidas por lo general por debajo del ancho mínimo establecido en los demás países de la región. Sin embargo también se observan tallas mayores a un centímetro de ancho. La distribución de tallas observada resulta de la captura de organismos en zonas no muy profundas y de la variedad de zonas donde los pescadores realizan sus actividades.

No existen valores históricos de esfuerzo y capturas. Sin embargo para este año por medio de entrevistas con pescadores y comercializadores se ha estimado un esfuerzo de 16 embarcaciones en las que operan un promedio de cinco pescadores en cada una. Cada embarcación realiza un promedio de cuatro viajes por semana. Durante todo el año el nivel de actividad promedio es de ocho embarcaciones, con lo cual extraen entre 34 a 36 toneladas sin procesar.

La pesquería de caracol es poco importante desde el punto de vista del numero de pescadores involucrados quienes representan el 0.03 por ciento de los usuarios en lado del Atlántico del país (2 615 pescadores). Sin embargo desde el punto de vista comercial son los proveedores de la materia prima para platos típicos de la región los cuales son requeridos por el turismo. Esta actividad de pesca en el área muestra un crecimiento constante durante los últimos cinco años.

La cadena de comercialización inicia con el pescador quien vende la libra de caracol en fresco (50 por ciento limpio) a 1,90 $EE.UU., el comercializador lo vende a 3,33 $EE.UU. un plato típico en la región se cotiza a un precio de 9,33 $EE.UU. (tasa de tipo de cambio 1$EE.UU. x 7.50 Q.). En el país no existe exportación de caracol.

La pesquería de caracol se da en conjunto con la de langosta, todo descarte se saca a la orilla de playas según los pescadores para no dejar los «cadáveres» en el sitio de trabajo ya que estos los confunde en sus próximas inmersiones. Un buen número de las conchas son enviadas a tierra para fines ornamentales, las cuales se venden al turismo entre 2 a 3$EE.UU. cada una.

Se carece de informaciones sobre impactos externos sobre la pesca. Sin embargo dentro de la zona interna de la bahía, específicamente en las áreas de pastos marinos existe un conflicto continuo sobre la actividad de pesca de arrastre que se realiza por parte de los barcos camaroneros debido a la destrucción del hábitat en los pastos marinos. En la zona expuesta la presencia de caracol es reducida, pero aun falta realizar estudios más completos para aseverar esta información.

[1]Este modelo de Plan de Ordenación Provisional representa solo la opinión del autor: Manuel de Jesús Ixquiac Cabrera, Encargado de la sub-área de Monitoreo y Evaluación de recursos pesqueros, Unidad de Manejo de Pesca y Acuicultura, UNIPESCA, Ministerio de Agricultura Ganadería y Alimentación, MAGA, Guatemala.

- **Descripción del recurso**

Actualmente se está desarrollando estudios sobre la «Caracterización de la distribución, abundancia, y densidad del Caracol Gigante *Strombus gigas* Linnaeus, 1 758 en la costa Atlántica de Guatemala».

El principal objetivo del presente estudio es la estimación de la distribución, abundancia, y densidad del caracol *S. gigas* en la costa Atlántica de Guatemala. La zona de investigación se determinará por medio de un estudio de prospección en el área de bahía La Graciosa, Cabo Tres Puntas, área del golfo de la Punta de Manabique y Motaguilla.

- **Análisis de la situación y los problemas enfrentados actualmente en el ámbito de la ordenación de la pesquería del caracol**

Uno de los principales problemas para la ordenación que existen en Guatemala es la falta de regulación especifica para la especies, sin embargo en el reglamento de pesca contempla a la Familia Strombidae como una especie objetivo de pesca para las actividades del Atlántico del país. En el reglamento actual no existen medidas de ordenación específicas para la especie sin embargo las mismas se espera generar e implementar en el 2007.

La comercialización de caracol reina en Guatemala es producto de las actividades de pescadores que poseen una doble nacionalidad (guatemalteca y beliceña) y venden su producto a comerciantes locales, en la comunidad de Puerto Barrios. Las principales capturas de caracol se realizan en la zona sur de Belice, sin embargo los pescadores tienen los permisos respectivos del país para la pesca. No obstante el ingreso a las aguas guatemaltecas circunscribe como un tráfico ilegal el cual debe ser ordenado, al menos en las regulaciones que respectan a tallas mínimas y respeto a las épocas de veda del país de origen.

La pesquería de caracol se realiza en forma conjunta con la captura de langosta, siendo ambas influenciadas por los vientos y la temperatura según la opinión de los pescadores, por lo cual las faenas de pesca son variables, aunque reconocen que se realizan durante todo el año.

Las utilidades que genera la pesquería de caracol para pescadores, comercializadores y restaurantes oscilan entre 406 000 $EE.UU. y 676 000 $EE.UU. anuales, según estimación generada a partir de conversaciones con usuarios.

Se considera de interés el monitoreo de las tallas mínimas de captura en el ancho del labio así como un peso mínimo de la carne, la cual pueda ser comercializada en los restaurantes locales.

La sustentabilidad de la pesquería en el país redunda en una utilización sustentable de recursos pesqueros como lo son langosta y caracol los cuales son parte de las comidas típicas de la región que son un atractivo turístico.

La ordenación podría permitir una utilización sustentable de las poblaciones de caracol, las cuales no muestran un nivel de colapso o disminución actual del recurso. Sin embargo los vacíos en la aplicación de las regulaciones podrían permitir serios daños a la pesquería en el corto plazo.

La armonización regional de las medidas de ordenación es algo que fortalece a la región Centroamérica por medio de entidades cono SICA/OSPESCA lo cual permite establecer niveles de negociación internacional en conjunto.

La responsabilidad con las generaciones futuras es un compromiso, institucional y personal dentro de las entidades de administración pesquera, la cual no posee valores tangibles pero si morales con el medio ambiente y nosotros mismos.

2. POLÍTICAS Y LEGISLACIÓN

❖ **Las políticas que establecen los principios de ordenación de la pesquería del caracol**

No existe una política específica para el ordenamiento de caracol, sin embargo, en el reglamento general de pesca, este se considera como una especie objetivo.

El reglamento de pesca, en el titulo IV el cual se refiere a las especies permitidas para la pesca en el Océano Atlántico, Artículo 40 hace referencia a la familia Strombidae (Caracoles).

❖ **La estructura jurídica que estipula la ordenación, el seguimiento, el control y el cumplimiento en el ámbito de la pesquería del caracol**

La ley de pesca 80-2002 y su reglamento 223-2005, aplica a esta especie en particular los artículos de vida silvestre de la ley 4-89 de CONAP por ser una especie amenazada, igualmente la ley de medio ambiente.

Sin embargo es la autoridad de pesca Unidad de Manejo de la Pesca y Acuicultura (UNIPESCA), la encargada de regular la explotación de los recursos pesqueros. El control y vigilancia se realiza por medio de UNIPESCA, SEPRONA y/o la base Naval del Atlántico.

❖ **Las convenciones internacionales y los acuerdos ratificados por el país que tengan una relevancia directa para la pesquería**

Tratado o convención	Lugar y fecha de adopción	Fecha de entrada en vigencia del tratado	Fecha de aprobación, ratificación y publicación
Convenio sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestre. *Artículos: II, IV, V, VIII y IX.*	Washington DC, EE.UU. 3/3/1973.	1/7/1975.	- Aprobado por el Decreto Legislativo No. 63-79 del 2/11/79; - Ratificado el 5/2/80; - Publicado en el Diario Oficial, Tomo, CCXIII, No. 32, fecha 14/3/80.
Convenio Constitutivo de la Organización Latinoamericana de Desarrollo Pesquero *Artículos: 2, 5, 7.*	México D.F. México 29/10/1982.	-----	- Aprobado por el Decreto-Ley No. 58-86 del 7/10/86; - Ratificado el 27/10/86; - Publicado en el Diario Oficial, Tomo CCXX, del 23/2/87.
Convención de las Naciones Unidas sobre el Derecho del Mar *Artículos: 194-1, 194-2, 194-3, 195, 196-1, 198, 199, 207, 208, 209, 210, 211, 212 y 217.*	Montego Bay, Jamaica 10/12/1982.	16/11/1994.	- Aprobada por el Decreto Legislativo No. 56-96 del 26/6/96; - Ratificada el 11/2/97; - Publicada en el Diario Oficial, Tomo CCLIV, No. 48, de fecha 29/7/96.
Convenio para la Protección y el desarrollo del medio marino de la Región del Gran Caribe.	Cartagena, Colombia 24/3/1983.	30/3/1986.	- Ratificado el 20/6/89; - Publicado en el Diario Oficial, Tomo CCXX-XVII No. 43, de fecha 22/3/90.

Tratado o convención	Lugar y fecha de adopción	Fecha de entrada en vigencia del tratado	Fecha de aprobación, ratificación y publicación
Artículos: 5, 6, 7, 8, 10, 11, 12 y 13.			
Protocolo Concerniente a la Cooperación en el Combate de los Derrames de Hidrocarburos en la región del Gran Caribe. *Artículos: 3, 5, 6, 7.*	Cartagena, Colombia 24/3/1983.	11/10/1986.	- Ratificado el 20/6/89; - Publicado en el Diario Oficial, Tomo CCXX-XVII No. 43, de fecha 22/3/90.
Protocolo Relativo a las Áreas y a la Flora y Fauna especialmente Protegidas del Convenio para la Protección y el Desarrollo del Medio Marino en la región del Gran Caribe. *Artículos: 1, 2, 3, 4,5, 6, 8, 9, 10-1, 10-5,11, 12, 13, 16.*	Kingston, Jamaica, 18/1/1990.	No esta en vigencia.	- Firmado el 18/1/90.
Convenio para la Conservación de la Biodiversidad y Protección de Áreas Silvestres Prioritarias en América Central. *Artículos: 11, 14, 15, 16, 19, 27, 29*	Managua, Nicaragua 05/6/1992.	20/12/1994.	- Ratificado el 10/9/93 - Publicado en el Diario Oficial, Tomo CCXLI-X, No. 93, de fecha 10/10/93.
Convenio sobre la Diversidad Biológica. *Artículos: 6-a, 7, 8-a, 8-e, 8-h, 8-k*	Río de Janeiro, Brasil 5/6/1992.	29/12/1993.	- Aprobado por el Decreto Legislativo No. 5-95 del 21/2/95; - Ratificado el 14/6/95; - Publicado en el Diario Oficial, Tomo CCLIII, No. 10, de fecha 12/1/96.

3. OBJETIVOS, INDICADORES Y PUNTOS DE REFERENCIA EN LA ORDENACIÓN

❖ Los objetivos operacionales de la pesquería del caracol, según lo indicado por los planes de ordenación, las políticas y la legislación disponibles

No existe un plan de ordenación específico para el caracol reina desde el punto de vista pesquero, sin embargo desde la perspectiva de la biodiversidad y el resguardo de especies en peligro de extinción el CONAP trabaja actualmente para evaluar la distribución y abundancia del caracol reina en las aguas territoriales de Guatemala.

La administración pesquera trabajará en la aplicación y cumplimientos de normativas generales tales como Aplicación de la veda simultáneamente con la de Belice, talla mínima del grosor del labio para su captura y peso mínimo de la carne para su comercialización.

❖ **Indicadores que son o podrían ser utilizados para evaluar el desempeño de la ordenación de la pesquería en relación a los objetivos**

Los objetivos deberían:

- estar encaminados a tallas mínimas de captura, zonas protegidas y vedas.
- permitir la explotación comercial sustentable, armonizando las acciones de los países que hacen usos de los mismos recursos.

❖ **Los puntos de referencia que son/podrían ser usados para definir un desempeño de la pesquería aceptable e inaceptable (por ejemplo, puntos de referencia objetivo y límite, cuando corresponda)**

En función de puntos de referencia la pesquería debería estar orientada a un punto de equilibrio bioeconómico, haciendo un uso optimo de las tallas más grandes.

El uso de Fmrs (mortalidad a lo máximo rendimiento sostenible como un punto de referencia limite (PRL), en lugar de un punto de referencia objetivo (PRO), proporcionaría flexibilidad al escoger un PRO más cauteloso basado en F, que tiene características útiles para la ordenación (McGarvey y Caddy, en prensa). Para esto se considera necesario un registro de las tallas (grosor de la concha) para realizar estimaciones de registros de la mortalidad por pesca por medio de modelos sencillos como los descritos en Sparre y Vennema (1995). Como los son las rutinas de Curva de Captura acumulativa del Método de Jones y van Zalinge, Captura linealizada y Método de Powel-Wetherall.

4. DATOS REQUERIDOS Y SISTEMA DE MONITOREO

❖ **El tipo de datos recopilados y las características del sistema de monitoreo**

Descripción de los datos	Unidad de medida	Años disponibles*	Procedimiento de muestreo (incluyendo la frecuencia de muestreo, la cobertura en porcentaje, los procedimientos de expansión, etc.)
Desembarques	Lb. de carne	Estimados actuales, 2006.	Monitoreos a los centros de acopio (5 en total)
Esfuerzo de pesca	Embarcaciones y número de pescadores	Actual, 2006.	Por medio de los centros de acopio y conversación con los pescadores.
Peso promedio de la carne	Lb.	2006	De dos a tres caracoles por libra de carne.
Frecuencia de tamaño	mm.	Actual, 2006	Grosos del labio de la concha, muestreo de desembarques de concha reina.
Densidad de población según estimación de encuestas	En proceso.	Inicio en agosto, 2005,	Estudio realizado por el CONAP, de distribución y abundancia.
Comercio - volumen - valor	Lb. de carne. Año.	2005-2006	Se estima una captura entre 158 000 a 176 000 libras de carne sin limpiar.

Número de pescadores - tiempo completo - medio tiempo	60 pescadores, 20 tiempo completo	2006	Encuesta directa con proveedores y pescadores del área.
Otros datos	-----	-----	La pesquería de caracol es complementada y compartida con la pesquería de langosta. Solo una comunidad de Guatemala realiza capturas de caracol, en raras ocasiones se extrae algún caracol de los bajos en punta de Manabique lo cual es consumido localmente.

❖ **Otros datos que deberían ser recopilados para el seguimiento del estado del recurso o del desempeño de la pesquería**

- Numero de embarcaciones, pescadores y áreas de pesca.
- Capturas por faena de pesca, tallas de captura y peso de la carne en limpio.

5. ANÁLISIS DE DATOS

❖ **Tipos de modelos de evaluación utilizados para evaluar el estado del recurso y estimar el impacto de las estrategias de explotación**

Actualmente no se utilizado ningún modelo de evaluación. Sin embargo, UNIPESCA ha programado realizar una evaluación del estado de explotación del caracol a partir del análisis de la frecuencia de tallas basado en la medida del grosor del labio, el cual permitiría establecer las características y la mortalidad por pesca de la población explotada por los pescadores de Guatemala.

❖ **Consideración de las incertidumbres en datos y supuestos en la evaluación**

Actualmente no se contemplan las interacciones biológicas o biofísicas con el medio ambiente, solo se busca establecer el impacto directo pescador-presa, por lo cual los efectos ambientales e interacciones y denso dependencia no son contempladas.

Sin embargo al abordar los estudios de pesquerías con los trabajos de biodiversidad en el área (los cuales son varios, sin embargo poco retroalimentan el manejo de pesquerías) podría realizarse un enfoque eco-sistémico que permita complementar los vacíos generados en los modelos de evaluaciones de pesquerías más utilizados.

❖ **Describa para quién fueron preparados los informes, si han sido utilizados para asistir en la ordenación de la pesquería y, si es el caso, de qué forma**

Al día de hoy para el recurso caracol no se ha realizado ningún informe técnico o estudio desarrollado en el país dirigido al manejo u ordenación del caracol reina.

- **Métodos alternativos de evaluación (cuando sean necesarios) que podrían ser utilizados para proporcionar una mejor información acerca del estado del recurso o del desempeño de la pesquería**

Establecer indicadores del estado de explotación de caracol por medio de estudios directos sobre la disponibilidad del recurso y estructuras de tallas desembarcadas por los pescadores. Para esto se considera necesario un registro de las tallas (grosor del labio) para realizar estimaciones de registros de la mortalidad por pesca por medio de modelos sencillos como los descritos en Sparre y Vennema (1995). Como lo es la rutina del Método de Powel-Wetherall.

Esto deberá ser complementado con parámetros poblacionales de estudios generados países cercanos.

6. CONTROLES

- **Las medidas de ordenación (controles) actualmente utilizados para alcanzar los objetivos de esta pesquería**

Actualmente no se realiza ningún control la siguiente lista es una propuesta a seguir.

Tipo de control	Años de implementación	Descripción i) del fundamento del control ii) de los detalles del control y iii) del nivel de restricción actual	Efectividad estimada del control
Talla/peso mínimo de los individuos en la captura	-----	Se considera que es la medida más práctica y aplicable en los desembarques. Estas deberían evaluarse posteriormente sin embargo se proponen inicialmente, 8 mm de grosor de labio, peso de carne de 150 gr. filete limpio.	-----
Especificaciones y restricciones en materia de artes de pesca	-----	Se debe prohibir el uso de equipos de buceo para la captura de caracol y langosta.	-----
Temporadas de veda (duración)	-----	Se deberán adaptar a la legislación existente en Belice.	-----
Zonas protegidas (indique el porcentaje de la área de la población en zona protegida)	-----	15,000 ha. En zona núcleo 60,000 ha. Arena marina de usos múltiples.	-----

- **Los problemas específicos experimentados con los controles y los controles adicionales en materia de ordenación que podrían ser utilizados en esta pesquería con el fin de alcanzar los objetivos de pesca**

La pesquería de caracol presenta varios inconvenientes en el monitoreo y los controles necesarios, debido a que el organismos es previamente transformado en la actividad de pesca, separando la concha del músculo y la entrega del producto se realiza en varios centros de acopio a diferentes horas. Algunos pescadores comercializan el producto directamente con restaurantes o encargos previos.

La aplicación de medidas de ordenación podría hacer que los pesadores no registren sus embarcaciones y tampoco apoyen en la colecta de información para lo cual será necesario apoyarse de otras instituciones que actualmente trabajan en el área.

7. APLICACIÓN Y CUMPLIMIENTO

- **Los sistemas de vigilancia y seguimiento implementados para asegurar el cumplimiento de las exigencias del sistema de ordenación**

La explotación de caracol en Guatemala se realiza para consumo local y comercios cercanos de la costa del Caribe, los mecanismos de control se realizan principalmente sobre los productos que se comercializan a la ciudad capital, por medio de la Unidad de Normas y Regulaciones que verifica el cumplimiento de normas sanitarias de transporte.

No existen medidas de ordenación especificas que se aplican a la pesquería de caracol reina, estas están en función de la talla y peso del músculo para su comercialización, por la exigencia del mercado. También existen vedas geográficas en las áreas protegidas marinas, las cuales están administradas por Organizaciones No Gubernamentales, quienes tienen poca eficiencia en el control y vigilancia de las zonas de resguardo.

La UNIPESCA cuenta con tres inspectores de pesca para la zona del caribe, quienes hacen actividades principalmente en la función de recolectar información y divulgar el nuevo reglamento de pesca. La aplicación de la ley y sanciones son realizadas en forma conjunta con SEPRONA el cual es una policía especial que apoya las acciones contra delitos al medio ambiente.

Guatemala no exporta caracol reina, su cuota de exportación es 0.

- **El tipo de sanciones y penalidades que se pueden aplicar en caso de incumplimiento de los controles de la ordenación**

(Tomado de la Ley General de Pesca 2002).

ARTÍCULO 80. Prohibición. Queda prohibido:

a) Realizar actividades pesqueras y acuícolas sin permiso o licencia, con la licencia o permiso vencido.

b) Extraer recursos pesqueros de aguas de dominio público declarados en veda, áreas de reserva y áreas protegidas; salvo en casos específicamente autorizados.

c) Pescar con métodos ilícitos, tales como el empleo de materiales tóxicos, explosivos, y otros cuya naturaleza cause peligro a los recursos hidrobiológicos así como llevar a bordo tales materiales.

d) Llevar a bordo o emplear aparejos o sistemas de pesca diferentes a los autorizados en el reglamento.

e) Utilizar embarcaciones pesqueras para fines no autorizados.

f) Trasegar a embarcaciones parte o la totalidad de la pesca, salvo los casos de excepción expresamente previstos en las normas legales y reglamentarias.

g) Capturar o pescar intencionalmente mamíferos marinos, tortugas marinas y otras especies que se declaren amenazadas o en peligro de extinción, de acuerdo a lo establecido por el MAGA a través de la autoridad competente, en coordinación con el Ministerio de Ambiente y Recursos Naturales y otras instituciones nacionales e internacionales.

h) Exportar huevos, larvas, postlarvas, crías, alevines y reproductores del medio natural, con excepción de los producidos en laboratorios y medios artificiales debidamente autorizados por la presente Ley.

ARTÍCULO 81. Sanciones. El MAGA a través de la autoridad competente, sancionará a quien contravenga las prohibiciones anteriores, de la forma siguiente:

1.En los casos de contravención a cualquiera de las prohibiciones a que se refieren las literales a), b), c), d), e), f), g) y h) del artículo anterior:

a) Por primera vez, se impondrá al armador o empresa acuícola individual o jurídica infractora, una multa entre ocho mil quetzales (Q.8, 000.00) y ochenta mil quetzales (80,000.00), y el decomiso de lo pescado en violación de ella, así como de las artes, aparejos y métodos de pesca ilícitos.

b) En caso de reincidencia, la multa a imponer se aumentará en un cien por ciento (100%) y se suspenderá el ejercicio de la pesca o de la acuicultura a la embarcación o empresa acuícola infractora por un lapso de seis (6) a doce (12) meses.

c) En caso de una tercera infracción, de existir licencia o permiso, se cancelará definitivamente el derecho a operar de la embarcación o empresa acuícola infractora; de no existir licencia o permiso, la autoridad competente no dará trámite a cualquier solicitud que sea presentada con posterioridad por el infractor.

❖ **Las limitaciones del sistema de aplicación (presupuestarias y otros factores) y las posibles medidas que se podrían tomar para mejorar el cumplimiento**

Se cuenta con un personal mínimo en el área (tres personas, US$ 28 000 anuales). El personal en el área esta enfocado en otras pesquerías de mayor valor comercial, sin embargo se podría apoyar un monitoreo por medio de los comercializadores de caracol en el área y pescadores involucrados en la actividad haciendo un desembolso no mayor de US 8 500 anuales, esto se buscara con alguna agencia cooperante para la colecta de información.

❖ **Informaciones disponibles acerca del tipo y del alcance de la explotación y del comercio ilegales**

La comercialización de caracol reina en Guatemala tiene es producto de una doble nacionalidad, Guatemaltecos y Beliceños, quienes venden su producto a comerciantes locales. Es claro que las capturas de caracol se realizan en la zona sur de Belice. Sin embargo los pescadores tienen los permisos respectivos del país para la pesca, el ingresos a aguas guatemaltecas lo circunscribe como un trafico ilegal el cual debe ser ordenado.

❖ **Comente acaso la pesquería se puede considerar coherente con la legislación nacional y los acuerdos internacionales**

La pesquería como tal esta contemplada en el reglamento y la ley de pesca, sin embargo esta no guarda las regulaciones mínimas con relación a la legislación de la pesca de caracol en países vecinos.

8. LA TOMA DE DECISIONES

❖ **Los ministerios o las instituciones con responsabilidades de ordenación de la pesquería, describa su ámbito de responsabilidad e interacciones**

- Ministerio del Medio Ambiente y Recursos Naturales (MARN)
  Autoridad de los Recursos Naturales;
- Consejo Nacional de Áreas Protegidas (CONAP)
  Autoridad CITES; and
- Unidad de Manejo de la Pesca y Acuicultura (UNIPESCA);
  Autoridad competente de la administración de los recursos hidrobiológicos.

- **El alcance y la forma en que la información científica es utilizada para ayudar en la toma de decisiones**

La ley de pesca establece en el artículo 31 de la ley de pesca que la pesca científica debe orientarse prioritariamente hacia el conocimiento del estado de explotación de los recursos hidrobiológicos, con miras a su eficiente administración y aprovechamiento sostenible. Constituirá otro fin prioritario de la pesca científica, la evaluación del potencial de los recursos pesqueros no aprovechados. Con tales propósitos la autoridad competente programará las investigaciones que se requieran, de acuerdo al Plan Nacional de Desarrollo Pesquero y Acuícola. Las demás entidades de la administración pública y de organismos nacionales y no gubernamentales que tengan injerencia en la investigación pesquera, se sujetarán a los lineamientos que señale la UNIPESCA con el fin de lograr la integración y optimización de las investigaciones base de la ordenación y desarrollo pesquero.

La finalidad de estas de los resultados de la pesca científica y la investigación pesquera en general, deben estar encaminados a brindar soluciones y alternativas al sector pesquero nacional.

Para llevar a acabo un registro estadístico de los desembarques de la pesca en el país la autoridad competente organizará y tendrá a su cargo el Sistema Estadístico Pesquero y Acuícola, que comprenderá los procesos de recolección, ordenamiento, procesamiento y de análisis de datos. Dichas información servirá como instrumento para fortalecer los mecanismos de ordenamiento.

- **Las reglas o los procedimientos existentes en materia de decisiones para establecer de qué forma la explotación debería ser modificada en función de los resultados del seguimiento**

Las consideraciones de la ley de pesca establecen: Es deber del Estado evitar la sobreexplotación y el exceso de capacidad de pesca aplicando medidas de ordenación, con el fin de asegurar que el esfuerzo de pesca sea proporcional a la capacidad de producción de los recursos hidrobiológicos y al aprovechamiento máximo sostenido de los mismos, estableciendo acciones para rehabilitar las poblaciones en la medida de lo posible.

- **Frecuencia que se examinan los controles de la ordenación y se contemplan ajustes**

La ley establece que se deben realizar cada cinco años, sin embargo se pueden generar y aplicar reglamentos especiales cuando así lo considere la administración de pesca, los responsables de estos ajustes es la UNIPESCA.

- **Los mecanismos implementados en materia de consulta con las partes involucradas**

No esta establecido un foro de discusión sin embargo la entidad administradora se reúne periódicamente con los usuarios para desarrollar reglamentos y existe una apertura por parte de la administración para recibir la opinión y recomendación de los pescadores organizados.

- **Los mecanismos de resolución de conflictos en el ámbito de la pesca**

Generalmente los conflictos en el ámbito de la pesca son abordados en reuniones directas entre el coordinador de pesca y los representantes de la pesca artesanal.

9. RETROALIMENTACIÓN Y REVISIÓN

- **Revisiones periódicas del sistema de ordenación**

El sistema de ordenación pesquera como tal esta siendo implementado en este año como uno de los objetivos de dar cumplimiento a la ley y reglamento de pesca, sin embargo existe un orden de

prioridad según los recursos pesqueros de mayor valor comercial. Cuando estas se dan se realizan por a través de un proyecto que evalué es el estado de la pesquería en estudio y talleres de trabajo con los usuarios para concienciar y adaptar las medidas de ordenación.

- **Mecanismo utilizados para realizar consultas y recibir respuestas de las partes involucradas**

Se trabaja a dos niveles, institucional y usuarios. Por la características de estos recursos el Consejo Nacional de Área protegidas por medio de la Unidad de de Vida Silvestre y la UNIPESCA son las dos instituciones gubernamentales que tiene relación con el recurso.

Los usuarios son consultados por medio de las organizaciones administradoras de las áreas protegidas y directamente por inspectores de pesca, según la disponibilidad de recursos se contrata consultarías específicas por medio de fondos provenientes generalmente de Agencias Donantes.

- **Uso de la información científica en la revisión**

Para elaborar dictámenes técnicos en función de vedas, decomisos, zonificación de áreas protegidas.

Por lo general se busca establecer el estado de los recursos y su hábitat, hasta el momento no se realizado ningún estudio especifico de caracol reina, sin embargo el mismo esta presente en estudios tales como evoluciones ecológicas rápidas.

- **Última vez que se examinaron y/o revisaron i) las políticas y ii) las reglamentaciones**

La política de pesca es general y no esta orientada a la ordenación especifica de alguna especie, la política pesquera fue aprobada en el 2002 y a pesar del cambo de Gobierno se ha mantenido los principios de la misma. El reglamento de pesca fue aprobado en mayo del 2005 actualmente la UNIPESCA esta en la fase de divulgación.

La familia Strombidae esta contemplada entre las especies objetivo de pesca para el litoral del caribe guatemalteco en el artículo 40 del reglamento de pesca.

- **Investigaciones contempladas o llevadas a cabo para mejorar la ordenación de la pesquería del caracol o para cumplir con requisitos específicos del plan de ordenación**

Actualmente se esta desarrollando un proyecto sobre el tema el cual contempla dos fases de investigación. El projecto, "Caracterización de la distribución, abundancia, y densidad del Caracol Gigante *Strombus gigas Linnaeus*, 1758 en la costa Atlántica de Guatemala" fue solicitado por medio de la Unidad de Vida Silvestre del CONAP.

La UNIPESCA por medio de la sub-área de monitoreo y evaluación de recursos pesqueros ha iniciado la identificación y caracterización de todas las actividades de pesca, por medio de un censo de pescadores artesanales, monitoreos biológicos de desembarque y estimaciones de esfuerzo de pesca por unidad pesca.

- **Consultas con agentes externos en el examen del sistema de ordenación**

El país por medio de la autoridad CITES en este caso el Consejo Nacional de Áreas Protegidas, CONAP, convoca a una reunión de trabajo con las instituciones involucradas y expertos en el país para establecer por medio de los últimos trabajos realizados sobre el tema de interés para emitir opinión.

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HAITI

Jean Robert Badio[1]

1. BACKGROUND

Haiti total area:	10 714 sq miles (27 750 km^2)
Land area:	27 560m^2
Sea area:	190 km
Population:	8 500 000 with an average annual increase of 1.8 percent
Fishers population:	27 886 fishers
Coastline:	1 535 km
Fisheries production:	16 500 tonnes
Export:	Estimated at 800 tonnes per annum
Import:	12 600 tonnes

❖ Description of the Fishery

Queen conch (Strombus gigas) is one of the most important fisheries in Haiti, providing employment and income for thousands of fishermen and others. Actually, conch exporters (shells and meat) are in the process of setting up an association. One of the main aims of the association will be to produce conservations guidelines regarding CITES recommendations and also to promote and protect the conch trade industry.

[1] This draft management plan represents only the opinion of the author: Jean Robert Badio, Ministry of Agriculture and Natural Resources, Department of Fisheries and Aquaculture, Haiti.

In Haiti, the queen conch is primarily collected by hand while diving. Other common conch fishing gears and methods are: Bottom gillnets (folle a lambi); gillnets; compressor (hookah gear); snorkelling scuba; and dynamite fishing. Like numerous countries in the Caribbean, Haiti has regulations on paper to control conch fishery. The decree of 1978, covering fisheries and marine resources, presented the following conch regulations:

- Closing time for conch is April 1st to September 30.
- Fishing for conch with scuba, dynamite, or a compressor is prohibited.
- Siphonal length of 25 cm is the legal minimum length.
- Prohibition on capture of immature conch by setting limit on shell lip-thickness.

Significant external impacts on the fishery have resulted from the activities of foreign fishermen. Large amounts of conch are lost to poachers annually. Actually, efforts are being made with the conch exporters association and other stakeholders to increase the monitoring and surveillance of this resource.

❖ **Description of the Resource**

Little is known about the conch resource in Haiti. However, a fishery census conducted in 1996 showed that there were approximately 312 conch fishers; 112 boats; 16 exporters of conch shells and meats; and about seven conch processing plants. For the period of 2002, the annual average production of conch was estimated at more than 350 tonnes and Haiti was, in 2002, the first conch shell exporter in the world. In 1995, the conch fishery in Haiti was studied by Wood (1995)[2] and the following results were presented:

Fishing area/method	Depth(m)	No. of dives	Transects	Ind./ha	Fishing pressure	Size
Fort liberte to la Tortue/ Compressor	5-15	5	2	9/15	low	Juvenile
Gonaives/ Bottom Nets	10-20	8	2	16/0.8	low	Juvenile +2 Adults
Gonave Island/ Comp+free	30	9	3	18/1.5	heavy	23 cm
Rochelois/ Com + free diving	11-15	2	1	3/0.4	high	Adult
Cayemites	10-30	4	2	20/X	heavy	20 cm
Dame Marie to Irois/ Comp + free diving	2	-	1	16/0.1	control	Adult

Data Collection Program

In 2002, with a project financed by Caricom Regional Fisheries Mechanism (CRFM) the Department of Fisheries and Aquaculture of Haiti collected catch data in seven fishing zones for nine months. The number of fishers per vessel, and the catch data (number of pounds) were recorded.

Conch Visual Assessment

In 1999, five Cubans boats and 42 Cubans fishermen accompanied with Haitian fishermen conducted a visual survey in Haiti's waters for conch, lobster and others species of great export value such as shrimp, octopus, swordfish, etc. Three of the seven fishing zones in Haiti have been considered as having viable conch populations.

[2] Wood, E.M, 1995, Study of the Fishery for Queen conch in Haiti, Marine Conservation Society, Ross-on-Wye, UK, 57p.

❖ **Problems faced at present in the management of the queen conch fishery**

To ensure the sustainability of queen conch the Convention of International Trade of Endangered species of Flaura and Fauna (CITES) has listed queen conch on Appendix II. Thus, to satisfy CITES recommendations, Haiti was considered in the category of countries of "Urgent Concern" and all export of conch (shells and meats) was prohibited from September 2003. The prohibition created a big gap in the economy of the country where more than 312 families and others stakeholders depend on that resource for a living. Some others problems faced at present in Haiti in the management of queen conch fisheries are:

- financial constraints due to the government focusing on other priority issues;
- education and public awareness;
- limited surveillance capacity of the Department of Fisheries;
- overfishing and collection of juvenile conch have been identified as serious problems;
- type of vessel, engine capacity (artisanal, small scale operations);
- sedimentation and a reduction in water quality in some areas affect conch populations, through degradation of nearshore seagrass bed nursery sites; and
- lack of resources to collect the ideal data that would be required to fully inform management decisions.

2. POLICIES AND LEGISLATION

❖ **Policies that set out the principles on which the fishery for queen conch is managed**

The Fisheries Policy in Haiti aims to ensure the sustainable use of the living marine resources and ecosystems through increased cooperation and collaboration with all the stakeholders for the improved welfare of Haiti's people. The policy also seeks to ensure that conch is harvested in a sustainable manner which is not detrimental for the species.

❖ **The legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch**

The legal framework for management of coastal resources is centred mainly on the decree of November 27, 1978 fishing law of Haiti. The law deals mainly with size limits on marine species, prohibitions on harvesting, designation of closed seasons for different resources, and the definition of import and export quotas for fishing. However, the Ministry of Agriculture is currently in the process of modernizing the fishing law specially to satisfy some CITES recommendations and also to address the FAO Code of Conduct for Responsible Fisheries. For example, it is required by law in Haiti, to have all fishermen registered with the Ministry of Agriculture. Unfortunately, this has never been enforced.

The two important aspects of the fisheries law that provide for management, monitoring, control and enforcement in the fishery for queen conch are:

Article 112: It is forbidden:

- to capture, sell, or buy small conch and to engage in the commerce of their shell without a permit from the Ministry of Agriculture; and
- to collect shells less than 10 cm in length and to use a hookah (air compressor)**.**

❖ **The International Conventions and Agreements ratified by the country that are of direct relevance to the fishery**

Unfortunately, Haiti which has a significant trade in the export of conch shells, is not yet an official signatory of CITES. However, provisions are being made for Haiti to soon become an official member of CITES.

- CRFM (Caribbean Regional Fisheries Mechanism): Haiti has been a member of the CRFM since September 1997 and more than four projects have been conducted by CRFM in Haiti.
- Provisions are being made and the process has been initiated for Haiti to become a member of SPAW (Special Protected Areas and Wildlife).
- Haiti is a member of ICCAT (International Commission for the Conservation of Atlantic Tunas): This agency provides management advice to countries which utilize coastal and offshore pelagic resources.
- CBD (Convention for the Conservation of Biological Diversity): Haiti is party to the CBD and has been since 1996.

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **The operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

- Improve management of queen conch resources in Haiti through the establishment of suitable management measures.
- Promote the development and use of selective fishing gears and take into account traditional knowledge and interest of local communities, small scale artisanal fisheries and indigenous people in development and management programmes.
- To carry out a preliminary investigation of the harvesting of queen conch in Haiti and to identify issues of concern and make recommendations for conservation and sustainable measures.

❖ **Indicators that are or could be used to measure the performance of the fishery management relative to the objectives**

Established Indicators are:

- Decrease in CPUE (catch per unit of effort)
- Density per hectare

❖ **The reference points that are/could be used to define acceptable and unacceptable performance of the fishery (i.e. target and limit reference points where applicable)**

- Anecdotal information obtained from discussions with fishermen and others knowledgeable people.
- Results from transects obtained from a transect done in 1996 – reference transects results from neighbouring country.

4. DATA REQUIREMENT AND MONITORING SYSTEM

❖ **Describe the type of data collected and the characteristics of the monitoring system (e.g., coverage, sampling procedures, the participation of fishery operatives, etc.)**

Description of Data	Unit of Measurement	Years available*	Sampling procedure (including frequency of sampling, percentage coverage, raising procedures, etc.)
Landings (survey realised with CRFM projects)	Total shells (2 shells = 1 pound).	1999–2003.	Landings are collected at landing zone everyday for about three months.
Export	Kilos or tonnes.	1990–2003 (electronic).	Export quantity should be declared at Fishery Department in order to get the export permit.
Fishing effort	Boat-days (boat goes out for 1 day) with 3 to 4 men per boat.	1996–2003.	Effort is recorded as the boats come into the processing facilities; the number of men on the boat is also recorded.
Stock densities estimated by surveys	Quantity of conch available per hectare in 7 fishing zones. (see table above)	1996 (report of Elizabeth Wood).	-----
Trade (Exports)	Tonnes of conch meat.	1997–2003.	Fisheries Dept. and Quarantine's Permit & Certificate.
No. of fishers -full time -part time	116 active fishermen.	1999–2005.	-----

Data have been digitised for the years 1999 to 2002 through a project of CRFM using the CARIFIS program. Export figures for shell and meat are available for some years, but records on catch have never been produced in Haiti; the market is incomplete. However, due to financial problems and the government focusing on other priority issues this program has been ended. Two technicians from the Fisheries Department staff have been trained by CRFM through the CARIFIS program; they are committed to digitizing all data as soon as the means become available.

❖ **Other data that should be collected to monitor the status of the resource or performance of the fishery**

- socio-economic studies to identify the impact of this fishery on the economy of Haiti , especially in the rural sector;
- estimation of local consumption (hotel , market and others);
- lip thickness and shell length;
- meat weight; and
- assessment (density/hectares), etc.

5. DATA ANALYSIS

❖ **Types of assessment models or other approaches are used to evaluate the status of the resource and to assess the impact of harvesting strategies**

Year	Model or method used	Data used	Summary of results and conclusions (include references to reports and document)
1993 & 1996	Interviews with fishers and field survey.	Landing (lbs.) effort (boat-days), CPUE (lbs./boat-day) 1996, and Density/hectares.	- Uneven distribution of conch. - Some places totally depleted, but some presented some viable resources.
2003- present	Closure.	None.	Following CITES recommendations of September 2003.
2006	Visual survey.	Visual survey.	Looks stable compared to previous surveys.

❖ **Comments on how the assessments take into account major uncertainties in data and assumptions**

No estimation of the MSY or the local consumption. Total fishing effort is unknown. Haiti is now interested in having a study to identify the status of the resource. All provisions have been made for the study to take place (a project has been prepared with help of CRFM) and the project will be initiated once financial support is executed.

❖ **Who the reports were prepared for and whether and how they have been used to assist in management of the fishery**

The report was prepared by Jean Robert BADIO, at the Division of Fisheries and Aquaculture of the Ministry of Agriculture in order to respond to CITES regarding the recommendations for Haiti and also to inform all others interested in the status of the queen conch (*Strombus gigas*) resource in Haiti.

❖ **Proposed alternative assessment methods (where necessary) that could be used to provide better information on the status of the resource or performance of the fishery and the data that would be needed for the alternative and what collection of the data it would entail**

There is a lot to be done in Haiti. A total assessment is now necessary to identify the following:

- density per hectare;
- CPUE;
- meat weight;
- anecdotal information (interviews with fishers and knowledgeable persons); and
- socio-economic studies.

6. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery**

Type of Control (patrolling of illegal fishing)	Years Implemented	Description of i) the rationale for the control ii) the details of the control and iii) current level of restriction	Estimated effectiveness of control
Please note: There is a total closure of the fishery following CITES recommendations.			
The Haitian Coast Guard, United Nations military, and in some places Haitian extension officers	Since 2004.	To control Haiti's coast line which reduces poaching from neighbouring countries.	So far , very effective.

7. ENFORCEMENT AND COMPLIANCE

❖ **The surveillance and monitoring systems that are in place to ensure that the requirements of the management system are in place. The methods used to enforce CITES regulations concerning exports of queen conch are also described.**

Monitoring Activities:

- Regarding the CITES recommendations, total closure has been observed for conch. However, provisions are being made, including the new conch associations and other stakeholders, to conduct a survey in which data on density/hectares will be taken. Data on cpue, catch and effort data will be gathered, as well as the initiation of a program for collecting data and monitoring including measurements of lip thickness and record taking at different docks.
- Export data for queen conch will be controlled and digitised, and also monitored using the CITES permit mechanism.
- Some areas will be delineated and protected as fisheries protected zones. These areas will also be monitored to determine the effectiveness of these areas in increasing stock size outside the protected area zone. Fishing permits will be given to all conch fisherman
- The survey will also consider the socio-economic parameters for all conch stakeholders. It will also take into account factors such as :
    - Social capital
    - Resource utilisation
    - Local consumption

Enforcement:

With help of the conch association and others, law regulations regarding conch will be respected. Enforcement activities will take place at:

- customs
- landing docks
- restaurant
- beaches
- processing plants, etc .

❖ **The types of sanctions and penalties that can be applied in case of non-compliance with the management controls**

Fishing permits or certificates of exports will be removed as sanctions, and depending on the level of non-compliance imprisonment or fees could be requested.

❖ **Comments on the current limitations of the enforcement system (budgetary and other factors) and on the potential measures that could be used to improve compliance**

Haiti has no limitation regarding personnel resources. Of the 21 fisheries personnel working at the Division of Fisheries and Aquaculture, 11 of them have graduate and post graduate degrees. In addition, we also have more than 40 technicians, well educated in Cuba, from different sectors including marine biology, mariculture, aquaculture, etc.

The fundamental limitations of enforcement are due to governmental financial problems owing to a focus on other priority issues.

❖ **Information that is available on the nature and extent of illegal harvest and trade and the best estimates of the extent of illegal harvest and trade**

Currently, no information is available regarding IUU fishing and poaching.

❖ **Comments on whether the fishery could be considered consistent with the national legislation and international agreements**

Haiti definitely needs to be a member of CITES and SPAWS and all others institutions which could help Haitian fisheries to be considered consistent with national legislation and international agreements.

8. DECISION –MAKING

❖ **The Departments or institutions with management responsibility in this fishery, described also by their area of responsibility and interactions**

Governmental agencies (with key involvement in fisheries):

- The Ministry of Agriculture and Natural Resources responsible for Fisheries and Natural Resources, is the ultimate policy maker via the Division of Fisheries and Aquaculture. The Division of Fisheries and Aquaculture of the Ministry of Agriculture is the Haitian authority competent to deal with CITES issues.

- Conservation Officers at the Quarantine office, extension officers “agent de peche” from the Division of Fisheries and Aquaculture, and custom officers are tasked with the following duties:

    - Airport Inspections to ensure individuals are not entering or leaving the country with prohibited fauna or flora.
    - Landing docks, restaurants and processing plants inspections to ensure compliance with the minimum size regulations for various marine products.
    - Customs Officers are the main agents of border protection. They ensure that products (e.g. marine products, endangered species, and endemic species) are not exported or imported into the country illegally.

The Caribbean Regional Fisheries Mechanism (CRFM): provides support and advice on various aspects of fisheries management for 18 CARIFORUM countries. Its major objective is to strengthen regional cooperation in fisheries in the CARICOM region. CRFM is mandated to promote sustainable use of fisheries and aquaculture resources in and among CARICOM Member States and participating countries by development, management and conservation of these resources, in collaboration with stakeholders to benefit the people of the Caribbean region.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): This convention regulates trade in species of flora and fauna (and products derived from such species) threatened by international trade. The Turks and Caicos Islands is in the process of developing legislation and implementing other mechanisms to facilitate ratification to this convention.

Food and Agricultural Organization of the United Nations FAO-WECAFC: facilitates coordination of research, educational efforts, training, and provides assistance with policy for the rational management of resources in the relevant region.

❖ **The extent of and the way in which scientific information is used to help in decision-making**

For now, neither research nor surveys have been conducted, nor data collected since 2002. However, provisions are being made for data to be collected and entered on the computer in order to provide specific information to help decision making.

❖ **The frequency of review of management controls and adjustments considered, and which Departments or institutions are doing the review**

Management controls will be reviewed every year and adjustments will be considered (i.e. quota and others). However, enforcement measures may be reviewed as needed. The Division of Fisheries and Aquaculture of the Ministry of Agriculture and Natural Resources in Haiti is responsible for such tasks.

❖ **The mechanisms in place for consultation with stakeholders**

With the creation of the conch association, formed mainly by fishers and exporters, consultation with stakeholders can be done very easily. Field extension officers at different levels will be responsible for the coordination.

9. FEEDBACK AND REVIEW

❖ **Procedures for undertaking regular reviews of management systems**

Plans will be made in order for the management system to be subject to regular reviews which can be done every year. Review of implementation will be done as needed with the approval of members of the conch association, the representatives of conch fishermen and all other stakeholders.

❖ **Mechanisms used for consultation to receive feedback from stakeholders and stakeholders consulted**

Field extension officers at different sections (customs, quarantine, landing zones, airports, etc.) are mandated to report all information and/or feedback to their Division every three months during which time all feedback from stakeholders is related.

❖ **Information on last review of regulations**

In September 2003, regarding CITES regulations, a total review was made in the sector of fisheries and policies and regulations were revised. Decisions such as total closures for conch fishing are observed and other provisions were made regarding policy and regulations which will be considered with the new parliament.

❖ **Research planned or undertaken to improve management of the fishery for queen conch or to meet specific requirements of the management plan**

A management plan will be prepared for the conch fishery in Haiti and the following activities will be realized:

- identification and preliminary characterization of the main conch fishing grounds
- training of local fisheries staff and assembly of research teams
- identification of main queen conch nursery ground on the basis of average size juveniles
- collection of morphometric data from each area surveyed and prepare standardized
- conversion of formulae for processed and unprocessed meat
- gathering and analysis of social and economic data
- Creation of a database and analysis of data
- Preparation of a report on the status of the stock and the estimate of MSY, and provide recommendations for management, including recommendations on upper limits for the overall catch and exports.
- It is essential that initiatives regarding management measures for Haiti are introduced with the involvement of the fishermen. Extension work involving educational awareness must be considered an integral part of the management plan and various socio-economic factors also have to be taken into account.

A concerted effort must therefore be made to inform and educate the fisherman so that they understand the problems and the reasons why management initiatives have to be introduced.

HONDURAS

Italo Giovanni Tugliani, Nelson Ehrhardt, Martin Galo and Luis Morales[1]

It is to be taken in consideration when reviewing this summary, that Honduras´ Conch Fishery report may differ in several ways from those reports of other countries, considering the fact that our Conch Fishery has been TOTALLY CLOSED since 2003 and will remain closed for commercial purposes during the next few years until all the intended studies have been effected.

1. ANTECEDENTES

❖ Descripción de la pesquería

Por recomendación de la CITES, en Septiembre de 2003 el Gobierno de Honduras suspendió las exportaciones de *Strombus gigas* e inició estudios tendientes a describir las densidades de caracol en los bancos de pesca tradicionales. En Febrero de 2005 el Gobierno de Honduras estableció una moratoria a la pesquería hasta cuando no se tenga el conocimiento científico suficiente para dimensionar las cuotas anuales que se de deberían capturar para mantener al recurso a niveles de abundancias que sean sostenibles. En Diciembre de 2005 Honduras y la CITES ratificaron las medidas adoptadas por Honduras concerniente a la necesidad de mantener la moratoria hasta tener información científica sobre la cual sustentar las cuotas anuales de pesca.

Con anterioridad a Septiembre de 2003 la pesquería contaba con 13 barcos industriales que capturaban caracol mediante buceo autónomo y que operaban desde las Islas de la Bahía, (French Harbor, Oak Ridge, Jonesville, y Guanaja). Las embarcaciones eran antiguas (20 – 30 años) y con esloras de 54 a 85 piés pudiendo acarrear de 30 a 60 cayucos para realizar la pesca. Cada cayuco era operado por un buzo y un cayuquero por lo que sobre 1000 pescadores más todo el personal de apoyo a bordo (capitán, maquinistas, cocineros, llenadotes de tanques de aire, operadores varios, etc.) y personal de soporte en tierra que quedaron sin empleo y debieron ser re-ubicados en la pesquería de langosta. Esta flota operaba en bancos sobre la plataforma continental externa dentro de las aguas de la Zona Económica Exclusiva de Honduras ubicados al norte del paralelo 14º 59’ 08” Lat N en zonas predominantemente de arrecifes coralinos, fondos rocosos y sustratos de grava y arena. Los principales bancos de pesca fueron los de Cabo Falso, Del Cabo, Gorda, Rosalinda, Thunder, Knoll y Serranilla, Misterios y El Rosario, Cayos Media Luna, y Arrecife Savanna.

Las pesquerías artesanales son de subsistencia y operan en las zonas costeras en donde incidentalmente se captura caracol para el consumo local el cual es limitado. Estas fracciones del stock habitan preferentemente en aguas someras con presencia de praderas de Fanerógamas marinas tales como *Thalassia testudinum* y *Syringodium filiforme*y. Desde mediados de la década de 1980 comienza un interés por la explotación comercial de este recurso en Honduras. Las exportaciones anuales crecieron de 400 tm en 1985 y a 1000 tm de producto limpio en 2003; sin embargo, los desembarques se estabilizaron en la década de los 1990 en aproximadamente 800 tm. No existió un sistema estadístico nacional para la recolección del esfuerzo de pesca o datos biológicos en esta pesquería.

El caracol complementaba en forma significativa a las operaciones de pesca industrial de la langosta. El impacto económico a pescador se estima del orden de los $4 millones por temporada impactando a un estimado de 4000 personas incluyéndose en estas a los familiares de los pescadores.

Las conchas fueron siempre descartadas por los buzos en el lugar mismo de captura. Se desconoce el impacto ecológico o ecosistémico que esta práctica pudo haber tendido. Los principales impactos del

[1] Este modelo de Plan de Ordenación Provisional representa solo la opinión de los autores: Italo Giovanni Tugliani, Martin Galo, and Luis Morales, Director DIGEPESCA, Secretaría de Agricultura y Ganadería; Nelson Ehrhardt, Division of Marine Biology and Fisheries. Rosenstiel School of Marine and Atmospheric Science. University of Miami.

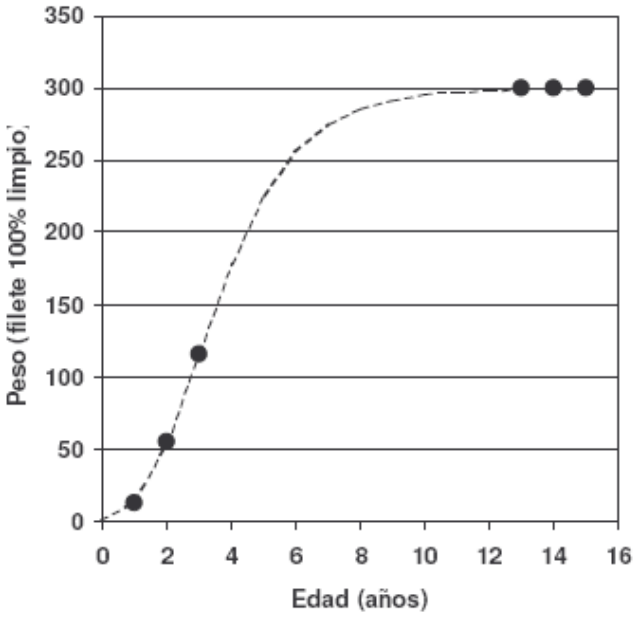
medio ambiente son de origen atmosférico, principalmente huracanes y marejadas, que afectan a las operaciones de pesca que eran más intensas durante las épocas de veda de la langosta.

❖ **Descripción del recurso**

Strombus gigas madura a los 3.5 años de edad, la fecundación es interna y la copulación precede al desove por varias semanas. El desove puede ocurrir 6 a 8 veces por estación depositando en promedio 400 mil huevos por desove. El proceso de apareamiento y desove ocurre fundamentalmente en zonas de arenas coralinas limpias; los huevos eclosionan en 5-6 días y las larvas pelágicas (veliger) pueden permanecer 18-40 días en las corrientes marinas antes de alcanzar la metamorfosis. Debido a las fuertes corrientes imperantes en el área (1-3 km/h), estas larvas pueden colonizar bancos lejanos desde el origen del desove. Esto tiene implicancias mayores en lo referente a definición de unidades de stock o población y por ende de las unidades de administración pesquera. Se desconoce la edad terminal de la especie pero se puede elucubrar que es de más de 10 años. Regionalmente, el crecimiento hasta la edad de primera madurez ha sido generalmente expresado como una función von Bertalanffy del largo sifonal sobre edad basándose en procesos de marcajes. Sin embargo, con el advenimiento de la madurez, el caracol reina cambia de dirección en el eje de crecimiento de ser sifonal a crecimiento y engrosamiento del labio, lo cual es la mejor señal de estado de maduración. El crecimiento en peso de la parte aprovechable ha sido estimado por Ehrhardt y Galo (2005) de acuerdo a la formulación de Ehrhardt (1999),

$$W_t = \frac{W_\infty}{W_\infty^{EXP(-A3*t)}}$$

en donde A3 = 0,59738 y W_=300g y cuya trayectoria se da en la figura que sigue:

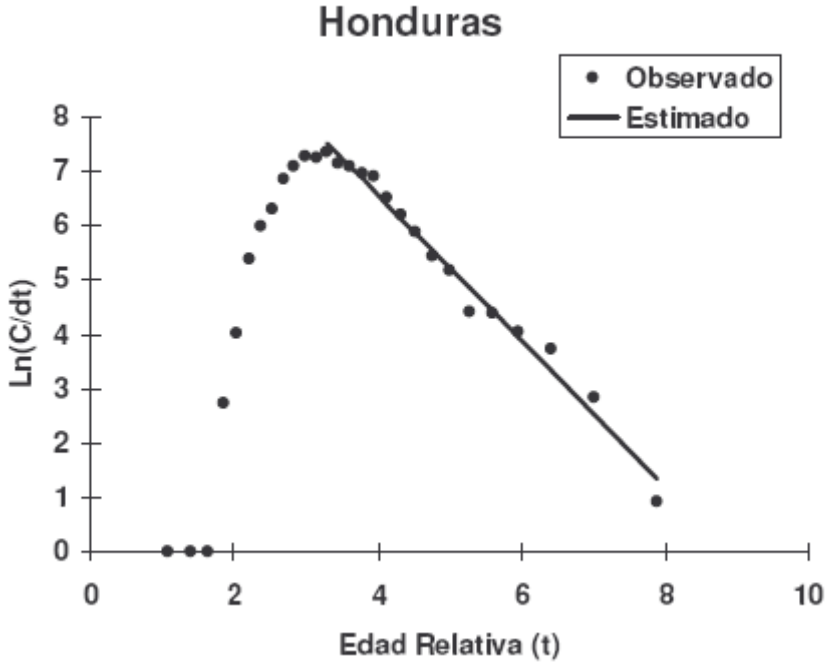


Crecimiento de *Strombus gigas* en Honduras

La mortalidad natural anual ha sido estimada por Ehrhardt y Galo (2005) como M=0.72 desde el tamaño de primera madurez según la formulación de Ehrhardt (1999),

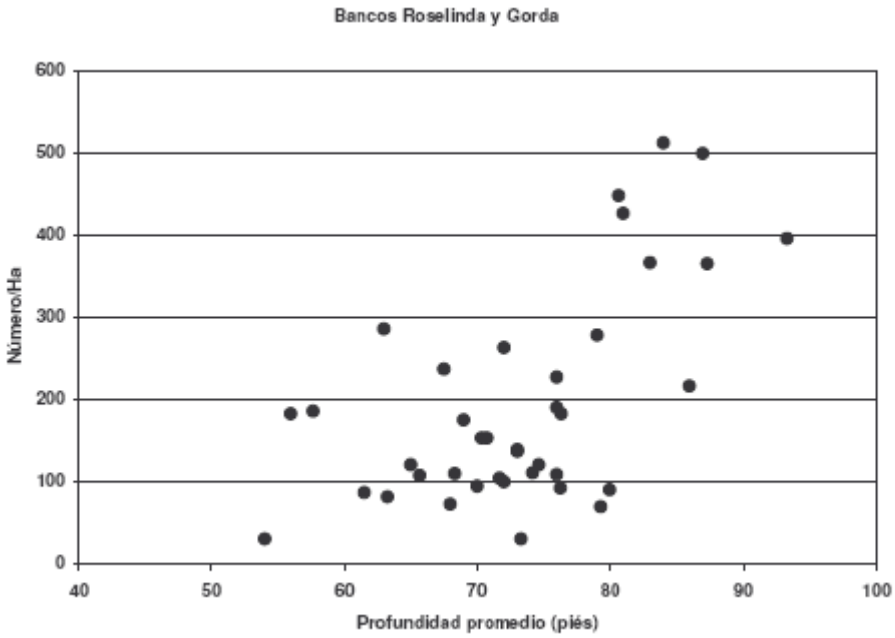
$$M_t = -0.242 - \frac{4.330 * A3}{\ln\left[\frac{\ln\left(W_\infty / W_t\right)}{\ln\left(W_\infty\right)}\right]}$$

Sin embargo, la pesquería industrial explotó al *Strombus gigas* en sus estadios ya maduros (mayores de 3.5 años) por lo que la mortalidad natural a partir de ese rango es de 0.66. La mortalidad de pesca para el periodo correspondiente a la última estación de pesca (2003) es de F=0.69 año $^{-1}$ la cual fue obtenida a partir de un estimado de Z=1.35 año $^{-1}$ obtenido desde una curva de pesca basada en peso individual según Ehrhardt (1999) que se muestra mas abajo. No existen otros estimados de mortalidad para el caracol en Honduras.

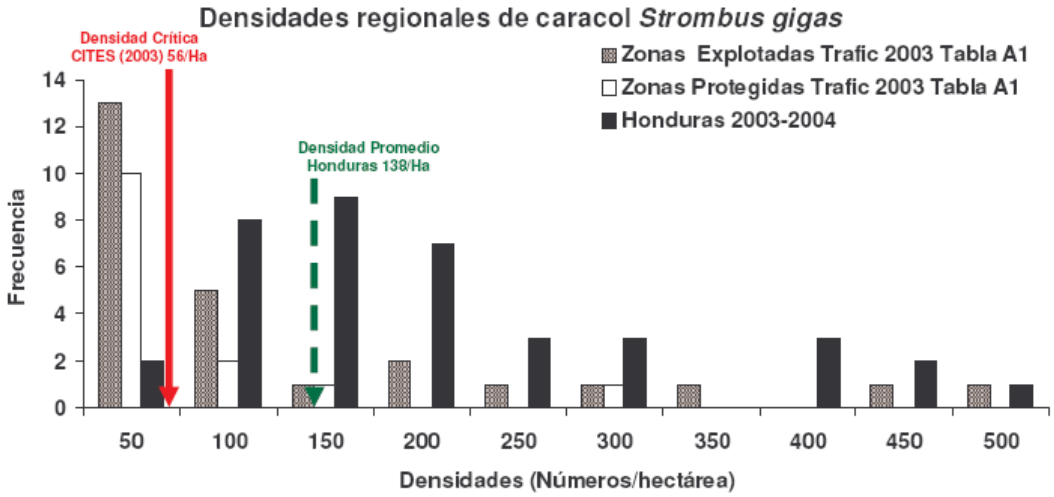


La especie se encuentra ampliamente distribuida sobre la plataforma continental Hondureño-Nicaragüense y a través de todo el corredor arrecifal Meso-Americano. Esto se debe a la presencia de hábitat propicio para la especie y la distribución espacial de las larvas que colonizan extensiones amplias de la plataforma.

Los estudios de densidad poblacional realizados por Honduras después del cierre de la pesquería en Diciembre de 2003 indican una mayor densidad a profundidades mayores de 80 piés como se indica en la figura que sigue:



Como se muestra mas abajo, las densidades encontradas en los bancos de pesca comercial en Honduras son superiores a la mayoría de los estimados de densidad aportados en el informe TRAFFIC (2003, Tabla A1). Desafortunadamente en el informe TRAFFIC se menciona una densidad de 7 individuos/ha para Honduras, una cifra que corresponde a Cayo Cochinos, un área somera que es cercana a la costa en el cual no operan las flotas industriales y que es una área en que las incursiones de navegantes se remonta al siglo 16.



La única evaluación sobre el estado de explotación del stock en aguas hondureñas corresponde al realizado en 2003/2004 cuyos resultados de mortalidad de pesca se aportan mas arriba. Sin embargo, dadas las capturas estabilizadas desde los años de 1990 y hasta principios de los 2000 en que se capturaban en promedio 800 mil tm y dado que la mortalidad de pesca obtenida es ligeramente superior a aquella de la mortalidad natural, entonces se podría especular que el stock se habría encontrado a los niveles máximos permisibles de explotación al cierre de la pesquería en Septiembre de 2003.

❖ **Análisis de la situación y de los problemas enfrentados actualmente en el ámbito de la ordenación de la pesquería del caracol**

La pesquería se encuentra en veda permanente o moratoria hasta cuando no existan las evidencias científicas que permitan la definición y justificación de una cuota anual. La industria pesquera ha cooperando significativamente con este proceso de ordenación y contribuye en la realización de los cruceros de evaluación temporal-espacial de las densidades de cada banco de pesca y con la colección de datos biológicos que están siendo utilizados para evaluar el estado del recurso en cuanto se refiere a abundancia latente. Al mismo tiempo Honduras está realizando esfuerzos mayores para desarrollar metodologías de evaluación de stocks que sean más adecuadas a la dinámica poblacional del caracol para así poder justificar el dimensionamiento de capturas biológicamente aceptables que se pudieran aplicar a la pesquería cuando ésta se reincorpore al sistema de producción nacional.

La situación de veda permanente ha creado condiciones críticas de orden socio-económico en el sector pesca. Sin embargo, se espera que las medidas tomadas lleven a un futuro en que el recurso de caracol *Strombus gigas* sea explotado de forma sostenible con controles sobre las capacidades de pesca.

2. POLÍTICAS Y LEGISLACIÓN

❖ **Las políticas que establecen los principios de ordenación de la pesquería del caracol**

La restauración bien dimensionada de la explotación del caracol teniendo en consideración una plataforma sostenible de las poblaciones existentes en el Caribe hondureño han pasado a ser el principio básico de la ordenación pesquera que se trata de implementar a partir de los extensos estudios científicos que se realizan durante la moratoria de la pesquería del caracol.

❖ **La estructura jurídica que estipula la ordenación, el seguimiento, el control y el cumplimiento en el ámbito de la pesquería del caracol**

No existe legislación dirigida a la investigación y ordenación de los recursos pesqueros en general y la ley de pesca está siendo revisada, la cual se considera como antigua y obsoleta en muchos aspectos de la administración moderna de los recursos pesqueros. La explotación de las pesquerías y algunas medidas de ordenación se estipulan de manera general en la ley de pesca y sus reglamentos; sin embargo, normativas de aplicación general son aplicadas cuando hay necesidad de ordenar, regular o prohibir actividades las cuales se realizan mediante Decretos Presidenciales o Ministeriales según correspondan. Sobre este punto, la moratoria a la captura industrial y exportación de *Strombus gigas* fue establecida por la Secretaría de Agricultura y Ganadería (SAG), mediante Acuerdo Ministerial Número 820-03 del 29 de Septiembre del 2003 y comunicada a la Secretaría de la CITES. Al mismo tiempo los acuerdos con la CITES con referencia a las solicitudes de Honduras de mantener la moratoria hasta cuando se pueda determinar con certeza los cupos anuales de pesca que sean biológicamente aceptables han sido enmarcados en el Decreto Ministerial Numero 176-06 del 13 de Enero del 2006.

❖ **Las convenciones internacionales y los acuerdos ratificados por el país que tengan una relevancia directa para la pesquería**

Honduras ha ratificado acuerdos y convenios con:

- CITES;
- Convención de las Naciones Unidas Sobre Derecho del Mar; y
- Código de Conducta Para la Pesca Responsable.

En cuanto a la manera en que los acuerdos y convenios inciden en la situación actual del recurso *Strombus gigas*, la convención CITES es la de mayor incidencia ya que de manera directa influye sobre la ordenación de la pesquería dado que esta especie se encuentra en el Apéndice II de la CITES.

3. OBJETIVOS, INDICADORES Y PUNTOS DE REFERENCIA EN LA ORDENACIÓN

- **Los objetivos operacionales de la pesquería del caracol, según lo indicado por los planes de ordenación, las políticas y la legislación disponibles**

La pesquería esta sujeta a una moratoria hasta cuando las cuotas anuales de pesca puedan ser definidas científicamente. Los trabajos científicos para elucidar esta situación están en proceso de implementación. Los objetivos operacionales para cuando se abra la pesquería serán el de dimensionar la capacidad de pesca de las flotas en base a una cuota biológicamente aceptable. Para esto se tiene planeado que las capacidades de pesca sean dimensionadas en base a un marco económico gobernado por la cuota anual disponible.

- **Indicadores que son o podrían ser utilizados para evaluar el desempeño de la ordenación de la pesquería en relación a los objetivos**

No existen tales indicadores para el caracol. El Gobierno está conjuntamente con la industria implementando un plan de investigación que permita elucidar que indicadores son los que de forma mas apropiada y efectiva puedan inferir acerca de la densidades poblacionales que son necesarias de mantener para que la pesquería sea sostenible.

- **Los puntos de referencia que son/podrían ser usados para definir un desempeño de la pesquería aceptable e inaceptable (por ejemplo, puntos de referencia objetivo y límite, cuando corresponda)**

No existen puntos de referencia ni objetivos ni limites probados para la dinámica poblacional del caracol *Strombus gigas*. En otros países de la región se han utilizado puntos de referencia relativos a las dinámicas de peces (F0.1, FMSY, etc.). Esto, sin embargo, es muy incierto debido a la fecundación interna que caracteriza la dinámica poblacional del *Strombus gigas*, y que requiere de una densidad mínima (punto límite) para generar tasas de copulación con éxito. Por lo tanto, los puntos de referencia deberían estar ligados directamente con las densidades poblacionales que habrá de quedar en el mar después de la explotación las que permitan un éxito de las tasa de copulación necesarias para mantener el esfuerzo reproductivo de la especie. La biomasa mínima aceptable dependerá en gran medida de la densidad objetivo que dicha biomasa genere. Por lo tanto, cualquier punto de referencia basado en la biomasa poblacional no es conmensurable con la problemática de administración del recurso caracol tal cual lo plantea Honduras. Por otra parte, el número máximo de buques no es un buen indicador en el caso del caracol puesto que representa una capacidad de pesca la cual (según la ordenación pesquera que Honduras ha establecido para el caracol) dependerá de la cuota anual que es biológicamente aceptable y que dicha capacidad estará enmarcada en un punto de equilibrio económico de las operaciones de pesca que actuarán bajo la cuota establecida para una estación.

4. DATOS REQUERIDOS Y SISTEMA DE MONITOREO

❖ **El tipo de datos recopilados y las características del sistema de monitoreo**

Descripción de los datos	Unidad de medida	Años disponibles*	Procedimiento de muestreo (incluyendo la frecuencia de muestreo, la cobertura en porcentaje, los procedimientos de expansión, etc.)
Desembarques			
Descartes			
Estimación de los desembarques no registrados (cuando corresponda)			
Esfuerzo de pesca	*Número de barcos*	*1990-2003*	*Licencias de pesca otorgadas para la pesca de caracol y langosta*
Peso promedio de la carne	*Gramos*	*2003-2004*	*Muestreos experimentales en exploraciones para la determinación de densidades poblacionales*
Frecuencia de tamaño	*Números*	*2003-2004*	*Muestreos experimentales en exploraciones para la determinación de densidades poblacionales y en plantas*
Densidad de población según estimación de encuestas	*Números/ ha*	*2003-2004*	*Muestreos experimentales en exploraciones para la determinación de densidades poblacionales*
Comercio - volumen - valor	*Libras de carne* *Total Dolares*	*1974 – 2003*	*Datos relativos a los envíos parciales que hacen las industrias. Peso de la carne procesada de acuerdo a declaraciones del Banco Central y de reportes correspondientes a las certificados CITES.*

❖ **Otros datos que deberían ser recopilados para el seguimiento del estado del recurso o del desempeño de la pesquería**

Densidades poblacionales por tipo de substrato y por banco de pesca; CPUE de acuerdo a lo anterior. Fracción madura del stock en cada banco de pesca. Temporalidad e intensidad del desove de acuerdo a las densidades expresadas más arriba.

❖ **Comentarios e información complementaria**

Hay necesidad de estimar la precisión de los métodos de evaluación de densidades según transeptos. Esta metodología parece no dar buenos resultados a bajos niveles o altos niveles de densidad. Esto es especialmente crítico para las exploraciones de muestreo realizadas en la época de apareamiento y desove. La experiencia ha demostrado que se requiere esfuerzo de muestreo de saturación sobre áreas mayores de la distribución del recurso para elucidar este problema que es de fundamental importancia.

5. ANÁLISIS DE DATOS

❖ **Tipos de modelos de evaluación u otros enfoques son utilizados para evaluar el estado del recurso y estimar el impacto de las estrategias de explotación**

Año	Modelo o método utilizado	Datos utilizados	Resumen de los resultados y conclusiones (incluir referencias a informes y documentos)
2003-2005	*Area barrida por buzos bajo saturación de esfuerzo*	*Números por m^2*	*Densidad poblacional*
2003-2005	*Crecimiento*	*Crecimiento juveniles y peso máximos después de primera madurez*	*Curva de crecimiento*
2003-2005	*Mortalidad Natural*	*Parámetros crecimiento*	*Curva de mortalidad natural a peso (edad), M*
2003-2005	*Curva de captura convertida a pesos*	*Frecuencia pesos, parámetros de crecimiento y M*	*Mortalidad total, Z*
2003-2005	*F=Z-M*	*Estimados de Z y M de los procesos anteriores*	*Mortalidad de pesca*

❖ **Consideración de las incertidumbres en datos y supuestos en la evaluación**

Se utiliza un proceso de re-muestreo (bootstrap) de las frecuencias de pesos en las estimaciones del crecimiento y mortalidades. Lo mismo se esta desarrollando para obtener varianzas e intervalos de confianza para los estimados de densidad por estratos y regiones.

❖ **Describa para quién fueron preparados los informes, si han sido utilizados para asistir en la ordenación de la pesquería y, si es el caso, de qué forma**

Para la CITES, para la industria y el Gobierno. Los informes dieron soporte a la decisión por parte del Gobierno de Honduras de establecer una moratoria en la pesquería de caracol *Strombus gigas.*

❖ **Métodos alternativos de evaluación (cuando sean necesarios) que podrían ser utilizados para proporcionar una mejor información acerca del estado del recurso o del desempeño de la pesquería**

De acuerdo a Ehrhardt y Galo (2005), el proceso de evaluación del caracol *Strombus gigas* es complejo debido a las características dinámicas de la reproducción que impone la necesidad de cuantificar los niveles mínimos y óptimos de densidades poblacionales que aseguren una capacidad de sustentación del éxito reproductivo. Sin embargo, se desconoce cual es la relación funcional entre la densidad y la abundancia de las poblaciones de caracol a diferentes niveles de explotación. Al desconocerse las relaciones anteriores, también se desconoce la forma mas probable del modelo desovante recluta que podría aplicarse a un gastrópodo de fecundación interna tal cual es *Strombus gigas*. Por lo mismo, es de especial atención pensar que el modelo logístico de crecimiento poblacional que tan usualmente se aplica a muchas pesquerías, puede que no tenga aplicabilidad a esta especie que después de ser sometido a una explotación que lleva a las poblaciones a alcanzar una

densidad mínima, su capacidad reproductiva colapsa y puede tomar varias décadas (como es el caso del stock de la Florida) para que se logre alguna recuperación. Existen graves dificultades técnicas y económicas de colectar información sobre captura y esfuerzo sobre áreas específicas del hábitat de la especie que permitan el desarrollo de índices relativos de abundancia (CPUE) que sean verdaderos lo cual crea una problema serio en cuanto al uso de estas estadísticas en modelos de producción. Existe un aspecto crítico de las relaciones interactivas entre las unidades de pesca (buzos) en que a mayor densidad de buzos en un área del hábitat de la especie, la capturabilidad por unidad de esfuerzo disminuye significativamente. Esto último afecta a la CPUE resultante no como un efecto de menor abundancia relativa sino de mayor esfuerzo utilizando una abundancia local fija. Lo anterior podría mejorarse mediante estandarizaciones del esfuerzo si es que se lograra obtener el grado de especificidad espacial de las estadísticas de captura y esfuerzo. Una vez mas este problema tiene implicancias directas sobre la aplicación de modelos de producción. Las estructuras de tallas en las capturas solo se refieren a los pesos de la carne aprovechable ya sea en estado limpio o semi-limpio. La mayoría de las metodologías que usan estructuras de edades para evaluar los stocks no son así aplicables. Existe una necesidad imperativa de desarrollar un método validado de determinación de las cuotas anuales de pesca basándose en los estimados de biomasas latentes que se estiman a partir de las densidades poblacionales y su área de distribución. Se propondrán métodos cuando se hayan desarrollado y probado.

6. CONTROLES

❖ **Las medidas de ordenación (controles) actualmente utilizados para alcanzar los objetivos de esta pesquería.**

Tipo de control	Años de implementación	Descripción i) del fundamento del control ii) de los detalles del control y ii) del nivel de restricción actual	Efectividad estimada del control
Moratoria	*2003 - actualmente*	*No se tiene conocimiento cierto como definir las cuotas anuales de pesca, se desconoce la respuesta de las densidades y capacidad reproductiva del stock a la explotación*	*Total*

❖ **Los problemas específicos experimentados con los controles y los controles adicionales en materia de ordenación que podrían ser utilizados en esta pesquería con el fin de alcanzar los objetivos de pesca.**

Pesca furtiva por otros países que no tienen moratoria. Este es un problema recurrente que en ausencia de actividades pesqueras en bancos de pesca en alta mar, embarcaciones no nacionales realizan faenas de pesca en dichos bancos. El costo de monitoreo y vigilancia en ausencia de una sistema de producción pesquero es económicamente insostenible.

7. APLICACIÓN Y CUMPLIMIENTO

❖ **Los sistemas de vigilancia y seguimiento implementados para asegurar el cumplimiento de las exigencias del sistema de ordenación**

- Vigilancia en aguas hondureñas por la Fuerza Naval.
- Instalación del Sistema Satelital a los barcos de exploración y evaluación de los stocks de caracol que operan en el plan de investigación de caracol.

- Implementar vedas regionales coincidentes cuando se abra la pesquería comercial de Honduras con el fin de estandarizar las operaciones y evitar la pesca furtiva.
- Inspectores de pesca que están fiscalizando en los puertos de desembarque la descarga de la producción de langosta que pueden haber traído caracol como pesca incidental de la zona de pesca.

❖ **El tipo de sanciones y penalidades que se pueden aplicar en caso de incumplimiento de los controles de la ordenación**

- Multas que van desde U$S 8 000 hasta los U$S 52 000.
- Suspensión de la licencia de pesca hasta por el término de un (1) año.

❖ **Las limitaciones del sistema de aplicación (presupuestarias y otros factores) y las posibles medidas que se podrían tomar para mejorar el cumplimiento**

La principal limitante en el momento de levantarse la moratoria será el costo de la vigilancia y control dado que los bancos de pesca se encuentran en alta mar a grandes distancias. Sin embargo el establecimiento por decreto ministerial de balizas satelitales en los barcos de la pesca industrial Hondureña contribuirá a solucionar este problema. Queda sin embargo la problemática de la pesca furtiva por otros países.

❖ **Informaciones disponibles acerca del tipo y del alcance de la explotación y del comercio ilegales y las mejores estimaciones del alcance de la explotación y del comercio ilegales**

No se cuenta con tal información y se desconoce su alcance al no existir información registrada. Solo existe información indirecta por observaciones realizadas por pescadores.

❖ **Comente acaso la pesquería se puede considerar coherente con la legislación nacional y los acuerdos internacionales**

La pesquería esta bajo una moratoria basada en un principio congruente el cual es coherente con la legislación nacional y los acuerdos establecidos en Diciembre de 2005 entre el Gobierno de Honduras y la CITES (Decreto Ministerial Numero 176-06 del 13 de Enero del 2006).

8. LA TOMA DE DECISIONES

❖ **Los ministerios o las instituciones con responsabilidades de ordenación de la pesquería, describa su ámbito de responsabilidad e interacciones**

- Secretaria de Agricultura y Ganadería
- Secretaria de Recursos Naturales y Ambiente a través de la Dirección de Biodiversidad
- Dirección de Marina Mercante a través del otorgamiento de patentes de barcos.

❖ **El alcance y la forma en que la información científica es utilizada para ayudar en la toma de decisiones**

La información científica existente para *Strombus gigas* es reducida. Sin embargo, dicha información fue fundamental para tomar decisiones de alto impacto en cuanto se refiere a la ordenación de la pesquería de caracol en Honduras. A medida que el programa de investigación de caracol se desarrolle y se obtenga mejor información sobre las bases en que se deben definir las cuotas anuales, entonces la toma de decisión de abrir una nueva pesquería ser hará con los dimensionamientos y marcos de referencia que dicte la información y las recomendaciones científicas derivadas de la misma.

- **Las reglas o los procedimientos existentes en materia de decisiones para establecer de qué forma la explotación debería ser modificada en función de los resultados del seguimiento**

En el caso de Honduras, debido a la situación crítica de las recomendaciones de la CITES, se ha establecido una moratoria o veda total a la pesca de *Strombus gigas*. La regla de decisión en este caso fue drástica ante la imposibilidad de seguir operando bajo las condiciones de falta de control existentes. Las reglas de decisión para re-establecer la pesquería no han sido desarrolladas aun pero ciertamente se basarán en principios económicos para el aprovechamiento de una cuota que será biológicamente aceptable para mantener la sostenibilidad del recurso.

- **Frecuencia se examinan los controles de la ordenación y se contemplan ajustes**

Al encontrarse la pesquería bajo una veda permanente, los controles de ordenación consisten en un plan de investigación y exploración pesquera continua a través del año 2006 y por los próximos 4 años. No existen ajustes sino un proceso de entendimiento para definir las cuotas anuales biológicamente aceptables. Una vez que se obtenga el nivel de entendimiento de cómo estimar dichas cuotas entonces se realizará una definición de las capacidades de pesca aceptables. La institución encargada es la Secretaría de Agricultura y Ganadería a través de la Dirección General de Pesca y Agricultura (DIGEPESCA).

- **Los mecanismos implementados en materia de consulta con las partes involucradas**

Se da a través de reuniones e intercambio de información.

- **Los mecanismos de resolución de conflictos en el ámbito de la pesca**

La Secretaria de Agricultura y Ganadería trabaja en coordinación con la industria pesquera representada por APESCA, asimismo se auxilia en la Dirección General de Marina Mercante y la Fuerza Naval.

9. RETROALIMENTACIÓN Y REVISIÓN

- **Revisiones periódicas del sistema de ordenación**

El sistema de ordenación esta recién siendo implementado.

- **Mecanismo utilizados para realizar consultas y recibir respuestas de las partes involucradas**

Reuniones, llamadas telefónicas, comunicaciones electrónicas, las partes involucradas que son consultadas son los pescadores y las instituciones de gobierno involucradas.

- **Uso de la información científica en la revisión**

El sistema de ordenación esta recién siendo implementado.

- **Última vez que se examinaron y/o revisaron i) las políticas y ii) las reglamentaciones**

En Marzo del 2006 en reunión con la industria pesquera, no ha habido cambios ya que el *Strombus gigas* continúa en veda indefinida.

❖ **Investigaciones contempladas o llevadas a cabo para mejorar la ordenación de la pesquería del caracol o para cumplir con requisitos específicos del plan de ordenación**

1. Exploraciones visuales anuales de las densidades poblacionales de caracol en cada banco de pesca que fue importante en la pesquería que existió hasta Septiembre de 2003.
2. Determinación de las composiciones de tallas y sexo por banco de pesca estudiado.
3. Determinación de la abundancia latente por banco de pesca estudiado.
4. Desarrollo de metodologías para el uso de las abundancias latentes en la determinación de las cuotas anuales.
5. Modelación de las estructuras de tallas para determinar mortalidad y abundancia.
6. Determinación de los costos de operación de las embarcaciones y determinación del punto de equilibrio de acuerdo a capturas anuales o por temporada que necesitan ser producidas.
7. Determinación del protocolo para la definición de las capacidades de pesca que deberían implementarse en cada estación una vez que se definan las cuotas biológicamente aceptables.

❖ **Consultas con agentes externos en el examen del sistema de ordenación**

Se cuenta con la asistencia científica externa necesaria para dar entrenamiento al personal técnico de la DIGEPESCA y para elaborar e implementar el pan de investigación del caracol *Strombus gigas* en Honduras.

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NETHERLANDS ANTILLES

Eric Newton[1]

1. BACKGROUND

The Netherlands Antilles consists of five islands. Two in the South of the Caribbean Curaçao (472 km^2) and Bonaire (272 km^2) and three in the Northeast, St Maarten (86 km^2), St Eustatius (21 km^2) and Saba (13 km^2). Within the fisheries zone of the Netherlands Antilles lays the Saba Bank (2200 km^2).

The Netherlands Antilles are party to both CITES and SPAW. Legislation for the management of conch fisheries is on an island-by-island basis.

❖ Description of the fishery

The inshore shelf of Curaçao and Bonaire is very narrow providing very little area for queen conch. More conch is available in some of the lagoons, particularly Lac on Bonaire and in the slightly deeper waters (around 50 m). Conch fisheries on these islands are only for the subsistence use of the fishers.

In the past there was a reasonable fishery in the Lac lagoon on Bonaire, evident through the historical shell mounds. Presently the stock is very low and only occasionally fishers add some juvenile conch on the mounds (for tourists).

❖ Analysis of the situation and any problems faced at present in the management of queen conch fisheries

A replenishment programme existed in the first half of the 1980s. Juveniles were produced and seeded, but lack of subsequent management made this effort useless. St Maarten is on the Anguilla Bank and should have more conch in the area, however, some transects around St Maarten show an extremely low density. St Eustatius has more conch, but still not enough for more than a subsistence type of fisheries. The only area where commercial level conch fisheries could be possible is on the Saba bank. In the past, before the Coast Guard became operational in 1999, there seemed to have been considerable conch fisheries on Saba Bank by several foreign fishing vessels. Presently the legal fishers from Saba, in possession of a permit to fish on the Saba Bank, only fish for lobster and occasionally for finfish. Now and again some Conch may enter the lobster pots, but they are not targeted. Saba Bank is now being surveyed for habitat type and general biological diversity. In the future a more quantitative Conch survey may be executed, through which limited commercial fisheries can be developed.

Curaçao and Bonaire do provide a large Conch market. Most of this is imported, both legally (Jamaica, Colombia) and illegally (Venezuela). It seems that the illegal trade is slowly getting smaller.

2. POLICIES AND LEGISLATION

❖ Policies that set out the principles on which the fishery for queen conch is managed

The Netherlands Antilles are presently developing sustainable conch fisheries on the Saba Bank.

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[1] This draft management plan represents only the opinion of the author: Eric Newton, Department of Environment and Nature, Netherlands Antilles.

❖ **The legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch**

- National fisheries ordinance for fisheries outside the territorial waters of each island (i.e. Saba Bank); and
- Island ordinances and regulations for each island.

❖ **International Conventions and Agreements ratified by the country that are of direct relevance to the fishery and how they affect the management of the fishery**

CITES: As part of the Kingdom of the Netherlands, the Netherlands Antilles is party to CITES. However, the implementation legislation is different from that of the Netherlands, which adheres to the European directives. The Netherlands Antilles implements CITES more according to the convention, no import permits are required for appendix II specimens. Trade between the Netherlands and the Netherlands Antilles is subject to the regulations of the convention.

All the export permits for *Strombus gigas* from the Netherlands Antilles are for shells. We have chosen not to use the possibility of a limited number of shells (three per person) to be free from the regulations of the convention, so this will exclude tourists, to avoid the possibility of the shell becoming the main product. Most shells are exported by ex-pats on return home, as well as taken from historical discarded heaps or juveniles washed ashore.

SPAW: The Netherlands Antilles are party to SPAW.

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **Operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

These management objectives are meant for the Saba Bank, where no conch fishing has taken place for the last seven years. Since 90 percent of the Saba Bank is outside the territorial waters of any island, but within the fisheries zone of the Netherlands Antilles, the National Fisheries Ordinance applies. All fishing vessels will need a permit, but presently there are no permits for conch fishing.

For the other islands, especially Bonaire and St Eustatius, the subsistence conch fisheries for the local market can be supported by facilitating a limited management plan from a bottom-up approach, if the fishers so wish.

The management objectives are to:

- Develop, slowly, a conch fishery to a level below MSY on Saba Bank
- Ensure that biological diversity and ecosystem services remain fully intact.
- Create reasonable employment opportunities and either produce foreign exchange, or if not reduce the loss of foreign exchange;

❖ **Indicators are or could be used to measure the performance of the fishery management relative to the objectives**

- The number of caught conch per diver/hour (cpue)
- Average weight per conch
- Gender distribution per locality
- Value of catch per diver/month
- State of the biomass every five years (survey)

❖ **The reference points that are/could be used to define acceptable and unacceptable performance of the fishery (i.e. target and limit reference points where applicable)**

- Cpue should not change over time nor with increase of divers
- Average weight per conch should not change over time nor with increase of divers
- No change in gender distribution
- Value of catch per diver should be above national minimum wages
- Biomass may not go down

4. DATA REQUIREMENTS AND MONITORING SYSTEM

❖ **Type of data collected and the characteristics of the monitoring system (e.g. coverage, sampling procedures, the participation of fishery operatives, etc.)**

Description of Data	Unit of measurement	Years available*	Sampling procedure (including frequency of sampling, percentage coverage, raising procedures, etc.)
Fishing effort	Number of divers.	Not presently available, but part of future plan.	-----
Mean meat weight	Kg/diver.	Not presently available, but part of future plan.	-----
Size frequency	-----	Not presently available, but part of future plan.	------
Stock densities estimated by surveys	Number per Ha.	Not presently available, but part of future plan.	Based on habitat map, diver towed survey. Extrapolate.

5. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery**

Type of Control	Years implemented	Description of i) the rationale for the control ii) the details of the control and ii) current level of restriction	Estimated effectiveness of control
Moratorium	*1999-2009*	*Effective coast guard control*	*90%*
Access control (e.g. limit number of licenses)	Not presently available, but part of future plan.	Planning to limit number of licenses.	-----
Effort control (e.g. number of boats, number of gears, days fishing, etc.)	Not presently available, but part of future plan.	Planning to limit boats with maximum number of diversity, to be slowly increased as long as cpue is not reduced.	-----
Catch quotas (TAC)	Not presently available, but part of future plan.	Will depend on survey results and adjusted by cpue information.	-----

Minimum size/weight in the catch	Not presently available, but part of future plan.	Will be only adults.	` ------
Gear specifications and restrictions	Not presently available, but part of future plan.	-----	-----
Protected areas (indicate the percentage of the stock area under protection)	Not presently available, but part of future plan.	Will depend on habitat, the bank will have certain areas where harvest is allowed.	-----

6. ENFORCEMENT AND COMPLIANCE

❖ **Surveillance and monitoring systems in place to ensure that the requirements of the management system are in place, including the methods used to enforce CITES regulations concerning exports of queen conch**

- Coastal and EEZ surveillance by the Coast Guard for the Netherlands Antilles and Aruba (works in cooperation with the Dutch Navy).
- Primary monitoring on CITES regulations by the Customs office of the Netherlands Antilles.

❖ **Types of sanctions and penalties that can be applied in case of non-compliance with the management controls**

As far as non-compliance with CITES, a maximum fine of US$ 650 000 can be applied.

7. DECISION-MAKING

❖ **The Departments or institutions with management responsibility in this fishery, described also by their area of responsibility and interactions**

- Ministry of Public Health, Department of Environment and Nature, as the CITES Management Authority;
- Ministry of Economic Affairs as the agency to issue fishing licenses in the fishing zone (EEZ)
- Island Departments for Agriculture and Fisheries for management on each island, with their territorial waters. (5x)
- Scientific Committee which functions as CITES Scientific Authority (appointed by the Minister of Public Health, with members from each island).

NICARAGUA

Renaldy Barnutty Navarro[1]

1. ANTECEDENTES

❖ Descripción de la pesquería

En Nicaragua no se ha establecido oficialmente una pesquería dirigida al caracol *Strombus gigas* y no existen embarcaciones que se dediquen específicamente a la captura de este recurso. Las capturas de caracol son recientes y los primeros registros de desembarque se dan a partir de 1997 cuando los barcos langosteros de buzos, tanto industriales como artesanales, lo comienzan a desembarcar como captura "incidental". Desde ese entonces en las estadísticas se dispone únicamente de cifras globales de desembarques.

Los buceadores de langosta que capturan ocasionalmente el caracol lo hacen a mano por medio del buceo con snorkel o con tanques (scuba) en las mismas áreas de distribución de la langosta. La carne es extraída de la concha por los buzos en el fondo del mar y a bordo de los cayucos, por tanto a la planta pesquera sólo llega la carne. Esta práctica permite acopiar más carne con menos espacio a bordo de las embarcaciones nodrizas, en el caso de la pesca industrial de langosta.

Los barcos industriales langosteros (por buceo) tienen un promedio de 20 m de eslora y faenan principalmente al norte y sureste de los Cayos Miskitos, en la Región Autónoma del Atlántico Norte (RAAN) de Nicaragua, desde los 13° 30" a los 15° norte, y desde los 82° a los 82° 30" oeste, a profundidades que varían entre 6.6 a 40 metros. En la parte sur de la plataforma alrededor de las islas del Maíz y noreste de los cayos perlas el caracol es capturado por embarcaciones de tipo artesanal que laboran en faenas diarias cinco días a la semana.

Inicialmente, por ser capturas eventuales y de bajos volúmenes, los caracoles se registraban en las estadísticas oficiales agrupados en una categoría denominada "otras especies". Cuando las capturas de caracol empiezan a incrementarse a finales de los años 90 es que se registran en forma independiente.

Posteriormente, y ha solicitud de la autoridad CITES de la cual Nicaragua forma parte desde 1977, ADPESCA definió una cuota de exportación de 44 000 libras de filete 100 por ciento limpio (20 t) anuales.

En el año 2000 los desembarques de caracol llegaron a las 72 190 libras (32.81 t), y la industria pesquera en coordinación con el ADPESCA, solicitan a CITES una cuota de exportación de 99 000 libras (45 ton) para el 2001. Esta solicitud fue aceptada alcanzándose para ese año cifras de desembarques de 124 246 libras (56.47 ton) de los cuales 98 161 libras (44.61 ton) fueron exportadas, siendo éstas las cifras más altas registradas históricamente. En el año 2002 los desembarques fueron de (23 ton) sin embargo la cantidad exportada fue de (35 ton) debido a que se logro exportar la diferencia desembarcada por encima de la cuota permitida en el año 2001. En el 2005 los desembarques mas el remanente no exportado en el 2004 alcanzaron los 155 111 libras (71 ton) y se exportaron 150 000 libras (68 ton), gracias a una ampliación de cuota autorizada por la CITES, (Figura 1).

[1] Este modelo de Plan de Ordenación Provisional representa solo la opinión del autor: Renaldy Barnutty Navarro, Biólogo del Centro de Investigaciones, Pesqueras y Acuícola CIPA - ADPESCA

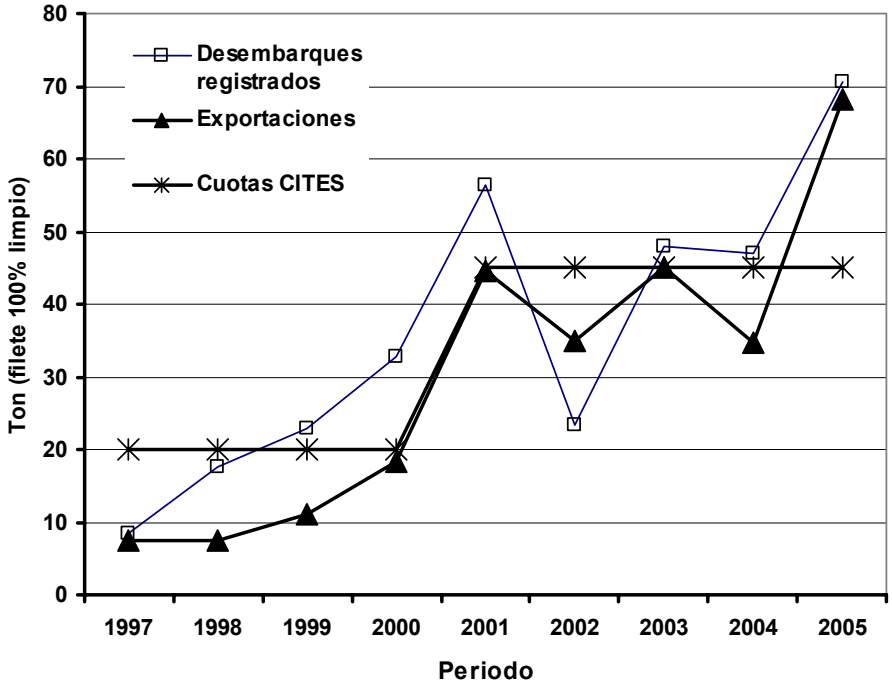

Figura 1. Desembarques registrados, exportaciones y cuotas CITES de filete 100 por ciento limpio de caracol *Strombus gigas* del Caribe de Nicaragua.

Del esfuerzo actual se sabe que ocasionalmente participan unas 22 embarcaciones industriales langosteras que capturan caracol como fauna de acompañamiento de la pesca de langosta por medio de buceo en cada embarcación laboran 26 buzos. También existen alrededor de 50 pangas artesanales langosteros que también sacan caracol en ocasiones y en cada una de estas laboran un total de dos buzos. Las embarcaciones industriales realizan 2 viajes de pesca/mes trabajando un promedio de 12 días/viaje, llevan a bordo hasta 26 buzos y 1 ó 2 compresores y alrededor de 150 tanques de buceo, los que son llenados con 2 500 libras de aire cada uno.

El caracol *Strombus gigas* aporta el 0.40 por ciento al volumen total de libras exportadas de productos pesqueros que a su vez corresponden a 0.21 por ciento del valor total en dólares exportados. El caracol se exporta en su totalidad hacia el mercado norteamericano procesado a filete 100 por ciento limpio se empaca en cajas de cinco libras (2 268 gr.) y master de ochenta libras. Actualmente los volúmenes de consumo local son bajos y generalmente se ofrece en restaurantes especializados en alimentos del mar.

En Nicaragua no existe información documentada sobre pérdida de habitas y degradación ambiental, sin embargo, pudieran existir efectos en el ambiente, particularmente en los fondos marinos, por las maniobras de arrastre camaronero, pérdida de nasas langosteras, sedimentación desde la costa y contaminación. Tanto las larvas, juveniles y los adultos del caracol tiene ecologías diferentes. Las larvas viven en ambientes planctónicos por alrededor de tres semanas, los juveniles habitan zonas someras abundantes en fondos con pastos marinos y arrecifes cercanos. Mientras crecen, se mueven hacia áreas profundas y regresan hacia áreas someras durante la época de reproducción. La degradación del hábitat, especialmente de ambientes frágiles coralinos como los que suele ocupar el caracol, puede entonces tener efectos críticos sobre el reclutamiento y disminuir significativamente los desembarques en el tiempo. El abandono de las conchas vacías en los sitios de captura también es un factor que estaría impactando negativamente el ecosistema de este recurso debido a que esta provocando una especie de pavimentación de los fondos.

❖ **Descripción del recurso**

El caracol se distribuye sobre las plataformas continentales de aguas tropicales y subtropicales desde aguas muy someras hasta profundidades de 250 pies. Las plataformas continentales estrechas son un factor limitante para el crecimiento poblacional. Otro factor limitante de la distribución y abundancia es la condición del hábitat, especialmente en áreas de establecimiento de juveniles. La abundancia de las larvas de *Strombus gigas* parece estar relacionada con las corrientes marinas, así como por la calidad y cantidad de alimento disponible. La combinación de plataformas continentales estrechas, aguas claras con baja productividad biológica y condiciones del habitat son factores, por tanto, que podrían limitar el tamaño poblacional del caracol.

La copulación y el desove ocurren durante el verano, aunque en algunas áreas se reproducen todo el año. Se ha reportado que la migración hacia áreas arenosas y aguas someras es indicativo del inicio de la época de desove de *S. gigas* en muchas áreas donde se distribuye. Estas características migratorias y de agrupamiento durante el desove, hacen a este caracol muy vulnerable a la pesca.

Hay evidencias de una relación entre la fecundidad y la edad (medida por el grosor del labio), indicando que la fecundidad aumenta con la edad, sin embargo, esta relación no puede extenderse a edades más avanzadas en las que cesa el crecimiento del labio.

La larva es pelágica y se alimenta de fitoplancton. Pasan entre 18 a 40 días en la columna de agua antes de establecerse en el fondo y comenzar la metamorfosis. Para entender el reclutamiento, se necesita información sobre la abundancia, distribución y ecología de las larvas. La información disponible no clarifica si el reclutamiento en áreas específicas es local o tiene un origen distante.

Poco se conoce también sobre los estadios juveniles en el ambiente natural. Los caracoles juveniles se encuentran enterrados en el sedimento, y la profundidad de enterramiento varía con el tamaño del animal. La predación es muy alta durante este estadio (alrededor de 50 por cieto de supervivencia). Entre los factores que se necesita profundizar en su conocimiento se encuentran: las condiciones de la metamorfosis y establecimiento en el fondo, la relación entre la temperatura y la alimentación, la abundancia y distribución de las tallas más pequeñas (50-60 mm) en el ambiente natural, y el efecto de las corrientes en la distribución de la larva.

El caracol crece en longitud de la concha hasta que alcanza la madurez sexual. Posteriormente el crecimiento es en el grosor del labio. Este cambio en el crecimiento es una de las características peculiares de este recurso que dificultan su estudio. Estimados de la longitud media de *S. gigas* (desde la punta de la espiral hasta el final distal del canal sifonal) oscilan entre 7.6 cm a 10.6 cm para conchas de un año; de 12.6 cm a 17 cm para dos años y de 18 cm a 20.5 cm al finalizar el tercer año. La madurez sexual ocurre cuando el labio está bien desarrollado alrededor de la edad de 3 a 3.5 años.

S. gigas alcanza una talla comercial aceptable a los 18.8 cm de longitud sifonal con un peso total (nominal) de 845 gramos, y una producción (rendimiento) de 100 gramos, a una edad de 2.5 años. La madurez sexual es alcanzada después de que el labio está bien desarrollado a una edad de 3 - 3.5 años; por lo tanto, el caracol rosado o concha reina alcanza una talla comercial antes de que sea sexualmente maduro. La longevidad media se ha estimado en 6 años.

Se ha documentado que *S. gigas* evidencia dos tipos de migraciones: la primera es el desplazamiento de los juveniles más grandes, que se dirigen hacia las aguas más profundas; la segunda es el desplazamiento de los adultos que migran hacia aguas someras durante el desove; esta migración para el desove junto con la agregación natural resulta en una mayor vulnerabilidad a la pesca.

El caracol rosado *S. gigas* se encuentra ampliamente distribuido en toda el área explorada del caribe de Nicaragua principalmente entre las coordenadas 13º 30´ 00´´ hasta los 15º 00´ 00´´ de latitud norte y los 82º 00´ 00´´ hasta los 83º 00´ 00´´ de longitud oeste y entre los 20 y 96 pies de profundidad.

Los estratos de profundidad donde se observaron las mejores capturas durante el periodo de la pesca comercial exploratoria en el año 2005 fueron entre los rangos de 60 a 70 pies de profundidad.

Los resultados de las faenas de pesca comercial exploratoria del caracol rosado, *Strombus gigas* del mar caribe de Nicaragua realizadas en el periodo (mayo – junio del 2005) coinciden en gran medida con las experiencias y trabajos realizados a lo largo del Caribe, en tal sentido, la distribución del caracol rosado se encontró relacionada con la profundidad en un rango que va de los 24 a los 96 pies, lo que coincide con los resultados obtenidos por Alcolado 1976 (citado por Pérez & Aldana, 2000).

Con relación al comportamiento de las tallas, se encontraron longitudes sifonales de hasta 320 mm. Siendo estas mayores a las encontradas en Bahamas por Stoner & Schwarte, 1994, (270 mm) y por Pérez & Aldana, 2002, en Arrecife Alacranes, México, (290 mm). La longitud sifonal promedio observada en la zona de estudio fue de 225 mm y la longitud promedio del grosor del labio fue de 20 mm, lo que nos indica que en su gran mayoría las capturas obtenidas estuvieron representadas por una población comercialmente aceptable y biológicamente adulta. En tal sentido, varios autores citados por CITES 2003, afirman que el caracol rosado alcanza una talla comercial cuando alcanza una longitud sifonal de 188 mm a una edad aproximada de 2.5 años. Sin embargo otros autores citados por CITES 2003, afirman que la madurez sexual es alcanzada a una de edad de 3 a 3.5 años y otros a los 5, no obstante todos coinciden en que la madurez sexual es alcanzada cuando el labio se ha desarrollado (engrosado) 10 mm aproximadamente. Es importante señalar que la talla promedio del grosor del labio encontrado en el presente estudio fue de 20 mm lo cual nos indica que la población muestreada de caracol *S. gigas* en el presente estudio del Caribe de Nicaragua es mayoritariamente adulta.

Debido a la complejidad del comportamiento biológico de la especie *Strombus gigas*, la herramienta más utilizada para establecer criterios de manejo del recurso recomendada por CITES ha sido la densidad por unidad de área; al respecto, en este estudio se encontró una densidad promedio de 230 Ind./Ha, equivalente a 0.023 Ind./m². Sobre este tema, Stoner y Ray-Culp, 2000 (CITES 2003) opinan que no se observa apareamiento de *Strombus gigas* cuando las densidades de los adultos se encuentran por debajo de los 56 Ind./ha., y que no hay desove cuando las densidades están por debajo de los 48 Ind./ha.; a esta situación los autores la llaman “Efecto Allen”, que es el estado en el cual se producen tasas de crecimiento poblacional per cápita negativas cuando las densidades se encuentran por debajo de niveles poblacionales críticos.

Está claro que las poblaciones con bajas densidades están relacionadas principalmente con una escasa tasa de encuentros entre hembras y machos; al respecto los mismos autores han encontrado que la reproducción aumenta proporcionalmente con los niveles de densidad (mayor la probabilidad de encuentros) y que se mantienen estables en densidades cercanas a los 200 Ind./Ha.

En nuestro caso el nivel de densidad promedio encontrada para el área explorada fue de 230 Ind./ha, con rango en los limites de confianza al 95 por ciento de (194 y 268 Ind./ha.) de acuerdo al criterio de Stoner y Ray-Culp (2000) la población de *Strombus gigas* del mar Caribe de Nicaragua se consideraría una población estable.

Existe información preliminar de las pocas experiencias pesqueras exploratorias del caracol con biólogos a bordo que se han realizado en la plataforma del Caribe Nicaragüense. En 1987 dos embarcaciones de nacionalidad dominicana pescaron en el área de Cayos Miskitos reportando un rendimiento de carne promedio de 1.32 kg/buzo/hora (2.9 lb) con una talla sifonal mínima de 220 mm y máximas de 240 mm. Una de las naves reportó 4.32 kg/buzo/hora (9.5 lb) a 3 m de profundidad.

En el año 2003 se realizó un muestreo de carne de caracol en empresas procesadoras ubicadas en Puerto Cabezas y Corn Island. De una muestra de 1 966 individuos se obtuvo un peso promedio de 4.94 onzas (140 gramos) y un peso máximo de 318 gramos (11.22 onzas) por individuo. Estos resultados se compararon con los pesos mínimos aceptables para pesquerías de países de la región como Colombia (100 g) y Belice (85 g), y en ambos casos se observó que el peso promedio individual desembarcado en Nicaragua era mayor.

La posible talla sifonal promedio que se estaba capturando en ese entonces se desconocía, y se calculó a partir del peso de la carne desembarcada, aplicando la formula propuesta por Rathier (1992) Peso (g) = 0.000001877 x L $^{3.46}$. Los resultados indicaron que, según el peso promedio de la carne desembarcada, la talla sifonal promedio de los individuos capturados resultó ser 189 milímetros, lo que indica que la mayoría de los individuos capturados en Nicaragua estaría por encima de los 180 mm, la cual es la talla mínima de captura permitida para varios países caribeños con pesquería de caracol rosado.

Los principales resultados obtenidos del programa de monitoreos en el mar y de muestreos en plantas de proceso realizados en el periodo entre abril y mayo del 2005 son los siguientes:

- El caracol rosado *Strombus gigas* se encuentra ampliamente distribuido en toda el área explorada ubicada entre las coordenadas 13º 30´ 00´´ hasta los 15º 00´ 00´´ de latitud norte y los 82º 00´ 00´´ hasta los 83º 00´ 00´´ de longitud oeste y entre los 20 y 96 pies de profundidad.
- Los estratos de profundidad donde se observaron las mejores capturas fue entre los rangos de 60 a 70 pies de profundidad.
- La proporción sexual hembra-macho observada fue de 1.2 : 1
- El 82.7 por ciento de los individuos capturados fueron adultos completamente maduros.
- Por sexo separado se observo un mayor porcentaje de machos maduros (90 por ciento) que de hembras (77 por ciento), porcentajes que se encontraron en toda el área explorada.
- Los estadios de madurez sexual I, II y III para ambos sexos de *Strombus gigas* se encontraron distribuidas indistintamente en toda el área explorada.
- Se observó en ambos sexos que el grosor del labio aumenta progresivamente al pasar de un estadio de menor a mayor madurez sexual, no así en el caso de la longitud sifonal ya que se observaron individuos de mas de 200 mm considerados como adultos en estadios (inmaduros) I y II.
- La longitud sifonal media encontrada fue de 225 mm (± 0.93), con longitudes mínimas y máximas de 105 y 320 mm respectivamente y el grosor del labio promedio observado fue de 20 mm (± 0.28) con longitudes mínimas y máximas de 2 a 38 milímetros respectivamente.
- De los resultados obtenidos se concluye que de todas las medidas analizadas el grosor del labio es la medida más consistente y apropiada para establecer pautas de ordenación referente a la talla mínima de primera captura.
- El comportamiento de la talla promedio por sexo separado fue prácticamente el mismo observado para ambos sexos.
- Se observó una tendencia positiva de encontrar individuos de mayor talla (grosor del labio) a medida que aumenta la profundidad.
- El análisis de las relaciones morfométricas indica que ninguna de ellas mostró correlación o buen ajuste entre las variables, siendo los grados de correlación más altos de 0.44 entre el largo sifonal (mm) y el peso de la carne con vísceras (g).
- Se estimaron los factores de conversión para esta especie, determinándose entre otros que para hacer una libra de filete 100 por ciento limpio se necesitan 3 filetes de caracol 100 por ciento limpio. (un filete = a un individuo).
- Se estimó una densidad promedio de 230 Ind./Ha en toda el área explorada. Esta densidad es mayor a la estimada en los países del área del Caribe que explotan esta especie a excepción de Cuba y Colombia.

- De acuerdo con las densidades promedios encontradas, las mayores concentraciones de caracol se encontraron al nor-este de los Cayos Miskitos, y en los estratos de profundidad de 60 a 70 pies.

❖ **Problemas enfrentados actualmente en el ámbito de la ordenación de la pesquería del caracol**

Como se ha mencionado, en Nicaragua el caracol *S. gigas* no es sujeto de una pesquería dirigida y los volúmenes permitidos de exportación son bajos comparados a los de otros países de la región y a la extensión de su plataforma continental, por lo que se ha argumentado que es un recurso que puede ser explotado aún más.

En Nicaragua no existe un sistema de evaluación pesquera para conocer el estado del recurso caracol a como se ha implementado para los camarones y langostas. Sin embargo, es evidente la falta de datos, sistemas de evaluación y monitoreo que generen información que pudieran ayudar a definir más apropiadamente algunos puntos de referencia para el manejo de la actividad (i.e. criterios que definan el concepto sobrepesca, estimación de biomasas o densidades, tasas de mortalidades por pesca sobre el recurso, coeficientes de capturabilidad). Se desconoce el esfuerzo de pesca que se aplica, sólo se conocen los volúmenes totales de carne que se acopia en las plantas pesqueras y la carne procesada que se exporta amparada en una cuota. La ausencia de datos implica la no aplicación de algunos modelos de evaluación pesquera que pudieran ayudar a definir los puntos de referencia para el manejo de este recurso.

Los beneficios que resultarían del ordenamiento pesquero del caracol del caribe de Nicaragua mediante la realización de estudios que incluyan la aplicación de métodos analíticos de evaluación y que consideren criterios que definan el concepto sobrepesca, estimación de biomasas o densidades, tasas de mortalidades por pesca sobre el recurso y coeficientes de capturabilidad serian de mucha importancia ya que permitirían la realización de una explotación sustentable de este recurso y para el caso de Nicaragua en donde se considera que el recurso esta sub explotado, permitiría definir los niveles de capturas o cuotas que sean biológicamente aceptables. Esto ultimo serviría como soporte científico para la solicitud de ampliación de cuotas de exportación a CITES.

2. POLÍTICAS Y LEGISLACIÓN

❖ **Las políticas que establecen los principios de ordenación de la pesquería del caracol**

En el marco legal e institucional para la administración de los recursos pesqueros en Nicaragua, se destaca la reciente Ley de Pesca aprobada (Ley No. 489 "Ley General de Pesca y Acuicultura) donde se definen claramente las funciones de la Administración Nacional de la Pesca y la Acuicultura (Adpesca) y de la Dirección General de Recursos Naturales (DGRN). Ambos pertenecientes al Ministerio de Fomento Industria y Comercio (MIFIC).

A pesar de la limitada información existente, el Ministerio de Fomento Industria y Comercio MIFIC, estableció medidas de regulación con la perspectiva de iniciar la ordenación acorde a las pautas generadas por CITES en la región. En tal sentido en el año 2005, se establecieron las siguientes regulaciones; (Acuerdo ministerial DGRN-PA N° 407-05).

- Veda total durante el período comprendido del 1° de junio al 30 de septiembre.
- Talla mínima legal de 200 mm de longitud sifonal de la concha, medida desde la punta de la espira hasta la punta del canal sifonal, en combinación con la medida igual o mayor de 9.5 milímetros de grosor del labio, medido desde la parte más gruesa del labio.

Actualmente en Nicaragua se tienen controles de las exportaciones, para lo cual ADPESCA ha establecido en coordinación con CITES – Nicaragua, una cuota autorizada de 114 t (en 2006).

- **La estructura jurídica que estipula la ordenación, el seguimiento, el control y el cumplimiento en el ámbito de la pesquería del caracol**

Según la Ley de Pesca 489.

Autoridad de Competencia

Arto. 13 El Ministerio de Fomento, Industria y Comercio, MIFIC, como responsable de la administración del uso y explotación de los recursos pesqueros es la autoridad competente para la aplicación de la presente Ley y su Reglamento, a través de la Administración Nacional de Pesca y Acuicultura, ADPESCA y la Dirección General de Recursos Naturales, DGRN, sin perjuicio de las facultades atribuidas a otras instituciones del Estado.

Arto. 14 Sin perjuicio de las funciones establecidas en la Ley de Organización, Competencia y Procedimientos del Poder Ejecutivo, publicada en La Gaceta, Diario
Oficial Número 102, el 3 de junio de 1998, la Administración Nacional de Pesca y Acuicultura, ADPESCA, deberá:

1. En materia de investigación:

a) Elaborar un Plan de Investigaciones pesqueras y acuicultura. De los resultados obtenidos se deberá establecer en coordinación con MARENA y consulta a la CONAPESCA, la ordenación y conservación en materia pesquera y acuícola.
b) Levantar de forma permanente, el inventario de los recursos hidrobiológicos, así como establecer su clasificación, distribución y abundancia.
c) Evaluar los recursos pesqueros de interés comercial a fin de proponer las medidas de ordenamiento tales como vedas, temporadas, zonas de pesca, artes de pesca, entre otras.
d) Recopilar, archivar y procesar información bioestadística de las actividades de la pesca y la acuicultura nacionales y publicarlas anualmente.
e) Calcular las capturas biológicamente aceptables que servirán de base para elaborar la propuesta técnica de la Cuota Global Anual de Captura de las pesquerías bajo acceso limitado y el número de embarcaciones que se pueden autorizar.
f) Investigar, validar y desarrollar nuevas técnicas pesqueras y de acuicultura tendientes a diversificar y a propiciar el aprovechamiento sostenible de los recursos hidrobiológicos.
g) Participar en la elaboración de las propuestas de toda norma técnica relacionada con las etapas de la actividad pesquera y acuícola.
h) Recopilar los datos y la información derivada de la actividad pesquera, tales como: captura, esfuerzo, inventario de flota, capacidad instalada de las empresas, costos, precios y cualquier otra información necesaria.
i) Contabilizar el porcentaje acumulado de las Cuotas Globales Anuales de Captura y ponerlo a disposición del público a través de los medios electrónicos de que se dispongan.

- **Las convenciones internacionales y los acuerdos ratificados por el país que tengan una relevancia directa para la pesquería**

  - Nicaragua es país parte de CITES desde el año 1977.

  Como país parte Nicaragua ha seguido las recomendaciones de CITES, referentes al establecimiento y cumplimiento de regulaciones pesqueras como las tallas mínimas, Cuotas de exportación (114 ton), y Monitoreo de la distribución, abundancia (Individuos por hectáreas) y biología del recurso.

  - Reunión de CITES en Republica Dominicana Diciembre del 2005.

- Cumplimiento del Examen significativo.
- Reunión en San Andrés Diciembre del 2005.
- Necesidad de homologar medidas de regulación.

3. OBJETIVOS, INDICADORES Y PUNTOS DE REFERENCIA EN LA ORDENACIÓN

❖ **Los objetivos operacionales de la pesquería del caracol, según lo indicado por los planes de ordenación, las políticas y la legislación disponibles**

En Nicaragua la ordenación pesquera se esta realizando mediante un plan de acción elaborado por el Centro de Investigaciones Pesqueras y Acuicolas para el manejo del recurso caracol y es con el cual se esta trabajando actualmente.

Los objetivos de la presente propuesta de plan de acción son:

1) Optimizar la producción de caracol asegurando la conservación del recurso.

2) Reducir los impactos adversos sobre la especie por medio de la regulación del esfuerzo de pesca o malas prácticas de pesca (pesca de juveniles).

3) Promover la adopción de medidas de manejo funcionales y adaptativas apoyadas por los usuarios del recurso.

4) Identificar los vacíos de información e identificar los datos que se requiere colectar para evaluación de la dinámica poblacional y de la actividad como tal.

5) Proporcionar recomendaciones de manejo a los tomadores de decisión nacional y local.

En la actualidad en Nicaragua no existe un sistema de evaluación pesquera para conocer el estado del recurso caracol, a como se ha implementado para otros recursos pesqueros como los camarones y langostas, Sin embargo, es evidente la falta de datos, sistemas de evaluación y monitoreo que generen información que pudieran ayudar a definir más apropiadamente algunos puntos de referencia para el manejo de la actividad (i.e. criterios que definan el concepto sobrepesca, estimación de biomasas o densidades, tasas de mortalidades por pesca sobre el recurso, coeficientes de capturabilidad). Se desconoce el esfuerzo de pesca que se aplica, sólo se conocen los volúmenes totales de carne que se acopia en las plantas pesqueras y la carne procesada que se exporta amparada en una cuota. La ausencia de datos implica la no aplicación de algunos modelos de evaluación pesquera que pudieran ayudar a definir los puntos de referencia para el manejo de este recurso.

Se ha planificado realizar a finales del 2006 un protocolo de investigación para el cálculo de las cuotas biológicamente aceptables y definir un esfuerzo pesquero óptimo para la pesquería ya que existe un desconocimiento de los niveles y magnitudes del recurso.

Sin embargo se podrían considerar algunos objetivos operacionales de la pesquería del caracol, según lo indicado en el plan de ordenación establecido.

❖ **Indicadores que son o podrían ser utilizados para evaluar el desempeño de la ordenación de la pesquería en relación a los objetivos**

- Disminución de las densidades.
- Disminución de las tallas.

- **Los puntos de referencia que son/podrían ser usados para definir un desempeño de la pesquería aceptable e inaceptable (por ejemplo, puntos de referencia objetivo y límite, cuando corresponda)**

Puntos de referencia relacionados a mortalidad por pesca, biomasa, distribución de los reproductores para realizar una pesquería sustentable y se asegure la perpetuidad del recurso.

a. Definir el esfuerzo pesquero en numero de barcos y número de buzos que podrán participar en su extracción y mantener el tamaño de la flota actual como máximo. (Primero se debería de calcular el tamaño de la flota óptimo).

b. El volumen de producción actual (según cuota CITES establecida) debería de mantenerse como ideal, según el límite de densidad observado en toda la zona de distribución del recurso.

c. Mantener la talla o el tamaño mínimo de la concha (largo sifonal y grosor del labio)

Los puntos de referencia aquí mencionados deberían de ser flexibles ya que dependen del estado de conocimiento del recurso.

4. DATOS REQUERIDOS Y SISTEMA DE MONITOREO

- **El tipo de datos recopilados y las características del sistema de monitoreo**

Descripción de los datos	Unidad de medida	Años disponibles*	Procedimiento de muestreo (incluyendo la frecuencia de muestreo, la cobertura en porcentaje, los procedimientos de expansión, etc.)
Desembarques y exportaciones	Libras de carne 100% (limpia) o procesada.	1997 – 2006 (digitalizados).	Datos relativos a los desembarques totales de toda la flota langostera (proporcionados mensualmente por la industria de procesamiento). Actualmente, la cobertura alcanza al 100% de las industrias.
Estimación de los desembarques no registrados (cuando corresponda)	Desembarques mensuales en lb. de filete 100%. limpio	2000 – 2006.	Todo el caracol desembarcado se exporta.
Esfuerzo de pesca	20 barcos industriales y 30 pangas artesanales.	1997 – 2006.	Son embarcaciones langosteras que en ocasiones capturan caracol.
Peso promedio de la carne	Si.	2004 – 2005.	Muestreo en plantas de proceso .
Frecuencia de tamaño	Si.	2004 – 2005.	Muestreo en plantas de proceso y a bordo de embarcaciones (Cruceros de exploración).
Densidad de población según estimación de encuestas	230/ha.	2005.	Muestreo a bordo de embarcaciones (Cruceros de exploración).
Comercio - volumen - valor	Si Estadísticas.	1997 – 2005.	Carne 100 %limpia Exportación en Lb.

Número de pescadores - tiempo completo - medio tiempo	520 Buzos industriales. 60 artesanales.	2000 – 2005.	Se refiere a buzos langosteros de 20 barcos industriales que capturan caracol en ocasiones.

** Datos que han sido digitalizados y están disponibles en bases de datos electrónicas*

- Desembarque y exportaciones en el periodo (1997 – 2006).
- Muestreos de pesos de la carne procesada años 2003 – 2005.

Tabla de valores promedio de tallas y pesos de caracol Strombus gigas resultantes de los muestreos realizados en plantas de proceso en el año 2005.

Observaciones		**Muestra de Pto Cabezas Mayo-junio 2005**	**95% Confianza**	**Muestra de Corn Island Feb-05**	**95% Confianza**
Largo sifonal	Promedio (mm)	220.87	± 1,55	235.00	± 1,77
Ancho del labio	Promedio (mm)	19.92	± 0,49	23.00	± 0,71
Peso entero promedio	de carne con vísceras (g)	389.94	± 8,55	413.00	± 13,02
Peso promedio	Filete 50 % (g)	217.63	± 4,55	212.00	± 7,21
En porcentaje (%)	Filete 50 % (g)	55.64		51.33	
Peso promedio	Filete 100 % (g)	149.91	± 3,4	144.00	± 5,67
En porcentaje (%)	Filete 100 % (g)	38.40		34.87	
No. de filetes 100%	**Por lb.**	**3.03**	± 0,07	**3.15**	± 0,13
N		**590**		**151**	

❖ **Otros datos que deberían ser recopilados para el seguimiento del estado del recurso o del desempeño de la pesquería**

- Esfuerzo pesquero industrial y artesanal (dirigido exclusivamente al caracol).
- Capturas y desembarques por unidades de pesca.
- Tallas y pesos de los individuos desembarcados.
- Rendimientos pesqueros CPUE.
- Datos bioeconomicos de la pesquería.

5. ANÁLISIS DE DATOS

❖ **Tipos de modelos de evaluación u otros enfoques son utilizados para evaluar el estado del recurso y estimar el impacto de las estrategias de explotación**

En Nicaragua hasta la fecha solamente se han realizado programas de monitoreo a bordo de embarcaciones comerciales y muestreos en plantas procesadoras. (períodos Marzo 2003, Enero 2004 y Mayo – Junio 2005). Con el objetivo de recopilar la información básica que sirva para conocer la estructura de la población, abundancia (densidades) etc.

Objetivo principal de los cruceros de exploración realizados en el 2005

El principal objetivo del presente monitoreo consistió en continuar estudiando la biología, distribución y abundancia relativa del caracol rosado *Strombus gigas* del Caribe Nicaragüense, a fin de evaluar su estado biológico, estructura poblacional y las densidades (Ind./Ha) en su distribución vertical y horizontal.

Objetivos Específicos:

- Distribución de frecuencias de las tallas y pesos.
- Determinar sexo y estadios de madurez sexual.
- Estimar la densidad promedio de caracoles en el área explorada y elaborar mapas de distribución y abundancia relativa (densidad) de acuerdo a las diferentes zonas y estratos de profundidad.
- Determinar la variabilidad de las frecuencias de tallas por estratos de profundidad.
- Calcular las relaciones morfométricas de las longitudes sifonal y ancho del labio así como con los distintos pesos de la carne sin procesar y filetes procesados.
- Determinar los factores de conversión a número de individuos por libra de filete 100 por ciento limpio y al peso de la carne en sus distintas etapas de proceso.

❖ **Consideración de las incertidumbres en datos y supuestos en la evaluación**

El Centro de Investigaciones Pesqueras y Acuícolas (CIPA) del AdPesca ha realizado trabajos preliminares de investigación relacionadas con la densidad, abundancia y dinámica poblacional del recurso caracol rosado, *Strombus gigas,* de la costa Caribe de Nicaragua. Esto con el propósito de establecer las bases científicas para la definición de las cuotas anuales de captura que deben ser proporcionadas cada año para aprobación por la CITES Un inconveniente significativo de los estudios realizados a la fecha es la característica comercial de los cruceros que no ha permitido la obtención de muestras representativas (insesgadas con elementos probabilísticos) de toda la población.
Con ello los resultados no permiten asegurar que los conocimientos obtenidos puedan ser extensivos a toda la distribución del recurso en la plataforma continental de Nicaragua

❖ **Describa para quién fueron preparados los informes, si han sido utilizados para asistir en la ordenación de la pesquería y, si es el caso, de qué forma**

Los estudios se han realizado con el propósito de establecer las bases científicas para la determinación de las cuotas anuales de captura que deben ser proporcionadas cada año para aprobación por la CITES, y de igual manera estos informes han sido presentados a la industria pesquera del país que esta interesada en los resultados de los cálculos de la abundancia de este recurso en Nicaragua para poder explotarlo de forma sustentable y también para ser presentados a FAO en los Talleres Internacionales de evaluación.

❖ **Métodos alternativos de evaluación (cuando sean necesarios) que podrían ser utilizados para proporcionar una mejor información acerca del estado del recurso o del desempeño de la pesquería**

- capturas;
- esfuerzo;
- tallas desembarcadas;
- abundancia y distribución; and
- densidades por zonas de pesca.

6. CONTROLES

❖ **Las medidas de ordenación (controles) actualmente utilizados para alcanzar los objetivos de esta pesquería**

Tipo de control	Años de implementación	Descripción i) del fundamento del control ii) de los detalles del control y ii) del nivel de restricción actual	Efectividad estimada del control
Cuotas de exportación	*2003 – 2006.*	114 MT (filete 100 % limpio) – es una cuota de exportación establecida a partir del 2006.	*Efectivo, pero existen problemas de capturas ilegales.*
Control del acceso (por ejemplo, número limitado de licencias)	2000 – 2006.	Hay control para el acceso de los barcos industriales langosteros de buzos que son los que en un 90 por ciento capturan el caracol cuando los rendimientos pesqueros de la langosta son bajos.	Efectivo.
Control del esfuerzo (por ejemplo, número de barcos, número de artes, días de pesca, etc.)	-----	Los pescadores artesanales de langosta trabajan bajo el sistema de libre acceso, sin embargo solamente unas 50 pangas se dedican a la captura de caracol cuando los rendimientos de langosta son bajos.	Poco efectiva, no hay manera de controlar donde están trabajando.
Cuotas de captura (TAC)	No se han establecido.	-----	El consumo interno es poco significativo de tal manera que las capturas son muy similares a las exportaciones.
Talla/peso mínimo de los individuos en la captura	200 mm. Longitud sifonal y 9.5 mm. ancho de labio (Se determinara de manera mas idónea tomando en cuenta las características de los bancos de pesca una vez que se explore toda el área.	Monitoreos en el mar y muestreos biológicos en plantas de proceso.	Difícil de controlar debido a que los buzos sacan a la superficie solamente la carne y a las plantas de proceso esta llega con un nivel de procesamiento o limpieza de un 98 por ciento.
Especificaciones y restricciones en materia de artes de pesca	No.	-----	Se utilizan tanques de buceo y los buzos por lo general solo sacan el caracol que esta en las áreas tradicionales de distribución de la langosta. No van a aguas muy someras.

Temporadas de veda (duración)	Del 1 de junio al 30 de septiembre.	-----	Efectiva (coincide con la veda de la langosta en su último mes, de tal manera que los buzos no van a los bancos de pesca con sus equipos de buceo ya que esta prohibido por la veda de la langosta.
Zonas protegidas (indique el porcentaje de la área de la población en zona protegida)	Cayos Miskitos 13,000 Km^2.	-----	Es poco efectiva (en las áreas protegidas los únicos que capturan langosta y caracol son los artesanales) y ellos no permiten la entrada de barcos industriales en la zona.

- **Los problemas específicos experimentados con los controles y los controles adicionales en materia de ordenación que podrían ser utilizados en esta pesquería con el fin de alcanzar los objetivos de pesca**

Las vedas y las cuotas establecidas son un excelente mecanismo de ordenación ya que estas pueden ser controladas y monitoreadas tanto por la administración pesquera (vedas) como por la autoridad CITES (cuotas de exportación) emisión de certificados de exportación. Estas medidas ya están garantizando la sobre vivencia del stock de caracol en las aguas del país.

En Nicaragua existe un desconocimiento por parte de los pescadores de la biología de este recurso y del motivo de los controles establecidos, por lo que sugerimos que se debe de implementar una campaña de educación dirigida a los pescadores y empresarios con el objetivo de crear conocimiento y conciencia de la necesidad de realizar un manejo que garantice la sostenibilidad del recurso.

7. APLICACIÓN Y CUMPLIMIENTO

- **Los sistemas de vigilancia y seguimiento implementados para asegurar el cumplimiento de las exigencias del sistema de ordenación**

Ley de pesca 489

*En materia de monitoreo, vigilancia y control***:**

a) Administrar el Sistema de Seguimiento, Vigilancia y Control Satelital y en tierra que garantice el cumplimiento de la presente Ley y su Reglamento, así como toda disposición sobre el tema, para lo cual deberá coordinarse y auxiliarse de la Fuerza Naval, la Dirección de Servicios Aduaneros, Policía Nacional, Procurador Ambiental, CONAPESCA y aquellas instituciones que sean necesarias.
b) Aplicar regulaciones en todas las etapas del proceso productivo, desde las actividades extractivas de cualquier recurso pesquero, granjas, centros de acopios de postlarvas silvestres, laboratorios de producción larvaria, proceso de empaque y comercialización en general.
c) Velar para que las operaciones de pesca y acuicultura se realicen con la debida autorización y apegadas a las leyes, los reglamentos y normas técnicas establecidas.

d) Levantar, con el apoyo de la Capitanía de Puertos, el instructivo, de oficio o por denuncia para la aplicación de las sanciones establecidas por infracciones a la presente Ley y su Reglamento.
e) Participar en la elaboración de las propuestas de toda norma técnica relacionada con las etapas de la actividad
f) pesquera y acuícola.
g) Realizar inspecciones para verificar el cumplimiento de las disposiciones de esta Ley, su Reglamento y demás normas pertinentes, en lo referente a las autorizaciones para el aprovechamiento.

La autoridad CITES de Nicaragua da seguimiento al cumplimiento de la cuota asignada y no da mas certificados de exportación una vez que la cuota se ha alcanzado.

❖ **Tipo de sanciones y penalidades que se pueden aplicar en caso de incumplimiento de los controles de la ordenación**

Ley de pesca y acuicultura 489. Titulo X.

De las infracciones y sanciones (capitulo único)

Arto. 121 Toda acción u omisión a las disposiciones contenidas en la presente Ley, su Reglamento y demás regulaciones sobre la materia constituyen delito o infracción.

Arto. 122 Las infracciones se clasifican en graves y menos graves, las que serán sancionados con multas donde se tomará de referencia el precio internacional y decomisos en dependencia de la gravedad del daño ocasionado, no exonerando al infractor de cualquier otra responsabilidad ya sea en la vía penal o civil.

Arto. 123 Constituyen infracciones graves:

1. Simular actos de pesca de subsistencia con el propósito de comercializar el producto obtenido. Se sancionará con el decomiso del producto y multa en córdobas equivalente al doble del valor del precio establecido como referencia por el MIFIC del producto decomisado.
2. No permitir el abordaje a las embarcaciones o la entrada a las instalaciones de plantas de procesamiento o centros de acopio de los inspectores de pesca o las personas autorizadas. Se sancionará con una multa en córdobas equivalente a un mil dólares (USD $1 000).
3. Realizar actividad de pesca industrial en zonas destinadas para la pesca artesanal o en áreas no autorizadas. Se sancionará con una multa en córdobas equivalente a mil quinientos dólares (USD $1,500).
4. Suministrar información falsa sobre la actividad. Se sancionará con una multa en córdobas equivalente a mil quinientos dólares (USD $1 500) y suspensión de la licencia o permiso por tres (3) meses.
5. Incumplir con las normas de ordenación pesquera, acuicultura higiene y seguridad ocupacional vigente. Se sancionará con una multa en córdobas equivalente a cinco mil dólares (USD $5 000).
6. Realizar pesca de camarón sin llevar instalados los Dispositivos Exclusores de Tortugas, DETs, en las redes de arrastre, o modificarlos para afectar su funcionamiento. Se sancionará a los titulares de la licencia de pesca con una multa en córdobas equivalente a cinco mil dólares (USD $5 000) y se sancionará a los capitanes de barcos con una multa en córdobas equivalente a un mil dólares (USD $1 000) y la suspensión de la Licencia de Capitán por un periodo de tres meses.

   La segunda vez que se incurra en la infracción establecida en el anterior subnumeral, se sancionará a los capitanes de barco con la suspensión de su Licencia de Capitán por un periodo de un año. La tercera vez, se le suspenderá definitivamente.
7. Capturar especies con artes de pesca no autorizados.

Se sancionará con el decomiso del producto, la suspensión de la Licencia o el Permiso por tres meses y una multa en córdobas equivalente a un mil dólares (USD $ 1 000 00).

8. Usar redes que obstruyan las entradas y desembocaduras de los ríos, canales o vías de comunicación acuática. Se sancionará con una multa en córdobas equivalente a un Mil Dólares (US $ 1 000).
9. Realizar actividades de pesca comercial sin poseer licencia o el permiso de pesca correspondiente. Se sancionará con una multa en córdobas equivalente a ciento cincuenta dólares (USD $150) por cada TRB a las embarcaciones mayores a 10 metros de eslora de la embarcación debidamente certificada por la DGTA y ciento cincuenta dólares (USD $150), en córdobas equivalente, por metro de eslora para embarcaciones menores de 10 metros.
10. Realizar actividades de acuicultura en tierras salitrosas y agua y fondos nacionales, sin poseer una concesión de acuicultura. Se sancionará con una multa en córdobas equivalente a dos mil dólares (USD $2 000) y el cierre temporal de la granja hasta que legalice la situación.
11. Transcurridos quince días de veda sin presentarse los informes, se procederá al decomiso del producto y al cierre de la empresa por lo que resta del periodo de veda.
12. Extraer, recolectar, capturar, poseer, comercializar y transportar recursos hidrobiológicos en los períodos de veda. Se sancionará con una multa en córdobas equivalente al doble del valor del producto que se encuentre, la que no será menor a un mil dólares (USD $1 000), más el decomiso del producto y la suspensión del permiso por un periodo de tres meses.
13. Capturare extraer ejemplares de recursos hidrobiológicos que no cumplan con las tallas, pesos mínimos de captura especificado, declaradas amenazadas o en peligro de extinción o realizar pesca por buceo no autorizada. Se sancionará con una multa en córdobas equivalente al doble del valor del producto que se encuentre, la que no será menor a mil dólares (USD $1 000), más el decomiso del producto y la suspensión de la licencia o del permiso por tres (3) meses.
14. La exportación de carne de langosta, se sancionara con el decomiso del producto, suspensión del permiso por tres meses y se aplicará una multa equivalente al doble del total del producto que se encuentre, la que no podrá ser inferior al equivalente en córdobas de un mil dólares (USD $1 000).
15. Destruir o capturar especies en zonas declaradas de refugio O de reproducción de recursos hidrobiológicos. Se sancionará con una multa en córdobas equivalente al doble del valor del producto que se encuentre, la que no será menor a un mil dólares (USD $1 000) y suspensión del permiso por tres (3) meses.
16. Talar los bosques de mangle que protegen el hábitat de los recursos hidrobiológicos dentro del área de concesión. Se sancionará con una multa en córdobas equivalente a diez mil dólares (USD $10 000) por hectárea talada y se deberá reforestar un área equivalente.
17. El procesamiento, comercialización y expendio de recursos hidrobiológicos declarados en veda; se sancionará con una multa en córdobas equivalente al doble del valor del producto encontrado, la que no podrá ser inferior a cinco mil dólares (USD $5 000), más el decomiso del producto y el cierre de la planta de procesamiento por tres meses posteriores a la veda.
18. Verter o derramar tóxicos y agentes contaminantes químicos, físicos, o biológicos en aguas jurisdiccionales y costas nicaragüenses que dañen el ecosistema y los recursos hidrobiológicos, se sancionará con una multa en córdobas equivalente a diez mil dólares (USD $10 000) y la reparación del darlo ocasionado

- **Las limitaciones del sistema de aplicación (presupuestarias y otros factores) y las posibles medidas que se podrían tomar para mejorar el cumplimiento**

La carencia de presupuesto para el seguimiento a las pesquerías (viáticos, equipo y presupuesto de transportación) generan problemas con la recopilación y supervisión de la toma de datos estadísticos y esto provoca que exista una falta de control de la calidad de la información, sumado también a la falta de personal adicional para procesar información en tiempo.

Para mejorar esta situación el Ministerio de Fomento Industria y Comercio MIFIC debería de asignar un mayor presupuesto y mayor número de recursos humanos a la entidad encargada de los recursos pesqueros del país.

❖ **Información disponible acerca del tipo y del alcance de la explotación y del comercio ilegales**

En Nicaragua no se tienen registros del volumen de pesca ilegal, pesca no registrada por los centros de acopio producto de la pesca legal ni tampoco del volumen de consumo y de venta local, sin embargo el CIPA/ADPESCA en el año 2005 realizó algunas estimaciones que consideran que el volumen de pesca de caracol del Caribe no registrada anda por el orden del 20 por ciento (Informe FAO, Nicaragua 2005).

De este total se estima en base a la experiencia obtenida por los biólogos del CIPA en los monitoreos realizados tanto en plantas de proceso como a bordo de embarcaciones de pesca comercial exploratoria, conversaciones con pescadores y consumidores de la zona que un 3 por ciento corresponde a pesca ilegal realizada por pescadores buzos artesanales hondureños que habitan en la franja fronteriza entre ambos países así como la que realizan barcos ilegales industriales de buzos que se dedican a la pesca de langosta en los bordes fronterizos y que a la vez capturan caracol de manera incidental.

El volumen de la pesca no registrada por los centros de acopio producto de la pesca legal se ha estimado en un 5 por ciento, este porcentaje corresponde al producto que normalmente es llevado a sus casas por buzos artesanales e industriales para consumo familiar, aquí se incluye también el consumo que realizan pescadores artesanales de centros de acopio ubicados en los cayos Miskitos y Cayos Perlas.

Las ventas locales no registradas se estimaron en un 12 por ciento y corresponde al producto que es vendido por los centros de acopio artesanales ubicados en las comunidades pesqueras ribereñas a vendedores o consumidores locales así como el producto no registrado que es enviado a hoteles y restaurantes del centro y pacífico del país.

❖ **Comente acaso la pesquería se puede considerar coherente con la legislación nacional y los acuerdos internacionales.**

La pesquería del caracol *S.gigas* en el caribe de Nicaragua se puede considerar coherente con la legislación nacional y con los acuerdos internacionales ya que la explotación de este recurso se esta realizando según el código de conducta para la pesca responsable recomendado por la FAO y según los lineamientos de la Comisión Internacional de las Especies Amenazadas CITES. El hecho de que para Nicaragua esta sea una pesquería reciente permite al país ajustarse a los lineamientos establecidos para su sostenibilidad y manejo.

8. LA TOMA DE DECISIONES

❖ **Los ministerios o las instituciones con responsabilidades de ordenación de la pesquería**

1. Ministerio de Fomento Industria y Comercio (MIFIC) a través de la dirección general de recursos naturales (DGRN), de la Administración nacional de pesca y acuicultura ADPESCA, el Centro de Investigaciones Pesqueras y acuicolas CIPA como autoridad científica.
2. Ministerio de los recursos naturales (MARENA).
3. CITES como autoridad administrative.

- **El alcance y la forma en que la información científica es utilizada para ayudar en la toma de decisiones**

Los trabajos científicos propuestos vienen a dar respuesta a los compromisos adquiridos por Nicaragua ante el CITES consistente en el establecimiento de un programa de seguimiento y manejo de este recurso realizado por medio de monitoreos en el mar para de esta manera poder obtener los datos necesarios con los cuales se pueda evaluar el estado de explotación actual del caracol rosado y tratar de garantizar que las cuotas anuales sean biológicamente aceptables y sostenibles en el tiempo.

- **Las reglas o procedimientos existentes en materia de decisiones para establecer de qué forma la explotación debería ser modificada en función de los resultados del seguimiento**

Control de las Tallas Mínimas

Prohibir la posesión de caracoles con una longitud sifonal o talla total de la concha menor a 200 mm, medida desde la punta de la espira hasta la punta del canal sifonal, o un grosor del labio de 3/8 pulgadas (9.5 mm) medido en la parte más gruesa del labio. Los caracoles que midan menos de 200 mm se considerarán ilegales si no presentan al menos un área del labio con un grosor que mida 3/8 pulgadas (9.5 mm).

Evaluar si la explotación de estos recursos debe hacerse bajo una pesquería dirigida

Actualmente se desconoce el esfuerzo de pesca que se aplica en la explotación del Caracol. Sería recomendable evaluar si las explotación de este recurso debe hacerse bajo la modalidad de una pesquería dirigida específicamente, o si se debe continuar operando bajo el concepto de "capturas incidentales" de la pesquería de langosta. Una pesquería dirigida necesitaría solicitar y extender Licencias de Pesca asociadas a Permisos de Pesca Anuales y requerir la presentación de Reportes en formatos establecidos previamente.

Una pesquería dirigida facilitaría obtener datos, por ejemplo de captura y esfuerzo, el darle seguimiento, monitoreo y control a la actividad. Los datos obtenidos permitirían a los biólogos y tomadores de decisión evaluar mejor la situación del recurso y recomendar las mejores opciones de manejo. Estos datos también podrían servir de base para considerar la implementación de modelos más avanzados de administración pesquera en el futuro.

1. Reducción de las cuotas de pesca autorizadas cuando se observen que los niveles de desembarque están alcanzando niveles críticos.

- **Frecuencia con que se examinan los controles de la ordenación y se contemplan ajustes**

Cada dos años.

- **Los mecanismos implementados en materia de consulta con las partes involucradas**

Mediante la Comisión Nacional de Pesca y Acuicultura CONAPESCA establecida en la Ley de pesca y Acuicultura que se reúne al menos dos veces al año

- **Los mecanismos de resolución de conflictos en el ámbito de la pesca**

Mediante la Comisión Nacional de Pesca y Acuicultura CONAPESCA.

9. RETROALIMENTACIÓN Y REVISIÓN

❖ **Revisiones periódicas del sistema de ordenación**

Cada dos años.

❖ **Mecanismo utilizado para realizar consultas y recibir respuestas de las partes involucradas**

Mediante la Comisión Nacional de Pesca y Acuicultura CONAPESCA.

❖ **Uso de información científica en la revisión**

Se utiliza la información obtenida en los cruceros de investigación y muestreos en plantas de proceso para recomendar cambios en el sistema de ordenación

❖ **Ultima vez que se examinaron y/o revisaron i) las políticas y ii) las reglamentaciones**

Año 2005.

❖ **Investigaciones contempladas o llevadas a cabo para mejorar la ordenación de la pesquería del caracol o para cumplir con requisitos específicos del plan de ordenación**

Muestreos biológicos en plantas de proceso y a bordo de embarcaciones que realizan pesca comercial exploratoria dando cumplimiento al plan de acción para el seguimiento y manejo del caracol del caribe que se propuso en el año 2004.

❖ **Consulta con agentes externos en el examen del sistema de ordenación**

Autoridad CITES y FAO.

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SAINT LUCIA

Susanna Scott[1]

1. BACKGROUND

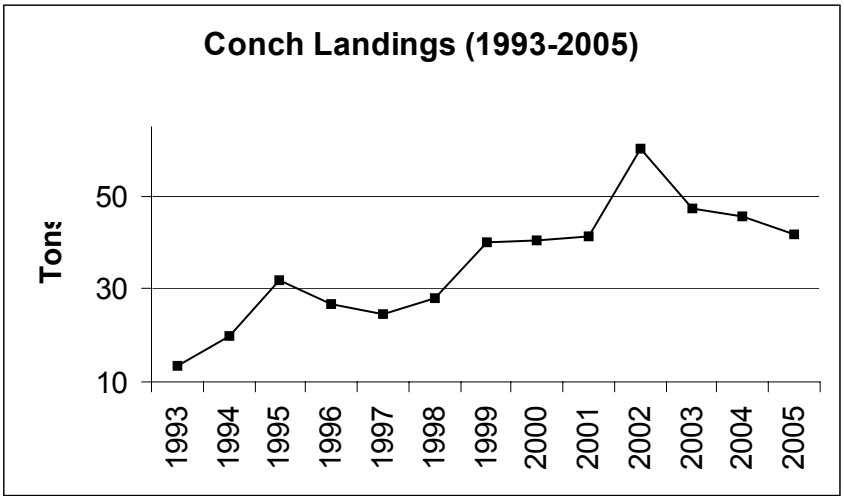
❖ Description of the fishery

The queen conch, *Strombus gigas* (Linaeus, 1758) is one of the single species nearshore fisheries of Saint Lucia. For the most part, fishers harvest stocks using SCUBA gear. However, conch is still harvested with gill nets and by free diving in areas along the west and southwest coasts (Rambally, 1999).

Conch is commercially exploited by over 40 fishers in depths ranging from 11 m to 43 m. Fishers mainly operate out of fibreglass pirogues ranging in length from 7.02–8.45 m, powered by outboard engines of 115–250 hp. Walker (2003), reported that while conch are targeted commercially by some fishers throughout the year, others fishers focus their efforts on this resource during the low period for "offshore" pelagic species, for, on average, five months. Fishers of this resource can be divided into part-time and full-time. Full-time fishers conduct dives on an average of four times each week alternating harvesting and rest days, whilst part-time fishers operate twice each week (DOF- Conch divers' survey, 1999). Walker (2003), reported that the majority of divers conduct greater than three dives per trip and approximately 100 – 500 individual conch are landed per trip. The quantity of conch landed per trip is dependent on the number of divers and the number of dives conducted during the trip. Subsistence exploitation in shallower areas occurs, but the extent is unknown.

Due to the nature of the fishery, the marketing system and an informal policy of the Department of Fisheries, the majority of conch harvested are landed whole (live) and then sold immediately or stored in wire-meshed cages in shallow areas close to shore until sale is obtained.

The following figure presents the estimated catch for conch during the period 1993-2005:



[1] This draft management plan represents only the opinion of the author: Susanna Scott, Senior Fisheries Biologist, Department of Fisheries, Ministry of Agriculture, Forestry and Fisheries Castries, Saint Lucia.

❖ **Description of the resource**

There have not been any recent density studies in the field. The last of such surveys was carried out in the early 1980s, and was very limited giving rough density estimates for a few conch populations in the north and south of the island. As such, the current status of conch stocks in the waters of Saint Lucia is unknown. However, it is noted that presently, near shore stocks have been over exploited and existing stocks are mostly located in deeper water, requiring SCUBA for harvesting.

Information obtained from a survey of vessels targeting conch resources (Walker, 2003), indicated that divers harvest conch regularly from various areas off Cas en Bas, Esperance, Grand Anse, Gros Islet, Mennard and Marisule in the north; Vieux Fort and Caille Bleu in the south; and Dennery on the east coast. Conch vessels target, on average, three areas on a rotational basis. At this point, the northern population is thought to be more heavily exploited than the southern population.

In 1996, a conch biological data collection initiative commenced and extended for a period of two years. The main aim of this initiative was to gather information in order to assess the status of the conch resources of the island so as to guide management decisions. Previous to this data collection exercise, the fishery was severely under recorded and information required to conduct basic monitoring of the resources was unavailable and in some cases, had never been collected. The following summarises some preliminary findings of this study:

- *Strombus gigas* harvested by commercial fishers from fishing areas in the north and south were sampled. Fishers involved in the study were asked to land all sizes of conch. Harvesting was done using SCUBA gear only.
- A total of 4 390 conch were sampled 3 114, from the northern fishing ground and 1 276 from the southern fishing ground. Less than eight percent (7.4 percent) of the sampled conch were immature, that is, did not have a flared lip. Sex was determined for a total of 317 conch of which just over 45 percent were female. For both areas, lip thickness showed a predominance of conch in the 15–27 mm size classes, with the greatest percentage in the 24–26 mm size classes. Very few conch with lip thickness less than 5 mm were landed.
- The mean shell length, lip thickness, total weight and meat weight were larger in the south compared to the north.
- For both fishing areas, the majority of conch were found in the 200–280 mm size classes. But peaks were obtained in the 260 mm–279 mm range for the south and 220–239 mm range for the north. The majority of conch found in the south were of a larger total shell length compared to those from the north. Over 99 percent of the total conch harvested had shell lengths greater than 180 mm, that is, the minimum size limit.
- Analyses revealed that although less than 10 percent of the conch sampled were immature (without a flared lip), less than 0.5 percent were less than 180 mm total length, meaning that the majority of conch landed are above the minimum size limit articulated in the Fisheries Regulations No. 10 of 1994. This supports the conclusion drawn from the crude method adopted previously, where monitoring landings was done by examining stock-piles of discarded conch shells. Examinations indicated that the fishery was targeting mainly adults, since juvenile landings were negligible. Stocks are thought to be sustaining the current level of fishing, although shallow water stocks have been over exploited.
- Conch matures at about 2.5–3 years, when shell lip has completely formed and thickens to 5 mm (Appeldorn, 1994). From preliminary analyses, the majority of conch landed appeared to be older than 3 years.

❖ **Analysis of the situation and any problems faced at present in the management of queen conch fisheries**

The following summarises the information on demand, market and other issues affecting the conch fishery:

- Currently, the major market for conch meat is the local market, which serves both the tourism sector and nationals. Over the past three years, there has been a growing demand for conch meat as a result of activities such as seafood festivals, developed in several communities to stimulate economic development in these communities. To date, these festivals take place weekly in four major communities namely, Gros Islet, Dennery, Anse la Raye and Vieux Fort.
- Sale of conch shells, especially in the tourism sector is another area for economic benefits. Shells are polished and sold as souvenirs. In 2002, the Standing Committee of CITES withdrew recommendations to suspend imports of conch from Saint Lucia and COP 12 agreed that shells of the queen conch would qualify as exempt from the provision of Articles III, IV and V of the Convention under the category of personal and household effect. Under Resolution, Conf. 12.9 "queen conch (*Strombus gigas)* shell – up to three per person do not require export or import permits, or re-export certificates, for personal or household effects for the dead specimens, parts and derivates." Before 2002, the number of shells leaving the island was monitored by the provision of CITES permits. However, this avenue for recording trade in under four shells no longer exists.
- Although biological data have been collected in the past for this species, the collection of such data has not been sustained after the termination of externally funded projects.
- Morphological differences among various conch populations in Saint Lucia have implications for management measures e.g. especially for those relating to shell length and weight.
- Information on stocks is still scarce, especially information on density, abundance and distribution. This scarcity of information limits informed management decisions.
- Although stocks are thought to be sustaining the current level of fishing pressure (as denoted by catch and effort data), fishers have moved from the near shore depleted resources to resources offshore. However, more recently, reports suggest that the depths at which the conch are now found is becoming an even greater limiting factor on the number of dives are being be conducted.
- In general, fisheries management and enforcement agencies have limited surveillance and enforcement capacities.

2. POLICIES AND LEGISLATION

❖ **Policies that set out the principles on which the fishery for queen conch is managed**

Two management objectives have been defined for this resource and are articulated in the *Plan for Managing the Fisheries of Saint Lucia (2001- 2005)*. They include rebuilding the near shore stocks and ensuring sustainable use of this resource. Options identified for attaining these objectives include initiating a flared lip thickness restriction, controlling effort through a licensing system, implementing closed areas and/or seasons, and co-management arrangements with resource users.

It should be noted that this fishery management plan is currently under review.

❖ **Legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch**

At the national level, Fisheries Regulations, in place since 1994, provide protection for this resource. This legislation states:

(1) No person shall -
   a. take from the fishery waters, sell, purchase, or at any time have in his possession any immature conch; or
   b. take from the fishery waters, expose for sale, purchase or at any time have in his possession any conch during the closed season for conch as specified by the Minister by notice published in the Gazette and in a newspaper which is printed or circulated in the State

(2) In this Regulation -
   a. "conch" includes the whole or any part of any conch;
   b. "immature conch" means a conch with -
      i a total weight of less than one kilogramme;
      ii meat weight of less than 280 grammes after removal of the digestive gland;
      iii a shell which is smaller than eighteen centimetres in length; or
      iv a shell which does not have a flared lip.

However, in 2000, the Department of Fisheries with assistance from FAO, embarked on an initiative to revise the fisheries legislation. The following are proposed amendments for the new fisheries legislation as they pertain to conch:

- Inclusion of a lip thickness in the definition of an immature conch (less than 5 mm).
- Removal of the stipulated shell length limit
- Provision for closed areas.
- Provision for a national permit system for harvesting of conch.

Apart from the three conch limit mentioned earlier, the import and export all conch and conch products are regulated under the CITES restrictions.

Note also that Saint Lucia is currently in the process of finalising and institutionalising national CITES enabling legislation.

❖ **The International Conventions and Agreements ratified by the country that are of direct relevance to the fishery and how they affect the management of the fishery**

Saint Lucia is signatory to a number of relevant international conventions and agreements.

Marine Pollution
The following provides a list of conventions/agreements that serve to support protection of the Caribbean Sea and associated ecosystems, which in effect, offers support to protection of conch habitats:

- Convention on the Prevention of Marine Pollution by Dumping Wastes and other Matter (London Convention) 1985
- International Convention for the Prevention of Pollution from Ships (MARPOL) 2000
- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention) 1984
- Protocol Concerning Cooperation in Combating Oils Spills in the Wider Caribbean Region; under the Cartagena Convention 1984

- Basal Convention for the Control of Transboundary Movements of Hazardous Wastes and their Disposal 1993

Fisheries Conduct
The Code of Conduct for Responsible Fisheries is a voluntary code that Saint Lucia has signed. This Code promotes responsible fishing practices, highlighting several areas that States should be in keeping with:

- Management of fisheries with an aim to maintaining the quality, diversity and availability of fishery resources
- Prevention of over fishing
- Base conservation and management on best scientific evidence and traditional knowledge
- Protection and rehabilitation of fisheries habitats
- Participation in regional management organizations to ensure responsible fishing and effective conservation at a regional level.

Species Protection
Protocol Concerning Specially Protected Areas and Wildlife of the Wider Caribbean Region (SPAW); under the Cartagena Convention 2000:
Strombus gigas is listed in Appendix III of the SPAW. This Appendix states that each Party shall, in co-operation with other Parties, formulate, adopt and implement plans for the management and use of such species, including:

- The prohibition of all non-selective means of capture, killing, hunting and fishing and of all actions likely to cause local disappearance of a species or serious disturbance of its tranquillity;
- The institution of closed hunting and fishing seasons and of other measures for maintaining their population;
- The regulation of the taking, possession, transport or sale of living or dead species, their eggs, parts or products.

Convention on the International Trade in Endangered Species of Wild Fauna and Flora, 1982:
Strombus gigas is listed in Appendix II of this convention. Species included in this Appendix are subject to trade regulations detailed in the Convention.

Convention on Biological Diversity: While this convention does not specifically speak to Strombus gigas, it addresses biodiversity conservation, sustainable use and equitable sharing of benefits derived from biodiversity use. Thus, the convention has implication for the management of conch resources.

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **The operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

- To maintain conch stocks at or above an acceptable level [*to be defined*].
- To maintain effort at current levels.
- To maintain or increase current levels of income to fishers from this fishery.
- To contribute to maintenance of conch habitat and nursery grounds in a productive state.

❖ **Indicators are or could be used to measure the performance of the fishery management relative to the objectives**

- Biomass (stock densities, abundance, distribution; catch/effort).
- Fishing effort (catch effort, fishermen's registration and licensing).
- Spawning stock status (catch composition (e.g. lip thickness), stock structure).
- Health of mangrove, coral and seagrass areas (e.g. detail indicators).

❖ **The reference points that are/could be used to define acceptable and unacceptable performance of the fishery**

- Effort (number of fishers) at current levels (licensing or a permit system).
- Lip thickness of all conch in catch at or above legal size limit (flared lip thickness -size limit).
- Conch stocks at or above an acceptable level [*to be determined*].
- E.g. vessel value of fishery at or above current value per trip.
- Area of all marine reserves at or above current levels. Marine reserves not specific to conch, but may provide some support to this resource.
- Level of cooperation with relevant agencies (re land management, agriculture, environmental management, physical development, etc) at or above current levels.

4. DATA REQUIREMENTS AND MONITORING SYSTEM

❖ **The type of data collected and the characteristics of the monitoring system (e.g., coverage, sampling procedures, the participation of fishery operatives, etc.)**

Description of Data	Unit of measurement	Years available*	Sampling procedure (including frequency of sampling, percentage coverage, raising procedures, etc.)
Landings	Pounds of meat.	1993 – 2005 (electronic database).	Stratified data sampling regime in place. Fish landings, including conch, collected from 8 landing sites. Weight is estimated (1lb per conch). On occasion, exact weights may be obtained from fishers.
Fishing effort	Number of trips.	2000-2005 (electronic database).	Sample number is obtained and number bumped up to give estimated number of trips.
Size frequency	Shell length. Lip thickness. Total weight. Meat weight.	1996-1999 (electronic database).	-----
Trade	Number of shells. Pounds of meat.	Mid 1980s –2006 (hard copies).	CITES permits .
No of fishers - full-time - part-time	Number of licensed fishers.	2005/6 (electronic database).	------

❖ **Other data that should be collected to monitor the status of the resource or performance of the fishery (e.g. in order to provide an indicator for a particular operational objective).**

- Locate specific areas where conch populations inhabit.

- Determine the distribution of conch resources around the island, both within fished and non-fished areas.
- Determine the abundance and density of conch within the various populations around the island.
- Identify and locate spawning aggregations.
- Obtain data on the population structure of the various populations of conch.

❖ **Comments and any additional information**

Prior to 2001, conch landings were only captured for Gros Islet in the north, where the majority of conch were landed. In 2001, the sampling plan was revised to include two other sites in the southwest (Joseph, 2003) one of which is known to have conch landings. This revision has improved the information base for this species.

5. DATA ANALYSIS

❖ **Types of assessment models or other approaches are used to evaluate the status of the resource and to assess the impact of harvesting strategies**

- Examination of conch shell piles
- Examination of catch
- Record landings

❖ **Comments on how the assessments take into account major uncertainties in data and assumptions**

Results from density and size/frequency surveys, conducted in the mid 1980s, were used to determine the fisheries regulations which were instituted in 1994 by way of the Fisheries Regulation Statutory Instrument #9 of 1994.

Results from preliminary analysis of the biological data collection program, conducted in 1996-9, were used to obtain incite to improving fisheries regulations. This information suggested that a lip thickness should be included in management measures for this fishery. A lip thickness has thus been introduced into the newly drafted fisheries legislation. This information also led to the recommendation of the removal of shell length as a management measure within the newly draft legislation.

❖ **Who the reports were prepared for and whether and how they have been used to assist in management of the fishery**

Reports, including recommendations, were prepared and submitted to the Chief Fisheries Officer. Information was also presented at regional fora organised by the Caribbean Regional Fisheries Mechanism (CRFM) and the CITES Secretariat.

6. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery**

Type of Control	Years implemented	Description of i) the rationale for the control ii) the details of the control and ii) current level of restriction	Estimated effectiveness of control
Access control (e.g. limit number of licenses)	-----	Where Saint Lucia does not have this as a control, the existing licensing system provides the means to facilitate this type of control if deemed necessary.	-----
Effort control (e.g., number of boats, number of gears, days fishing, etc.)	-----	As above.	------
Minimum size/weight of conch in the catch	1987-present.	Flared lip required. Lip thickness (proposed in new legislation).	Different morphology of conch makes shell length and meat weight management measures challenging to impose.
Gear specifications and restrictions	1994-present.	Fishers must obtain permission to use SCUBA in fishery.	Limited capacity within relevant agencies to conduct surveillance and enforcement patrols.
Seasonal (time) closures	----	The present fisheries legislation makes provisions for closed seasons, but this has not yet been instituted.	Limited information exists to allow for appropriate close season (time frame) to be recommended.
Protected areas (indicate the percentage of the stock area under protection)	-----	The present fisheries legislation makes provisions for marine reserves (no take areas), but no marine reserves have been designated specifically for the protection of conch.	-----
Catch	-----	Catch must be landed whole (i.e. with shell) – policy.	Where conch is observed outside of the shell, it is difficult to determine if conch is mature.

7. ENFORCEMENT AND COMPLIANCE

- **The surveillance and monitoring systems in place to ensure that the requirements of the management system are in place, also the methods used to enforce CITES regulations concerning exports of queen conch**

Due to financial and manpower limitations, enforcement focuses on only the harvesting of individuals with flared lips due to the ease of implementation in the field. Inspections at landing sites and examination of discarded shells are conducted on a quarterly basis.
At the national level, the Ministry of Agriculture, Forestry and Fisheries is the Management Authority for CITES, with the office of the Permanent Secretary serving as Focal Point, while the Departments of Fisheries and Forestry function as Scientific Authorities, focusing primarily on relevant aquatic and terrestrial issues respectively.

- **Indicate the types of sanctions and penalties that can be applied in case of non-compliance with the management controls**

Currently, fisheries legislation allows a maximum fine of XCD (East Caribbean Dollar) 5 000 (US$ 1 860) for each offence and/or incarceration. However, the newly drafted fisheries legislation proposes to increase the fines relating to various fishery offences. In addition, there are fines proposed in the draft CITES legislation and these range from XCD 10 000 – XCD 200 000 (US$ 3 721- 74 419) depending on the offence.

- **Comments on whether the fishery could be considered consistent with the national legislation and international agreements**

Yes, they are believed to be consistent. However, more information is needed on stock status to verify.

8. DECISION-MAKING

- **The Departments or institutions with management responsibility in this fishery, describing their area of responsibility and interactions**

At the national level, the Ministry of Agriculture, Forestry and Fisheries is the Management Authority for CITES, with the office of the Permanent Secretary serving as Focal Point, while the Forestry Department and the Department of Fisheries function as the Scientific Authorities, focusing on relevant terrestrial and aquatic issues respectively. More recently, the Ministry put in place an Ad-Hoc CITES Committee, comprising representatives from the Fisheries and Forestry Departments, the Veterinary and Phyto-Sanitary Divisions, the Biodiversity office, the Customs and Excise Department and the Ministry of Commerce. To date, this committee has spearheaded the development of draft CITES legislation that will enable more effective implementation and enforcement of the Convention at the national level.

- **Mechanisms for resolution of disputes within the fishery**

Through 1) broad based consultations with stakeholders; 2) group meetings for interested parties; and 3) one-on-one meetings.

9. FEEDBACK AND REVIEW

❖ Procedures for undertaking regular reviews of management systems

The Fisheries Management Plan is scheduled to be reviewed every five years. Fisheries legislation is also reviewed as deemed necessary, to address changing in circumstances (albeit at the national or international level).

Procedures used:

- broad based consultations
- application of relevant scientific information, where available

❖ Mechanism used for consultation to receive feedback from stakeholders and consult with stakeholders

- Broad-based stakeholder meetings.
- Meetings with fishermen.
- One on one meetings between fisher and fisheries extension officers.

❖ The use of scientific information in reviews

Available scientific information is used to determine whether or not there should be any modifications/changes in management measures being used.

❖ Information on last review of regulations

- The Fisheries Management Plan (2001-2005) is currently being reviewed.
- The Fisheries Act No. 10 of 1984 and the Fisheries Regulations No. 9 of 1994 have been revised and are currently with the Legislative Drafting Unit of the Attorney General's Office being finalised. Areas being recommended for change are detailed under Section 2b.

❖ Research planned or undertaken to improve management of the fishery for queen conch or to meet specific requirements of the management plan

An assessment of conch populations will entail two aspects: i) preliminary surveys and ii) assessments of conch stocks in various areas.

Preliminary surveys:

- A number of preliminary surveys will be carried out to identify suitable areas for survey activities.
- The areas at which preliminary surveys are to be conducted will be determined by interviews with conch divers, fisheries extension officers and other relevant persons. Selection of sites to be assessed will also be based on other anecdotal data obtained by the Department of Fisheries.
- Based on estimated densities of conch obtained during preliminary surveys, a number of study sites will be selected for research.

Assessment surveys:

- All divers will be trained in the methodologies to be used to conduct assessments.
- Random swims using towlines will be used to assess the distribution of conch in each study area.
- Transect lines will be set in each study area to determine population abundance and densities in these areas.

- The location of each study site will be recorded using a global positioning system.
- The bottom substrate types contained in each study area will be recorded.
- Conch samples will be collected from along transect lines from each study area to obtain biological and maturity data.

However, this plan is dependant on identification of sufficient funding.

❖ **External reviewers used in review of the management system**

Review systems also involve the Caribbean Regional Fisheries Mechanism.

SAINT VINCENT AND THE GRENADINES

Leslie Straker[1]

1. BACKGROUND

The queen conch (*Strombus gigas*) is considered one of the most important export fishery resources in St. Vincent and the Grenadines due to local consumption as well as sources of income, primarily from export. In recent years the overall harvest of conch has increased largely driven by international exports as well as growing resident populations and increasing tourism in the island. These factors have been the main contributors leading to the perceived decline in conch population densities and distribution. Deep waters provide refuge from fishing, as the conchs are often difficult and/or uneconomical to exploit. However, the use of SCUBA equipment and hookah, in place of traditional conch hooks and free diving techniques, has allowed expansion of the fishery into previously unexploited areas, thus placing many deep-water populations at risk.

❖ Description of the fishery

The conch fishery of St. Vincent and the Grenadines is based mainly in the Grenadines. It is considered to be moderately important to the fishers in the Grenadines and is mainly carried out during the lobster closed season. The fishery is mainly export driven with only about 15-20 percent of total harvest being consumed locally. Regional markets such as St. Lucia, Anguilla and other Leeward Islands are the main destinations for conch exports. In the past significant quantities were also exported to Martinique, however, this has ceased since the European Union's ban on fish and fishery products from St. Vincent and the Grenadines into that territory in 2000. An estimated average of 25 000 lbs (11 339 kg) is landed annually with a corresponding value of US$ 46 500. However, in recent years this average figure has been increasing. About 150 fishers are involved in the harvesting of conch. Small outboard powered vessels less than 25 feet in length, equipped with 45-100 hp engines are used as the fishing platform. The fishing operation generally lasts for 4-5 hours in the early morning.

Catch and export data for conch is collected at the various landing sites and fish markets in the Grenadines. Because of the pooling of catches before they are landed and the landing of the conch without the shell it has been difficult to institute a proper catch and effort and biological sampling programme for this species. The archipelagic nature of the Grenadine Islands also makes this an especially challenging undertaking. Nonetheless, some limited catch and effort data exists and there are plans to collect biological data for this species and to conduct abundance surveys where possible. Some traditional knowledge exists with respect to the distribution and nursery grounds of the species. It is known that the species is mainly concentrated on the Grenadine bank.

Current management regulations for the conch include size limits and protected fishing areas. The Minister of Fisheries also has the authority to implement closed seasons and other appropriate management regulations if it becomes necessary to do so. While these regulations exist, inadequate enforcement and the lack of human and financial resources hamper the effective management of the resource. There is need to develop and implement an effective management programme for sustainable development of the conch fishery.

[1] This draft management plan represents only the opinion of the author: Leslie Straker, Fisheries Officer, Fisheries Division, Ministry of Agriculture, Forestry and Fisheries, St. Vincent and the Grenadines.

❖ **Analysis of the situation and any problems faced at present in the management of queen conch fisheries**

The direct beneficiaries will be the fishers and their families who will enjoy the benefits of stable and sustainable fisheries, the national fisheries departments and fishers who will be empowered to take collective responsibility for sustainable exploitation of the conch resources.

If this project is not implemented, the queen conch resource which is classified as a threatened species will continue to decline. Unsustainable exploitation and inadequate management will continue. The governments in the CRFM countries will not be able to obtain sustainable economic and social benefits. Some countries will still be penalized and banned from participating in international trade of conch and conch products. Poverty, unemployment and malnutrition will increase in coastal communities that are dependent on the queen conch.

*Some of the main challenges preventing the sustainable management of the resource include***:**

- Improving enforcement at the local level;
- Improving level of compliance in reporting to CITES;
- Improving local and regional communication and action;
- Development and implementation of management plan for conch;
- Multi-island state;
- Anecdotal evidence seem to indicate that stocks may be decreasing (apparent reduction in distribution, fishers having to go deeper);
- Implementation of a useful and non-detrimental quota system;
- To what extent are other anthropogenic and other natural factors; external to fishing, are impacting on the conch resources;
- Implementation of commensurate and cost-effective sustainable management plans for the resource.

3. POLICIES AND LEGISLATION

❖ **Policies that set out the principles on which the fishery for queen conch is managed**

General Government Policy
Over the medium term the broad policy objective of the Government of St. Vincent and the Grenadines will continue to focus on the attainment of alleviation of higher levels of poverty, increasing the levels of employment and raising social consciousness.

Fisheries Specific Policy
The Fisheries Department is committed towards ensuring sustainable utilisation of its natural resources, while protecting and promoting biodiversity and economic prosperity through a sustainable fishing industry and protected areas system.

❖ **Legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch**

The mandate for fisheries management and development St. Vincent and the Grenadines embodied in the following legislation:

1. Act No. 15 of 1983, which declares and establishes the maritime areas of St. Vincent and the Grenadines and to provide for protection of and use of these areas. This enabled the state to define the following areas: (1) Internal waters, (2) Archipelagic waters, (3) Territorial sea,(4)

Contiguous Zone, (5) Exclusive Economic Zone, (EEZ), (6) Continental Shelf, (7) Territorial Extent and (8) Safety zones. These maritime areas are accepted by the OECS states and Barbados although the boundaries have not been demarcated.

2. Act No. 8 of 1986 makes provisions for the promotion, management and development of fisheries, marine reserves and conservation measures, registration of local fishing vessels and enforcement.

3. Fisheries regulations of 1987 deals with the establishment of a Fishery Advisory Committee, local and foreign fishing licensing and registration, fish processing establishment licensing and registration, storage of gear, fisheries conservation measures and fish aggregation devices.

❖ **International Conventions and Agreements ratified by the country that are of direct relevance to the fishery and how they affect the management of the fishery.**

International Factors:

- the United Nations Convention on the Law of the Sea;
- the UN Fish Stocks Agreement;
- FAO Compliance Agreement;
- FAO Code of Conduct for Responsible Fisheries;
- convention on Climate Change;
- the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- the Cartagena Convention;
- the Convention on Biological Diversity;
- the International Commission for the Conservation of Atlantic Tunas (ICCAT);
- the United Nations Environment Programme (UNEP);
- the World Trade Organisation (WTO); and
- the International Convention on Regulation of Whaling (ICRW).

Regional Factors:

- the Western Central Atlantic Fishery Commission (WECAFC);
- the Caribbean Regional Fisheries Mechanism (CRFM); and
- fishing Agreements.

The National Environment:

- Ministry of Health;
- St. Vincent National Properties;
- National Development Foundation and the National Commercial Bank;
- Ministry of Tourism;
- Department of Co-operatives;
- Ministry of Education, Private and Public Schools and the Colleges of St. Vincent; and
- Enforcement Agencies.

4. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **Operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

Issues Affecting the Sustainability of Queen Conch:

- depletion of conch resources in certain areas/ranges;
- lack of or inadequate Integrated Coastal Zone Policy to address issues related to pollution, watershed management, land use practices, beach/mangrove protection and coastal development;
- discard of conch shells on land; and
- negative impact natural phenomenon, such as hurricanes/storms, climate change, drought and volcanic activity.

Operational Objectives:

- maintain CPUE to current levels;
- maintain catch to current levels;
- rebuild stocks above 30 percent of unexploited level;
- maintain stocks above 30 percent of unexploited level;
- sustainable use of stocks;
- maintain income above national minimum wage; and
- maintain the current integrity of certain vital habitats.

❖ **Indicators that are or could be used to measure the performance of the fishery management relative to the objectives**

- determination of national minimum wage;
- annual CPUE;
- annual production;
- area of marine reserve declared relative to the total availability of the various type of habitat (e.g., sea grass beds, algal plains); and
- indicators of quality of reserve, including recreational water quality parameters; sea grass densities; conch densities; etc.

5. DATA REQUIREMENT AND MONITORING SYSTEM

❖ **Type of data collected and the characteristics of the monitoring system (e.g. coverage, sampling procedures, the participation of fishery operatives, etc.)**

Description of Data	Unit of Measurement	Years available*	Sampling procedure (including frequency of sampling, percentage coverage, raising procedures, etc.)
Landings	Pounds of meat.	1990-present (hard-copy and digitised).	It is estimated that 80% of harvest is exported. Export data available by month by year from export license forms.

			There is also some information available captured in the data collection programme.
Discards	No.	No.	No information is available on discards, however, there are significant stockpiles of shells on various beaches throughout the Grenadines.
Estimated unrecorded landings (where applicable)	No.	No.	No information on unrecorded catches but anecdotal evidence indicates that some catches may go unrecorded.
Fishing effort	Yes.	1990-present (hard-copy and digitised).	Captured in the data collection programme.
Trade - mass - value	Yes.	1990-present (hard-copy and digitised).	Export data available by month by year from export license forms.

❖ **Other data that should be collected to monitor the status of the resource or performance of the fishery.**

There will also be the need to collect socio-economic data on: operations: fuel used, bait used, etc.

6. DATA ANALYSIS

❖ **Alternative assessment methods (where necessary) that could be used to provide better information on the status of the resource or performance of the fishery**

The use of Traditional Ecological Knowledge in providing historical information on the status, abundance and distribution of the resources could be employed. There is documented information on conducting such surveys.

7. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery.**

Type of Control	Years Implemented	Description of i) the rationale for the control ii) the details of the control and iii) current level of restriction	Estimated effectiveness of control
Access control (e.g. limit number of licenses)	No.	-----	Access control (e.g. limit number of licenses).
Effort control (e.g., number of boats, number of gears, days fishing, etc.)	No.	------	Effort control (e.g., number of boats, number of gears, days fishing, etc.).
Catch quotas (TAC)	No.	-----	Catch quotas (TAC).

Minimum size/weight in the catch	Yes.	According to the St. Vincent and the Grenadines Fisheries Regulations of 1987, an adult conch should meet at least one of the following criteria: Has a shell that is greater than seven (7) inches (18 centimetres) in length; Has a flared lip; Has a total meat weight of less than 8 ounces (225 grams) after the removal of the digestive gland.	Minimum size/weight in the catch.
Gear specifications and restrictions	Some.	-----	Gear specifications and restrictions

8. ENFORCEMENT AND COMPLIANCE

❖ **Surveillance and monitoring systems in place to ensure that the requirements of the management system are in place, including methods used to enforce CITES regulations concerning exports of queen conch**

Exporters must first apply for licenses from the Department of Trade. A tax of US 19 cents is charged for every pound of conch exported. Licenses must also be sent to the Fisheries Division, Ministry of Agriculture, Forestry and Fisheries, for approval. The Fisheries Division issues both the CITES permit and the health certificate, after the shipment has been inspected by an authorized officer. It is from these various forms that the export data are collected.

9. FEEDBACK AND REVIEW

❖ **Research planned or undertaken to improve management of the fishery for queen conch or to meet specific requirements of the management plan**

A project for the "Rehabilitation and Management of the queen conch (*Strombus gigas*) Resources in the CARICOM/CARIFORUM States" was formulated. This project was submitted to the FAO for funding.

The key outputs will include the following:

1. Results of fishery-independent studies available and transformed into management advice.
2. Monitoring systems for catch, effort, biological, socioeconomic and trade data operational and strengthened.
3. Conversion factors developed to ensure regional comparisons and standardized reporting on conch catches, etc.
4. Updated information on conch fisheries available.
5. Model conch management regulations developed and being adopted and implemented by the countries.
6. Prepared or updated conch fisheries management plans.
7. Regional database on conch created and regularly updated.

8. Awareness campaign and public education on conservation and sustainable management of conch developed and in place.
9. Sensitized and supportive fishers.
10. Collaboration among fishers and other stakeholders and governments through memoranda of agreement for the management of conch.
11. Plan developed for improvement and harmonization of closed seasons and other management measures for conch at the regional level.

❖ **Use of external reviewers in the review of the management system**

- CITES authorities under the Review of Significant Trade.

TURKS AND CAICOS ISLANDS

Wesley Clerveaux and Kathy Lockhart[1]

1. BACKGROUND

The Turks and Caicos Islands (TCI) are a group of calcareous islands containing approximately 193 miles^2 (311 km^2), of which only 10 percent is land. The islands are located at the southeastern end of the Bahamian archipelago, approximately 145 km north of Hispaniola. The Turks and Caicos Islands consist of eight main islands and a series of uninhabited cays dissected by three shallow water banks: the Caicos Bank, the Turks Bank and the Mouchoir Bank.

There are two main fisheries which represents almost 100 percent of TCI's Export. In terms of economic value, the Spiny Lobster fishery is the mort valuable fishery, followed by the queen conch (*Strombus gigas*), with a smaller fin fishery utilized for local consumption. Most of the catch for all three fisheries are landed at the various processing plants within the TCI, with a relatively small quantity being marketed directly to local restaurants for local consumption.

❖ Description of fisheries and fleet

Commercial fishing in the Turks and Caicos Islands predominantly takes place on the shallow water of the Caicos bank, although some subsistence fishing does occur on the Turks Bank as well. On the other hand, although the Mouchoir Bank is considered part of the territorial waters of the Turks and Caicos Islands, very low levels of fishing by the natives of the TCI takes place there, this is largely due to the banks significant distance from landing sites.

The TCI fishery is based on the use of small retrofitted open V-hull vessels ranging in length from 5.5-6 meter (18 ft to 20 ft) with 85 to 115 Horse Powered (HP) outboard engines. Conchs are hand collected by fishers free-diving to depths of 3.0 to 9.1 m (10 to 30 ft) aided by the use of mask, fins and snorkel.

❖ Description of resource

The conch fishing season in TCI commences on October of any given year and ends in July of the following year. In 2004/2005 fishing season, there were 366 licensed commercial fishers and 154 licensed vessels.

The queen conch fishery of TCI boasts the most extensive time series of catch and effort data in the region from as far back as 1887 (Fig. 1). The landings have fluctuated from 2 619 tonnes (5 773 906 lbs) in 1943 to an all time low of 16.4 tonnes (36 155 lbs.) following Hurricane Donna in 1960. The fishery rebounded and has remained relatively stable at the current Maximum Sustainable Yield (MSY) level of 760 tonnes (1 674 990 lbs). Numerous hypothesis in several published articles have been put forth to explain the fluctuations observed, for example; localized depletion, and other independent factors such as climate impacts, a shift to more lucrative employment, and elevated demand levels during World Wars I & II (Medley & Ninnes 1999, Bene & Tewfik 2001, and Clerveaux & Vaughan 2001).

Economically, the queen conch is the second most valuable fishery in the TCI, with export levels of approximately 272 tonnes (600 000 lbs) of clean conch meat, 86 tonnes (190 000 lbs.) of conch trimmings, 3.2 tonnes (7 100 lbs) of maricultured conch meat, 1 800 mariculture live conch and

[1] This draft management plan represents only the opinion of the authors: Wesley Clerveaux and Kathy Lockhart, Department of Environment and Coastal Resources, Ministry of Natural Resources, Turks and Caicos Islands.

13 000 conch shells and shell derivatives. Even though the queen conch is fished extensively throughout the Turks and Caicos Islands, the stocks are still considered to be stable.

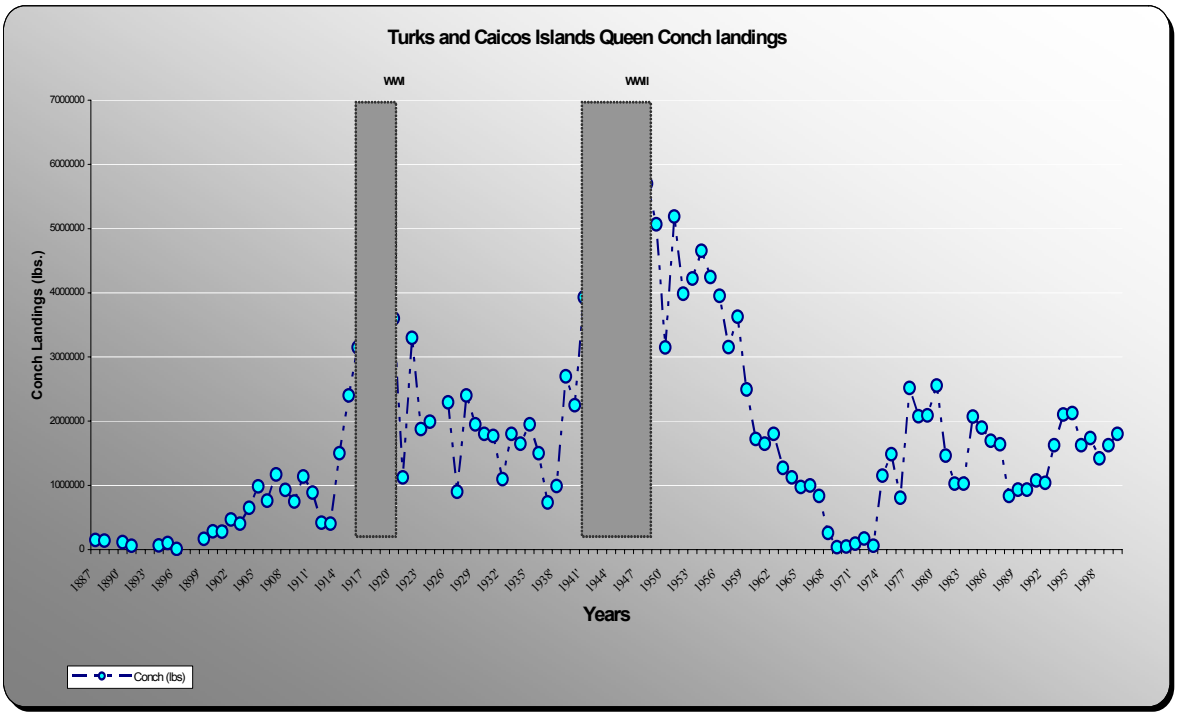


Figure 1 - Historical catch landings of queen conch, showing the trends and fluctuations in catch over the years. The two highest peaks represents high catch rates as a result of high demands during World War I & II. The fishery declined drastically following Hurricane Dona in 1960, and a mass exodus from the fishery in search of alternative employment in the Bahamas coupled with a switch to the more economically lucrative lobster fishing.

❖ **Problems faced at present in the management of queen conch fisheries**

The Convention of International Trade of Endangered Species of Flora and Fauna (CITES) has listed queen conch on Appendix II, to ensure the sustainability of this important resource. To satisfy CITES requirements, a modified version of the Schaefer model is being utilized in TCI since 1993/1994 licensing year to model historical catch and effort data, estimate catch per unit effort (CPUE), and provide the basis for an annual Total Allowable Catch (TAC). However, since 1994 the model has consistently underestimated CPUE. To cross-check yield estimates derived from the modified Schaefer model, a visual assessment of queen conch stocks across the Caicos Bank was conducted in 2000-2001. Surveys were carried out in traditionally fished areas using replicate belt transects at randomly selected sites. All queen conchs encountered were enumerated and placed into size/age categories based on siphonal length and lip thickness. In total, 170 sites were surveyed between October 2000 and August 2001, and nearly 4 000 queen conch enumerated. Our results indicate that the yield estimate derived using the modified Schaefer model is very close (i.e. within <1%) to those generated using the biomass estimate from our visual surveys, and within 10 percent of those estimated using the standard Schaefer and Fox surplus production models. As such, we conclude that the modified Schaefer model is producing reasonable yield estimates.

A visually assessment of the queen conch stocks were also conducted between October 2001 to June 2002 for the Turks Bank, in order to estimate an exploitable biomass. The results indicated a much lower density figure in comparison to the Caicos Bank.

Furthermore, in an effort to increase the robustness of the Schaefer Model, local consumption information was collected and incorporated into the model in 2006. The results produced showed a high correlation of between 60 and 70 percent between observed and expected catch rates (cpue). The model seemed to fit better when information on local consumption is added (Fig. 2).

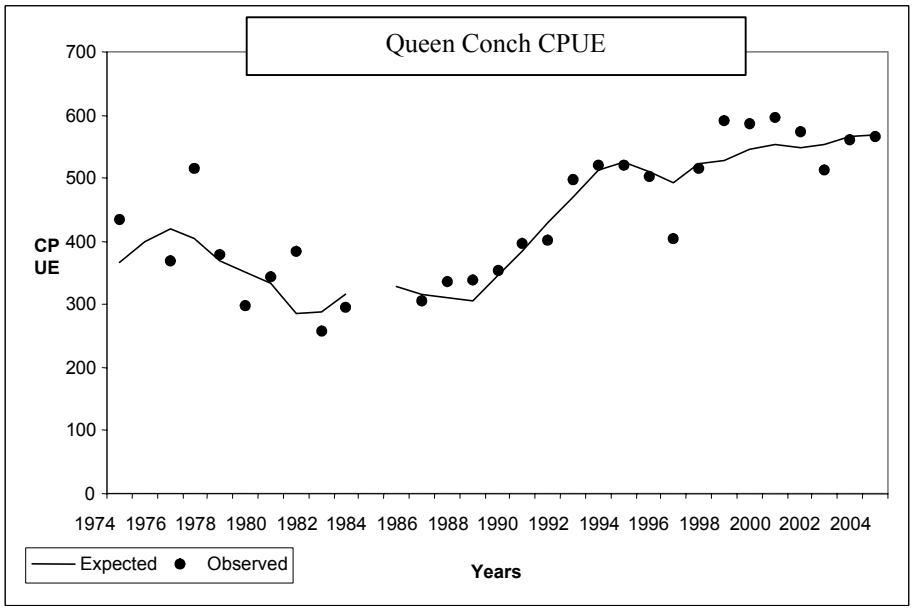
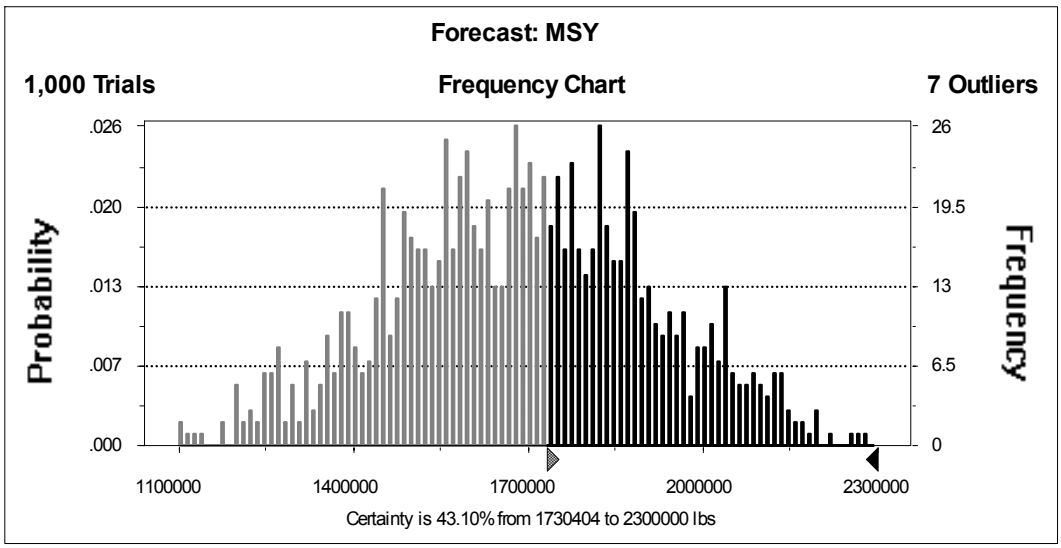
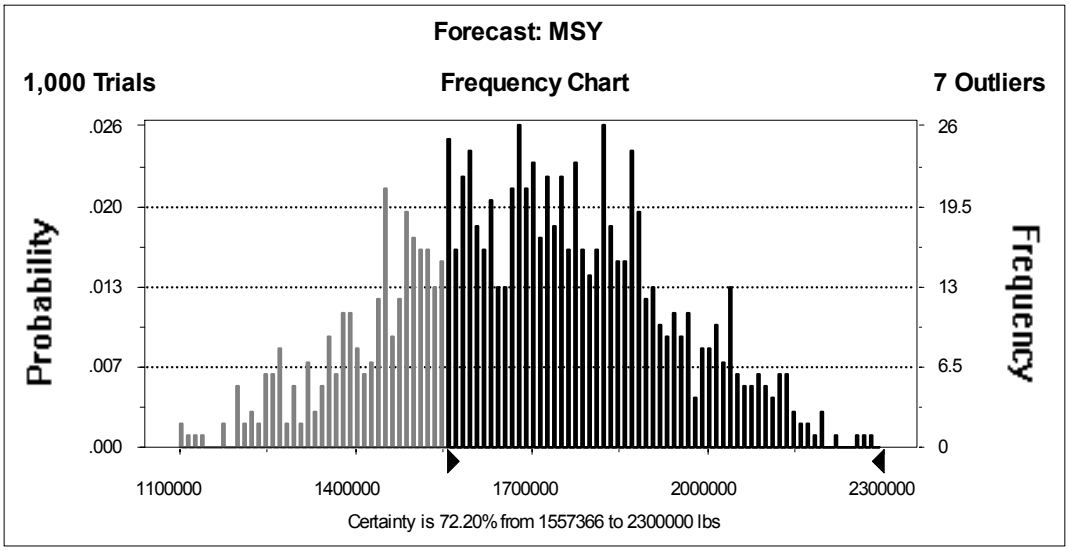


Figure 2 – Observed vs. Expected CPUE fitted using Excel's Solver with local consumption information incorporated.

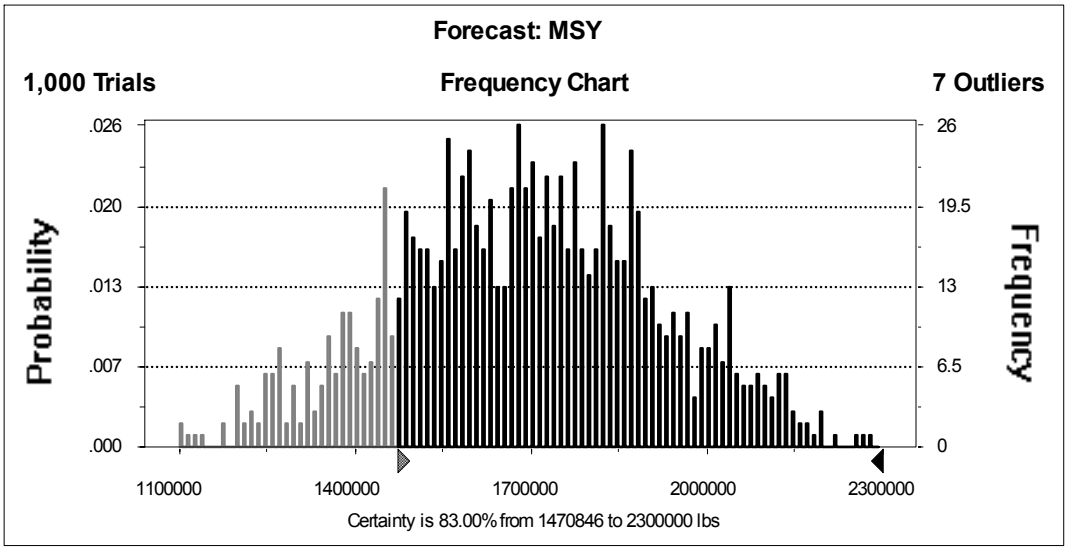
Although modelling has shown that the fishery is stable and not threatened with collapse, the TCI Government has adopted as part of its management strategy to use the calculated MSY as a limit reference point. This is because at MSY there is a high probability (56.5 percent) of over fishing (Figure 3a). The Government has therefore used a fraction of the MSY as the Target Reference Point for the setting of the Total Allowable Catch (TAC). Targeting catch at 90 percent of the MSY has a lower probability (27.4 percent) of overfishing (Figure 3b). Similarly, at 85 percent and 75 percent of the MSY the probability of over-fishing is 16.6 percent and 4.5 percent respectively (Figure 3c& 3d).



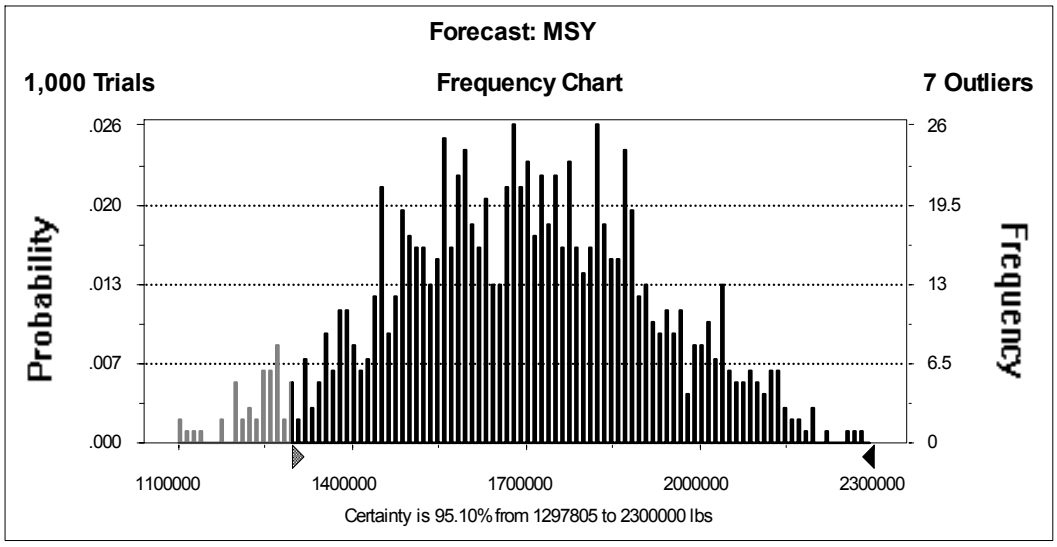
(a) Fishing at MSY



(b) Fishing at 90 percent of the MSY



(c) Fishing at 85 percent of the MSY



(d) Fishing at 75 percent of the MSY

Figures 3a-d – Probability of over-fishing using different levels of catch for the target reference point.

2. POLICIES AND LEGISLATION

❖ Policies that set out the principles on which the fishery for queen conch is managed

In 2005, the Government of TCI unveiled the *National Policy for the Management and Development of the Fisheries Sector*. The Fisheries Policy aims to ensure the sustainable use of the living marine resources and ecosystems through increased cooperation and collaboration with all the stakeholders for the improved welfare of the people of the TCI.

Some of the objectives of the National Fisheries Policy are:

- Ensure that the catch in any one-year does not exceed the Maximum Sustainable Yield.
- Restore and/or maintain populations of marine species to sustainable levels, that is, at the level that can give the MSY.
- Conserve local populations of endangered species and ensure sustainable harvesting and trade.
- Strengthen scientific and research capabilities in order to obtain relevant information on the fisheries resources such as carrying capacity, stock status etc.
- Enhance income generation by a factor of 15 percent by improving and creating market opportunities for fish products at the national, regional and international levels by 2009.
- Improve TCI's collaboration and participation in regional and international initiative in the management of the fisheries resource.
- Develop and implement mariculture/aquaculture guidelines and regulations.
- Achieve environmental and developmental awareness of marine resources in all sectors of society from primary school through adulthood.

❖ Legal structure that provides for management, monitoring, control and enforcement in the fishery for queen conch

- Fisheries Protection Ordinance. Cap. 104: This is the main legislation which provides the legal basis and regulations for managing the fishery resources of the Turks and Caicos Islands.

Other Fisheries Related Legislation include:

- Fishery Limit. Cap. 105: Defines the Territorial Waters and Economic Exclusion Zones (EEZ) of the Turks and Caicos Islands.
- National Park Ordinance. Cap. 80: Provides the legal basis for the establishment and management of marine protected areas such as National Parks, Marine Reserves, and Sanctuaries.
- Coastal Protection Ordinance: This legislation combines several pieces of legislations, such as the national parks ordinance, fisheries protection ordinance and others to provide protection for the coastal zone.
- Endangered Species Bill: This legislation is currently in draft form. On completion, it will provide the legal basis for protection of endangered species in the Turks and Caicos Islands.

❖ International Conventions and Agreements ratified by the country that are of direct relevance to the fishery

- CRFM (Caribbean Regional Fisheries Mechanism): TCI is a member of the CRFM which was established in March 2003.

- ICCAT (International Commission for the Conservation of Atlantic Tunas): This agency provides management advice to countries which utilize the coastal and offshore pelagic resources.

The United Kingdom has signed other international agreements on behalf of its Overseas Territories, but which the TCI have not yet implanted. These include:

- CITES (Convention for the International Trade in Endangered Species), (See pg 15 below for details).
- CBD (Convention for the Conservation of Biological Diversity).

3. MANAGEMENT OBJECTIVES, INDICATORS AND REFERENCE POINTS

❖ **Operational objectives for the queen conch fishery, as indicated in available management plans, policies and legislation**

1. To ensure that the catch does not exceed sustainable levels or a predetermined reference point (e.g. MSY).
2. To improve the value of the queen conch fishery to National Development.
3. To explore the feasibility of expanding markets for derivatives of conch (shells, trimmings, ornaments).
4. To promote national and international collaboration in research and management in order to improve the effectiveness of managing the conch fishery of the Turks and Caicos Islands.

❖ **Reference points that are/could be used to define acceptable and unacceptable performance of the fishery (i.e. target and limit reference points where applicable)**

Established referenced points:

- MSY as the Limit Reference Point (LRP);
- A percentage of the MSY (e.g. 90 percent of MSY) as the Target Reference Point;
- Increase in the contribution of the queen conch fishery to GDP estimates for the TCI fishery;
- Increase fishermen net earning by a factor of 15 percent in the conch fishery.

The establishment of these reference points involves the following activities:

- Assess the conch stock yearly, based on catch and effort data to determine an estimated maximum sustainable yield (MSY) (Maximum biomass) that can not be exceeded.
- Investigate setting the limit reference point via economic yield.

4. DATA REQUIREMENT AND MONITORING SYSTEM

❖ **Type of data collected and the characteristics of the monitoring system**

Description of Data	Unit of Measurement	Years available*	Sampling procedure (including frequency of sampling, percentage coverage, raising procedures, etc.)
Landings	Pounds or unclean conch (excluding shell weight).	1887-1974 (electronic, but not yet verified). 1974-2005 (electronic).	Landings are collected through the processing facilities.
Estimated unrecorded landings (where applicable)	Pounds consumed/person/annually.	2004-2005 (electronic).	Local Consumption Survey conducted for the residents of the TCI (via. Island, age, gender and nationality)
Fishing effort	Boat-days (one boat goes out for 1 day). Man-days (one boat goes out for 1 day, but includes the number of men on boat).	1974-2005 (electronic).	Effort is recorded as the boats come into the processing facilities; the number of men on the boat are also recorded.
Stock densities estimated by surveys	Quantity of conch available per hectare; conch are measured via size/age (small juvenile <150 mm no shell lip; medium juvenile 150-200 mm no shell lip; Large juvenile >200 mm no shell lip; sub-adult <4mm shell lip thickness; young adult >4 mm shell lip thickness and predominant spines; old adult >4 mm shell lip thickness with worn spines).	1999 (electronic) published paper by: Wesley Clerveaux 2001.	At each random GPS location (across Caicos Bank) 3 separate 30 meter * 1 meter belt transects were deployed. Conch were measured and counted within this belt transects via size/age. The data was then analyzed to provide the density for the Caicos Bank.
Trade (Exports) -mass -value	Pounds of Conch Meat Pounds of Trimmings.	Unknown (customs) 1994-2005 (Department of environment and coastal	All conch that export from the TCI is required to attain a CITES Permit for export. Local consumption is allowed to take up to 10 lbs. without a CITES Permit, however, persons are still

		resources) 2003-2005 (Electronic versions in DECR).	required to attain a written form with names, locations, amounts, and time.
No. of fishers -full time -part time	Open access for TCI citizen (any TCI person can attain a commercial fishing licence) Foreign Assistants are provided to a TCI citizen through request to the Minister.	2000-2005 (electronic).	Most fishers attain their commercial licence before August 1 (fishing season) from the DECR.

❖ **Other data that should be collected to monitor the status of the resource or performance of the fishery (e.g. in order to provide an indicator for a particular operational objective)**

- Economic study on the cost/benefit of the fishery
- Socio-economic studies of the fishery.

❖ **Comments and any additional information**

Further details about data collection programs:

Queen Conch Landing (Catch and Effort)
The Department of Environmental and Coastal Resources (DECR) has been collecting catch data since 1887, however effort data has only been collected since 1977. This series of data is one of the most extensive data collections in the Caribbean region. Everyday the number of fishers per vessel and the catch data (number of pounds) are recorded at each of the processing plants. Effort is standardized and measured as man-days.

Mariculture
Currently all mariculture data is collected from CITES Permits issued for export. However, with the help of the Caicos Conch Farm, a research protocol is being set to better determine survivability, egg farming and reseeding among other parameters.

Local Consumption of Marine Products
The DECR is currently collecting information on local consumption, by conducting surveys and by mandating the restaurants and hotels to submit to the DECR monthly data on marine species purchase. This effort will improve the robustness of the Schaefer model being used to set the annual TAC.

Conch Visual Assessment
Two visual surveys were conducted in the past, for the Caicos and the Turks Bank. The Government of the Turks and Caicos Islands is in the planning process to conduct another visual survey of the Caicos Bank in 2007.

Conch Morphometric Information is also currently being collected by the DECR.

5. DATA ANALYSIS

❖ **Types of assessment models or other approaches used to evaluate the status of the resource and to assess the impact of harvesting strategies**

Year	Model or method used	Data used	Summary of Results and conclusions (include references to reports and document)
1990's-2005	Schaefer Surplus Model.	Landings (lbs.) effort (boat-days), CPUE (lbs./boat-day) 1974-2005.	Stock appears to be functioning at or near optimum level.* (Ninnes, 1994; Medley & Ninnes, 1999; Anon., 1999; and TCI Scientific Authority Report 2004 and 2005).
2005	Schaefer Surplus Model.	Landings (lbs.) effort (boat-days), CPUE (lbs./boat-day) 1974-2005 Includes estimated local consumption 2004.	Stock appears to be functioning at or near optimum level. Sensitivity analysis indicates that the local consumption information does increase the MSY, but it does not greatly influence the effort necessary to achieve MSY. If the TCI was to set a quota for the fishery based on the MSY from catch and effort data only, it would be operating within 0.1 percent of the most conservative MSY. However, if the assessment is based on the addition of local consumption, the TCI government must remember that approximately 400,000 lbs. of conch would be consumed locally and must be removed from the total MSY before the quota allocation for export* (Scientific Authority Report 2005).
1999	Visual Survey.	Quantity of conch available per hectare; conch are measured via size/age (small juvenile <150 mm no shell lip; medium juvenile 150-200 mm no shell lip; Large juvenile >200 mm no shell lip; sub-adult <4mm shell lip thickness; young .adult >4 mm shell lip thickness and predominant spines; old adult >4 mm shell lip thickness with worn spines).	The assessment indicated that the Schaefer Surplus Model is predicting the optimum yield accurately (Cleaveuax, 2001).

**See attached sensitivity chart*

**Sensitivity was then considered between the two analyses. The following was determined:*

	MSY	f_{MSY}	B/B_{virgin}	Effort (% f_{MSY}	Quota 2003-2004.	Effort.
Assessment (recorded catch & effort) only (1974-2003)	1 743 512 lbs.	3984.70 boat-days	54%	88.1%	1 587 227 lbs.	3511 boat. days.
Assessment (include local consumption) (1974-2003)	2 037 505 lbs.	3980.84 boat-days	54%	88.2%	1 972 233 lbs. (-400 000 lbs. local consumption).	3511 boat. days.

- **Comments on how the assessments take into account major uncertainties in data and assumptions**

Concerns were raised that the model may overestimate the MSY, as it did not take into account the unknown level of local consumption of queen conch. A survey was undertaken in which the local consumption index for queen conch was determined and incorporated into the Schaefer Model. It was determined that the local consumption does indeed increase the MSY (see above). However, it does not greatly influence the effort necessary to achieve MSY. In other words, the inclusion of local consumption data in the model will not affect yield estimate allocated as the annual TAC.

The TCI is now concerned with the uncertainty of illegal poaching. Efforts are underway to develop a research plan which would attempt to evaluate and or estimate the portion of catch which is being removed from the fishery by illegal, unregulated, and unreported (IUU) fishing activities.

- **Who the reports were prepared for and whether and how they have been used to assist in management of the fishery**

The reports are created by the Scientific Authority to inform the CITES Management Authority about the TCI status of the queen conch stock. They are used to assist the management of the fishery and establishment of a Total Allowable Catch (TAC) or Quota for the queen conch Fishery in the TCI.

- **Alternative assessment methods (whether necessary) that could be used to provide better information on the status of the resource or performance of the fishery**

The TCI Government has great confidence in the current model being used in the management of the queen conch fishery. It is therefore, the intention of the Government to further improve on the robustness of the model.

6. CONTROLS

❖ **Current management controls used to achieve the objectives for this fishery**

Type of Control	Years Implemented	Description of i) the rationale for the control ii) the details of the control and iii) current level of restriction	Estimated effectiveness of control
Catch quotas (TAC)	1995-present.	i) a TAC is established to maintain stock above the biomass of maximum sustainable yield; ii) Current TAC of 685.1 metric tonnes.	Very effective.
Minimum size/weight in catch minimum shell length of 7 inches and/or meat weight of 8 ounces	1973-present.	i) Attain mature conch that should have had the opportunity to reproduce at least once; ii) When cleaned, the meat weight must reach legal size for export; and iii) 8 ounce for meat weight to export.	Insufficient, some conch that are landed are mature (old) conch, but have been "stunted" in size.
Use of SCUBA or artificial breathing device is illegal	1973-present.	i) To restrict overexploitation of the species due to increase in fishing effectiveness; ii) Potential for arrest and charges if captured with for the use of commercially fishing; and iii) Zero tolerance.	Efficient for local commercial fishers. However, foreign fishers are often caught illegally fishing using these devices; "hookas".
Seasonal (time) closures (Closed season from July 15th to October 15th for commercially exported catch)	1990's-present.	i) To allow for fishery to reproduce and set next years TAC; ii) High control on processing facilities; and iii) Zero tolerance.	Efficient for local export of species. However, the local market is allowed to obtain conch throughout the year for local consumption.
Protected Areas (e.g. East Harbour Lobster and Conch Reserve)	1992-present.	Protect a portion of the population as a management tool to improve the status of the stock; i) Enforced by conservation officers; and ii) Some tolerance.	Insufficient, some persons collect conch for personal consumption (need to eat), and restricted personnel for duties at hand.

7. ENFORCEMENT AND COMPLIANCE

❖ **Surveillance and monitoring systems in place to ensure that the requirements of the management system are in place, including methods used to enforce CITES regulations concerning exports of queen conch**

Monitoring Activities:

- Catch and effort data for spiny lobster and queen conch are being monitored at the landing docks. Conch catches are recorded at the docks as weight of unclean meat when removed from the shell.
- Export data for queen conch (including exports from the conch farm) are also being monitored using the CITES permit mechanism.
- The Department of Environment and Coastal Resources (Fisheries Sub-unit) has collected local consumption data of marine products to determine the seafood consumption rate which is incorporated in stock assessment models to determine the status of fish stocks in the Turks and Caicos Islands. All facilities that offer marine products for sale (e.g. restaurants, hotels, fish vendors, supermarkets etc.) are asked to complete a predefined form and submit it to the Department monthly.
- Approximately every four years, the D.E.C.R. Fisheries Unit conducts queen conch visual surveys of the Turks and Caicos Banks. This is a fishery independent approach of assessing the queen conch stocks and in addition cross checks the biomass results obtained using fishery dependent data in mathematical models.
- From 1992, monitoring of the morphometric measurements of queen conch has been carried out, collected from different regions of the Caicos and Turks Banks. However, with shortage of staff and a shift in management objectives, there are some gaps in the data.
- Areas which are delineated and protected as fisheries protected zones are also being monitored to determine the effectiveness of these areas in increasing stock size outside the protected area zone.
- Catch data from confiscated international vessels poaching in the waters of the Turks and Caicos Islands are also monitored. These vessels usually fish on the Mouchoir Bank. By monitoring the catches from these vessels, the Department anticipates the use of these data to assess the status of the fish stocks in these areas and determine an index which can be plugged into the Schaefer model to account for level of IUU fishing, thus improving the robustness of the model.
- The Department is also actively monitoring the number of persons, number and sizes of vessels, sizes of engines, and gear types being used in each fishery through the licensing system so as to determine "effective effort" exerted on the respective fisheries.
- Although the Department has conducted numerous socio-economic surveys in the past, this research approach for the most part have been underutilised. Many of the socio-economic surveys have been in collaboration with individuals and or institutions, looking at the following:
    - Social Capital
    - Resource utilisation
    - Local consumption

Enforcement Activities:

- The D.E.C.R. plays a major role in enforcing the legislation and regulations that pertains to fisheries and the marine and terrestrial environment.

- Conservation Officers are tasked with the following duties:
  - Airport Inspections to ensure individuals are not entering or leaving the country with prohibited fauna or flora.
  - Landing docks, restaurant and processing plant inspections to ensure compliance with the minimum size regulations for various marine products.
  - Boarding and searching of vessels to discourage the use of prohibited gear and noxious substance.
  - Sea patrol of inshore areas.
  - Joint sea patrols with the Marine Police of the EEZ.
  - Marine Police (all police officers are deemed Fisheries Officers).
  - Air patrols (air-wing of the Marine Police Branch).
  - Conduct sea patrols of the EEZ limit for illegal poaching and other illegal activities.
  - Collaborate with Customs Department to ensure no illegal import or export of queen conch and other endangered species.
  - Customs Officers are the main agency of border protection. They ensure that products (e.g. marine products, endangered species, and endemic species) are not exported or imported into the country illegally.

❖ **Types of sanctions and penalties that can be applied in case of non-compliance with the management control**

Non-compliance can result in imprisonment of up to 12 months and/or fines up to $50 000 or both.

❖ **Comments on the current limitations of the enforcement system (budgetary and other factors) and on the potential measures that could be used to improve compliance**

Departmental Resources:

- Scientific Research Officers: 2
- Environmental Officers: 2 (public education and assist the scientific officer in research)
- Enforcement Officers: 17
- Research Vessels: 1
- Motor Vehicles:4
- Patrol Vessels: 6

Given the mandate of the Department to conserve all the natural resources of the Turks and Caicos Islands, the manpower and budget to carry out this mandate is very small. The personnel within the department cover seven main islands, many cays and more 1 600 sq. km of coastal waters.

❖ **Information that is available on the nature and extent of illegal harvest and trade and the best estimates of the extent of illegal harvest and trade**

Catch data from confiscated international vessels poaching in the waters of the Turks and Caicos Islands are also monitored. These vessels usually fish on the Mouchoir Bank.

The DECR is also currently experiencing some problem with the illegal export of dried conch to Haiti. However, enforcement strategies have improved to combat this problem.

❖ **Comments on whether the fishery could be considered consistent with the national legislation and international agreements**

The queen conch fishery is highly consistent with both national legislation and international agreements. Even though the TCI has yet to become a signatory to CITES, it is currently making all arrangements to become a signatory within the next year.

8. DECISION-MAKING

❖ **Departments or institutions with management responsibility in this fishery, area of responsibility and interactions**

Governmental agencies (with key involvement in fisheries):

- The Minister responsible for Fisheries and Natural Resources is the ultimate policy maker. Polices for the management and development of the fishing industry are developed and the Department of Environment and Coastal Resources (DECR) implements them.
- The D.E.C.R. plays a major role in enforcing the legislation and regulations that pertains to fisheries and the marine and terrestrial environment.
- Conservation Officers are tasked with the following duties:
    - Airport Inspections to ensure individuals are not entering or leaving the country with prohibited fauna or flora;
    - Landing docks, restaurant and processing plant inspections to ensure compliance with the minimum size regulations for various marine products;
    - Boarding and searching of vessels to discourage the use of prohibited gear and noxious substance;
    - Sea patrol of inshore areas; and
    - Joint sea patrols with the Marine Police of the EEZ.
- Marine Police (all police officers are deemed Fisheries Officers):
    - Air patrols (air-wing of the Marine Police Branch); and
    - Conduct sea patrols of the EEZ limit for illegal poaching and other illegal activities.
- Customs Department: Custom Officers are the main agents of border protection. They ensure that products (e.g. marine products, endangered species, and endemic species) are not exported or imported into the country illegally.
- Airport Security Officers: These officers are tasked with the duty to search persons boarding flights. Smugglers often conceal the exportation of products in small carry-on items or on their bodies.

Fishery Advisory Committee (FAC):

The Fisheries Protection Ordinance Cap. 104, provides the legal basis for the establishment of the Fisheries Advisory Committee (FAC). The Ordinance also gives specific guidance in establishing the committee, the terms of office of the members and the role of the committee to represent the views of the various sectors of the industry to the Governor or the Minister responsible for Fisheries.

The FAC convenes quarterly to discuss progress in the management of the fisheries. However, the Chairman may call a meeting at anytime should a crisis occur or a problem needs to be resolved. Since the inception of the FAC, the Chief Fisheries Officer has played the role of chairman. However, since the beginning of the 2003/2004 fishing season, the Chairman is selected from within the group of five selected members. It is felt that this approach would help to promote participatory management.

Role of regional/international agencies:
The Caribbean Regional Fisheries Mechanism (CRFM): provides support and advice on various aspects of Fisheries Management for 18 CARIFORUM countries and its major objective is to strengthen regional cooperation in Fisheries in the CARICOM region. CRFM is mandated to promote sustainable use of fisheries and aquaculture resources in and among CARICOM Member States and participating countries by development, management and conservation of these resources, in collaboration with stakeholders, to benefit the people of the Caribbean region.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): This convention regulates trade in species of flora and fauna (and products derived from such species) threatened by international trade. The Turks and Caicos Islands is in the process of developing legislations and implementing other mechanism to facilitate ratification to this convention.

Food and Agricultural Organization of the United Nations FAO-WECAFC: This commission facilitates coordination of research and educational efforts, and provides assistance for policies to promote rational management of resources for countries in the region.

❖ **The extent of and the way in which scientific information is used to help in decision-making**

All data that is collected is entered on the computer. This data which is collected can provide specific information as to the amount of landings, cleaning style, location and consumption of the queen conch species, which can further improve estimations by of TAC by the Schaefer Surplus Model.

❖ **The frequency of review of management controls and adjustments considered, and which Departments or institutions are doing the review.**

Management controls are reviewed every year and adjustments are considered (i.e. quota). However, enforcement measures may be reviewed bi-annually or as the need arises. The following are institutions with responsibility in different parts of the review process.

- APPROVAL: Minister of Natural Resources and Executive Council reviews.
- FORMULATION/REVISION: Fisheries Division formulates or revises (Scientific Authority).
- APPRAISAL: Fishery Advisory Committee (FAC), Management Authority.
- EVALUATION: Periodic evaluation, at least once every year, by Fisheries Division, FAC, Scientific Authority, Management Authority, Ministry of Natural Resources, Executive Council.

❖ **Mechanism in place for consultation with stakeholders.**

[see sections 8 and 9]

9. FEEDBACK AND REVIEW

❖ **Review of management system**

Annually, a system audit is conducted of the management effectiveness of all Government Departments.

❖ **Mechanisms used for consultation to receive feedback from and consult with stakeholders**

- Quarterly fishermen/public meeting.
- The Fisheries Advisory Committee is mandated by law to report to and from the fishermen of the management activities of the Government.

❖ **Information on last review of regulations**

The Turks and Caicos Islands have recently completed a Fisheries Policy for the TCI in November 2005. Regulations are continually being updated. However the last revisions took place in 2003.

❖ **Research planned or undertaken to improve management of the fishery for queen conch or to meet specific requirements of the management plan**

- Conduct research on size and length of conch.
- Work with the Department of Economics and Planning to study economic aspects of the fishery before end of 2006.
- Fill the gaps of information for the TCI queen conch Fishery, such as tourist consumption
- Assess the effectiveness of East Harbour Lobster and Conch Reserve (EHLCR).
- Egg mass survey, Gonosomatic Assessment, Larval Assessment.
- Undertake project to identify and map conch habitats with GIS maps.
- Investigate feasibility of replenishing stocks with conch seeds.
- Conduct visual survey to locate deep-water stocks.
- Conduct survey of Caicos and Turk Bank and assess the distribution, density and possible impact of queen conch stunting.
- Continue to collect conchs from different regions of the banks and measure morphometric parameters.

The Regional Workshop on Monitoring and Management of Queen Conch, *Strombus gigas* took place in Kingston, Jamaica from 1 to 5 May 2006. The purpose of the workshop was to assist Caribbean countries in the development of effective management plans for queen conch fisheries and, consequently, to improve their capacity to implement regulations and obligations under the Convention on International Trade in Endangered Species of Wild Fauna and Flora and the Protocol Concerning Specially Protected Areas and Wildlife of the Cartagena Convention. This report includes, in the main body, the workshop objectives and programme, national reports from participating countries, analysis of issues from the subregional management zones and main conclusions of the workshop. Draft national management plans completed by individual participants and other workshop outputs are documented in the appendix to this report.

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