THE CURRENT STATUS OF THE QUEEN CONCH

DAVID WITTING

INTRODUCTION

Queen conch have been a cultural and economic symbol of the Caribbean for at least 500 years. For centuries the shells have been used as instruments in traditional festivals, as well as for curios and jewellery. The meat has also been locally consumed, first by indigenous Indians and later by Loyalists and the descendents of slaves and plantation workers who stayed on the islands (Bénéand Tewfik 2000). The commercial exploitation of conch began in the middle of the 18th century and has fluctuated significantly over the past century and a half, partly influenced by the first and second world war, but also by the salt trade and fluctuations in the spiny lobster fishery (Bénéand Tewfik 2000).

About 2.3 million pounds of "conch" were imported into the US in 2002, slightly less than the amount imported in 2001 (2.7 million pounds). This constitutes a total value of approximately $3.4 million in 2002 (USDA Trade 2003), which is approximately 1% of the total import value from the Caribbean region. While queen conch comprises the majority of the "conch" market (Mulliken, no date), at least 12 other gastropod species are imported to the US as "conch" including Atlantic triton's trumpet (*Charonia variegate*), Cameo helmet (*Cassis madagascarensis*), Caribbean helmet (*Cassis tuberose*), Caribbean vase (*Vasum muricatum*), Flame helmet (*Cassis flammea*), Green star shell (*Astrea tuber*), Hawkwing conch (*S. raninus*), Milk conch (*S. costatus*), Roostertail conch (*S. gallus*), True tulip (*Fasciolaria tulipa*), West Indian fighting conch (*S. pugilis*), and Whelk (West Indian top shell, *Cittarium pica*) (CFMC 1996). None of these other species are monitored or managed.

All conch sold in the US is imported from outside the US. Currently, the dominant sources of conch in US markets are the Dominican Republic (50% in 2002), Honduras (19% in 2002), and the Turks and Caicos Islands (19% in 2002). The remaining imports come primarily from the Bahamas (5.9%) and Jamaica (3.9%), with 3.8% shared between Aruba, Belize, Colombia, El Salvador, Haiti, Mexico, Nicaragua, Peru, and Trinidad and Tobago (NMFS 2003). Over the past ten years, the primary sources of conch meat to US markets have been those listed above, with a historically larger proportion of meat coming from Jamaica (Fig. 1). After 1999, imports of Jamaican conch meat plummeted, resulting in an overall reduction of the imports of conch to the US (Fig. 2). Imports from the Turks & Caicos Islands and Honduras have been fairly consistent over the past 12 years, but imports of conch meat from the Dominican Republic have increased significantly in the past 2-3 years (Fig. 2). Relatively small amounts of conch meat have been consistently imported to the US from the Bahamas, Colombia, Haiti, and Belize, with one anomalous year (1997) where larger amounts of conch meat were imported from Haiti (Fig. 2)

The major points that relate to the status of conch populations that are exploited for the purpose of import to the US are:

Conch populations have declined throughout their range - densities are typically far below 10's of animals per hectare. Experts suggest that conch abundance has decreased by 2 orders of magnitude or more. Current fisheries are fishing deeper (using the dangerous practice of hookah fishing greater than 100 ') and putting in more effort for a smaller catch (CFMC 1999, Sullivan-Sealey pers.com.).

In several regions (i.e., Bermuda and Florida), conch populations have completely collapsed as a result of overfishing, and are showing no signs of recovery despite more than a decade of closed fisheries. This failure to recover is likely due to a combination of the effects of low adult densities resulting in poor or no reproductive activity (Stoner and Ray-Culp 2000), decreases in nearshore water quality, and degradation of conch habitat, particularly in nursery areas (Sullivan-Sealey pers. comm.).

- Conch require high densities of adults for successful reproduction, so overfishing may result in the functional extinction of a population long before the last conch is taken. Fishers continue to exploit the "refugia" of the species by fishing deeper as technology and demand increases and nearshore areas are depleted. This activity puts pressure on isolated offshore banks that may replenish coastal populations.
- Very old conch are important to reproductive output, as with age, conch lose body mass of muscle, and increase gonad weight (Sullivan-Sealey pers. comm.).
- The pelagic larval period of conch is short (23 days) and they require specific habitat characteristics to settle. They also have no way of delaying settlement, so they either settle or die. This means that recruitment is likely to be affected by nursery habitat quality and may vary drastically from year-to-year depending upon the specific conditions within nursery areas.
- Conch juveniles bury in the sand and are therefore difficult to survey, so direct measures of recruitment are not available for most populations.
- Conch are difficult to age, so age specific population analyses are lacking (Appeldoorn 1994). In addition, growth rates vary tremendously from site to site and around the Caribbean and there is concern that conch have distinct "races" or metapopulations - and there are bans on importing live conch from one area of the Caribbean to the other, thus one population cannot be rebuilt by importing individuals from another population (Sullivan-Sealey pers. comm.).

It is likely that conch is a species (as seems may be true for several species of Pacific rockfishes, abalone, and perhaps many other marine species), that depends upon four population characteristics for persistence as a species. The first two are longevity and low mortality rates of adults. This means that if conditions are poor for larval settlement/recruitment for one or several years, they will survive to spawn another year. The third characteristic is abundance. High abundance coupled with longevity and low adult mortality rates gives tremendous buffering capacity for periods of poor recruitment and increases the probability of occasional "boom" years of recruitment that replenish the population. Finally, the fourth characteristic is high fecundity. Producing a lot of offspring results in the ability to have a great recruitment year when the right combination of events occurs. The down side of high fecundity is that the eggs/larvae/juveniles experience high, or perhaps in some years complete, mortality when conditions are not ideal. Intensive fishing effort directly eliminates the critical element of this model (low adult mortality rates), and consequently changes another (longevity). Furthermore, conch play a very important role in the bioturbation of the sediments. If the conch are too sparse, the habitat may change to disfavour new juvenile conchs, and the diversity of other benthos declines (Sullivan-Sealey pers. comm.).

In spite of clear evidence of decline throughout conch's geographic range, sound management practices are slow to develop and are usually not fully implemented until it is too late (i.e., Bermuda and Florida). When good management is attempted (Bahamas, Turks & Caicos), it is only implemented within national boundaries for a species that extends throughout the entire tropical western Atlantic. Some island nations may not even benefit from management if their neighbours do not also comply (Sullivan-Sealey pers. comm.).

Poaching is an enormous problem that is likely to be the source of a large fraction of the imports to US markets, particularly imports from the Dominican Republic and Honduras.

LIFE HISTORY

As indicator of a species' vulnerability to fishing pressure

Intrinsic rate of increase[1]: Estimates of rate of increase have been made for a few conch populations using catch and effort data (CFMC 1999). These analysis resulted in estimates of r of 0.24 (catch data only) and 0.50 (including visual census) year^{-1} for Jamaica, and 0.64 year^{-1} for the Turks & Caicos Islands. Detailed life table analyses of queen conch are difficult or impossible because accurate aging is not possible in this species (Appeldoorn 1994).

Age at sexual maturity[2]: 3-3.6 years (Berg 1976)

Maximum age[3]: Conch are difficult to age, so accurate estimates of their maximum age are difficult to obtain (Appeldoorn 1994). Most agree that they can live at least 7-12 years, and probably as long as 20+ years (CFMC 1999).

Fecundity: Females release egg masses that contain 310,000 to 750,000 eggs (Randall 1964, D'Asaro 1965). Females will release between 1 and 25 egg masses per season (CFMC 1999).

Special Considerations

Eggs are typically laid on the

substrate in clean coral sand with low organic content (D'Asaro 1965, Brownell and Stevely 1981, Davis et al. 1984). Migrations to shallow sandy areas result in aggregations during the spawning period (Stoner et al. 1992) making adults particularly vulnerable to collection during the reproductive season. Juveniles remain buried during their first year, making estimates of recruitment based on juvenile indices difficult or impossible. Recent research has found that over-exploited conch populations may be slow in recovery due to the role played by the "Allee effect" (Stoner and Ray-Culp 2000). This effect occurs when successful reproduction is contingent upon a minimum density of adults. This work found that mating never occurred when density was <56 conch ha^{-1}, and spawning never occurred at <48 conch ha^{-1}, while spawning increased asymptotically as conch densities approached 200 conch ha^{-1}.

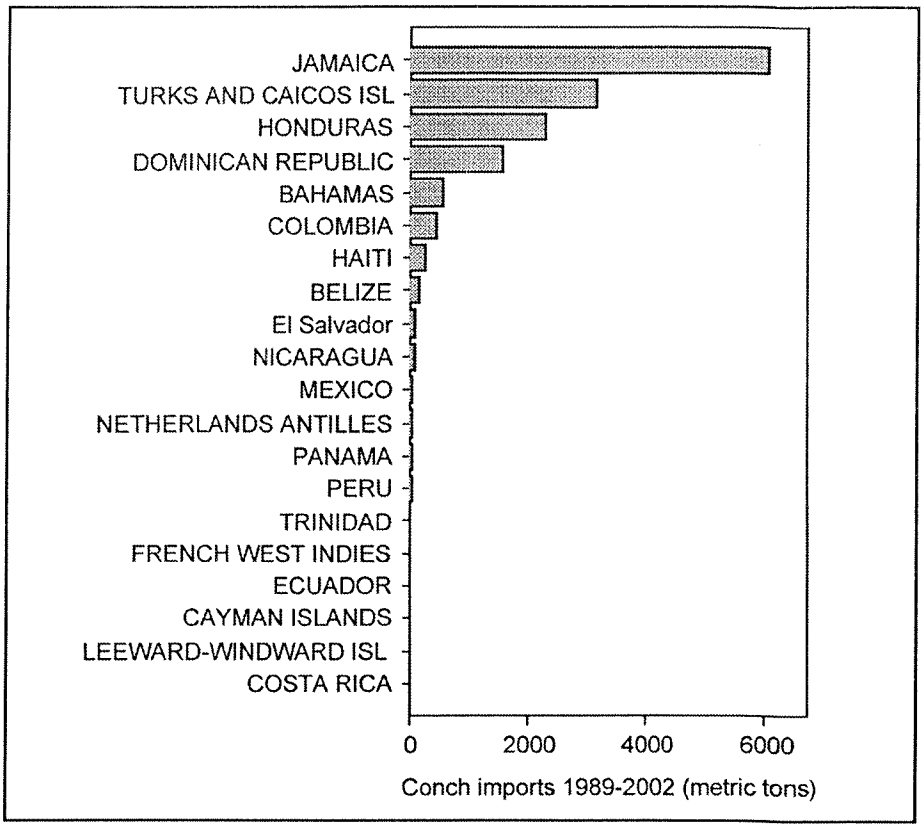

Figure 1. Combined imports of conch meat to US markets from 1989 to 2002 (from USDA trade, 2003).

Queen conch has a significant impact on the marine benthic composition through their feeding and movement activities (Stoner 1989). By feeding on eelgrass epiphytes and detritus, they play a role in the maintenance of healthy eelgrass habitats, when at natural densities (>100 per hectare) their movements and feeding act to increase bioturbation and as a result increase the quality of the habitat for new juvenile conch (Sullivan-Sealey pers. comm). There is also evidence suggesting that natural densities of adult conch maintain lower levels of macrofauna (Stoner et al. 1995). Thus, natural densities of adult conch may be critical to the continued health of eelgrass habitats in general, as well as an important component of the habitat quality of juveniles.

Very old queen conch may also play an important role in population dynamics in that as conch age they increase gonad weight, meaning that the older conch have higher reproductive output than younger adults (Sullivan-Sealey pers. comm.).

Queen conch is found in all the shallow waters from northern South America, through the Caribbean and the Bahamas, to south Florida and Bermuda (CFMC 1996). After emergence from the substrate, conch have been shown to shift habitats to nearby eelgrass beds (Sandt and Stoner 1993). A second habitat shift occurs when larger juveniles move from shallow juvenile nursery habitats to deeper water CFMC 1999). Adult conch migrate seasonally from deeper water habitats to shallow, sand bottom habitats as the spawning season (typically May to November) approaches (Hesse 1979, Weil and Laughlin 1984). This movement to spawning areas is likely triggered by the increasing water temperatures that occur in March.

Eggs occupy the substrate in shallow waters for an incubation period of approximately 5 days, after which they emerge from the egg masses and assume a pelagic life style, occupying mostly the upper water column (CFMC 1999). The larvae undergo metamorphosis and settle simultaneously after approximately 17 to 22 days after hatching. From that point on they occupy benthic habitats for the rest of their lives.

Pelagic larvae eat small phytoplankton (D'Asaro 1965). Recently-settled individuals continue to feed on phytoplankton until the transformation to the juvenile stage is complete. Juveniles and adults feed primarily on dead and detrital remains of marine vegetation including seagrass epiphytes, and macroalgae (Randall 1964).

ABUNDANCE

Population Abundance

Conch densities are well below what is considered to be necessary for successful reproduction (>100 per

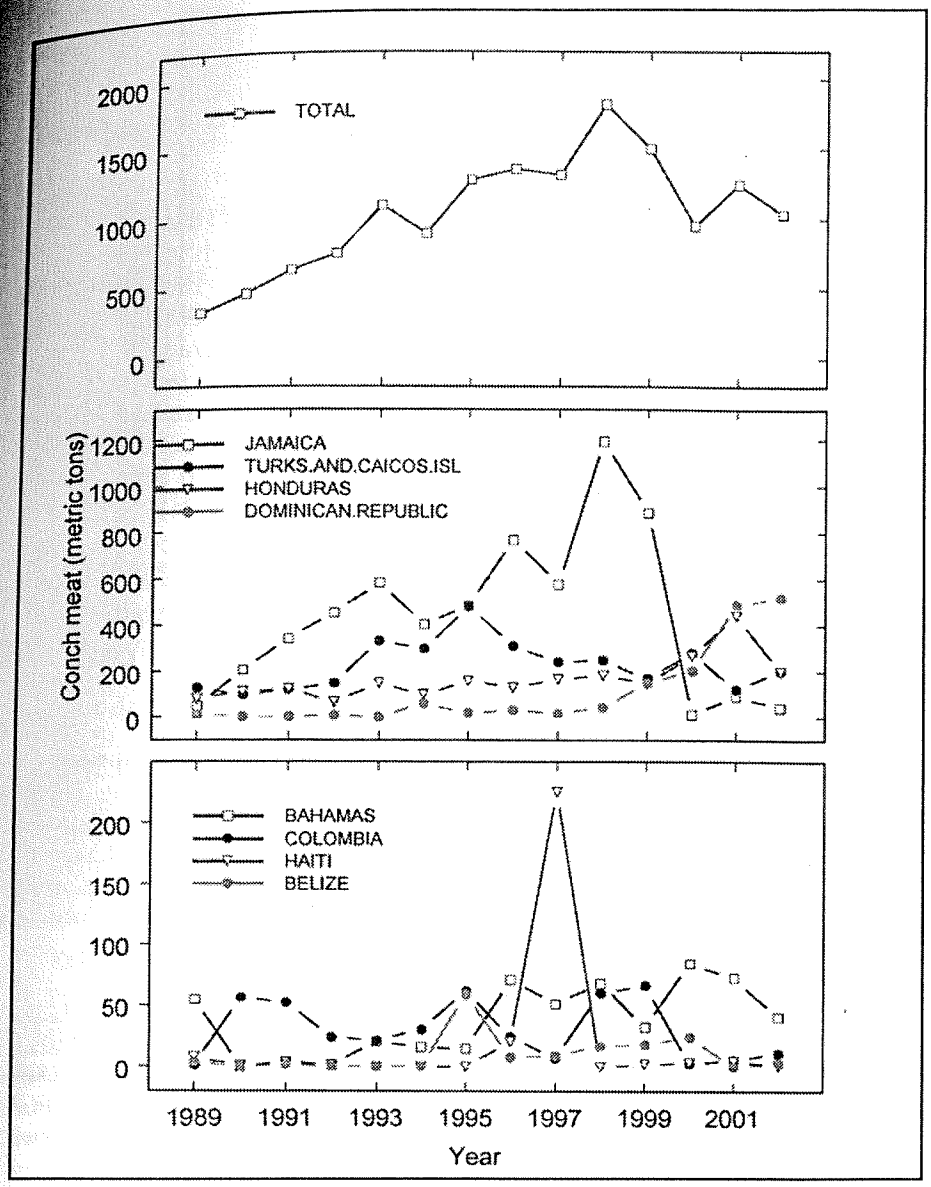

Figure 2. Trends in conch meat imports to US markets 1989-2002 (from USDA Trade, 2003).

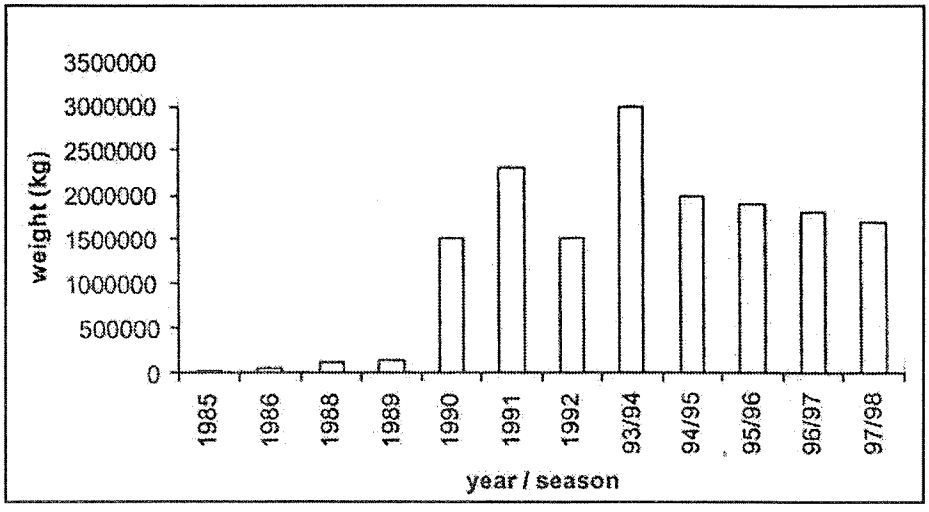

Figure 3. Jamaican conch landings 1995-1998 (CFMC 1999).

hectare) in many areas. In addition, estimates of density are confounded by the patchy nature of conch distribution (CFMC 1999). In the Dominican Republic densities are very low even within the National Parks (0.26 to 1.04 per hectare, Sullivan-Sealey, pers comm.). In Honduras densities are only reported for the Cayos Cochinos Biological Reserve, a small, privately run reserve located offshore with densities of about 14.6 per hectare despite restrictions on fishing (Tewfik, et al. 1998). These low densities are attributed to 30 years of exploitation by Garifuna fishermen and commercial divers prior to the creation of the reserve. Density estimates from Belize are 14-15 per hectare (CFMC 1999). In Mexico conch density estimates in Cozumel were around 89 per hectare in 1989 prior to closure of the fishery and 830 per hectare in 1995 after closure (CFMC 1999). Densities in the US Virgin Islands and Puerto Rico all less than 20 per hectare (CFMC 1999). Densities in all unprotected areas of the Bahamas are all less than 30 per hectare (CFMC 1999), while protected areas were higher at 53.6 and 96 per hectare (Stoner and Ray 1996).

Trends

Most experts agree that conch populations are either declining or collapsed throughout the species range (Sullivan-Sealey, pers. com.)

Classification status

As a result of the reported declines in queen conch populations throughout their range, they were listed on Appendix II of Convention on International Trade of Endangered Species (CITES) in March of 1992 due the rapid decline of conch populations and the rapid increase in the commercial conch fishery. Appendix II lists species that are not threatened presently with extinction, but may become threatened unless trade of such species is subjected to strict regulations. International trade of CITES Ap-

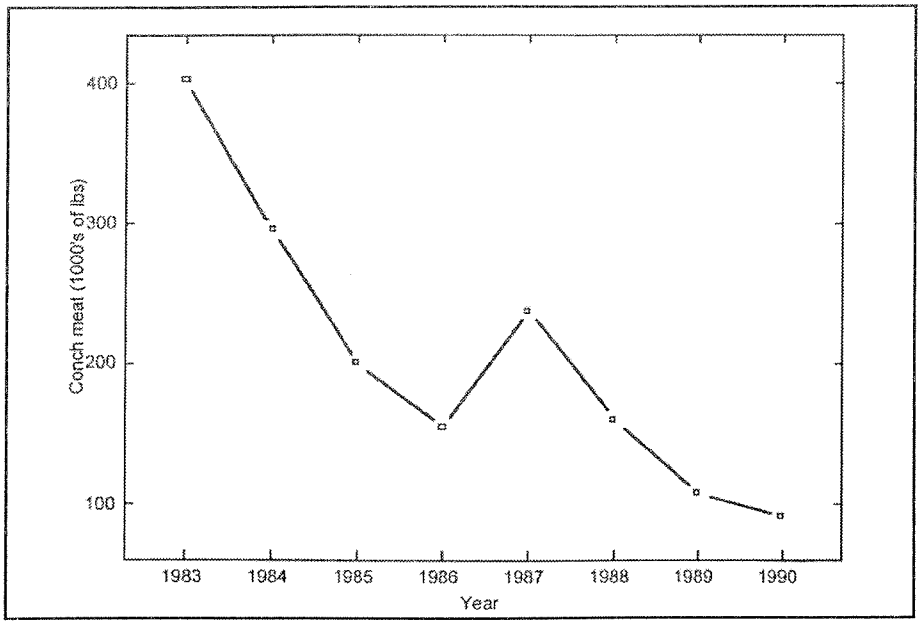

Figure 4. Conch landings from Puerto Rico 1893-1992 (CFMC, 1996).

pendix II listed species requires that such exploitation is conducted at a sustainable level, and that the parties involved have a CITES permit. This protection, however, is limited to conch shells. Any manufactured product (e.g., conch fritters) is not protected, and fishery products (e.g., frozen or fresh conch meat), is not covered under CITES, but is rather under the jurisdiction of the individual management agencies of each range state (Sullivan-Sealey pers. comm.).

Appeldorn (1994) summarized the status and management approach of a number of range states for conch and reported that Venezuela, Columbia, Belize, Bahamas, Puerto Rico, US Virgin Islands, Dominica, Martinique, and Grenada conch stocks are either partially or fully overfished. The conch stocks in the Turks & Caicos and Cuba are listed in this report as stable, and those of Jamaica are listed at "not sustainable at present harvest rate". The status of Honduran and Dominican Republic conch stocks are not listed in this document.

Chakalall and Cochrane (no date) compiled a similar list of the status of conch stocks in the Caribbean and found similar results. They listed the status of Antigua and Barbuda (overexploited) the Bahamas (overexploited only in localized areas), Belize (overfished), Bermuda (closed since 1978), Colombia (overexploited only in localized areas), Cuba (fully exploited), Dominica (severely overfished), Grenada (growth overfished), Jamaica (fished above MSY), Martinique (Inshore overfished, offshore stable), Mexico (overfished), St. Kitts/Nevis (overfished nearshore), St. Lucia (overfished nearshore, unknown offshore), St. Vincent and the Grenadines (stable, possibly overfished nearshore), Turks & Caicos (stable, probably fully exploited), USA Florida (collapsed, fishery closed in 1985), USA Virgin Islands (generally overfished, stable in St. Croix), USA Puerto Rico (recruitment overfished). Again, Honduran and Dominican Republic stocks were not mentioned in this summary.

HABITAT

Type of gear used

Traditionally, conch was fished from small boats using a glass bottomed bucket to locate them, and a pole with a hook on the end to bring them up. As demand and technologies developed, the use of free diving, SCUBA, and hookah (surface-supplied air) rigs were used, allowing fishers to exploit conch in deeper habitats that were once refugia from collection.

Ecosystem health

Settlement of conch is highly contingent upon specific habitat requirements (Stoner et al. 1995), thus coastal habitat degradation is implicated as being an important factor that has both increased the rate of decline of some conch populations, and hampered the recovery of others (e.g., Florida)

MANAGEMENT

Authority: What bodies manage this fishery?

United States

Florida waters: State of Florida Exclusive Economic Zone (EEZ) surrounding the US Virgin Islands and Puerto Rico - National Marine Fisheries Service (NMFS), Caribbean Fishery Management Council (CFMC)

Bahamas, Belize, Jamaica, Honduras, Dominican Republic and Turks & Caicos Islands – Local government fisheries departments, TCI with support from the British government.

Management framework in place?

United States

Florida waters: fishery closed, State of Florida investigating feasibility of stock enhancement via aquaculture as the only way to bring conch populations back to historic levels.

US Virgin Islands and Puerto Rico: yes, see management measures, below.

Bahamas, Belize, Jamaica, Honduras, Dominican Republic and Turks & Caicos Islands: yes to varying degrees, see management measures, below.

Are there reference points for sustainability such as MSY?

Yes for USVI and Puerto Rico (Valle-Esquivel 2002), not found for anywhere else (CFMC 1999).

Are catches monitored?

Yes for USVI, Puerto Rico, Bahamas, Jamaica, Turks & Caicos Islands, not found for anywhere else (CFMC 1999).

Are stock assessments being performed?

Yes for USVI, Puerto Rico, Bahamas, Jamaica, Turks & Caicos Islands. Some effort for stock assessment has been attempted with limited data for Belize, Cuba, Grenada, St. Kitts and Nevis, and St. Lucia (CFMC 1999). Results of most analyses suggest that either the data are too sparse to make a conclusion, or, with the exception of TCI, are likely to be overfished.

If overfished, is there a rebuilding plan or measures being instituted to rebuild?

Some areas have rebuilding plans, but in most cases, they have been implemented too late for successful management (Gascoigne et al. 2002) or not at all (Sullivan-Sealey Pers. com.). Bermuda and Florida are clear examples where fishing of all kinds has been closed for several decades with good enforcement, but no sign of population rebuilding has occurred. St. John and St. Thomas closed the conch fishery for five years when evidence of population decline was detected, but when densities began to rise, the fishery was reopened in response to pressure from the fishing industry, resulting in a rapid decline back to the levels that prompted the fishery to close in the first place. One success story comes from the TCI, where two management practices have resulted in what appears to be a stable population of conch, despite fairly heavy fishing pressure. The first is that the fishery is a free-diving only fishery. No compressed air apparatus is allowed to be used to collect conch in TCI waters. The second is the establishment of large no-take areas prior to the onset of heavy fishing pressure. These two practices could serve as a baseline for the management of conch in other parts of it's range.

What management measures are used to control fishing?

United States *Florida waters:* fishery closed, State of Florida investigating feasibility of stock enhancement via aquaculture as the only way to bring conch populations back to historic levels.

US Virgin Islands and Puerto Rico: Size limits (9" total length or 3/8" lip thickness), closed season (July-September), daily bag limit for non-commercial fishers (3/person/day, not exceed 12/boat), licensed commercial fishers (150/day for first year, 100/day for second year, and 75/day for third year).

Other Caribbean States

Turks & Caicos: gear restrictions (no hookah or SCUBA), marine protected areas.

Bahamas: gear restrictions, closed areas.

Belize: closed areas

Dominican Republic: none

Honduras: some privately run marine parks around offshore Islands.

Jamaica: completely unmanaged until 1992, most commercial fishing occurring offshore on the Pedro Bank. Here large vessels (approx. 23 m) have teams of up to 10 divers that collect conch in depths up 25 meters (CFMC 1999). Most of these vessels were leased from countries including USA, Nicaragua, Honduras and the Dominican Republic (CFMC 1999, Sullivan-Sealey pers com). Catch quotas are in place, but most agree that these are not set at a sustainable level.

If bycatch is a problem, is management taking action?

Bycatch is not noted as being a problem.

Is pirate fishing a problem, or illegal fishing significant? If so, what's being done?

Poaching remains an enormous problem in the conch fishery (Appeldoorn 1994, Sullivan-Sealey pers. com.). It is likely that a large fraction of the conch imported to the US from both the Dominican Republic and Honduras are captured illegally (Sullivan-Sealey pers. com.). The number of days-at-sea reported by commercial boats from the Dominican Republic is one indication of the poaching activities. Typically boats are reporting a minimum of ten days at sea per trip, suggesting that they are not fishing in local waters. Secondly, the number of Dominican boats chased out of Bahamian waters and sightings reported by local police to the Royal Bahamas Defense Force (RDBF) is rising. Since 1995 the RDBF has approached nearly 100 Dominican boats and brought 14 back to Nassau.

Poaching is also clearly occurring in Honduras where fishers with legal licenses fish for and sell conch meat, then illegally import the shells to the US shell markets in an attempt to double their money. Oddly, it appears that the shells are protected by CITES, but the meat is not. For example, in 2001, federal officials found 516 queen conch shells in a Honduran shrimp fishing vessel at the international seaport of Brownsville, Texas. These conch were likely on their way to Isabel or South Padre Island, where commercial importers buy and sell shells (Ikenson 2001). See also http://www.traffic.org/bulletin/Nov2002/seizures6.html for more examples of poaching by Honduran vessels.

Is enforcement of regulations a significant concern within management (or the conservation community)?

Enforcement is very good in only a few areas (Bermuda and Florida), moderate in some (Bahamas) and is extremely poor in many (Dominican Republic, Honduras, others). This is largely the reason for the high rate of poaching (Appeldoorn 1994, Sullivan-Sealey pers. com.).

Is there a lawsuit/ legal action/international intervention for this fishery?

Not at this time – See controversial issues

Are there other controversial issues around management of this fishery?

Because the major sources of conch to US markets are also the countries with major management and poaching problems, trade relations with the US are a particularly delicate issue. This is particularly true in the Dominican Republic, where poaching is a big problem. The Dominican Republic is an important US trade partner (biggest in the Caribbean, 32nd largest in the world, USTR Press release 2002), and the US State Department supports exports from the Dominican Republic of any kind. Conch represents the highest dollar value marine resource sold to the US (NMFS trade data) by the Dominican Republic. The Dominican government has agreed to help control the influx of illegal Haitian immigrants to the Bahamas and Turks & Caicos, who, in turn, change the employment dynamic markedly in those areas, or are smuggled to the US.

Furthermore, many of the boats used by Dominicans are "rented" to the fishers by buyers that live either in the Dominican Republic or elsewhere, including within the US (primarily in Florida). The fishers only get a small fraction of the their total landings, so the fishers have little incentive to control their own use of the resources. They simply go to new, and often illegal, areas once one area is depleted (Sullivan-Sealey Pers. Comm.).

Innovative solutions or practices that have shown positive results?

The most promising model for conch management beyond closing the fishery entirely comes from the Turks & Caicos Islands, where technology restrictions (i.e., no compressed air devices), and the implementation and continued maintenance of closed areas has resulted in stable conch populations despite intense fishing effort. Unfortunately, these populations are in constant threat due to poaching from the Dominican Republic and other range states (Sullivan-Sealey pers. comm.).

OTHER CHARACTERISTICS OF THE FISHERY

Where is the species primarily caught?

Inshore – Shallow embayments, sand flats, eelgrass beds.
Offshore – Isolated, offshore banks

Is the fishery predominantly recreational, commercial, or both recreational and commercial? What is the distribution of catch among these sectors?

The queen conch fishery is almost entirely commercial. There is some recreational collection, but specific numbers were not found and are likely to be a very small fraction of the total for most areas.

When does the fishery occur?

Year-round except in areas where there are closed periods

Landings Data: Trends in Catch

In general, landings data suggest that conch are either stable (Figure 3) or declining (Figure 4). In areas where landings appear to be stable or are declining very slowly (Figure 3), it often means that fishers are exploiting new and typically deeper areas using SCUBA and hookah equipment as shallower areas are depleted (Sullivan-Sealey Pers. Com.)

Fishing Mortality

Below overfishing threshold – conch may be fished at acceptable levels in parts of the Bahamas and in the Turks & Caicos Islands (CFMC 1999), but are in constant danger of overfishing due to poaching from other countries such as the Dominican Republic (Sullivan-Sealey pers comm.).
Above overfishing threshold – conch are generally considered to be fished above the overfishing threshold throughout much of their range.
Unknown – in many regions within the range of queen conch, there are not enough data to make estimates of the fishing mortality, however, in most ranges, the limited density estimates that do exist suggest that conch densities are too low for successful reproduction (i.e., less than 100 per hectare, Sullivan-Sealey pers. comm., CFMC 1999).

MARKET/TRADE

Who are the main consumers of this species?

Currently the US is the biggest importer and consumer of conch from the Caribbean (Sullivan-Sealey pers. com.). Virtually all conch imported to the US enter through Miami, Florida, (USDA statistics) and are consumed largely as conch fritters by tourists in the Florida Keys

Table 1. Businesses involved in the import of conch meat to the US (NMFS trade statistics)

BUSINESS	CITY, STATE	*Source
AMBASSADOR SEAFOODS INC	MIAMI, FL	HONDURAS,PERU,EL SAL,ECUADOR,MEXICO
ATLANTIC PRIDE CORP	BOCA RATON, FL	BWI(CAICOS)
BASIC FOOD INTL INC	FORT LAUDERDALE, FL	PERU,VENEZUEL,MEXICO,ASIA,EUROPE
BEAVER STREET FISHERIES	JACKSONVILLE, FL	PANAMA,MEXICO,CHILE,ECUADOR
BEAVER STREET FISHERIES INC	MIAMI, FL	PANAMA, BWI(CAICOS)
CHANNEL SEAFOOD INTERNATIONAL	FORT LAUDERDALE, FL	PERU,VENEZUEL,MEXICO,NET
EMPIRE SEAFOOD INC	MEDLEY, FL	JAMAICA, DOMINICAN REPUB
FLAMINGO SEAFOOD	MIAMI, FL	JAMAICA, HAITI, BAHAMAS
J F SEAFOOD INC	HIALEAH, FL	DO REPUBLIC
LISTA ENTERPRISE SEAFOOD	HIALEAH, FL	BWI(TURKS & CAICOS)
LUDWIG SHRIMP CO	MIAMI, FL	HONDURAS,TRINIDAD,BWI
MANNY'S ENTERPRISES	FORT LAUDERDALE, FL	GUATEMALA,MEXICO
MAXIM IMPORT CO	MIAMI, FL	PANAMA,VENEZUELA, ECUADO
PLACERES & SONS INC	HIALEAH, FL	DO,HN,HT,PA,TC,COLOMBIA,
RUSTIC INN IMPORT/EXPORT	FT LAUDERDALE, FL	HONDURAS,NICARAGUA,GUATE
SOUTH PACIFIC SEAFOODS	MIAMI, FL	PANAMA, VENEZUELA, ECUAD
STERLING SEAFOOD CO	PANAMA CITY, FL	MEXICO
SEATRADE CORP	JERSEY CITY, NJ	BELIZE,ECUADOR,ASIA

(800,000 visitors on cruise ships in Key West last year, Sullivan-Sealey pers. com.). Much of the remaining conch goes to tourist destinations in Florida, including Disney, South Beach (where it is a "featured" dish in local seafood restaurants) and areas along the west coast of Florida.

Who are the major exporters?

Honduras – Mariscos Agua Azul (http://www.jackson_holding.com/aguaazul/index.htm) is an exclusive exporter of Honduran shrimp, fish, lobster, and conch.

Who are the major importers?

(Table 1) Businesses involved in the import of conch meat to the US (NMFS trade statistics)

SOURCES/ CITATIONS

Dr. Kathleen Sullivan-Sealey at the University of Miami Biology Department was extremely helpful both as a source of information about conch biology and population status in general and specifically for information about issues relating to the Dominican Republic. Dr. Sullivan-Sealey and her students have been working on conch in the DR for several years and her input was critical for a better understanding of the complexity of the conch fishery in the Caribbean. Other sources cited in this document are as follows:

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Notes

[1]Intrinsic rate of increase (r) is the best indicator of how resilient a population is to fishing pressure because it tells us how quickly a population can grow at any one time. Because all other life history parameters are used to determine the intrinsic rate of increase (age at maturity, adult lifespan, fecundity per year, and survivorship to maturity), when an r value is available, it is the best indicator to use (Musick 1999).

[2] Age at maturity is the second best indicator of how vulnerable the species is to fishing.

[3] Because the maximum age of a species is often altered by fisheries and is correlated with age at maturity, it is the least preferable indicator of resilience to fishing. In the absence of available values for intrinsic rate of increase or age at maturity, however, it remains the next most useful indicator.