

Seafood Watch

Seafood Report



MONTEREY BAY AQUARIUM®

Queen Conch

Strombus gigas



Image courtesy CITES

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About Seafood Watch® and the Seafood Reports

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch® defines sustainable seafood as that originating from species, wild-caught or farmed, that can exist into the long-term through maintained or increased stock abundance and conservation of the structure, function, biodiversity and productivity of the surrounding ecosystem. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from the Internet (www.montereybayaquarium.org) or obtained from the program by emailing seafoodwatch@mbayaq.org. The program's goals are to raise awareness of important ocean conservation issues and to shift the purchasing habits of consumers, restaurateurs and other seafood purveyors to support sustainable fishing and aquaculture practices.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices", "Proceed with Caution" or "Avoid". In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Fishery Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch's sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

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Seafood Watch® strives to have all Seafood Reports reviewed for accuracy and completeness by external scientists with expertise in ecology, fishery science and aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch® program or its recommendations on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Executive Summary

The queen conch is a large marine snail native to the Caribbean Basin. While relatively fecund (laying approximately 100,000---480,000 eggs per female per year), the queen conch’s life history predisposes it to fishing vulnerability. This conch matures late for a tropical species (4-5 years) and has a long life span (sup to 20 years). Its life history presupposes heavy juvenile mortality but almost no predation upon mature adults, whose massive shells protect them from all but a very few predators. However, the shells are no deterrent to humans, and the queen conch inhabits the nearshore shallows (0.3 m—25 m), placing it squarely in the range of waders and skin divers. Queen conch are slow-moving algae-eaters and very easy to pick up by hand, or with the simplest of fishing gear (poke poles). They are especially vulnerable to fishing during the spawning season, when they gather in huge aggregations. The introduction of scuba gear and freezer technology in the 1970s changed conch from a local specialty to an internationally-traded commodity, and since the 1970s, conch populations have been in recognized decline throughout the animal’s range. Pollution and loss of nearshore habitat are preventing recovery in some areas, but there is also disturbing evidence that this species requires a certain density of adults to stimulate spawning behavior—i.e., where populations are too sparse, the adults no longer breed. Because of overfishing, Florida closed its commercial conch fishery in 1975 and its recreational fishery in 1986. The Florida resource has been slow to recover, and it is illegal to take any conch from Florida waters. Conch stocks of Puerto Rico and the U.S. Virgin Islands are managed by a federal FMP; NMFS considers these populations overfished, although fishing has not been halted because of economic hardship to the fishermen. Queen conch are harvested by 36 nations and territories across the Caribbean. Because of international concerns about continuing decline in conch stocks throughout the 1980s, queen conch was placed on CITES Appendix II in 1992. A 2003 review by CITES found management and stock status to be critically poor in three major conch-exporting nations (Honduras, Haiti, and the Dominican Republic); found that most other nations need to begin stock assessment and take basic steps to curb rampant illegal fishing; and rated just two conch-exporting nations (Jamaica and Turks/Caicos) as having adequate management and stocks that are “probably not overfished”. In 2002, the last year for which figures are complete, the 3 banned nations (Honduras, Haiti, and the Dominican Republic) accounted for about 73% of the queen conch on the U.S. market.

Table of Sustainability Ranks

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherent Vulnerability			√	
Status of Stocks				√
Bycatch	√			
Habitat Effects	√			
Management Effectiveness				√

Overall Seafood Rank: Avoid

Seafood Watch is indebted to the outside experts who graciously volunteered their time to review the facts presented in this report for completeness and scientific accuracy: Dr. Robert Glazer, Florida Fish and Wildlife Conservation Committee, Paul Raymond, NMFS Enforcement, and Stephanie Theile, TRAFFIC Europe. It is important to note that scientific review does not constitute an endorsement of Seafood Watch on the part of the reviewing scientists; the Seafood Watch staff is solely responsible for the conclusions reached in this report.

Introduction

The queen conch, *Strombus gigas*, is a large marine snail native to the Caribbean basin [NMFS OPR, 2003]. Its primary habitat is shallow subtidal seagrass beds, sand flats and coral reefs [UMich, 2003]. Five other conch species inhabit the Caribbean basin: the milk conch *S. costatus*, Florida fighting conch *S. alatus*, West Indian fighting conch *S. pugilis*, hawk-wing conch *S. raninus*, and rooster tail conch *S. gallus* [Conch News, 2003; CHN CIC 2003b]. However, queen conch are the largest of these species and the basis of the commercial fishery [CHN CIC, 2003b].

The queen conch is found in the Caribbean, from the mouth of the Gulf of Mexico as far south as Venezuela—see Figure 1, below. Its range encompasses the Florida Keys as well as the southeastern shore of the Florida peninsula. An outlying population is present around Bermuda [CHN CIC, 2003b].

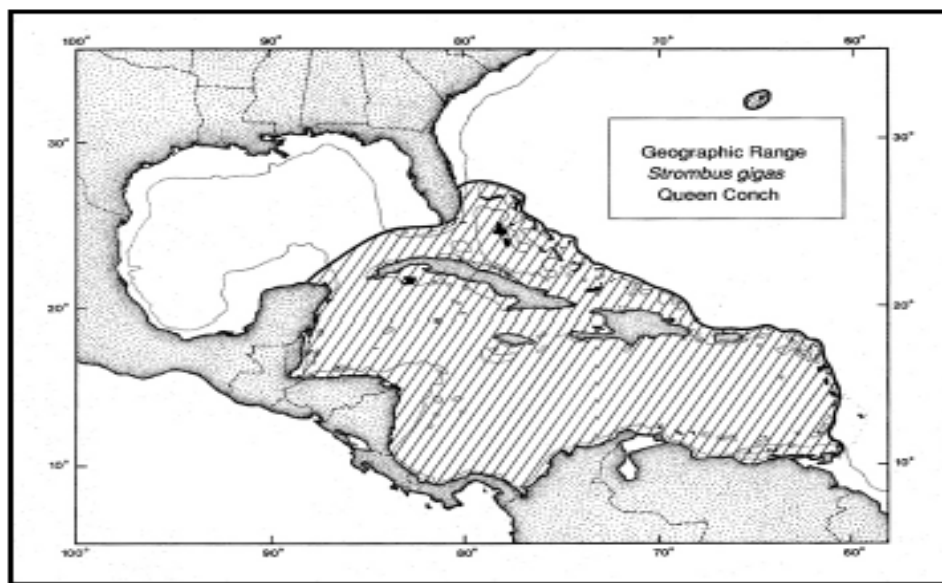


Figure 1: Range of the queen conch, *Strombus gigas*. Map courtesy Conch Heritage Network, *Conch in the Classroom*/ <http://www.savetheconch.org/classroom.html>

Queen conchs are commonly found at depths from 0.3 meters to 25 meters [ANSP, 2003], although they have been reported occasionally from much deeper waters [Glazer, 2004]. The youngest conch are found close to shore, but adults move deeper as they grow older and larger [UMich, 2003].

The queen conch feeds near the bottom of the food chain, sifting through grains of sand for algae and detritus [Marine Depot, 2003], eating the fronds of plumose red algae, and scraping the epiphytes off seagrass [Creswell & Davis 1991; Stoner & Sandt, 1992].

Queen conchs reach sexual maturity at the age of 4 to 5 years [CHN CIC, 2003b; Theile, 2004] and a minimum shell length of about 16 cm [CHN, 2003; Glazer, 2004]. Sexes are separate [CHN CIC, 2003b]. The reproductive season differs between different populations [Theile, 2004]; in the Florida Keys, it is usually March-September [CHN, 2003]. In El Niño years, when oceanographic temperatures are unusual, queen conch sometimes spawn year-round [Glazer, 2004]. When breeding, the conch gather in large spawning aggregations in seagrass and sandflat habitat [CHN, 2003; USFWS, 2003]. Mature females lay strings of 185,000 to 460,000 eggs that would stretch 50 to 75

feet in length if uncurled [Animals Online, 2003; Glazer, 2004]. Queen conch egg masses are typically coiled, “like a croissant made of linguini” [Glazer, 2004]. The sticky eggs are laid at the surface of sandy areas and soon become coated with camouflaging sand grains [CHN CIC, 2003b].

Three to five days after being laid, conch eggs hatch into planktonic larvae called veligers [CHN CIC, 2003b]. In a 16 to 40-day planktonic phase, the veligers pass through several developmental stages before settling to the seafloor and undergoing metamorphosis into juveniles [Glazer, 2004; CHN CIC, 2003b]. The planktonic larvae are the main dispersal phase of this relatively sedentary organism; larvae can settle more than 100 miles from their point of origin [CHN, 2003]. Larval settling is not automatic, but depends on the presence of chemical cues from benthic diatoms, the juvenile conch’s primary food source [CHN, 2003]. Larval conch will only begin their transformation to the benthic juvenile form when these chemicals signal the presence of enough food to settle for [CHN, 2003]. In their first year, juvenile conch spend most of their time buried in the sand to hide from predators. As they grow, they spend more and more time above the substrate [UMich, 2003].

The shell of the queen conch is large and heavy, growing to more than 12 inches (30 cm) long [Marine Depot, 2003; UMich, 2003]. The maximum reported shell length for this species is 35.2 cm [ANSP, 2003]. Conchs grow rapidly, reaching their maximum length in 3-4 years [CHN CIC, 2003b]. Within the next year or so after reaching maximum length, they attain sexual maturity [Theile, 2004]. In the years following sexual maturity, a conch no longer grows longer, but adds width and thickness to its shell lip [CHN CIC, 2003b], making the shell of a fully mature queen conch a weighty and impressive structure. This shell protects the animal, not just from predators, but from upheaval caused by the frequent storms in the region.

According to one source, in certain areas queen conch were traditionally seen as a symbol of endurance, because conch dislodged and tossed out to sea by storms always seemed to find their way back to the shallows where they started [Whitfield Jack, 2003]. Because of this “homing instinct”, some Caribbean sailors wore conch shells as amulets against being lost at sea [Whitfield Jack, 2003].

Juvenile queen conchs are eaten by predatory sea snails, Caribbean spiny lobsters, hermit crabs, and fishes such as triggerfish and porcupine fish that are equipped with shell-crushing jaws [CFMC, 1996; Glazer, 2004]. Midsize queen conchs are eaten by eagle rays, nurse sharks, groupers and octopuses [CFMC, 1996]. The only predator known to be capable of crushing a full-grown queen conch out of its shell is the loggerhead sea turtle [CFMC, 1996], although the horse conch, a predatory sea snail, attacks adults as well [Glazer, 2004]. Adapted for a long life with little predation upon adults, queen conchs are ill-prepared by evolution to deal with substantial human fishing pressure [CFMC, 1996].

The lifespan of the queen conch is typically 8 to 11 years [Glazer, 2004], although individuals may attain ages of 20 years [CHN CIC, 2003b; Marine Depot, 2003] or more. In one Bermuda population, queen conch have been aged at 40 years, based on the age of corals attached to their shells [Glazer, 2004].

Availability of Science

Driven by concern for the decline of conch populations, more and more peer-reviewed research into the biology and ecology of queen conch is being published each year. Stoner [1997] noted this trend, which has continued. However, the range of the queen conch covers 36 nations and territories; 25 of

these currently fish commercially for queen conch [TRAFFIC, 2003; Theile, 2004]. Stock assessments are produced in less than half of these [Theile, 2004].

The Caribbean Fishery Management Council notes that “conch possess a number of unfortunate features that make it difficult to assess” [CFMC, 1999]. “The species cannot be aged directly, and has a growth form that makes it impossible to use standard size-frequency methods correctly. Also, growth appears to vary from area to area and probably also varies with density. Natural mortality estimates vary with density, and only exist for juveniles” [CFMC, 1999]. This is not entirely accurate, as Appledorn (1987) assessed mortality in queen conch in southwestern Puerto Rico [Glazer, 2004]. However, it may be said that good measures of the basic biological parameters for this species are quite rare.

Queen Conch Fishery

Queen conch have been an important species for both subsistence and commercial fishermen across the animal’s range [NMFS OPR, 2003]. Traditionally, conchs were simply picked up by waders in shallow water (often using a glass-bottom bucket). Other traditional methods include hook-and-pole (sometimes from small boats), breath-hold diving, and snorkel diving [CHN CIC, 2003a]. In the 1970s, the introduction of scuba and hookah dive gear greatly increased catches and is believed to have contributed to overfishing in several areas [CHN, 2003; CFMC, 1996; Glazer, 2004]. Likewise, freezer storage and refrigerated shipping became widespread in the Caribbean in the 1970s, and these technologies allowed conch to change from a largely-local product to an international fisheries commodity [CHN, 2003].

Available landings figures suggest that up to 7,400 mt of conch meat per year were landed legally in the Caribbean in the years 1992-2001 [TRAFFIC, 2003]. However, international import data suggest that far more conch than this was actually *traded* each year, and so the illegal take of conch is thought to have been much higher than the legal take [TRAFFIC, 2003]. Since some nations report landings in terms of unprocessed meat weight, while others report processed meat weight, any figure given for all-Caribbean landings can only be an estimate [Theile, 2004]. Much of the conch traded may be undersized (immature) animals, and there is information that conch landed in one nation is often caught in another nation’s waters [Theile, 2004].

Market Availability

For centuries, the queen conch has been prized for food by the peoples of the Caribbean basin. The muscular “foot” of the animal is cut out of the shell and prepared in a variety of ways, sometimes being tenderized first by pounding. Conch fritters and chowder are Caribbean specialties, found on menus throughout the region [CHN, 2003]. The heavy shell of the queen conch, with its brilliant pink-to-red interior, has many traditional uses, including a role as a musical instrument. Today, the shells of conch taken in the meat trade are often sold as curios or carved into jewelry [NMFS OPR, 2003].

About 80% of the queen conch traded on the world market is bought by the United States [TRAFFIC, 2003]. Figure 2, below, shows the origin of conch on the U.S. market in 2002. Figure 3 shows the rapid increase in conch meat imports to the U.S., 1989-1998.

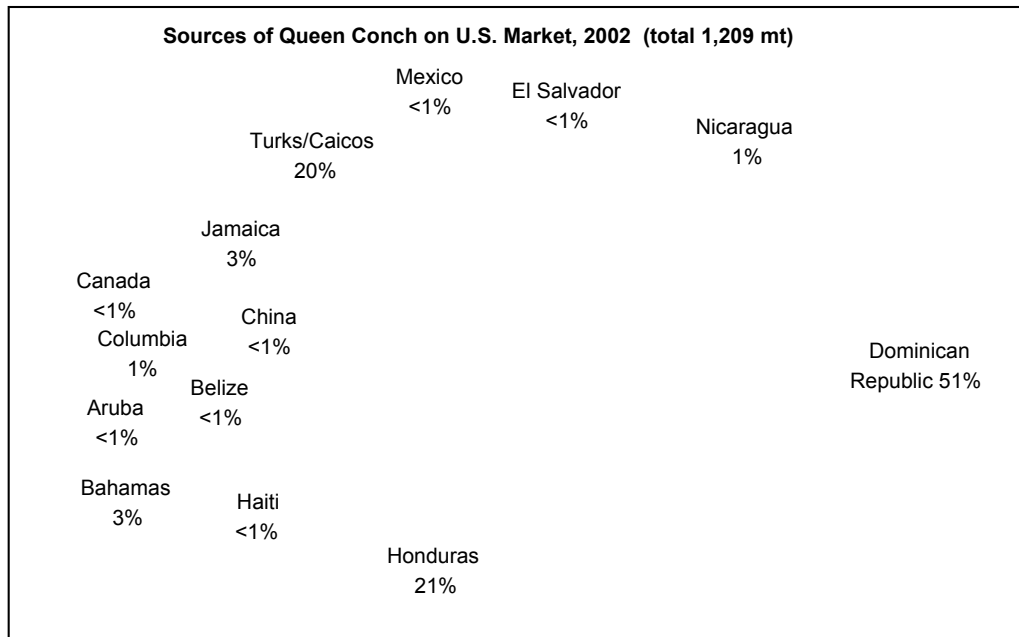


Figure 2: Sources of queen conch on the U.S. market, 2002. Source: NMFS Stats, 2004. Colors refer to approximate stock status of conch in the different nations. Note that, as of September 2003, imports were suspended from Haiti, Honduras, and Dominican Republic, which together accounted for about 73% of conch imported into the U.S. the previous year.

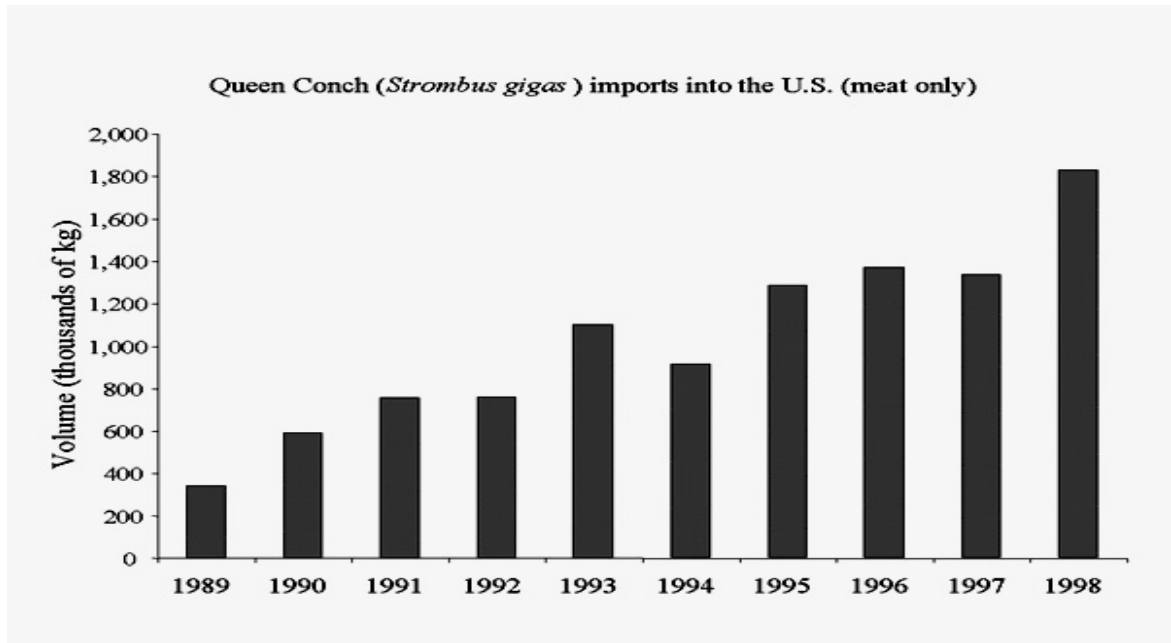


Figure 3: Imports of conch into the U.S. have increased rapidly in the last decade. Graph courtesy NMFS, www.nmfs.noaa.gov/prot_res/PR/queenconch.html

Queen Conch Aquaculture

There has been considerable interest in culturing queen conch to supplement dwindling natural populations. Florida’s conch restoration program, other research institutions, and the single commercial conch farms in the Caribbean (located in the Turks & Caicos Islands) rely upon eggs collected from the wild [Glazer, 2001; Myers, 2003; Glazer, 2004]. This is not necessarily destructive to the depleted conch populations, as natural mortality of conch larvae is so high [CHN, 2003; Glazer, 2004]. Wild-spawned, captive-raised queen conch are offered for sale as an

ornamental species in the home-aquarium trade [Marine Depot, 2003] and for food in the aquaculture trade [CHN, 2003]. The primary aquaculture market has been for small (~6 cm) captive-raised conch, sometimes called “ocean escargot”, although small amounts of larger adults (greater than 16 cm shell length) are also available [CHN, 2003; Glazer, 2004].

The Turks and Caicos conch farm collects eggs by enclosing an extensive area of coral reef with a net. Adult conch are released into this area to spawn, and their eggs are collected [Glazer, 2004]. For the production of conch for the food or aquarium trade, this is an acceptable method of collecting stock. However, when the young conch are to be restored to the wild, it is important that they reflect the genetic diversity of their parent population [Glazer, 2004]. When collecting eggs for restoration purposes, Florida managers are careful to take eggs from as many wild egg masses as possible--collecting just a few eggs from each--so that the genetic diversity of the resulting young is maximized [Glazer, 2004].

However, of course, the ultimate goal of conch aquaculture is to “close the lifecycle” by producing eggs in captivity. In the spring of 2003, researchers at the Harbor Branch Oceanographic Institute reported the first captive spawning of the queen conch [HBOI, 2003]. This event has not yet been duplicated [Glazer, 2004]. Ongoing research into conch culture in recirculating systems [Shaw et al., 2003], offers hope that this algae-eating, highly-desirable food species will eventually be produced via sustainable aquaculture.

The “Other” United States Conchs: *Busycon carica* and *B. canticulatum*



***Busycon carica*, the knobbed whelk. Image courtesy www.jaxshells.org**

It must be noted that two large temperate marine snails, the knobbed whelk *Busycon carica* and its close relative the channeled whelk *Busycon canticulatum*, are caught and marketed as “conch” along the U.S. Atlantic seaboard [Woods Hole MBI, 2003]. These animals range from Maine south to the middle of the Florida peninsula [Woods Hole MBI, 2003]. The *Busycon* whelks grow 8-10 inches in length. Unlike the queen conch, the *Busycon* whelks are predators, feeding upon clams and other shellfish [Woods Hole MBI, 2003]. They have been controlled as a pest upon Atlantic shellfish beds [Woods Hole MBI, 2003]. *Busycon carica* has been declared the state shellfish of New Jersey and of Georgia [NJ SHG, 2004].

In 2002, U.S. fisheries landed 972.2 metric tons of *Busycon* “conch”, with about half of the catch coming from Delaware and Virginia and most of the rest from New Jersey and Massachusetts

[NMFS Stats, 2003]. *Busycon* conch are also landed in Maine, Connecticut, Maryland, New York and Rhode Island, as well as North Carolina, South Carolina and Georgia. [NMFS Stats, 2003]. This “conch” should not be confused with the queen conch, although some domestic *Busycon* “conch” may well be substituting for queen conch in Florida restaurants.

Commercial fishing for *Busycon* whelk began when lobster fishermen marketed *Busycon* that crawled into their lobster traps after the bait [Woods Hole MBI, 2003]. Today, the directed fishery for *Busycon* whelk uses traps, often baited with the eggs of horseshoe crab [ASFMC, 2001]. (In recent years, horseshoe crab have been heavily exploited, and conservationists fear that the taking of horseshoe crab eggs is having ecosystem consequences for migratory birds and other wildlife that depend upon the eggs for food [Audubon, 2000; Maryland Conservation Commission, 2000]. East Coast managers are developing a horseshoe crab FMP to help deal with the situation [ASMFC, 2001].)

The commercial fishery for *Busycon* whelk has been expanding rapidly in the past ten years, and managers are conscious of the potential for overfishing [Woods Hole MBI, 2003]. No federal FMP yet exists for the *Busycon* whelks [GMFMC, 2004; SAFMC, 2004; NEFMC, 2004; MAFMC, 2004]; as nearshore species, *Busycon* management is largely in the hands of state agencies. Regulations vary state to state; Massachusetts requires purchase of a conch endorsement and has set a minimum size of 23/4 inches in shell diameter [Woods Hole MBI, 2003].

Analysis of Seafood Watch® Criteria

Criterion 1: Inherent Vulnerability to Fishing Pressure

Primary Factors to evaluate

Intrinsic rate of increase ('r')

Unknown

Age at 50% sexual maturity

High (greater than 10 years)

high for a tropical invertebrate, at 3-4 years.

Maximum age

High (greater than 30 years)

High for a tropical invertebrate

Is maximum age validated?

Yes

Reproductive potential (fecundity)

Medium (e.g. egg layer with small clutches)

Additional Factors to evaluate

Species range

Narrow (e.g. endemism or existence of local stocks that may become depleted)

Evidence of special behaviors that increase ease, or population consequences, of capture (e.g. spawning aggregations, site fidelity, segregation by sex, unusual attraction to gear, etc.)

Yes

This species has **several** such factors, including spawning aggregation, shallow-water habitat, slow movement (can't escape fishermen), and a life-history adapted for very little predation on mature adults. This species recovers very slowly from overfishing; the Florida population has begun to recover, but only after more than ten years of a complete fishing ban [Glazer, 2004].

Evidence of high population variability driven by physical environmental change (e.g. El Nino, Decadal Oscillations)

No

Synthesis, Inherent Vulnerability

Though relatively fecund, laying between 100,000 and 480,000 eggs per female per year, queen conch are inherently vulnerable to fishing pressure. Queen conch mature late compared to other tropical conch species, at 3-4 years of age, and are highly vulnerable to predation as juveniles. Once mature, queen conch are heavily armored and can defend against almost all natural predators, but their thick shells are no defense against fishing methods utilized by humans. Queen conch are slow-moving and inhabit nearshore shallows, making them easy targets for waders, skin divers, or small fishing vessels. They are especially vulnerable during the spawning season, as they gather together in huge aggregations, and there is evidence that they require a specific density of adults to stimulate

spawning behavior. Where populations are too sparse, the adults no longer breed. The introduction of scuba gear and freezer technology in the 1970s changed conch from a local specialty to an internationally-traded commodity, and since the 1970s, conch populations have been in decline throughout the animal's range. Pollution and loss of nearshore habitat are also preventing recovery in some areas. All these factors result in a ranking of "high" for inherent vulnerability to fishing pressure.

Inherent Vulnerability Rank: Conservation Concern Low Medium High

Criterion 2: Status of Wild Stocks

Subject to heavy fishing throughout its range, populations of queen conch have been in recognized decline since the 1970s [CHN, 2003; Stoner, 1997; CITES, 2003; Glazer & DelGado, in press]. As a nearshore species, conch are easy to overfish [USFWS, 2003]. Their relatively late maturation and habit of congregating in mass groups to spawn increase their vulnerability to fishing pressure [USFWS, 2003]. In addition, their nearshore habitat is threatened by pollution, siltation, and development [CHN CIC, 2003a]. Juvenile recruitment is disrupted by bottom-contact fishing nets and other efforts that disturb seagrass/sandflat habitat [CHN CIC, 2003a].

As of 2003, the vast majority of queen conch populations were in decline, although some are in worse shape than others [CHN, 2003; CITES, 2003]. Certain populations in the Bahamas, Turks and Caicos, and Jamaica are considered stable [Theile, 2004], but they are the exception to a generalized rule of decline. As noted above, the introduction of scuba gear in the 1970s greatly increased conch catches, as scuba divers could take conch in much deeper waters than skin divers [CHN, 2003]. Hookah diving, in which the diver breathes a continuous supply of air from the surface via a long hose, has even more of an impact because hookah divers can stay at depth much longer than scuba divers [Federal Register, 1996]. Today, some authorities assert that conch populations are healthiest in areas where scuba and hookah fishing are banned [CHN, 2003]. In such areas, small numbers of mature queen conch survive in water too deep for non-scuba/hookah fishing, ensuring at least a minimal surviving biomass of breeding adults [CHN, 2003].

Disturbingly, in the Florida Keys, adult conch living in nearshore waters show a marked decline in fertility, compared to adults living in deeper water [CHN CIC, 2003c; Delgado et al., 2004]. In 2004, the Florida Fish and Wildlife Conservation Committee began a study on environmental effects (habitat disturbance, poor water quality, endocrine disruption) which could be causing this depression in reproductive ability [CHN CIC, 2003a; CHN CIC, 2003c; Glazer, 2004]. For many years, Florida managers had released captive-raised juvenile conch, but recent studies have shown that this is not a cost-effective way to boost local populations [FWC Committee Report, 2000; Glazer, 2004]. Instead, the Florida Fish and Wildlife Conservation Committee is moving large wild adults from inshore to offshore waters in an attempt to restore their fertility [CHN CIC, 2003c]. Typically, these adults begin to breed about three months after being moved to the offshore areas [Delgado et al., 2004]. Translocation of adult conch is now the FWC's favored conch-restoration strategy because, compared to the release of hatchery-raised juveniles, the translocation of adults results in a more rapid increase in reproductive output and better maintains the genetic integrity of the wild stock [Delgado et al., 2004].

A recent study has turned up evidence that queen conch require the presence of large numbers of conspecifics to stimulate spawning [Stoner and Ray-Culp, 2000]. In this study of free-living conch in the Bahamas, queen conch never mated when conch density was less than 56 adults per hectare [Stoner and Ray-Culp, 2000]. This study suggests that density-dependent mating depression may be holding back conch recovery even where populations are protected [Stoner and Ray-Culp, 2000].

Many scientists fear that, without substantial improvement in management throughout the Caribbean basin, the queen conch is headed for commercial extinction [CITES, 2003]. Although many conch-fishing nations have laws on the books to manage the fishery and protect queen conch, enforcement is often poor or nonexistent, and illegal fishing (conch poaching) is widespread in many areas [USFWS, 2003; TRAFFIC, 2003]. Please see the Management section, below, for a fuller discussion.

In 1992, queen conch was listed in Appendix II of CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora [TRAFFIC, 2003]. This listing requires that a scientific authority of any nation desiring to export conch certify that the export “will not be detrimental to the survival of the species concerned” [CITES, 2003].

In 2003, TRAFFIC (on behalf of CITES) completed a major review of queen conch’s biological and trade status (known formally as a Review of Significant Trade in Appendix II Species [Theile, 2004]). TRAFFIC’s report concluded that illegal and unregulated conch fishing is rampant, and that many conch-fishing nations lack adequate monitoring programs for stocks and landings [TRAFFIC, 2003]. Following an assessment of the review, CITES recommended in 2003 that conch imports from three of the major conch-producing nations (Haiti, Honduras, and the Dominican Republic) be suspended [Theile, 2004]. CITES also required additional protective efforts and management measures on the part of several other conch-exporting nations [TRAFFIC, 2003; CITES, 2003; Theile, 2004]. Please see the Management section, below, for a fuller discussion.

Primary Factors to evaluate

Classification status

Recruitment or growth overfished, overexploited or depleted ■

Throughout its range. Many fisheries have closed from overfishing, and recovery is not in evidence.

Current population abundance relative to BMSY

BMSY not established for most populations due to lack of basic data unknown ■

Long term (greater than 10 years) trend in population abundance as measured by fishery independent means (i.e. stock assessment)

Trend is down ■

Where stock assessments and visual surveys are conducted

Short term (less than 5 – 10 years) trend in population abundance as measured by fishery independent means (i.e. stock assessment)

Trend is down ■

Where stock assessments and visual surveys are conducted

Long term (greater than 10 years) trend in population abundance as estimated from catch per unit effort (CPUE)

Trend is down ■

Where sufficient catch and effort data exist to calculate CPUE

Short term (less than 5 – 10 years) trend in population abundance as estimated from catch per unit effort (CPUE)

Trend is down ■

Where sufficient catch and effort data exist to calculate CPUE

Occurrence of overfishing (current level of fishing mortality relative to overfishing threshold)

Overfishing occurring (mortality is above threshold) ■

Threshold not established in most areas, but stocks and landings are declining and/or fishers are moving further offshore and employing deep-diver gear.

Current age, size or sex distribution of the stock relative to natural condition

Distribution(s) is(are) skewed

Age distributions skewed away from mature adults, which are target of the fisheries

Overall degree of uncertainty in status of stock

Medium (e.g. Only limited, fishery dependent data on stock status are available)

Exact data often unavailable, but market evidence suggests ongoing decline since 1970s.

Synthesis, Status of the Stocks

Throughout its range, queen conch is overfished, and many fisheries have been closed due to overfishing. Recovery is not yet evident in these fisheries. There is a lack of basic population data on queen conch, although stock assessments and visual surveys indicate both short-term and long-term declines in populations of queen conch throughout the Caribbean. Due to the unavailability of exact data on population abundance for queen conch, the overfished status of many stocks, and the general trend in declining stocks, queen conch stock status rates “critical”.

Status of the Stocks Rank:

Conservation Concern Low Medium High **Critical**

Criterion 3: Nature and Extent of Bycatch

Queen conch are fished by picking them up by hand while wading in the shallows, by poke-poling (sometimes from small boats), or by breath-hold diving, scuba diving, or hookah diving. These fishing methods are all very selective for queen conch and result in little or no bycatch.

Primary Factors to evaluate:

Bycatch includes a low diversity of organisms (e.g. a single or only a few species), none of which are of “special concern”

Population consequences of bycatch

Low: Quantity of bycatch is thought to have little or no impact on population levels

For bycatch species of similar or lower trophic level (relative to the targeted species): Quantity of bycatch relative to the quantity of targeted landings Not Applicable

Short and long-term trend in quantity and composition of bycatch as a result of management decisions (including gear innovations):
not applicable because bycatch is low

Additional Factor to evaluate

Evidence that the ecosystem has been or will likely be altered in response to the continued removal of the bycatch species
No evidence to date

Synthesis, Bycatch

Queen conch are fished by picking them up by hand, or by poke-poling (sometimes from small boats), or by breath-hold diving, scuba diving, or hookah diving. All of these are low-bycatch fishing methods.

Bycatch Rank:

Low

Medium

High

Criterion 4: Effect of Fishing Practices on Habitats and Ecosystems

Primary habitat factors to evaluate:

Areal extent of cumulative fishing gear effects:

Limited area (e.g. hook, spear or harpoon areas)

Effect of fishing gear on physical and biogenic habitats (known for specific fishery or inferred from other studies)

Minimal damage (e.g. from midwater trawl or gillnet, pelagic or bottom longline, hook and line, or spear/harpoon)

Resilience of physical and biogenic habitats to disturbance by fishing method:

Moderate (e.g. mud and sand bottoms)

Primary ecosystem factors to evaluate:

Evidence that the removal of targeted species has or will likely substantially disrupt the food web

Science is uncertain

Evidence that the fishing method has caused or is likely to cause ecosystem state changes, including alternate stable states or regime shifts.

No evidence to date

Synthesis, Effects of Fishing Practices

Queen conch are fished by picking them up by hand while wading in the shallows, poke-poling from small boats, or collecting via free diving, scuba diving, or hookah diving. These fishing methods are all very selective and do little damage to the marine habitat. Queen conch are typically caught on sandy and muddy bottoms, and little damage is done to the benthic habitat during their capture.

The ecosystems surrounding queen conch may be impacted by their removal, but the extent of this impact is unknown at this time.

Effect of Fishing Practices Rank: **Low** **Medium** **High**

Criterion 5: Effectiveness of the Management Regime

U.S. Conch Management—Florida

Because of overfishing that depleted conch populations, and habitat loss that has prevented substantial recovery, Florida has had a complete moratorium on commercial conch fishing since 1975 and on recreational fishing since 1986 [CHN, 2003]. It is illegal to catch or possess queen conch in Florida waters.

The State of Florida monitors conch populations using diver surveys [Glazer, 2001]. This monitoring began in 1986, the year of the final closure. However, no substantial recovery was noted between 1986 and 1993. It appeared that the fishing closure alone was not going to be enough to recover the depleted conch population [FWC Committee Report, 2000; Glazer & DelGado, in press]. In 1993, the State began a program to rebuild depleted conch populations [Glazer, 2001]. That program involved the release of captive-raised juvenile conchs, transplanting of adult conchs from nearshore areas to offshore waters, and substantial monitoring and larval surveys [Glazer, 2001]. Citizen groups and The Nature Conservancy donated labor and resources to this effort [Glazer, 2001]. Recent studies have shown that the release of captive-raised juveniles is not a cost-effective way to boost local populations [Glazer, 2004]. The Florida Fish and Wildlife Commission now concentrates on moving large wild adults from inshore to offshore waters in an attempt to restore their fertility [CHN CIC, 2003c]. Typically, these adults begin to breed about six months after being moved to the offshore areas [Glazer, 2004]. Thanks to these restoration efforts and other protective measures, Florida's conch population has begun to recover [Glazer, 2004].

U.S. Conch Management—Puerto Rico and U.S. Virgin Islands

Conch resources in federal waters of Puerto Rico and the U.S. Virgin Islands are managed by the U.S. Caribbean Fishery Management Council (CFMC). A federal FMP for conch management was introduced in 1996 to help rebuild a conch population that was officially considered overfished, i.e., at less than 20% of unfished biomass [CFMC FMP, 1996]. Trends in landings suggest that queen conch populations around Puerto Rico and the U.S. Virgin Islands declined by more than 50% between 1980 and 1996 [Federal Register, 1996]. The Caribbean Queen Conch FMP was put in place specifically to rebuild the population and to protect spawning stock from further decline [Federal Register, 1996] (the text of the FMP phrases this mandate as “to avoid a stock collapse similar to those noted elsewhere” [CFMC, 1996]). Management measures of this FMP include a minimum size, gear restrictions, and a closed season. The specifics include: all conch must be landed still in the shell to allow identification; minimum shell length of 9 inches and minimum shell-lip thickness of 3/8 inch; fishing closure July 1-September 30 to protect stocks during the height of the spawning season; a prohibition on the use of hookah gear in the EEZ; a recreational bag limit of 3 conch per day; and a commercial bag limit of 150 conch per day in the first year a fisher holds a commercial license, 100 conch per day for the fisher's second year, and 75 conch per day for the third year and thereafter [CFMC, 1997]. The CFMC also considered banning the use of scuba gear in U.S. Caribbean conch fisheries, but decided this would be too burdensome upon the fishermen [Federal Register, 1996]. Recently, NMFS managers have again been calling for a complete ban on conch fishing in Puerto Rico to let stocks recover [Glazer, 2004].

When formulating the 1996 Conch FMP, the CFMC found that it lacked the basic population data, landings data, and fishing effort data to effectively calculate a conch MSY for either Puerto Rico or the U.S. Virgin Islands [CFMC, 1996]. They note, however, severe and ongoing declines in conch landings between the mid-1980s and mid-1990s, despite apparent increases in effort, disappearance of conch from nearshore areas, and increasing reliance upon scuba gear to fish conch in previously-

untouched depths [CFMC, 1996]. Despite this strong evidence of a severely depleted stock, the CFMC declined to close the fishery. “Total closures are not recommended immediately, despite overfishing, because 1) the Council wants to minimize the significant and disruptive socio-economic impact this would have on the commercial fishers and their families, and 2) of their (sic) lack of proven success in other areas, such as Florida and Bermuda...The economic burden of this very restrictive management strategy is too damaging to the commercial fishers” [CFMC, 1996, page 29].

The Caribbean Fishery Management Council’s regional workshop on queen conch stock assessment and management [CFMC, 1999] found it impossible to calculate current stock status or MSY for Puerto Rico because of a dearth of catch-effort time-series data [CFMC, 1999]. For the U.S. Virgin Islands, catch-effort data from 1993-1998 were used to estimate an MSY of 16 mt/year, which had been exceeded twice in that time period [CFMC, 1999].

International Management Agreements and Treaties

The range of the queen conch covers 36 nations and territories; 25 of these currently fish commercially for queen conch [TRAFFIC, 2003; Theile, 2004]. Because conch larvae disperse basin-wide, it is widely recognized that conch management policy in one Caribbean nation may influence conch abundance in other nations around the region. For this reason, there are several international efforts to coordinate conch research and management across international boundaries.

The Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (the Cartagena Convention) is a coalition of the majority of Caribbean nations and territories. Because of concerns about overfishing, in 1990 Cartagena member nations placed queen conch on their list of commercial species requiring special management protection [NMFS OPR, 2003].

The United States’ Caribbean Fishery Management Council heads an effort called the International Queen Conch Initiative [NMFS OPR, 2003]. Begun in 1996, this program aims to strengthen international cooperation on conch management throughout the Caribbean, and to work toward the establishment of common management regimes for the sustainable use of queen conch [NMFS OPR, 2003].

In 1992, queen conch was listed in Appendix II of CITES, the Convention on International Trade in Endangered Species in Wild Fauna and Flora [TRAFFIC, 2003]. Appendix II is for “troubled” species, allowing international trade only if the listed species are managed according to strict sustainability standards. CITES has kept a close eye on the biological and trade status of queen conch, conducting a Significant Trade Reviews in 1995 and discussing the species in its Animals Committee in 2001. Because of ongoing concerns about declining conch populations in certain areas, CITES undertook a second Significant Trade Review in 2003 [Theile, 2004]. Market evidence of substantial illegal fishing suggested that queen conch was being exploited unsustainably—in ways counter to the agreements of CITES parties [TRAFFIC, 2003; Theile, 2004]. Some researchers began calling for queen conch to be moved to CITES Appendix I, which protects severely threatened species by banning all international trade.

The queen conch Significant Trade Review included consultations with representatives from all Caribbean conch-fishing nations [TRAFFIC, 2003]. In September 2003, CITES completed this review [CITES, 2003]. While queen conch remains in CITES Appendix II, CITES banned imports to CITES nations of queen conch originating in Honduras, the Dominican republic, and Haiti. The 2003 review concluded that these nations have failed to implement management measures to ensure

that exports are sustainable, and have also failed to stop rampant illegal fishing for conch. The 2003 review also tightened the rules for conch exploitation in several other nations. These changes are summarized below.

Management Nation-by-Nation and 2003 CITES findings

Although many conch-fishing nations have laws on the books to protect queen conch, enforcement is often poor or nonexistent [USFWS, 2003]. In recent years, CITES authorities noted that the amount of conch meat entering the international market has far exceeded the legal catch quotas of the 25 conch-fishing nations and territories [TRAFFIC, 2003]. There were widespread reports that some nations, notably Honduras and the Dominican Republic, were exporting conch that had been fished illegally from the territories of other nations [Theile, 2004]. These situations led to a re-investigation of conch's international trade status, completed by CITES in September 2003 [CITES, 2003].

As a result of the CITES decision, the Dominican Republic and Honduras announced in September 2003 that they would suspend exports of conch and would commit to comply with other CITES regulations [Theile, 2004]. Haiti failed to voluntarily suspend its conch exports, and therefore CITES recommended to all its member nations that they cease importing conch from this country [Theile, 2004].

The United States announced in the fall of 2003 that it would no longer allow queen conch imports from the Dominican Republic, Honduras, and Haiti. Imports to the U.S. from four other nations (Antigua/Barbuda, Barbados, Dominica, and Trinidad/Tobago) had already been suspended following the first CITES Significant Trade Review in 2001 [USFWS OLE, 2003a; Theile, 2004].

Nations from which queen conch may still be imported include Anguilla, Aruba, the Bahamas, Belize, Bermuda, Brazil, the British Virgin Islands, the Cayman Islands, Columbia, Costa Rica, Grenada, Guadalupe, Guatemala, Jamaica, Mexico, Montserrat, the Netherland Antilles, Nicaragua, Panama, St. Kitts/Nevis, Saint Lucia, St. Vincent/Grenadines, Turks/Caicos, and Venezuela [USFWS OLE, 2003b].

In 2002, the latest year for which NMFS import figures are complete, the United States imported 1,208.7 metric tons of queen conch [NMFS Stats, 2004]. The national origin of most of this conch is broken out below, although it must be noted that the Caribbean origin of 8.1 metric tons is unknown, as 2.7 mt were imported from Canada and 5.4 mt from China [NMFS Stats, 2004].

Review of Conch Management in the Banned Nations

Antigua/Barbuda

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004]. Antigua applies a minimum weight and shell length/flared lip maturity requirement [CHN CIC, 2003a].

Barbados

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Dominica

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Dominican Republic

Exported 609.4 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Since 1999, when Jamaica began to reduce its conch catch quotas, the Dominican Republic has emerged as a major new source of queen conch [TRAFFIC, 2003]. Laws on the books include minimum size and a closed season [Theile, 2004]. Conch exports almost doubled in the three years 1999-2001, from 280 mt in 1999 to 560 mt in 2001 [TRAFFIC, 2003]. However, CITES cites evidence that much of this catch is taken illegally in foreign waters and brought to the Dominican Republic for landing and export [TRAFFIC, 2003]. The Dominican Republic's own conch stocks show signs of overfishing, with low adult densities [TRAFFIC, 2003]. The harvest consists mainly of juvenile conchs that have not yet reached reproductive age [TRAFFIC, 2003]. The Dominican Republic has conducted no stock assessment of its conch resource and has no catch quotas in place to limit fishing effort [TRAFFIC, 2003]. In September 2003 CITES recommended a suspension of international trade in Dominican Republic conch until the government implements a series of recommendations: a nationwide stock assessment, establishment of catch and export quotas, and a monitoring program [CITES, 2003; Theile, 2004]. As a result of the CITES decision, the Dominican Republic announced that they would suspend exports of conch and would commit to comply with other CITES regulations [Theile, 2004].

Haiti

Exported 2.4 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Haiti is not a party to the CITES treaty. CITES examination found the queen conch stocks of Haiti to be severely depleted and fishery management to be inadequate to protect the resource. In addition, there is evidence of massive illegal conch fishing in Haitian waters, with much of the catch being exported to the French islands of Guadalupe and Martinique [TRAFFIC, 2003]. Haiti has failed to voluntarily suspend its conch exports, and therefore, in September 2003, CITES recommended to all its member nations that they cease importing conch from this country [Theile, 2004].

Honduras

Exported 237.8 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Honduras' law includes closed seasons and no-take reserves [CHN CIC, 2003a]. According to NMFS enforcement personnel, Honduras has progressive fishing laws on the books, but enforcement is very poor and illegal fishing is rampant [Hunt, 2003]. A 1995 population survey found low abundance of conch in the Cayos Cochinos Biological Reserve; this study blamed the low abundance on 30 years of unregulated fishing and also noted that conch fishing was intensifying with the use of scuba and hookah gear [Tewfik, Guzman and Jacome, 1995]. Since 1999, when Jamaica began to reduce its conch catch quotas, Honduras has emerged as a major new source of queen conch [TRAFFIC, 2003]. Conch exports almost doubled in the three years 1999-2001, from 750 mt in 1999 to 1,330 mt in 2001 [TRAFFIC, 2003]. However, CITES cites evidence that much of this catch is taken illegally in foreign waters and brought to Honduras for landing and export [TRAFFIC, 2003]. Honduras' own conch stocks show signs of overfishing, with low adult densities [TRAFFIC, 2003]. The harvest consists mainly of juvenile conchs that have not yet reached reproductive age [TRAFFIC, 2003]. Honduras has conducted no stock assessment of its conch resource and has no catch quotas in place to limit fishing effort [TRAFFIC, 2003]. As a result of the CITES decision, Honduras announced in September 2003 that they would suspend exports of conch and would commit to comply with other CITES regulations [Theile, 2004]. However, there are reports of Honduran conch dealers approaching officials in several other nations in an effort to "greenwash" their conch for international trade [Glazer, 2004].

Trinidad/Tobago

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Review of Conch Management in the Allowed Nations

Anguilla

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Aruba

Exported 5.8 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004].

Bahamas

Exported 40.5 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004].

The Bahamas applies a catch-quota system [CHN CIC, 2003a] and uses export quotas to regulate its conch fishery [TRAFFIC, 2003]. CITES considers this nation's queen conch resource to be in a state of "possible concern" [CITES, 2003]. Based upon the findings of its September 2003 Significant Trade Review, CITES has requested the nation to formulate catch and export quotas based upon a current stock assessment by September 2004 [CITES, 2003]. The nation is also requested to develop a conch management program that includes regular stock assessments, collection of catch and effort data, and communication of its conch export quotas to other CITES parties (thus making it easier to spot when illegally-caught conch is inflating exports) [CITES 2003; TRAFFIC 2003]. The Caribbean Fishery Management Council's regional workshop on queen conch stock assessment and management [CFMC, 1999] found that the Bahamas probably have a number of separate conch stocks, and that their overall condition was "probably not fully exploited", although "local over-exploitation of conch cannot be ruled out" [CFMC, 1999].

Belize

Exported 2.8 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Uses export quotas to regulate its conch fishery [TRAFFIC, 2003]. CITES considers this nation's queen conch resource to be in a state of "possible concern" [CITES, 2003]. Based upon the findings of its September 2003 Significant Trade Review, CITES has requested the nation to formulate catch and export quotas based upon a current stock assessment by September 2004 [CITES, 2003]. The nation is also requested to develop a conch management program that includes regular stock assessments, collection of catch and effort data, and communication of its conch export quotas to other CITES parties (thus making it easier to spot when illegally-caught conch is inflating exports) [CITES 2003; TRAFFIC 2003]. The Caribbean Fishery Management Council's regional workshop on queen conch stock assessment and management [CFMC, 1999] found that Belize's catch and effort data were too limited to draw any conclusions about stock status.

Bermuda

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004]. Bermuda has voluntarily suspended its exports of conch [Theile, 2004].

Brazil

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

British Virgin Islands

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Cayman Islands

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Columbia

Exported 10.9 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Uses export quotas to regulate its conch fishery [TRAFFIC, 2003]. CITES considers this nation's queen conch resource to be in a state of "possible concern" [CITES, 2003]. Based upon the findings of its September 2003 Significant Trade Review, CITES has requested the nation to formulate catch and export quotas based upon a current stock assessment by September 2004 [CITES, 2003]. The nation is also requested to develop a conch management program that includes regular stock assessments, collection of catch and effort data, and communication of its conch export quotas to other CITES parties (thus making it easier to spot when illegally-caught conch is inflating exports) [CITES 2003; TRAFFIC 2003].

Costa Rica

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Grenada

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004]. The Caribbean Fishery Management Council's regional workshop on queen conch stock assessment and management [CFMC, 1999] found that inadequate data prevented any firm conclusions on the status of the conch stocks. Total catches were not recorded and only the largest mature conchs were included in data on conch meat weights [CFMC, 1999].

Guadalupe

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Guatemala

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Jamaica

Exported 40.7 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Until 1999, Jamaica was the world's largest producer of queen conch [TRAFFIC, 2003]. Most of this was fished on the Pedro Banks, a large undersea area that is the habitat for one of the Caribbean's largest and most important queen conch stocks [TRAFFIC, 2003]. In the early 1990s, Jamaica's landings of Pedro Banks conch topped 3,000 mt per year [TRAFFIC, 2003]. Jamaica also conducted its first conch stock assessments in the early 1990s. Recognizing a decline in the resource, the Jamaican government introduced annual catch and export quotas, implemented in 1994 in Jamaica's first conch fishery management plan [TRAFFIC, 2003]. MSY for queen conch was calculated at 700-1300 mt/year [CFMC, 1999]. Unfortunately, illegal fishing is now rampant on the Pedro Banks, much of it by foreign vessels that simply ignore Jamaican law [TRAFFIC, 2003]. In the years 1999-2002, illegal harvest was estimated to account for 40% of the conch fishing on the Pedro Banks [TRAFFIC, 2003]. Jamaica conducted its third conch stock assessment in 2003 [TRAFFIC, 2003]. Although this stock assessment suggested a total allowable catch of 900 mt, Jamaica set its conch export quota at 500 mt to allow for some inevitable losses to illegal fishing [TRAFFIC, 2003]. The Caribbean Fishery Management Council's regional workshop on queen conch stock assessment and management [CFMC, 1999] noted that Jamaica employs a visual-census conch survey as a fishery-independent monitor of conch populations [CFMC, 1999]. Based upon the findings of its September

2003 Significant Trade Review, CITES considers Jamaica to have an adequate conch management regime and relatively healthy queen conch populations [TRAFFIC, 2003; CITES, 2003]. Jamaica is one of only two Caribbean conch-exporting nations to earn the CITES designation of “least concern” for its queen conch resources [TRAFFIC, 2003; CITES, 2003].

Mexico

Exported 1.4 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Mexico restricts conch fishing to certain areas [CHN CIC, 2003a]. A 2000 study of queen conch near Punta Gavilan, Mexico extracted a k-value of 0.44 and found high total mortality and a population heavily biased towards juveniles [De Jesus-Navarrete et al., 2000]. Although the study area was a protected no-fishing zone, the conch population profile strongly suggested to the researchers that heavy exploitation was continuing there [De Jesus-Navarrete et al., 2000].

Montserrat

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Netherlands Antilles

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

Nicaragua

Exported 7.9 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. Uses export quotas to regulate its conch fishery [TRAFFIC, 2003]. CITES considers this nation’s queen conch resource to be in a state of “possible concern” [CITES, 2003]. Based upon the findings of its September 2003 Significant Trade Review, CITES has requested the nation to formulate catch and export quotas based upon a current stock assessment by September 2004 [CITES, 2003]. The nation is also requested to develop a conch management program that includes regular stock assessments, collection of catch and effort data, and communication of its conch export quotas to other CITES parties (thus making it easier to spot when illegally-caught conch is inflating exports) [CITES 2003; TRAFFIC 2003]. Honduran conch is reportedly being transshipped to Nicaragua, sometimes stockpiled there frozen, and then released to the international market as Nicaraguan product [Paul Raymond, NMFS enforcement, as reported by Glazer, 2004]. Nicaraguan conch may be next in line for CITES censure if this trend continues [Glazer, 2004].

Panama

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004].

St. Kitts/Nevis

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004]. CITES considers this nation’s queen conch resource to be in a state of “possible concern” [CITES, 2003]. The Caribbean Fishery Management Council’s regional workshop on queen conch stock assessment and management [CFMC, 1999] developed a precautionary MSY of 68 mt/year, although time/effort data were lacking [CFMC, 1999]. Based upon the findings of its September 2003 Significant Trade Review, CITES has requested the nation to formulate catch and export quotas based upon a current stock assessment by September 2004 [CITES, 2003]. The nation is also requested to develop a conch management program that includes regular stock assessments, collection of catch and effort data, and communication of its conch export quotas to other CITES parties (thus making it easier to spot when illegally-caught conch is inflating exports) [CITES 2003; TRAFFIC 2003].

Saint Lucia

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004]. The Caribbean Fishery Management Council's regional workshop on queen conch stock assessment and management [CFMC, 1999] found the available data inadequate to assess stock status or calculate an MSY [CFMC, 1999].

St. Vincent/Grenadines

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004]. CITES considers this nation's queen conch resource to be in a state of "possible concern" [CITES, 2003]. Based upon the findings of its September 2003 Significant Trade Review, CITES has requested the nation to formulate catch and export quotas based upon a current stock assessment by September 2004 [CITES, 2003]. The nation is also requested to develop a conch management program that includes regular stock assessments, collection of catch and effort data, and communication of its conch export quotas to other CITES parties (thus making it easier to spot when illegally-caught conch is inflating exports) [CITES 2003; TRAFFIC 2003].

Turks/Caicos

Exported 239.2 metric tons of conch to the U.S. in 2002 [NMFS Stats, 2004]. The Caribbean Fishery Management Council's regional workshop on queen conch stock assessment and management [CFMC, 1999] found that this nation had the longest catch-effort time series of any Caribbean nation (1974-1998). Based on this data, MSY was estimated at 682 mt/year [CFMC, 1999]. Based upon the findings of its September 2003 Significant Trade Review, CITES considers this nation to have an adequate conch management regime and relatively healthy queen conch populations [TRAFFIC, 2003; CITES, 2003]. It is one of only two Caribbean conch-exporting nations to earn the CITES designation of "least concern" for its queen conch resources [TRAFFIC, 2003; CITES, 2003].

Venezuela

Exported no conch to the U.S. in 2002 [NMFS Stats, 2004]. Venezuela closed its conch fishery in 2000 [CHN CIC, 2003a] and currently exports no conch [Theile, 2004].

Primary Factors to evaluate

Evaluating the management regimes of the three nations that were the source of 73% of the queen conch on the U.S. market in 2002, i.e., Haiti, Honduras, and Dominican Republic:

Stock Status: Management implements a stock assessment that seeks scientific knowledge related to the short and long-term status of the stock

No stock assessment available or planned in the near future ■

Scientific Monitoring: Management regularly collects data and analyzes it with respect to stock abundance: No regular collection of data before the CITES ban ■

CITES now requires these nations to implement stock assessments if they wish the CITES ban lifted [Glazer, 2004].

Scientific Advice: Does management ignore advice from its scientific advisors?

Yes, regularly ■ These nations repeatedly ignored the advice of CITES scientists before the ban.

Bycatch: Management implements an effective bycatch reduction plan
no bycatch plan needed because bycatch is "low" ■

Fishing practices: Management addresses the effect of the fishing method(s) on habitats and ecosystems: no measures needed because fishing method is deemed to be “benign”

Enforcement: Management and appropriate government bodies enforce fishery regulations:

Regulations not enforced

Illegal fishing is rampant and uncontrolled

Management Track Record: Conservation measures enacted by management have resulted in the long-term maintenance of stock abundance and ecosystem integrity:

Measures have not prevented declines or were implemented only after significant declines

A 2003 review by CITES banned international trade in conch from Haiti, Honduras, and Dominican Republic, citing their inability to protect the resource and ongoing declines in already-overfished stocks. Glazer (2004) reports personal communication from Paul Raymond of NMFS enforcement to the effect that the CITES ban is being widely circumvented by certain Caribbean nations, notably Honduras. Reportedly, the CITES ban has not decreased conch fishing in Honduras; both legal and illegal take continue unabated [Glazer, 2004]. Honduran conch is reportedly being transshipped to Nicaragua, sometimes stockpiled there frozen, and then released to the international market as Nicaraguan product [Glazer, 2004]. Nicaraguan conch may be next in line for a CITES ban if this trend continues [Glazer, 2004]. There are reports of Honduran conch dealers approaching officials in several other in an effort to “greenwash” their conch for international trade.

Synthesis, Management Effectiveness:

The Florida resource has been slow to recover, and it is illegal to take any conch from Florida waters. Conch stocks of Puerto Rico and the U.S. Virgin Islands are managed by a federal FMP; NMFS considers these populations overfished, although fishing has not been halted because of economic hardship to the fishermen. Queen conch are harvested by 36 nations and territories across the Caribbean. Because of international concerns about continuing decline in conch stocks throughout the 1980s, queen conch was placed on CITES Appendix II in 1992. A 2003 review by CITES found management and stock status to be critically poor in three major conch-exporting nations (Honduras, Haiti, and the Dominican Republic). This same review found that most other nations need to begin stock assessment and take basic steps to curb rampant illegal fishing. It rated just two conch-exporting nations (Jamaica and Turks/Caicos) as having adequate management and stocks that were “probably not overfished”. In 2002, the last year for which figures are complete, the 3 banned nations (Honduras, Haiti, and the Dominican Republic) accounted for approximately 73% of the queen conch on the U.S. market.

Effectiveness of Management Rank:

Conservation Concern Low Medium High Critical

Overall Evaluation and Seafood Ranking: Caribbean Queen Conch

The queen conch is a large marine snail native to the Caribbean Basin. While relatively fecund (laying approximately 100,000---480,000 eggs per female per year), the queen conch’s life history predisposes it to fishing vulnerability. This conch matures late for a tropical species (4-5 years) and has a long life span (sup to 20 years). Its life history presupposes heavy juvenile mortality but almost no predation upon mature adults, whose massive shells protect them from all but a very few predators. However, the shells are no deterrent to humans, and the queen conch inhabits the nearshore shallows (0.3 m—25 m), placing it squarely in the range of waders and skin divers. Queen conch are slow-moving algae-eaters and very easy to pick up by hand, or with the simplest of fishing gear (poke poles). They are especially vulnerable to fishing during the spawning season, when they gather in huge aggregations. The introduction of scuba gear and freezer technology in the 1970s changed conch from a local specialty to an internationally-traded commodity, and since the 1970s, conch populations have been in recognized decline throughout the animal’s range. Pollution and loss of nearshore habitat are preventing recovery in some areas, but there is also disturbing evidence that this species requires a certain density of adults to stimulate spawning behavior—i.e., where populations are too sparse, the adults no longer breed. Because of overfishing, Florida closed its commercial conch fishery in 1975 and its recreational fishery in 1986. The Florida resource has been slow to recover, and it is illegal to take any conch from Florida waters. Conch stocks of Puerto Rico and the U.S. Virgin Islands are managed by a federal FMP; NMFS considers these populations overfished, although fishing has not been halted because of economic hardship to the fishermen. Queen conch are harvested by 36 nations and territories across the Caribbean. Because of international concerns about continuing decline in conch stocks throughout the 1980s, queen conch was placed on CITES Appendix II in 1992. A 2003 review by CITES found management and stock status to be critically poor in three major conch-exporting nations (Honduras, Haiti, and the Dominican Republic); found that most other nations need to begin stock assessment and take basic steps to curb rampant illegal fishing; and rated just two conch-exporting nations (Jamaica and Turks/Caicos) as having adequate management and stocks that are “probably not overfished”. In 2002, the last year for which figures are complete, the 3 banned nations (Honduras, Haiti, and the Dominican Republic) accounted for approximately 73% of the queen conch on the U.S. market.

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherent Vulnerability			√	
Status of Stocks				√
Bycatch	√			
Habitat Effects	√			
Management Effectiveness				√

Overall Seafood Rank: Avoid

Literature Cited, Queen Conch

AnimalsOnline, 2003. Queen Conch (*Strombus gigas*) fact sheet. www.animals-online.be/mollusca/kroonslakken/queen_conch.html

ANSP, 2003. *Strombus gigas*. Online biodiversity database of the Academy of Natural Sciences of Philadelphia. [http://erato/acnatsci.org/wasp/search/php/2733](http://erato.acnatsci.org/wasp/search/php/2733)

Appledoorn, 1987. Assessment of mortality in a population of queen conch, *Strombus gigas*, in southwest Puerto Rico. *Fishery Bulletin*, v. 85, #4.

ASMFC, 2001. Proceedings of the Atlantic States Marine Fisheries Commission Horseshoe Crab Management Board. April 24, 2001, Arlington, VA

Audubon, 2000. Public comments on ASFMC Fishery Management Plan (Addendum 1 to the Horseshoe Crab Fishery Management Plan), submitted Jan. 21, 2000. Online at www.audubon.org/campaign/horseshoe/comments.html

CFMC, 1996. Fishery management plan for the queen conch resources of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico.

CFMC, 1997. Regulations guide for fishing in Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico.

CFMC QCSAMW, 1999. Proceedings of the Queen Conch Stock Assessment and Management Workshop, Belize City, Belize March 15-22 1999. Caribbean Fishery Management Council.

CHN, 2003. Conch Heritage Network, an effort of Harbor Branch Oceanographic Institution. Research and information online at www.savetheconch.org

CHN CIC, 2003a. The history and socioeconomics of the queen conch fishery in Florida and the Caribbean. Conch Heritage Network Conch Information Center, "Conch in the Classroom", curriculum resources for teachers.

CHN CIC, 2003b. The geography, habitat and biology of the queen conch. Conch Heritage Network "Conch in the Classroom", curriculum resources for teachers. Online at www.savetheconch.org/classroom.html

CHN CIC, 2003b. The history and socioeconomics of the queen conch fishery in Florida and the Caribbean. Conch Heritage Network "Conch in the Classroom", curriculum resources for teachers. Online at www.savetheconch.org/classroom.html

CHN CIC, 2003c. Queen conch fisheries management and marine reserves. Conch Heritage Network "Conch in the Classroom", curriculum resources for teachers. Online at www.savetheconch.org/classroom.html

CHN CIC, 2003d. Queen conch aquaculture. Conch Heritage Network "Conch in the Classroom", curriculum resources for teachers. Online at www.savetheconch.org/classroom.html

CITES, 2003. Review of significant trade in specimens of Appendix-II species. Report of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Available online at www.cites.org/eng/resols/12/12-8.shtml

Conch News, 2003. Family Strombidae. Publication of Harbor Branch Oceanographic Institute, at www.oakhammockbooks.com/conchnews/ and following pages.

Creswell, L., and M. Davis. 1991. Queen conch: The well-bred queen of the Caribbean. *World Aquaculture*, 22 (1): 28-41.

DeJesus-Navarrete, Alberto. M. Dominguez-Viveros, A. Medina-Quej, and J.J. Oliva-Rivera, 2000. Crecimiento, mortalidad y reclutamiento del caracol *Strombus gigas* en Punta Gavilan, Quintana Roo, Mexico. *Ciencia Pesquera* #14.

Delgado, Gabriel, Claudine Bartels, Robert Glazer, Nancy Brown-Peterson, and Kevin McCarthy. 2004. Translocation as a strategy to rehabilitate the queen conch (*Strombus gigas*) population in the Florida Keys. *Fisheries Bulletin* 102, pp. 278-288

FWC Committee Report, 2000. Queen conch stock restoration. Florida Fish and Wildlife Conservation Commission.

Glazer, Robert. 2001. Queen Conch Restoration. Florida Marine Research Institute. Available online at www.floridamarine.org/features/view_article.asp?id=12509

Glazer, Robert. 2004. Comments received in the review of this report.

Glazer, R.A. and G.A. Delgado. In press. Towards a holistic strategy to managing Florida's queen conch (*Strombus gigas*) population. *Proceeding of the Gulf and Caribbean Fisheries Institute*.

GMFMC, 2004. Gulf of Mexico Fishery Management Council. www.gulfcouncil.org

HBOI, 2003. Breakthrough event in queen conch aquaculture. Publication of Harbor Branch Oceanographic Institution, Aquaculture Division, Ft. Pierce, FL. Available online at www.hboi.edu/news/features/queenconch.html

Hunt, John H., 2003. Florida Marine Research Institute. Personal communication with Alice Cascorbi, by phone, 10/28/2003.

MarineDepot, 2003. Captive-bred queen conch. Marine Depot Live (saltwater aquarium supplies), www.marinedepotlive.com/cabrquogil.html

MAFMC, 2004. Mid-Atlantic Fishery Management Council. www.mafmc.org

MCC, 2000. Maryland Conservation Council—Help Horseshoe Crabs, by Millie Kriemelmeyer. www.marylandconservationcouncil.net/v26n02.htm

Myers, Laura. 2003. First U.S. conch farm to replenish Key West conch. *Environmental News Network*, November 12, 2003. Online at www.enn.com/news/2003-11-12/s_10282.asp

NE FMC, 2004. New England Fishery Management Council. www.nefmc.org/

NJ SHG, 2004. New Jersey Symbols: Shell, Knobbed Whelk. www.statehousegirls.net/nj/symbols/shell

NMFS Stats, 2004. Domestic and international fisheries landings statistics, National Marine Fisheries Service.

NMFS OPR, 2003. Queen conch, *Strombus gigas*. NMFS Office of Protected Resources. Available online at www.nmfs.noaa.gov/prot_res/PR/queenconch.html

SAFMC, 2004. South Atlantic Fishery Management Council. www.safmc.net/

Shawl, Amber, Dave Jenkins, Megan Davis, and Kevan Main. 2003. Growth of fighting conch, *Strombus alatus*, in recirculating systems. Publication of Harbor Branch Oceanographic Institution, Aquaculture Division, Ft. Pierce, FL

Stoner, Allan. 1997. The status of queen conch *Strombus gigas* research in the Caribbean. *Marine Fisheries Review* 59 (3), pp.14-22.

Stoner, Allan and V.J. Sandt. 1992. Population structure, seasonal movements and feeding of queen conch *Strombus gigas*, in deep-water habitats of the Bahamas. *Bull. Mar. Sci.* 51(3):287-300].

Stoner, Allan, and Melody Ray-Culp. 2000. Evidence for Allee effects in an over-harvested marine gastropod: density-dependent mating and egg production. *Marine Ecology Progress Series* 202, pp. 297-302.

Tewfik, Alexander, Hector Guzman, and Gabriel Jacomez. 1995. Assessment of the queen conch *Strombus gigas* population in Cayos Cochinos, Honduras. Available online at <http://rbt.ots.ac.cr/revistas/suplemen/honduras/12tew2.htm>

Theile, Stephanie. 2001. Queen conch fisheries and their management in the Caribbean. TRAFFIC Europe, technical report to the CITES secretariat in completion of Contract A2000/01.

Theile, Stephanie. 2004. TRAFFIC Europe. Comments received in the review of this report.

TRAFFIC, 2003. Background to queen conch *Strombus gigas* and the significant trade process. TRAFFIC/IUCN, WWF. Online at www.traffic.org/news/queen_conch.html

USFWS, 2003. Queen Conch. Publication of U.S. Fish and Wildlife Service, International Affairs division. Available online at <http://international.fws.gov/queen%20conch/queen%20conch.html>

UMich, 2003. *Strombus gigas*. Animal Diversity Web, Online database of the University of Michigan. http://animaldiversity.ummz.umich.edu/site/accounts/information/Strombus_gigas.html

USFWS OLE, 2003a. Notice to the wildlife import/export community: trade restrictions on live and dead queen conch (*Strombus gigas*) parts and products. Publication of U.S. Fish and Wildlife Service, Office of Law Enforcement. Available online at www.le.fws.gov/PBQueenConchTradeRestrictions.htm

USFWS OLE, 2003b. Importing queen conch: what you need to know. Publication of U.S. Fish and Wildlife Service, Office of Law Enforcement. Available online at www.le.fws.gov/PBQueenConchTradeRestrictions.htm

Whitfield Jack, 2003. The legend of the conch. Whitfield Jack Jewelry, Key West, Florida. Online at www.jewelrygenius.com/legend.html

Woods Hole MBI, 2003. *Busycon carica* (knobbed whelk). Marine Organism Database, Woods Hole Marine Biological Laboratory, online at www.mbl.edu/marine_org/