

Understanding the ecology and social perceptions of commercially important fisheries for the development of long-term education and enforcement strategies to support sustainable fisheries in Bahamas and the Dominican Republic

by

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Historical account of the parrotfish and conch fisheries

Introduction

Coral reefs and other marine habitats, such as seagrasses and mangroves, are central to the livelihoods of coastal communities in the Caribbean, as they provide a physical buffer from waves, storms, and hurricanes. Also, there is a high ecological and functional connection between these three habitats, as most coral reef fish species display an ontogenetic shift at a particular life stage from shallow nursery biotopes (seagrass and mangroves) to deeper coral reefs. The structural complexity of seagrass and mangroves serve as refuge for fish recruits and juveniles, thus providing shelter against predators (Nagelkerken et al. 2001). Coral reef ecosystems are unique because they contain the highest biodiversity of organisms, similar to their land counterparts, rainforests. Functionally, they provide essential nutrients for the food chain such as nitrogen and help with nutrient recycling. Coral reefs are important economically, as they provide jobs and income to local economies through fishing, recreation, protection, and tourism. As stated by NOAA (<http://coralreef.noaa.gov/>), the estimated total global value of coral-reef based recreation and tourism is at \$9.6 billion of the total global net benefit of coral reefs. An example of how important coral reefs are to the local economy is the Great Barrier Reef in Australia. The Great Barrier Reef generates 1.5 billion dollars in revenue to Australian economy from fishing and tourism.

Over the past four decades, coral reefs in the Caribbean have changed dramatically (Hughes 1994, Jackson 1997). The abundance of reef-associated organisms, especially corals and fishes, have suffered massive declines. Hurricanes, white band disease, variation in life history traits and connectivity (Rogers et al. 1991; Hughes and Tanner 2000; Aronson and Precht 2001) have triggered the demise of these framework building species and has resulted in the onset of a shift in coral composition to brooding corals and/or what has been termed ‘weedy’ species (Green et al. 2008). The loss of reef-building corals has important ecological implications because weedy species have lower calcification rates and the dominance of these functional groups may further reduce carbonate production rates below ‘predeclined’ levels (Alvarez-Filip et al. 2013; Perry et al. 2013; 2015). While many reefs have been reduced to less desirable coral species, a vast majority have been destroyed and reduced to coral rubble.

Current declines in fish populations throughout the Caribbean have been associated with unregulated fishing and habitat degradation. Ecological extinction caused by overfishing precedes all anthropogenic disturbance to the coral ecosystems, including pollution (Jackson et al. 2001). Paddock et al. (2009) observed the annual rates of change in fish populations through time and found reef fish densities shifted from being positive or indistinguishable from zero to negative over five decades. Severe overfishing can drive species to ecological extinction and modify overall fish community interactions (Cushing 1988). The stability of fish communities relies heavily on the interaction between trophic groups, especially predators and prey (Bascompte et al. 2006). Fishing down the food web has led to fishery catches dominated by small-sized fishes (Pauly and Palomares 2005), and in most places of the Caribbean, fishers have shifted focus to the removal of apex predators (sharks and groupers). This has resulted in fishers targeting other functional groups, such as the parrotfishes.

Parrotfish (16 species in the Caribbean, see Appendix #) are one of the main herbivores on a reef, maintaining low algal abundance and thus facilitating coral growth and settlement. Sand produced by parrotfish replenishes beaches and creates habitats for benthic organisms, like worms

and crabs. A strong relationship was observed between human population densities and population structure of parrotfishes, with the greatest declines in large individuals and a high variation between the different species (Bellwood et al. 2012). Removal of these functionally important fishes has negatively affected habitat quality (Mumby 2014) and can directly impact coral accretion rates (Cramer et al. 2017).

Artisanal coral reef fishing has been the primary source of protein for many Caribbean coastal communities (Jackson 1997). Fisheries in the Caribbean provide a valuable income with annual net benefits estimated at USD \$395 million and over 300,000 employment opportunities (Agard et al. 2007, Burke et al. 2011). The most profitable and sought out fisheries in the Caribbean are the queen conch (*Lobatus gigas*) and spiny lobster (*Panulirus argus*) (Mumby et al. 2015). In The Bahamas, the Caribbean queen conch fishery is one of the most culturally and economically important species (Booker et al. 2013, Stoner et al. 2012). In the Dominican Republic, this fishery supports both local and, in the past, international markets. In the tropics, the conch fishery has been a small-scale and sustainable economic activity for coastal populations for centuries (Catarci 2004), however, by the mid-1970's, the conch fisheries have expanded into a large-scale commercial fishing (Theile 2005). As a result of the large-scale exportation and their dwindling numbers, queen conch has been listed as an endangered species in Appendix II of the Convention on International Trade in Endangered Species (CITES) (Daves and Fields 2004).

Queen conch is a large and valuable fishery in the Caribbean. Appeldoorn (1994) estimated that the economic value of queen conch in the Western Atlantic was close to \$40 million US. Queen conch is considered the most important resource in the Dominican Republic (Herrera et al. 2011). In 2014, conch landings in The Bahamas amounted to more than 600 tons, while more than 250 tons of conch meat was exported representing over 3.2 million dollars in revenues (See Appendices # for more information). The most recent publicly available data for the Dominican Republic suggest a similar landing and trading pattern as to that in the Bahamas, where in 2,000 stromboid conch landings amounted to approximately 350 tons worth over 850 thousand dollars. In the Bahamas, the queen conch fishery represents a supplementary income as they are fished year round, while the spiny lobster (*Panulirus argus*) fishery season is closed (April 1-July 31) (Catarci 2004). Comparably, the stromboid conch fishery is also a historically important resource for the Dominican Republic. However, in the Dominican Republic queen conch fishery was mainly for domestic consumption, and in a lesser degree for export (Theile 2001). As a result of the growing demand of domestic and international consumers, queen conch is being seriously overfished in the Dominican Republic (Theile 2001), which have lead Dominican fishers to poach conch outside the exclusive economic zone (EEZ), focusing much of the fishers' poaching efforts in the Bahamas. Unfortunately, the lax regulatory frameworks and law enforcement efforts in both countries further worsen the unsustainable extractions of these two commercial and ecologically essential species groups.

The Dominican Republic and The Bahamas are both unique cases, given the difference in demand of parrotfish consumption. Therefore, one would expect the parrotfish populations in the Bahamas to be healthier than the Dominican Republic. In the following sections we will review the current laws, regulations, and description of fishing activities in The Bahamas and Dominican Republic. Also, we will summarize the current status of conch and parrotfish populations in both countries and recommend management strategies.

Fisheries and Regulations

Bahamas

The Department of Marine Resources is responsible for the management and development of the fisheries in The Bahamas. In addition, the Department administers the fisheries and implements policies to promote the development of local fisheries, ensure the sustainable utilization of the fisheries resources for the benefit of the Bahamian people, and lastly improve the well-being and technical capabilities of the local fishers (See A Guide to Bahamian Fisheries Regulations). Specific fishing guidelines are highlighted in the “A Guide to Bahamian Fisheries Regulations.” In this handbook, there is a bag limit that includes 20 fish or 60 lbs of demersal/scale fish per boat per day. Only Nassau grouper is off-limits during the closed season. A fisher is allowed to land other groupers if it weighs more than three pounds, still has skin intact, and is not caught during the spawning aggregation period between December and February. It should be noted, that only native Bahamians are allowed to partake in commercial fishing activities, but this law is routinely broken. Enforcement is the responsibility of the Department of Marine Resources, Bahamas Defense Force, and the Royal Bahamas Police Force. The Bahamas National Trust manages areas that have been given restrictions, such as Marine Protected Areas.

In The Bahamas, the fisheries sector plays an important role in the economy by producing employment, local revenue, and a food supply. In 2012, given the export data provided by the department, the fishing industry had provided more than USD \$80 million in revenue from export earnings. The fishing industry has also provided more than 9,300 full-time employment for commercial fishers, and this does not include indirect job opportunities such as processing plants, vessel maintenance, etc. (FAO 2016). In the FAO (2016) report it was stated that the Bahamian fishing fleet is mainly characterized by small vessels, however, with the exception of the lobster fishing boats which can reach a size of 30 meters and smaller vessels do not need to register. Lobster, queen conch, groupers (*Epinephelus* and *Mycteroperca*), stone crabs (*Menippe mercenaria*) and snappers (*Lutjanus* spp.) have been the main fisheries in the landing and export data from 2003 to 2012. Gittens (2004) estimated that 95% of the fishers in the Bahamas target spiny lobsters.

Historically, there are no accounts of fishers landing parrotfish, and there is data supporting this all the way back until 1883 (Adderley 1883). Dr. Kenneth Broaden and Dr. James Sanchirico have extensively interviewed some fishers in The Bahamas, and on rare occasions, parrotfish had been mentioned. The parrotfish fishery is a relatively new fishery and unregulated for The Bahamas and there is no landings or export data collected by the Department of Marine Resources. However, in the new Coral Reef Report Card for The Bahamas (Dahlgren et al. 2016), low scores of large parrotfish were observed from Little Bahamas Bank and large parrotfish were absent at many sites in the Southern Bahamas. Interviews with fishers have alluded that parrotfish landings were primarily for baiting traps and not for local sale and consumption (Dahlgren pers comm). Therefore, the low scores of large parrotfish could be a result of an unregulated fishery targeting these species or due to bycatch.

Dominican Republic

The fishing industry in the Dominican Republic is considerably different from The Bahamas, as fishery activities are usually small-scale, artisanal, and do not contribute significantly to the local revenue. While in the Bahamas, the fishing industry is the third largest revenue (FAO 2009). In the Dominican Republic, the Central Bank estimated that the fisheries industry only counts for less than 1% of the gross domestic product (in Spanish PBI or product interno bruto, Silva pers comm). The fisheries sector annual production is 13,000 MT and imports account for more than 50% of the local fish consumption (Mateo Perez 2004). Around 10,000 fishers with a fleet of 3,750 boats operate in the Dominican Republic. Mateo Perez (2004) observed the most problematic issues in the fishing sector to be overfishing, inadequate monitoring, control and surveillance, lack of economic support for management, environmental degradation, lack of sustainable fishing techniques, lack of funds for adequate gear, storage and distribution of catch, and unregulated and unreported fishing.

As stated in the law 307-04, The Dominican Fisheries and Aquaculture Council (CODOPESCA) is responsible for regulating, developing, promoting, and monitoring activities and research of harvesting resources by aquaculture or extraction from biotic resources (fishing). Each fisher, whether artisanal or commercial, need to register their fishing products, boats, and fishing gear. A fishing license is good for two years. Fishing is only prohibited within 54 nautical miles from the coast, with the exception La Plata and Navidad banks. Fishing in these banks is only reserved for subsistence, artisanal, sport, and scientific fishing. These following species are regulated for harvest, spotted spiny lobster (*Panulirus gattatus*), green lobster (*Panulirus laevicauda*), stone lobster (*Scyllarides* sp.), spiny lobster (*Panulirus argus*), echinoderms, ornamental species, queen conch (*Lobatus gigas*). In article 57, it states that CODOPESCA will determine the limitation of capture or extraction of conch by size and/or weight of meat and breeding season. The weight and size of the conch has to be greater than 227 grams of meat and/or greater than 20 cm, from apex to siphonal channel of its shell. Juvenile conch is prohibited for capture.

Up until 2017, the harvesting of parrotfish has not been regulated and managed. In June 2017, the Ministry of the Environment and Natural Resources announced a decision to prohibit the harvesting of all species of sharks, parrotfishes, surgeonfish, and black long-spined sea urchin (*Diadema antillarum*), for up to two to five years, for the entire country. The impact of this regulation is unknown because, in the Dominican Republic, the parrotfish fishery is entirely different from that of The Bahamas, as parrotfishes are one of the primary groups of species targeted for consumption. Silva (1994) reported ten species of parrotfish that are targeted for consumption. As our team at the Institute for Socio-Ecological Research (ISER) spoke with fishers and consumers, the reasons why fishers target parrotfish for consumption is based on their tender meat and easy catch. The presence of adult (terminal phase) parrotfishes are rare on coastal coral reefs, as they are mainly targeted by artisanal fishers (Redondo unpublished). In Punta Cana, 57% of the fishes caught via artisanal fishing were parrotfishes (Nagie and Leib 2015). The species of parrotfish that Punta Cana fishers targeted were the stoplight, redband, red tail, and princess parrotfish. These species were caught with the use of a compressor and/or free diving. In trap fisheries, another study (Aquino and Infante 1994) found that 16% of the fish species caught were

from the Scaridae family. It has been reported that the intensive fishing of parrotfish species has changed their abundance, density, and size (Chiappone et al. 2000).

The fishing gear utilized in the Dominican Republic varies depending on the fishery. Lobsters are usually caught by traps, free diving, and/or with a compressor using hooks or harpoons. Reef and deep-sea fish are caught with the same fishing gear, handlines, traps, diving, longlines, and traps (Herrera et al. 2011). There is practically no information on the fishery of demersal fish catches, such as the Acanthuridae, Pomacentridae, Holocentridae, etc. Pelagic species (tuna, mahi, wahoo, etc.) are captured with the use of longlines, gillnets, trolling and live baiting with and without Fish Aggregating Devices (FADs).

Current status of conch

Dominican Republic

Queen conch play an important ecological role in structuring marine benthic communities (Torres 2003). *L. gigas* are usually found in sandy, seagrass, and coral reef habitats. They are reported to reside in mostly shallow-water habitats, however, they have been observed close to mesophotic reefs (30-50m, pers. observ.). Conch recruits inhabit sandy areas, where they burrow during the days and surface at night (Sandt and Stoner 1993). Conch then makes an ontogenic shift to deeper vegetative habitats once a juvenile stage is reached.

The exploitation of queen conch (*Lobatus gigas*) in the Dominican Republic originated with the Taino Indians, where they fished conch as a source of food and used their shell as tools and ceremonial items. The distribution of the smaller individuals in shallower waters, resulted in Taino Indians targeting juvenile conchs. Today, conch has become a staple in the Dominican Republic cuisine and by 2011, a total of 354,775 kg of conch were landed (CRFM 2013, see Table 1), and with the use of compressors and other advanced SCUBA equipment has led to the overexploitation of queen conch at a range of depths. Relative recent overfishing has been observed by the size difference of shells in prehistorical and modern middens (pile of conch shells), where prehistorical shells were significantly larger than contemporary ones (O’Dea et al. 2014). In the Dominican Republic, the sale and consumption of queen conch increased during the late 1990’s and have decreased slightly since then (Mateo and Tejada 2008). The demand for conch was observed in the field as Delgado (1999) reported a significant decline in conch abundance from 1996 to 1997, and this decrease continued until 2000 when it was last published.

Queen conch is consumed locally and plays a major role in the diet and culture of the Dominican Republic people. The annual closure for conch is from July 1st to October 31st of each year. The conch fishery in the Dominican Republic is disorganized and a large number of fishers are concentrated in a small area. The main fishing areas for conch are in La Altagarcia, Montecristi, Coastal provinces platform, and Pedernales, where most of the landings take place (Herrera et al. 2011). A large amount of conch is harvested illegally in the Bahamas and landed in Puerto Plata (CRFM 2013). In the Dominican Republic, fishers target conch in shallow-water habitats, principally in seagrass zones (Mateo and Tejada 2008). Juveniles and adults have been overexploited, and because of this export permits have been temporarily suspended to protect the species (UNEP-WCMC 2006). This fishery is completely artisanal and fishers harvest conch by free diving or diving with an air compressor.

Surveys have not regularly been conducted in the Dominican Republic. Quantitative assessments of queen conch in the Dominican Republic have been focused in only a few areas, Parque Nacional Jaragua (Appeldoorn 1993, Tejeda 1995ab, Vargas and Franco 1998, Posada et al. 1999, 2000) and Parque Nacional del Este (Torres and Sealey 2002ab, Mateo 2003). The densities of queen conch, both juveniles and adults

Table 1. The volume (kg) of *Lobatus gigas* captured at the different locations in the Dominican Republic for 2009, 2010, and 2011. (Source: CRFM 2013)

Province	Landing Site	2009	2010	2011
Azua	Puerto Viejo			7
Barahona	Punta Inglesa	313	62	27
Barahona	Caimán		292	74
Barahona	Guarocuya		3	66
Barahona	Los Coquitos		42	
Barahona	El cayo			2
El Seibó	Los mameyes	203	222	49
El Seibó	Rio yeguada			18
Hato Mayor	Sabana de la Mar	37.950		1.591
Hato Mayor	Las Cañitas			1.364
La Altagracia	Boca de Yuma	512	61	293
La Altagracia	Juanillo		1.033	1.474
La Altagracia	Cabeza de Toro			114
La Romana	La Caleta	1.816	2.837	1.669
La Romana	Bayahibe			9
Monte Cristi	El embarcadero	349		
Monte Cristi	Los japoneses	236	30	878
Monte Cristi	Playa de Buen Hombre	283	19	109
Monte Cristi	Playa mi Popa	8	68	3
Pedernales	El Can	6.590	4.698	4.457
Pedernales	Playa Cabo Rojo	631	147	525
Pedernales	Playa La Cueva	415	97	415
Pedernales	Playa Pedernales	6.948	2.955	15.062
Pedernales	Juancho		4.459	
Pedernales	Playa Trudillé	201	454	18
Puerto Plata	El Muelle de Luperón	13	81	2.731
Puerto Plata	Guzmán	6		
Puerto Plata	La Ensenada	400	465	39
Puerto Plata	Muelle de Puerto Plata	311.000	864	327.955
Puerto Plata	Playa El Castillo	65	1	
Puerto Plata	Punta Rusia	388	555	48
Puerto Plata	El pato		111	14
Peravia	Matanzas		15	14

San Cristóbal	Palenque			
Totales		368.327	19.571	359.023

at these two parks varied (see Table 1). Therefore, abundance assessments of queen conch are missing for most of the country, and this includes Samaná and Puerto Plata. In addition, there is no times series data available for any of the studied region, therefore making it difficult to estimate the current status of queen conch in the Dominican Republic. The most recent surveys were taken place in Jaragua National Park in 2002, where densities ranged between 83 and 798 conchs per transect, and 144 individuals per hectare in Barahona. A majority of these studies have agreed that the conch population is declining at most coastal areas (Theile 2001).

Table 2. Average density of queen conch by hectare in Eastern National Park (PNE) and Jaragua National Park (PNJ) (Source: Mateo and Tejada 2008)

Juveniles (PNE, 1996)	283	Delgado (1998)
Adults (PNE, 1996)	4.5	Delgado (1998)
Juveniles (PNE, 1997)	22.5	Delgado (1998)
Adults (PNE, 1997)	1.6	Delgado (1998)
Juveniles (PNE)	14.4	Torres & Sullivan-Sealy (2000)
Adults (PNE)	0.6	Torres & Sullivan-Sealy (2000)
Juveniles (PNJ)	53	Posada et al. (1999)
Adults (PNJ)	0.6	Posada et al. (1999)

In conclusion, the current abundance of queen conch along the coast of the Dominican Republic is understudied. The only area where conch has been studied are in the national parks, Eastern National Park and Jaragua National Park. The current abundance of conch at many locations is unknown or not reported, especially for Samaná and Puerto Plata. There needs to be a survey on the abundance and demographics on conch around the island. This will allow management officials to fully understand the stock of this important fishery.

Biological Surveys - Current Status of Parrotfishes

Caribbean-wide status of coral reef fish

The demand for seafood in the Caribbean is high, given that most populations live close to the coast. Burke et al. (2011) estimated that 70% of the coral reefs across the Caribbean are under threat of overfishing. As mentioned before, fishers have overexploited apex predators such as the large groupers and are now exploiting smaller fish predators (snappers) and grazers (parrotfishes). Parrotfishes have been targeted by fishers at many islands, due to its easy catch and distribution (close to the coast), while there are some countries (Bonaire, Cayman Islands, Bermuda, and Dominican Republic) which have undergone a ban on the fishing of parrotfish.

Overfishing is the overexploitation of a fish stock past acceptable levels. Stock assessments provide important information and aid in the management and conservation of a particular species.

Understanding the state of the stocks is a difficult task, given the amount of data that is needed. Multiple parameters need to be collected to fully understand a stock, including catch, abundance, and biological data. Therefore, a simple indicator would be essential to examine the overexploitation of reef fish in the Caribbean. Recently, Vallés and Oxenford (2015) produced an easy and useful tool to examine the fishing effects in the Caribbean. They found that individual parrotfish weight was the factor most sensitive to incremental changes in fishing pressure.

Parrotfish play an immensely important role in tropical ecosystems. They consume algae that otherwise would overgrow, smother, and limited available space for other benthic organisms, such as scleractinian corals. Each species of parrotfish has a particular functional role, which plays an important role in the herbivore-algal dynamics (Suchley et al. 2016). *Sparisoma*, with the exception of *S. viride* (bioeroders), are macroalgae browsers, removing fleshy macroalgae. While, *Scarus* species graze primarily on algal turfs (Burkpile and Hay 2011, Bonaldo et al. 2014, Adam et al. 2015 a, b), and *S. viride* bioerodes by grazing on coral. Given these differences, each of the species needs to be accounted for when understanding the algal dynamics on coral reefs.

During 2010 and 2011, Caribbean-wide surveys were conducted for a European Union project, called Future of Reefs in a Changing Environment (FORCE, grant 244161 of the FP7). Coral reef fish communities were surveyed in 10 countries: Antigua, Barbados, Belize, Bonaire, Curaçao, Dominican Republic, Honduras, Jamaica, St. Lucia, and St. Vincent and the Grenadines (Figure 1). Sites were selected using the “generate random points” tool of Hawth Tools program in ArcGIS 9.2 (ESRI 2009). Surveys were conducted at 85 forereefs and at 10-15 m depths with the exception of Honduras and Belize where assessments were carried out at 5-10 m and 15-20 m. Reef fishes were recorded while deploying transects, with cryptic and small benthic species recorded during a 10-15 minute search. In Honduras and Belize, fish abundance and individual sizes (total length to the nearest centimetre) were recorded in four 30 x 4 m (120 m²) transects. In the other countries, the size and abundance of fish were measured in four 10 x 4 m (40 m²) transects. All data were converted to biomass per unit area of reef (g m⁻²) using species-specific length-weight equations (Froese and Pauly 2005):

$$W=aTL^b$$

where W is the weight in grams, parameters a and b are species-specific constants (Froese and Pauly 2005), and TL is the total length in cm. For further analyses, fish were grouped into functional groups (sharing a feeding strategy) according to FishBase (available online) and Randall (1967). Parrotfishes are included in the scraper/excavator functional group. These data will be used as a baseline, as it includes countries with enforced regulations on fishing parrotfish (Bonaire) and countries without any regulations (Jamaica). The species-level average of individual parrotfish will be examined and compared with data collected in the Dominican Republic and the Bahamas.

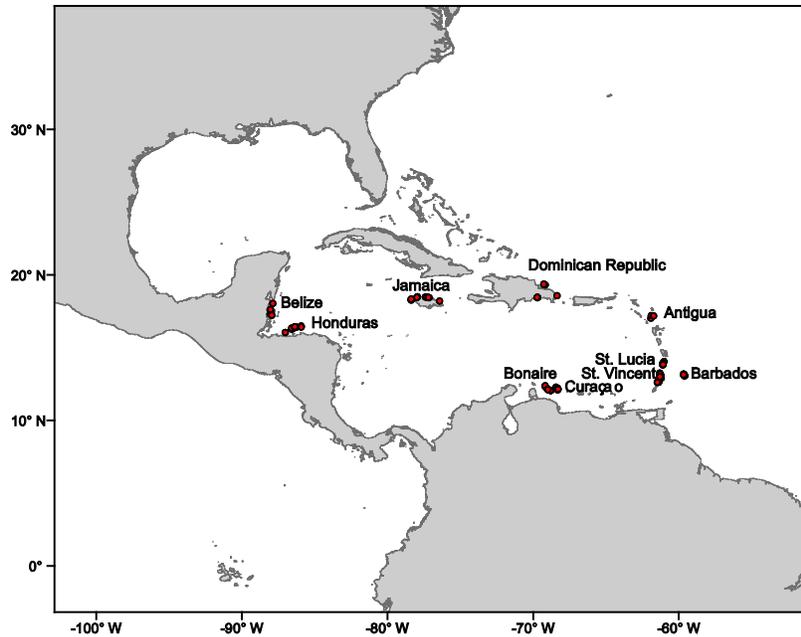


Figure 1. Map of study sites surveyed at 10 countries in the Caribbean for the Future of the Reefs in a Changing Climate (FORCE) project.

Total fish biomass ranged from 14.2 to 407.1 g m⁻² across all 85 *Orbicella* reefs. Approximately 22% of the total biomass (\pm SE) was composed of planktivores (22.3 ± 2.4 g m⁻²), followed by macroinvertebrates (21.5 ± 1.8 g m⁻²) and excavator/scrapers (20.2 ± 1.5 g m⁻²) (Fig. 5). Large schools (>140 g m⁻²) of *Chromis multilineata* (brown chromis), *Clepticus parrae* (creole wrasse) and *Haemulon vittata* (boga) were observed at sites in Bonaire, Curaçao, St. Lucia and St. Vincent and the Grenadines, and contributed to the high biomass of planktivores. Piscivores (10.4 ± 0.9 g m⁻²) comprised 10% of the total biomass, ranging from 3.1 ± 0.6 g m⁻² in Jamaica to 20.1 ± 9.0 g m⁻² in Belize (Fig. 8). The lowest mean biomass (\pm SE) of commercially important fish (excavator/scrapers, pisci-invertebrates, piscivores, and macroinvertebrates) was in Jamaica (22.0 ± 2.8 g m⁻²) and Dominican Republic (24.1 ± 4.3 g m⁻²), while Belize (117.1 ± 21.3 g m⁻²) and Bonaire (101.2 ± 8.9 g m⁻²) exhibited the highest biomass.

There was significant inter-country variation in fish assemblages, but only Bonaire, Jamaica, Belize and Honduras differed significantly in fish composition from the other countries (PERMANOVA, Pseudo-F=6.9, $p < 0.05$). In Bonaire, excavator/scrapers, planktivores and microinvertebrates contributed 57% to the variation in total fish community. Parrotfish biomass was the greatest in Bonaire, with an average of 49.3 ± 5.8 g m⁻². The dominant fish groups in Belize were excavator/scrapers, macroinvertebrates, and microinvertebrates, with a combined contribution of 59%, while in Honduras excavator/scrapers, microinvertebrates, and grazers were the dominant functional group (SIMPER, combined 57.4%). While in Jamaica, fish assemblages were characterized by excavator/scrapers (31.3% contribution), microinvertebrates (19.6%) and grazers (16.8%). The high similarity in fish assemblages between St. Lucia and St. Vincent and the Grenadines (PERMANOVA, $t=0.9$, $p=0.5$) was associated with the high biomass of planktivores, macroinvertebrates and microinvertebrates. Parrotfish is heavily fished in the Dominican Republic, Barbados, and Jamaica, thus explaining the low biomass recorded during

2011 (See Figure 2). Parrotfish biomass ranged from $8.0 \pm 1.0 \text{ g m}^{-2}$ in Jamaica to $9.8 \pm 2.2 \text{ g m}^{-2}$ in the Dominican Republic.

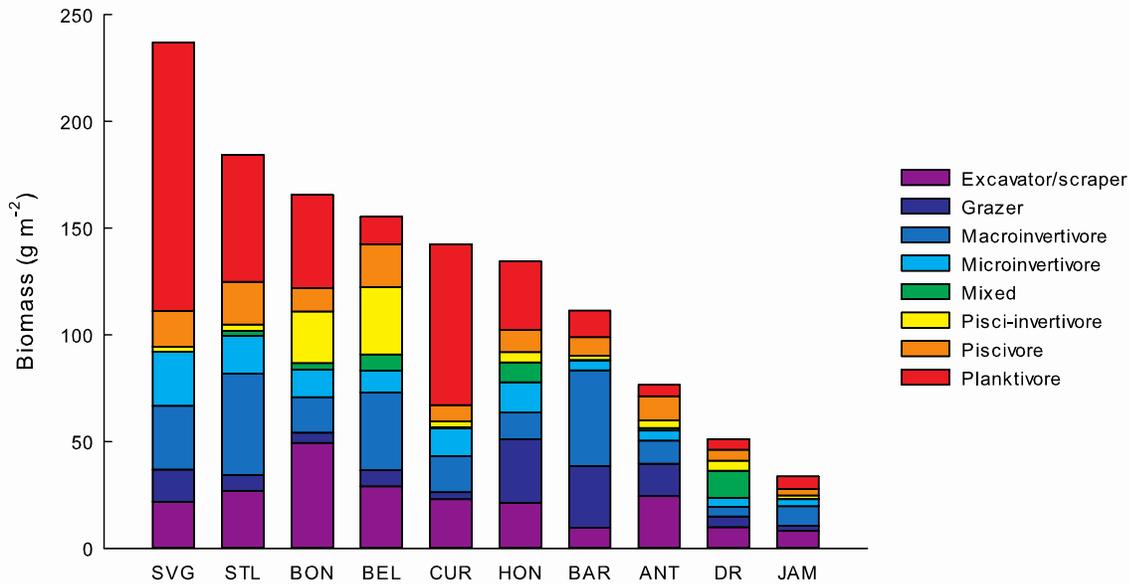


Figure 2. A detailed breakdown of the major functional groups of fish between 10 countries in the Caribbean. Data is presented from high to low total mean biomass (g m^{-2}). SVG: St. Vincent and Grenadines, STL: St. Lucia, BON: Bonaire, BEL: Belize, CUR: Curacao, HON: Honduras, BAR: Barbados, ANT: Antigua, DR: Dominican Republic, JAM: Jamaica

The consistently low biomass of top predators in this study is indicative of the occurrence of overfishing in the Caribbean. The overall fish biomass was lowest in Jamaica and Dominican Republic, both low-income countries that have relied heavily on marine resources as a major source of protein and income (Stoffle 2001; Hardt 2009). In contrast, fishing regulations such as restrictions of gear types, catch sizes and marine reserves have allowed for the relatively higher biomass of top predators in Belize and functionally important fish like parrotfishes on reefs in Bonaire.

The Bahamas

Coral reefs are a vital resource in the Bahamas, as they provide coastal protection to topographically-flat islands, and provide a livelihood and food supply for the people living throughout the islands. In 2016, Dahlgren and others produced a report card on the health of the coral reef ecosystems on Cay Sal Bank, Andros, the Southern Bahamas, New Providence and Rose Island, the Little Bahama Bank, Exuma Cays and Berry Islands. The health of the coral reefs was determined from the status of six indicators: benthic index, coral condition, reef structure, recruit density, large parrotfish density, and grouper index. Dr. Dahlgren and others study found that the

density of large parrotfish (>30cm) was fair, with the healthiest populations on The Exuma Cays and southern Berry Islands, both are marine protected areas. Parrotfish density ranged from ~0.6 Ind 100m⁻³ to close to 1.5 Ind 100m⁻³ on patch reefs and forereefs they ranged from ~0.1 Ind 100m⁻³ to ~2.5 Ind 100m⁻³. They also identified a positive relationship between the abundance of large parrotfish and coral recruits, and an inverse relationship with fleshy macroalgae. The overall conclusion of their study was that large parrotfish densities are still two to four times greater than other locations in the Caribbean. Another study, Roff et al. (2011) examined the corallivory of four species of parrotfish at Andros Island, Exuma Cays, and San Salvador in the Bahamas. In their study, the parrotfish biomass varied between the islands, ranging from 586.7 ± 186 g 120m⁻² at San Salvador to 1767.4 ± 658 g 120m⁻² in Exuma Cays. The community structure of parrotfish in the Bahamas was characterized by initial and terminal phases of *S. viride*, and terminal phase of *S. aurofrenatum*.

Current status of parrotfishes in Eleuthera, Bahamas

In August 2016, scientists from CEI and Perry Institute surveyed the fish populations at 39 sites along the coast of Eleuthera, The Bahamas (Figure 3). At each site, the abundance and size of fish were recorded 30 m x 2 m long belt transects. The number of transects performed at each site varied from four to 13. As mentioned above, all data were converted to biomass per unit area of the reef (g m⁻²) using species-specific length-weight equations (Froese and Pauly 2005):

$$W=aTL^b$$

where *W* is the weight in grams, parameters *a* and *b* are species-specific constants (Froese and Pauly 2005), and *TL* is the total length in cm.

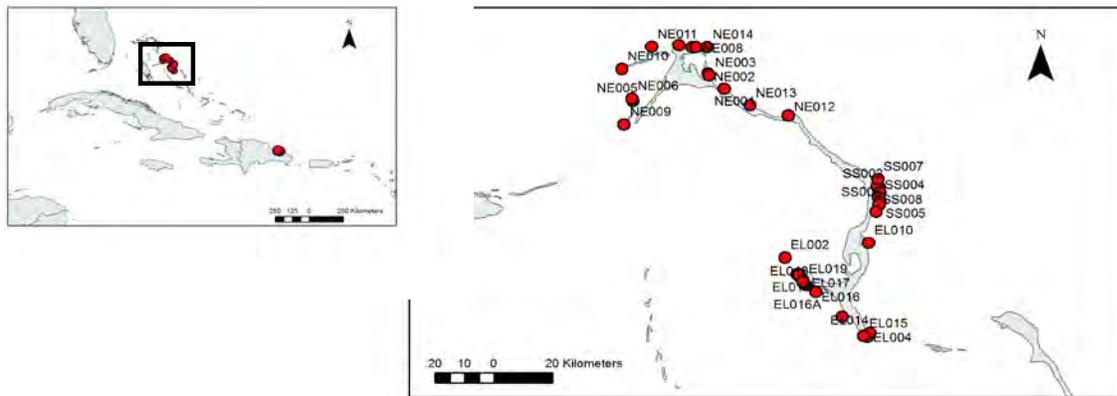


Figure 3. A map of the sites surveyed in Eleuthera, Bahamas.

Total parrotfish density and biomass

There were 11 parrotfish species identified and recorded in Eleuthera, Bahamas. This species count includes rare species for the Caribbean, such as *Scarus coelestinus* (midnight), *Scarus coeruleus* (blue), and *Scarus guacamaia* (rainbow). The overall mean density (Ind 100m⁻² ± SE) of parrotfish in Eleuthera was 15.8 ± 1.2 Ind 100m⁻² and the average biomass was 1,223.2 ± 133.1 g 100m⁻². Parrotfish density and biomass significantly varied among regions but did not differ between sites within the regions (Table 3). Southern Eleuthera (EL) had the highest overall abundance and biomass of parrotfishes, 28.3 ± 2.2 Ind 100m⁻² and 1,598.6 ± g 100m⁻², respectively (Figure 4). While, in northern Eleuthera (NE) parrotfishes were absent at the majority of sites (9 out of 14 sites), and the biomass was significantly low compared to the other regions, 402.8 ± g 100m⁻².

Table 3. A Permutational Multivariate Analysis of Variance (PERMANOVA) tests assessing the total parrotfish density (Ind 100m⁻²) and biomass (g 100m⁻²) in Eleuthera, The Bahamas. Region (Re) was considered a fixed factor while site (Si) was random and nested in region. PERMANOVAs were performed with Euclidean similarity index, given that the data were univariate.

Density	df	SS	MS	Pseudo-F	p-value
Re	2	7.91E+07	3.96E+07	6.8828	0.003
Si(Re)	36	2.04E+08	5.67E+06	1.436	0.077
Res	213	8.41E+08	3.95E+06		
Total	251	1.12E+09			
Biomass	df	SS	MS	Pseudo-F	p-value
Re	2	7.91E+07	3.96E+07	6.8828	0.005
Si(Re)	36	2.04E+08	5.67E+06	1.436	0.058
Res	213	8.41E+08	3.95E+06		
Total	251	1.12E+09			

As shown in Figure 5, the biomass and density of parrotfish varied among sites within the different regions. In the northern region, parrotfish average density ranged from 0 Ind 100m⁻² to 9.2 ± 5.0 Ind 100m⁻² (NE001), and biomass from 0 to 2854.7 ± 2,811.3 g 100m⁻² at NE004. Five *S. coelestinus* (midnight parrotfish) contributed to the high biomass at NE004. As for the central region of Eleuthera parrotfish densities ranged from 5.9 ± 1.4 Ind 100m⁻² at SS005 to 20.65 ± 6.8 Ind 100m⁻² at SS008, and biomass ranged from 505 ± 297.9 g 100m⁻² to 3603.1 ± 1792.1 g 100m⁻². Parrotfish densities deviated greatly among sites in southern Eleuthera. The density ranged from 12.3 ± 3.4 Ind 100m⁻² at EL010 to 60.9 ± 3.5 Ind 100m⁻² at EL018 and biomass ranged from 464.8 ± 127.1 g 100m⁻² at EL015 to 4880 ± 937.3 g 100m⁻² at EL018.

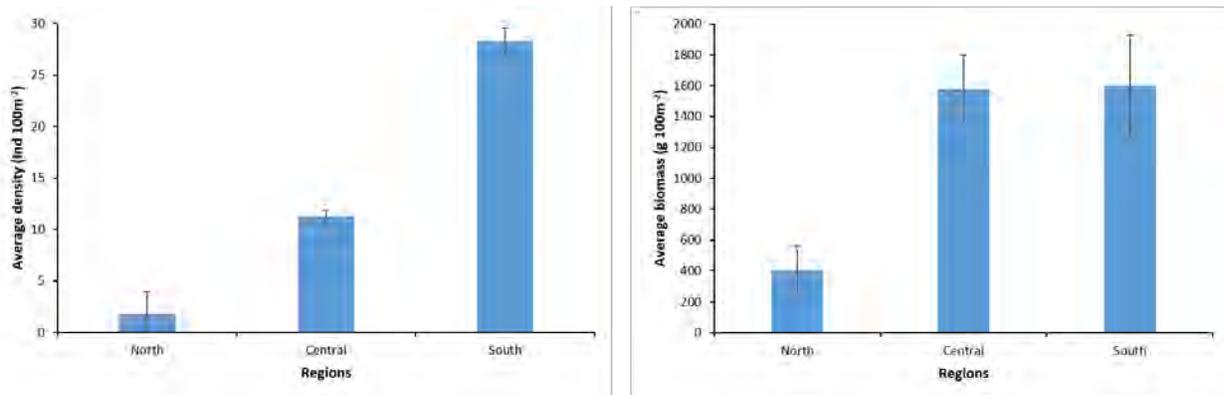


Figure 4. The average density (Ind 100m⁻²) and biomass (g 100m⁻²) of parrotfish between regions in Eleuthera, Bahamas. The bars denote standard errors.

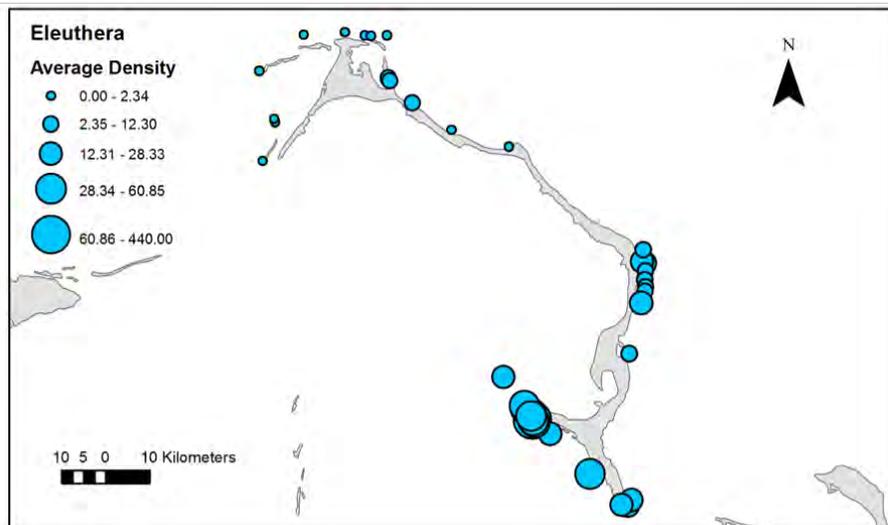
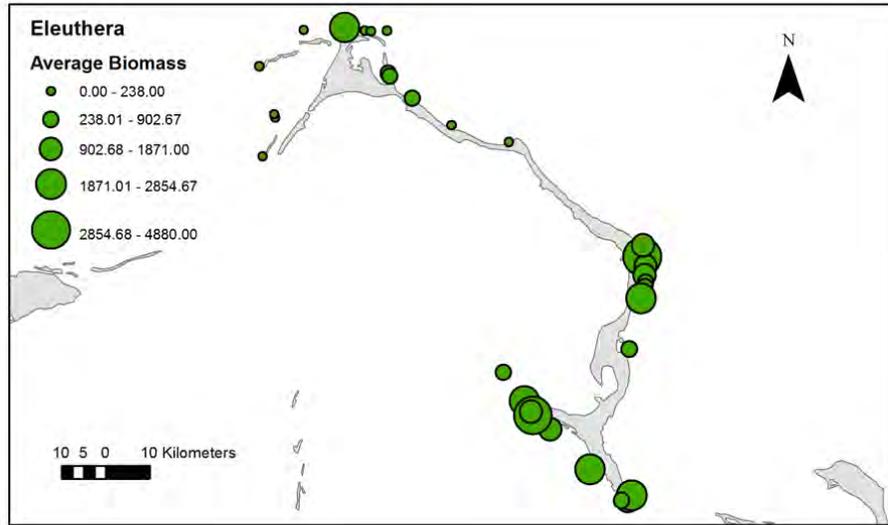


Figure 5. Average density (Ind 100m⁻²) and biomass (g 100m⁻²) of parrotfish at each site in Eleuthera, Bahamas. The size of the bubbles represent the density ranges labeled in the legend.

Parrotfish species-specific data

The species with the highest density was *Scarus iseri* (striped, 6.4 ± 0.7 Ind 100m⁻²), followed by *Scarus taeniopterus* (princess, 2.5 ± 0.2 Ind 100m⁻²) and *Sparisoma aurofrenatum* (redband, 2.3 ± 0.1 Ind 100m⁻²). The densities and biomass of the parrotfish assemblage significantly differed between regions and sites within each of the regions (Table 4). As shown in Figure 6, the abundance of species and the contribution of the different species to the total parrotfish density varied between regions. In the north, *S. iseri* and *Scarus coeruleus* contributed 96% of the total densities (SIMPER), while in the central and southern region, the contribution diversified among species (Figure 6). *Sparisoma viride* (stoplight), *S. iseri*, *Sparisoma rubripinne* (yellowtail), *Scarus vetula* (queen), and *Scarus guacamaia* contributed 93% of the total densities

in the middle, while *S. iseri*, *S. viride*, *S. taeniopterus*, and *S. aurofrenatum* contributed 91% to the total density in the south (SIMPER).

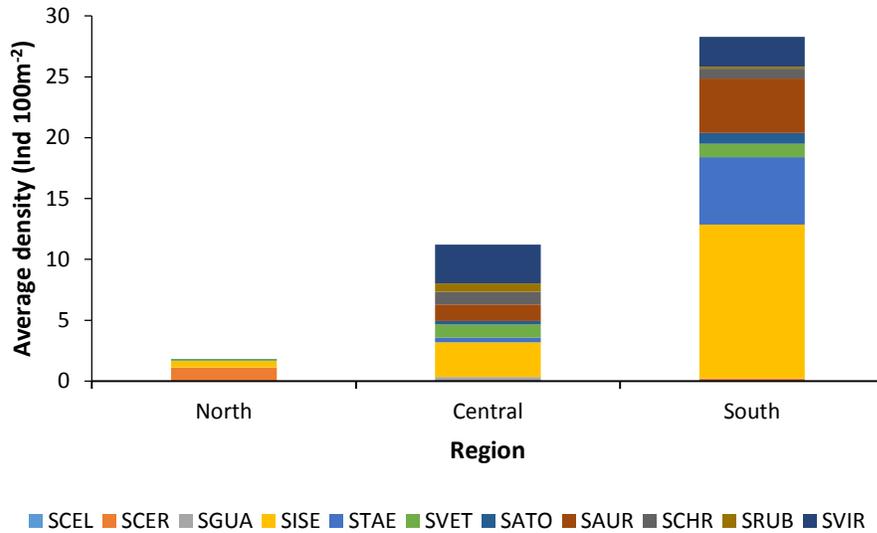


Figure 6. The average densities (Ind 100m⁻²) and biomass of parrotfish species at the regions in Eleuthera, Bahamas. SCEL: *Scarus coelestinus*, SCER: *Scarus coeruleus*, SGUA: *Scarus guacamaia*, SISE: *Scarus iseri*, STAE: *Scarus taeniopterus*, SVET: *Scarus vetula*, SATE: *Scarus taeniopterus*, SVET: *Scarus vetula*, SATO: *Sparisoma atomarium*, SAUR: *Sparisoma aurofrenatum*, SCHR: *Sparisoma chrysopterus*, SRUB: *Sparisoma rubripinne*, SVIR: *Sparisoma viride*.

Table 4. A Permutational Multivariate Analysis of Variance (PERMANOVA) tests assessing the density (Ind 100m⁻²) and biomass (g 100m⁻²) of parrotfish assemblages in Eleuthera, The Bahamas. Region (Re) was considered a fixed factor while site (Si) was random and nested in region. PERMANOVAs were ran with Bray-Curtis similarity index, given that the data were univariate.

Density	df	SS	MS	Pseudo-F	p-value
Re	2	5.37E+04	2.68E+04	6.1859	0.001
Si(Re)	27	1.29E+05	4.78E+03	1.5881	0.001
Res	149	4.49E+05	3.01E+03		
Total	178	6.40E+05			
Biomass	df	SS	MS	Pseudo-F	p-value
Re	2	5.12E+04	2.56E+04	6.0018	0.001
Si(Re)	27	1.28E+05	4.72E+03	1.5845	0.001
Res	146	4.35E+05	2.98E+03		
Total	175	6.22E+05			

Biomass

The species with the highest biomass was *S. viridis* ($782.8 \pm \text{g } 100\text{m}^{-2}$), followed by *S. vetula* ($327.3 \pm 20.6 \text{ g } 100\text{m}^{-2}$) and *S. iseri* ($301.2 \pm 19.0 \text{ g } 100\text{m}^{-2}$). The biomass of the different species of parrotfish significantly differed between regions and sites within each of the regions (Table 4). As shown in Figure 7, the abundance of species and the contribution of the different species to the total parrotfish biomass varied between regions. In the north, *S. iseri* contributed 93% of the total biomass (SIMPER), while in the central and southern region, the contribution diversified among species (Figure 7). *Sparisoma viride* (stoplight), *S. iseri*, *S. rubripinne*, *Scarus vetula* (queen), and *Scarus guacamaia* contributed 92% of the total biomass in the central, while *S. iseri*, *S. viride*, *S. taeniopterus*, and *S. aurofrenatum* contributed 91% to the total density in the south (SIMPER).

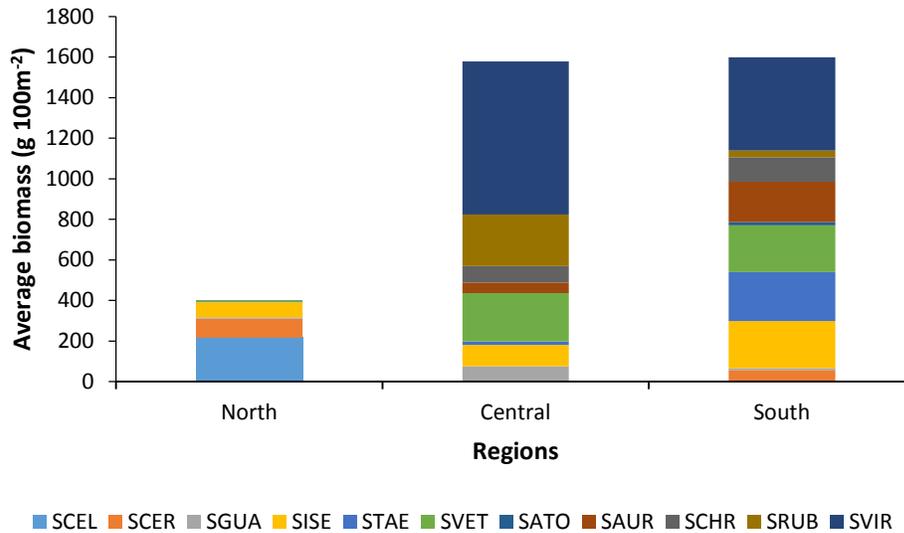


Figure 7. The average biomass ($\text{g } 100\text{m}^{-2}$) of parrotfish species at the regions in Eleuthera, Bahamas. SCEL: *Scarus coelestinus*, SCER: *Scarus coeruleus*, SGUA: *Scarus guacamaia*, SISE: *Scarus iseri*, STAE: *Scarus taeniopterus*, SVET: *Scarus vetula*, SATO: *Sparisoma atomarium*, SAUR: *Sparisoma aurofrenatum*, SCHR: *Sparisoma chrysopterus*, SRUB: *Sparisoma rubripinne*, SVIR: *Sparisoma viride*.

The Dominican Republic

As we spoke to representatives from CODOPESCA, the main challenge of managing and regulating a species is the lack of standardized time series data on fishery landings. Therefore, the numbers given below are liberal and should be taken with caution. CODOPESCA has collated some general information about the landings of parrotfish country-wide, by provinces, and by fishing method for the year 2014 and 2015. Country-wide, 47,984 kg of parrotfish were landed during the year 2014; this decreased substantially during 2015 with 17,900 kg. Looking at the overall landings, 22% of the fish caught was parrotfish in 2014, and in 2015, 36%. In 2014-15, fishers caught more parrotfish using nets, and parrotfish biomass were greater when the methods

of nets and diving (compressor) were carried out. The amount and biomass of parrotfish caught varied between provinces, however this could depend on the number of fishers surveyed in each area. The greatest landings of parrotfish during 2014-15 occurred in Barahona (maximum 4,255 kg), Romana (22,034 kg), and Pedernales (10,561 kg). As of 2014, 433 kg of parrotfish landings were recorded for Samana, and 1,238 kg for Puerto Plata, no data were collected in 2015.

There have been a couple of unpublished scientific studies conducted on the north coast of the Dominican Republic (Steneck and Torres 2015, Redondo unpublished). As reported in Steneck and others study, fishing pressure on the Dominican coral reefs is high. Fishers are directly targeting parrotfish, most likely as a result of the loss of other commercially important fisheries. In this study they assessed the coral reef status of nine sites around the Dominican Republic. In this study the biomass and abundance of scarids varied among the sites surveyed. The scarid biomass was greater in Las Galeras and Monti Cristi than the other sites surveyed (Punta Cana, Placencia). In addition, they observed a positive relationship between Scarid abundance and juvenile coral density. Thus, supporting the importance of parrotfish on coral reefs.

In 2009, Redondo (unpublished) assessed the variation in abundance and composition of valued species of fish in Los Cabezos reef in the Sosua Marine Sanctuary. He then repeated the surveys in 2013. The parrotfish abundance differed between the two years, with an increase from 2009 to 2013, 44 to 114 individuals, respectively. The most abundant species along the transects during 2013 were *S. aurorenatum*, *Scarus taniopterus*, and *S. inserti*. Indicators of fishing impacts were evident as the parrotfish composition in Sosua were mainly composed of initial and juvenile phases. Adult parrotfish were rare.

Current status of parrotfish status in Samaná, Dominican Republic

In September 2015, a team of scientists from the Atlantic Gulf Rapid Reef Assessment (AGRRA), surveyed 12 coral reefs (Figure 8) within the bay of Samaná, Dominican Republic. At each site, fish were surveyed within 10, 30 m x 2 m belt transects, with a total survey area of 600 square meters for each reef. Fish biomass was calculated by the equation given in previous sections.

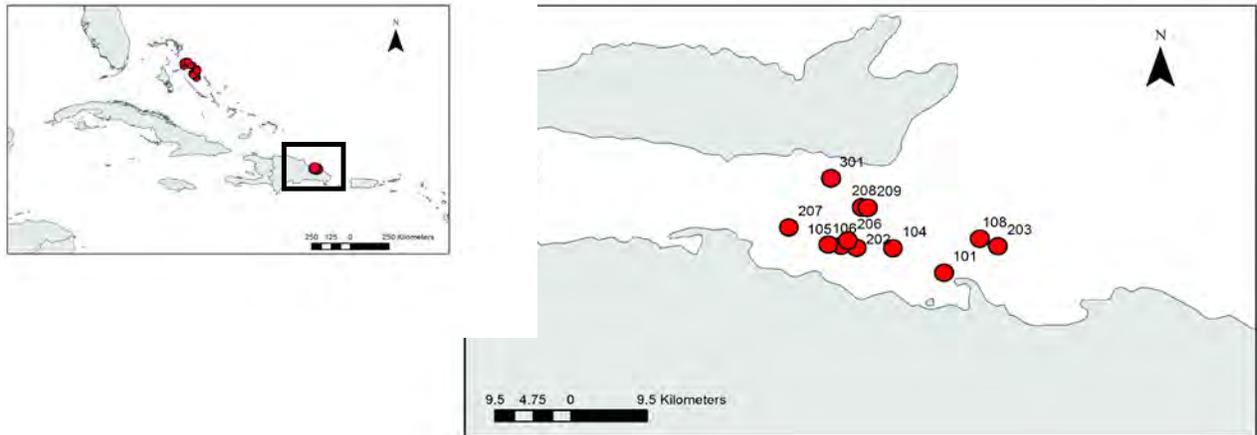


Figure 8. A map of the sites surveyed using Atlantic Gulf Rapid Reef Assessment in Samaná, Dominican Republic.

Total parrotfish density and biomass

Eight species of parrotfish were identified and recorded in Samaná, Dominican Republic. Rare parrotfish species for the Caribbean, such as *Scarus coelestinus* (midnight), *Scarus coeruleus* (blue), and *Scarus guacamaia* (rainbow) were absent during the AGRRA surveys. The overall mean density ($\text{Ind } 100\text{m}^{-2} \pm \text{SE}$) of parrotfish in Samaná was $22.8 \pm 1.7 \text{ Ind } 100\text{m}^{-2}$ and the average biomass was $1,507.5 \pm 144.4 \text{ g } 100\text{m}^{-2}$. Parrotfish density and biomass significantly varied among sites (Table 5, Figure 9). Site 105 had the highest overall abundance ($28.3 \pm 2.2 \text{ Ind } 100\text{m}^{-2}$) and Site 209 had the highest biomass with $2,178.1 \pm 768.4 \text{ g } 100\text{m}^{-2}$, respectively (Figure 9). While, Site 108, had the lowest density of parrotfish (4.2 ± 1.1) $\text{Ind } 100\text{m}^{-2}$, and Site 207 exhibited the lowest biomass of parrotfish with $320.7 \pm 97.7 \text{ g } 100\text{m}^{-2}$.

Table 5. The parrotfish density ($\text{Ind } 100\text{m}^{-2}$) and biomass ($\text{g } 100\text{m}^{-2}$) in Samaná, Dominican Republic. Site (Si) was fixed factor. PERMANOVAs were performed with Euclidean similarity index, given that the data were univariate.

Density	df	SS	MS	Pseudo-F	p-value
Si	11	17076	1552.4	7.527	0.001
Res	106	21862	206.24		
Total	117	38938			
Biomass	df	SS	MS	Pseudo-F	p-value
Si	11	5.57E+07	5.06E+06	2.3135	0.014
Res	106	2.32E+08	2.19E+06		
Total	117	2.88E+08			

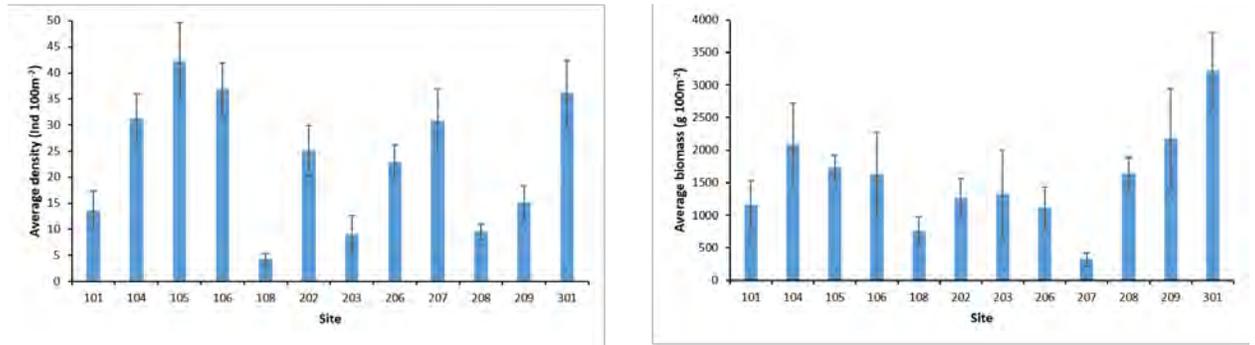


Figure 9. The average density (Ind 100m⁻²) and biomass (g 100m⁻²) of parrotfish between sites in Samaná, Dominican Republic. The bars denote standard errors.

Parrotfish species-specific data

The species with the highest density was *Scarus iseri* (striped, 18.6 ± 1.7 Ind 100m⁻²), followed by *Sparisoma aurofrenatum* (redband, 1.8 ± 0.3 Ind 100m⁻²), and *Sparisoma viride* (stoplight, 1.7 ± 0.2 Ind 100m⁻²). The densities and biomass of the parrotfish assemblage significantly differed between the sites (Table 6). However, what is a recurrent pattern between the sites is the high percent contribution of *S. iseri* to the overall densities (Figure 10). For an example, at Site 105, the site with the highest density was mostly comprised of *S. iseri* (97.6% contribution, SIMPER). Site 208 and 209 more species of parrotfish contributed to the overall density of the sites, even if it was low.

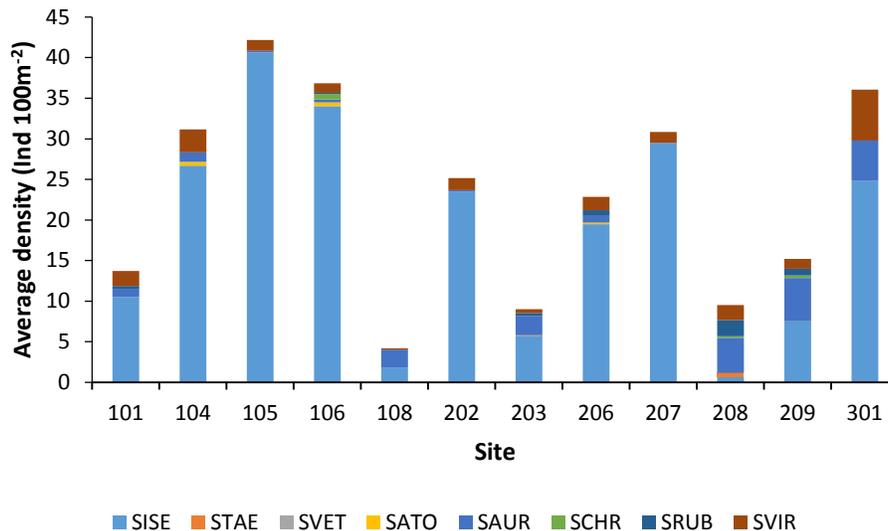


Figure 10. The average densities (Ind 100m⁻²) and biomass of parrotfish species at the sites in Samaná, Dominican Republic. SISE: *Scarus iseri*, STAE: *Scarus taeniopterus*, SVET: *Scarus vetula*, SATO: *Sparisoma atomarium*, SAUR: *Sparisoma aurofrenatum*, SCHR: *Sparisoma chrysopterus*, SRUB: *Sparisoma rubripinne*, SVIR: *Sparisoma viride*.

Table 6. A Permutational Multivariate Analysis of Variance (PERMANOVA) tests assessing the density (Ind 100m⁻²) and biomass (g 100m⁻²) of parrotfish assemblages in Samaná, Dominican Republic. Site (Si) was a fixed factor. PERMANOVAs were ran with Bray-Curtis similarity index, given that the data were univariate.

Density	df	SS	MS	Pseudo-F	p-value
Si	11	1.15E+05	10424	6.811	0.001
Res	104	1.59E+05	1530.4		
Total	115	2.74E+05			
Biomass	df	SS	MS	Pseudo-F	p-value
Si	11	1.04E+05	9469.7	4.0924	0.001
Res	103	2.38E+05	2314		
Total	114	3.43E+05			

Biomass

The species with the highest biomass was *S. viridis* (826.2 ± 94.7 g 100m⁻²), followed by *S. aurofrenatum* (320.6 ± 59.5 g 100m⁻²) and *S. viride* (345.7 ± 41.9 g 100m⁻²). The biomass of the different species of parrotfish significantly differed between regions and sites within each of the regions (Table 7). As shown in Figure 11, the abundance of species and the contribution of the different species to the total parrotfish density varied between sites. As shown in Figure 10 and 11, there was a high abundance of small princess parrotfish, while redband and stoplight parrotfish were slightly larger in size.

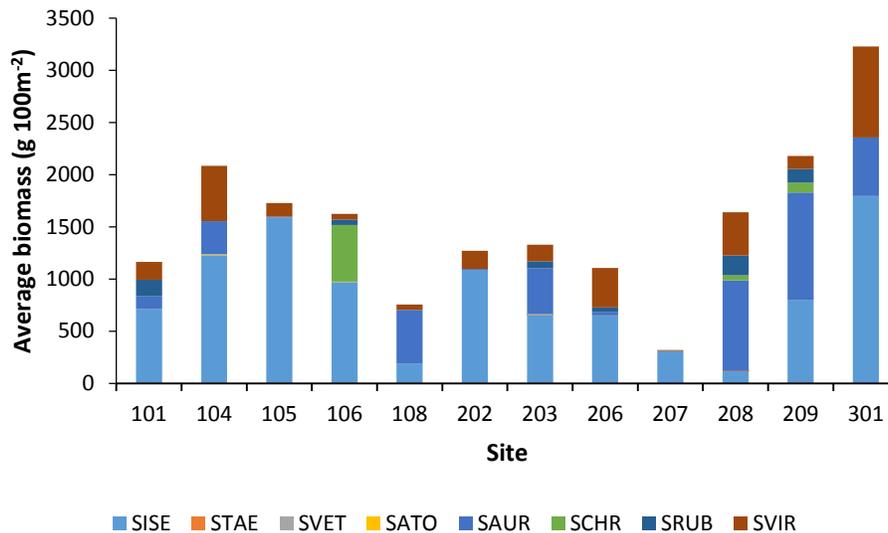


Figure 11. The average biomass (g 100m⁻²) of parrotfish species at the sites in Samaná, Dominican Republic. SISE: *Scarus iseri*, STAE: *Scarus taeniopterus*, SVET: *Scarus vetula*, SATO: *Sparisoma atomarium*, SAUR: *Sparisoma aurofrenatum*, SCHR: *Sparisoma chrysopterus*, SRUB: *Sparisoma rubripinne*, SVIR: *Sparisoma viride*.

Social Surveys

Three different survey instruments were completed for different audiences: 1) Consumers, 2) Fishers, and 3) Fisheries Managers. A preliminary design of the community-based campaign for The Bahamas and the Dominican Republic was created with the data obtained from the social surveys. A total of 31 fisher and 36 consumer surveys were collected in Eleuthera, Bahamas. While in the Dominican Republic, 17 and 37 fishers and 46 and 43 consumer surveys were collected for Puerto Plata and Samaná, respectively. In addition to the survey instruments mentioned above, our team also conducted six expert interviews in the Dominican Republic. These included Jeannette Mateo, Director of Fisheries Resources, at the Dominican Republic Fishing Counsel (CODOPESCA); José Infante, Director of Department of Fisheries, CODOPESCA, Solomón Pérez, CODOPESCA Inspector at Puerto Plata; Miguel Silva, Coordinator of Samaná Bay Seascape - Dominican Republic, The Nature Conservancy; Manuel Alejandro de Jesús Rodríguez Redondo, Viceministry of Marine and Coastal Resources; and Jesús Peralta, President of the Fishers Association El Buen Samaritano, from Sánchez, Dominican Republic. In the Bahamas, expert interviews were conducted with Dr. Craig Dahlgren, the Managing Director for the Bahamas National Trust, Denny Rankin, a Fisheries Officer for the Department of Marine Resources in Eleuthera, Krista Sherman a PhD student from the University of Exeter in the United Kingdom, and Lindy Knowles a Senior Science Officer for the Bahamas National Trust.

Once the surveys were completed by our partners and volunteers on the ground, ISER personnel analyzed all research data and provided summaries and recommendations to all partners to move forward with the next steps in the campaign design process. The results from the surveys were transposed onto an Excel database for the three sites and were summarized results to gather feedback from partners' feedback. Data collected was shared with our partners on the ground and additional collaborators, such as Felicity Burrows from The Nature Conservancy and Dr. Craig Dahlgren from the Perry Institute.

Summary of Fisher and Consumer surveys

The following graphs summarize the most relevant data guiding our campaign direction in order to be most effective and culturally sensitive. This snapshot includes fishing trends, consumption trends, and parrotfish specific information. As seen in Figure 12, most of the fishers interviewed for this project were full-time fishers, with the exception in Puerto Plata, Dominican Republic. More than half of the fisher's income comes from fishing, however more than half of fishers have other occupations (Figure 13).

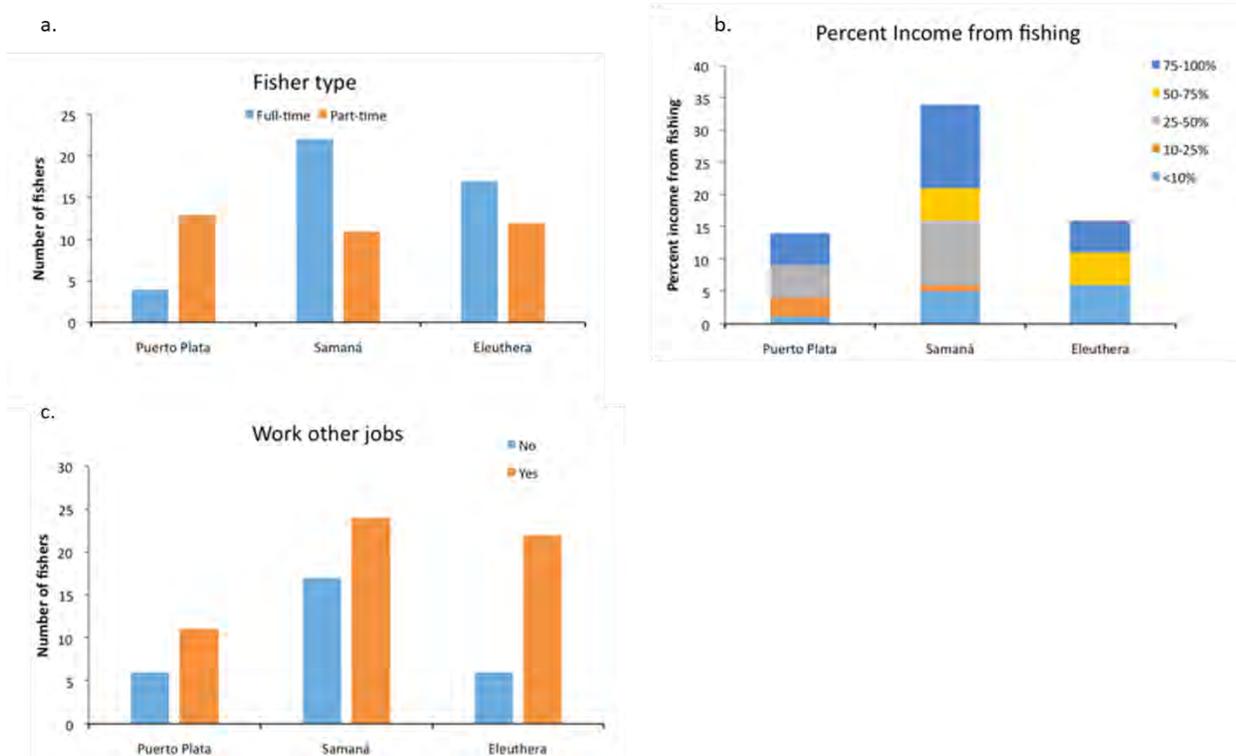


Figure 12. The form of employment (a), percent income from fishing (b), and other type of occupation for fishers in Puerto Plata and Samaná in the Dominican Republic and Eleuthera, The Bahamas.

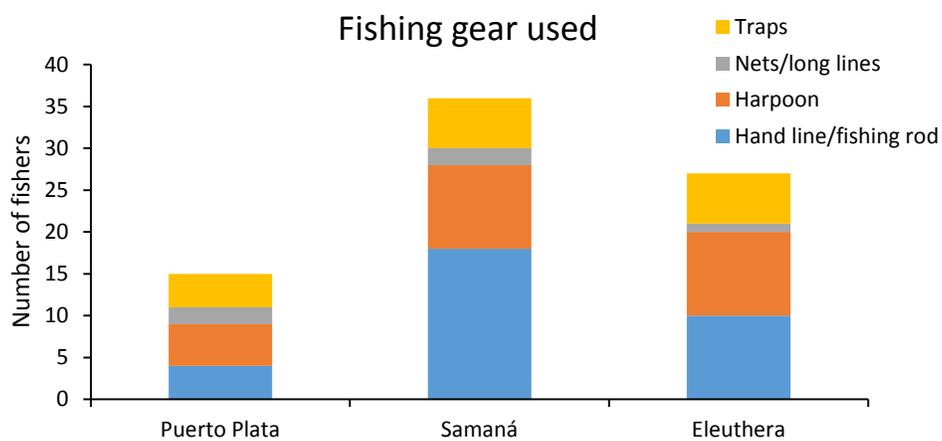


Figure 13. The fishing gear used by fishers in Puerto Plata and Samaná in the Dominican Republic and Eleuthera, The Bahamas.

There were four main types of fishing gear used at all three sites, and these include traps, nets/long lines, harpoon, and handline/fishing rod (Figure 13). In all three sites, handlines/fishing rod was the most frequent fishing method, followed by harpoon. Most of the fish groups overlapped between the three sites (Figure 14). However, parrotfish was the fish group which defined the differences between Eleuthera and the Dominican Republic. The four main seafood landed in Eleuthera were grouper, snapper, lobster, and conch. While, in the Dominican Republic, especially Puerto Plata, parrotfishes were one of the main fish targeted (Figure 14). Parrotfish were mentioned as a targeted species only by two fishers (Figure 15) in Eleuthera. In Eleuthera, fishers (40%) caught the parrotfish as bycatch. As seen in Figure 15, most of the fishers in Eleuthera catch parrotfish by traps.

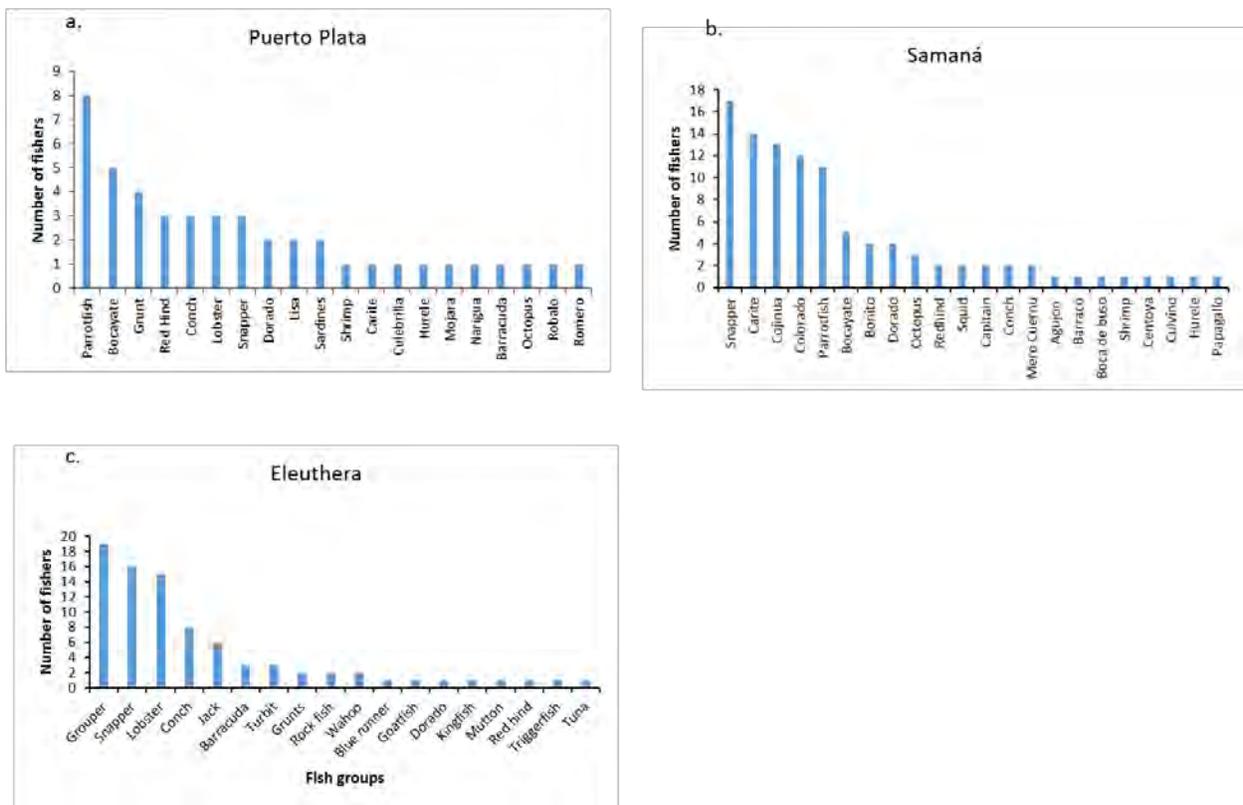


Figure 14. The main seafood groups targeted by fishers in Puerto Plata and Samaná in the Dominican Republic and Eleuthera, The Bahamas.

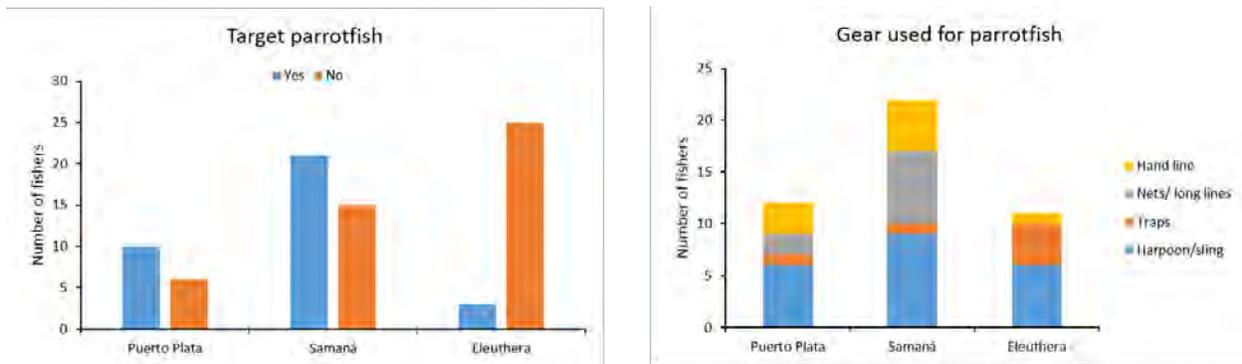


Figure 15. The number of fishers that target parrotfish (left) and the type of gear used to catch parrotfish (right) in Puerto Plata and Samaná in the Dominican Republic and Eleuthera, The Bahamas.

As shown in Figure 16, there is a stark difference in who eats parrotfish between the Dominican Republic and The Bahamas. The demand for parrotfish in the Dominican Republic is much higher than in Eleuthera, The Bahamas and this is evidenced in Figure 16. Most of the consumers and fishers interviewed in the Dominican Republic said they eat parrotfish. In contrast, many of the consumers interviewed in Eleuthera said they did not eat parrotfish or did not know of parrotfishes. The places of parrotfish sales varied between the countries and between the sites in the Dominican Republic. In Samaná, most of the parrotfish sold were in fish markets and at the landing sites (dock or beach) (Figure 17), while, in Puerto Plata places of sale varied, thus parrotfishes were mostly sold in restaurants and markets. In Eleuthera, parrotfishes were sold at landing sites (dock or the beach).

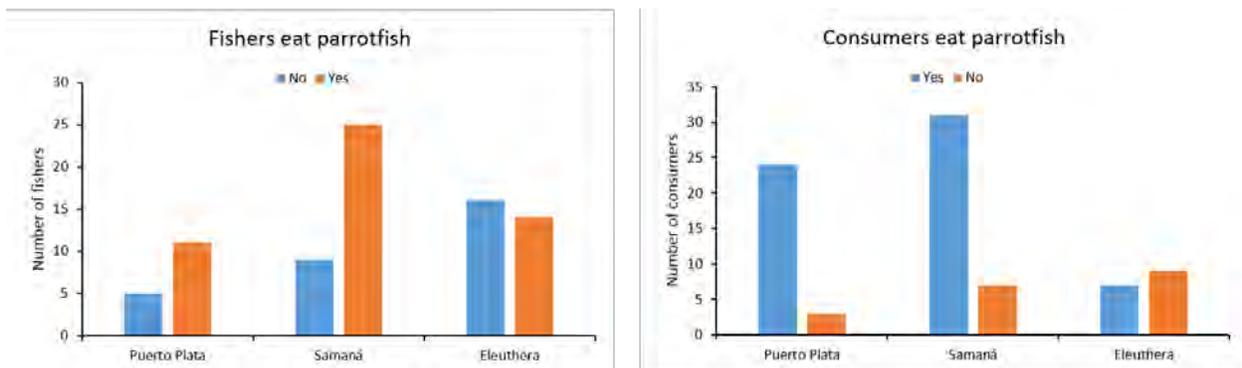


Figure 16. The number of fishers (left) and consumers (right) that eat parrotfish in Puerto Plata and Samaná in the Dominican Republic and Eleuthera, The Bahamas.

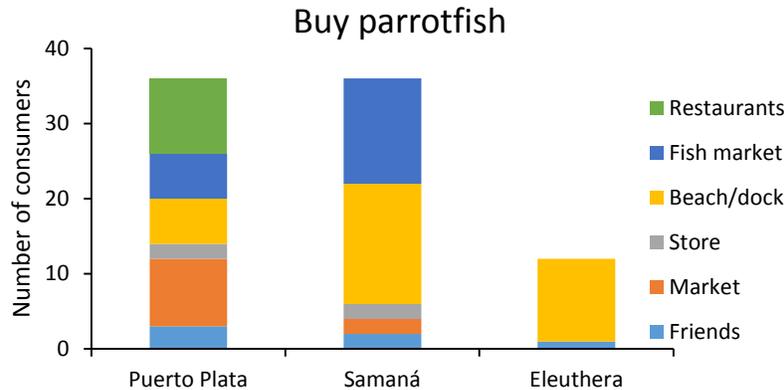


Figure 17. The locations of parrotfish sales in Puerto Plata and Samaná in the Dominican Republic and Eleuthera, The Bahamas.

Discussion

The average density of parrotfish collected during the recent AGRRA surveys in Eleuthera (15.8 Ind 100m⁻²) was the same as calculated for the Caribbean by Vallés and Oxenford (2014), and furthermore, the average biomass reported in this project was in the range of previous reports for The Bahamas (Roff et al. 2011, Valles and Oxenford 2014). Large parrotfish (midnight, blue, and rainbow) were not common at sites in Eleuthera and were present at 36% of the sites. In large parrotfish, densities in recent surveys ranged from 0.2 Ind 100m⁻² to 5.6 Ind 100m⁻² and are comparable to the report by Dahlgren et al. (2016). However, when the Eleuthera data were compared with the FORCE data for the Caribbean, the average parrotfish biomass in Eleuthera was much lower than many Caribbean countries (7 out of 10) but slightly higher than countries that actively fish parrotfish (Dominican Republic and Jamaica). The parrotfish populations in southern Eleuthera were slightly better compared to the two other regions. There were five sites with a biomass greater than 2,000 g 100m⁻².

Three factors may be influencing the parrotfish density and biomass in Eleuthera, and these include reef habitat type, nursery availability, predators, and fishing pressure. The depth, reef type, and reef structure varied among the sites surveyed along Eleuthera. Also, the central sites are close to a productive mangrove nursery in Savannah Sound, which could explain for the high biomass at SS002. As seen in Figure 5, parrotfish abundance was considerably lower in northern Eleuthera, compared to the central and south regions. This low abundance and biomass in the north is attributed to the overall low abundance and biomass for Eleuthera. Many of the fishers and consumers that we interviewed deny to eating parrotfish. However, these surveys were conducted around the Rock Sound area, which is towards the central to south Eleuthera. Experts have stated that within the last five years, parrotfish are being sold at fish markets in certain parts of The Bahamas. Bahamas fishers are targeting parrotfish because it is harder for them to find traditional target species (K. Sherman per comm). The human population on Eleuthera is concentrated in the north, with Dunmore Town and Spanish Harbour as some of the major settlements. As shown in Figure 18, fishing pressure is high up north, thus these fishers maybe landing parrotfish. The absence of parrotfish at many of the sites up north is concerning and should be investigated further.

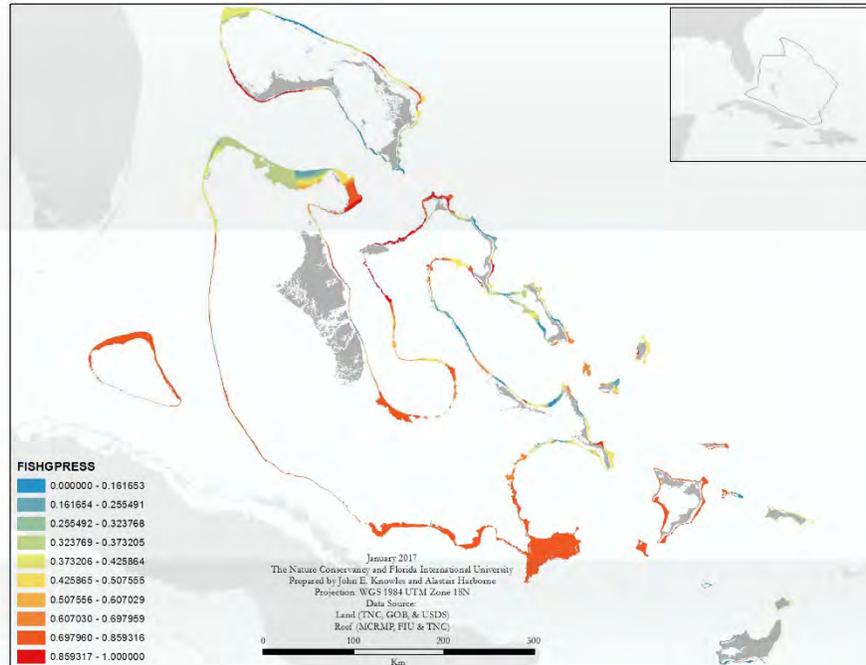


Figure 18. Spatial distribution of predicted relative fishing pressure (0 = low fishing pressure) across The Bahamas. (Source Harborne 2017)

The overall density and biomass of parrotfish was greater in Samaná, Dominican Republic than in Eleuthera and what was reported for during the FORCE project. The sampling and surveying methodology varied between the FORCE project and AGRRA, thus possibly accounting for the difference in biomass. In the Dominican Republic, there were many sites that had a high abundance of parrotfish but at these same sites there was also a low overall biomass. Therefore, signifying a lot of small parrotfish at these sites. As seen in the social surveys, fishers are targeting parrotfish, since they are in high demand by the consumer base. Terminal males in the Dominican Republic are much smaller than that seen in other Caribbean locations (Williams unpublished), however resemble countries that overexploit fish (Jamaica and Haiti). As seen in Haiti (Kramer et al. 2016), male parrotfish were transitioning to terminal phase at much smaller size in a desperate attempt to reproduce.

Biological surveys have been extensive in The Bahamas for both queen conch and parrotfish. However, these surveys are highly lacking in the Dominican Republic, especially for conch data, given that the only data collected have been in the national parks. In order to understand the stock assessment of any fisheries, biological and fisheries data are necessary. The experts in the Dominican Republic all agree that coral reef health is degrading. However, the scale of degradation is unknown given the lack of biological surveys. Therefore, it is fundamental to carry out coral reef surveys and conch assessments in the different regions of the Dominican Republic. A time-series assessment of parrotfish and conch populations would be beneficial at both countries as it would aid in understanding the factors which cause the change in benthic, fish, and other macroinvertebrates, such as conch.

Overfishing is a major threat to humanity and precedes all anthropogenic disturbance to the coral ecosystems. South Eleuthera and the Dominican Republic are economically depressed with communities heavily relying on the fishing sector. The signs of overexploitation are present in the biological data (low density and biomass) and the social surveys (change in perceptions). Overfishing is especially evident in the Dominican Republic as seen by the high abundance of small parrotfish and the social surveys, fishers have admitted their energy invested has increased over time (Figure 19). At all three sites, fishers stated that nowadays they have had to go out farther to catch fish, and the amount of fish caught has decreased. Fishers however, have not seen a change in the size of fish caught, with the exception of fishers in Puerto Plata.

Conservation of parrotfish should be handled differently between the two countries, given the different demands. Parrotfish is not in high demand in the Bahamas, as in the Dominican Republic. Some experts believe that The Bahamas is not at a point of overexploiting parrotfish, given the lack of interest from consumers and fishers. However, 40% of the fishers in Eleuthera stated that they do land parrotfish as bycatch, whether in their traps or lines. Therefore, a catch and release campaign and/or modification of fishing gear may be beneficial in conserving and protecting parrotfish. A parrotfish ban, which is supported by local experts, would encourage fishers to release parrotfish when landed. Given that demands are exceptionally high in the Dominican Republic, enforcing the present ban on parrotfish is necessary and critical to the populations given the demand and density/biomass relationship. This ban will probably have to be extended after the planned two years and effectively enforced in order to see any results. The lack of enforcement is a challenge in all locations. Belize and Bonaire have banned the fishing of parrotfish. In both countries, the banning of landing parrotfish has been proven to be helpful to restock natural populations.

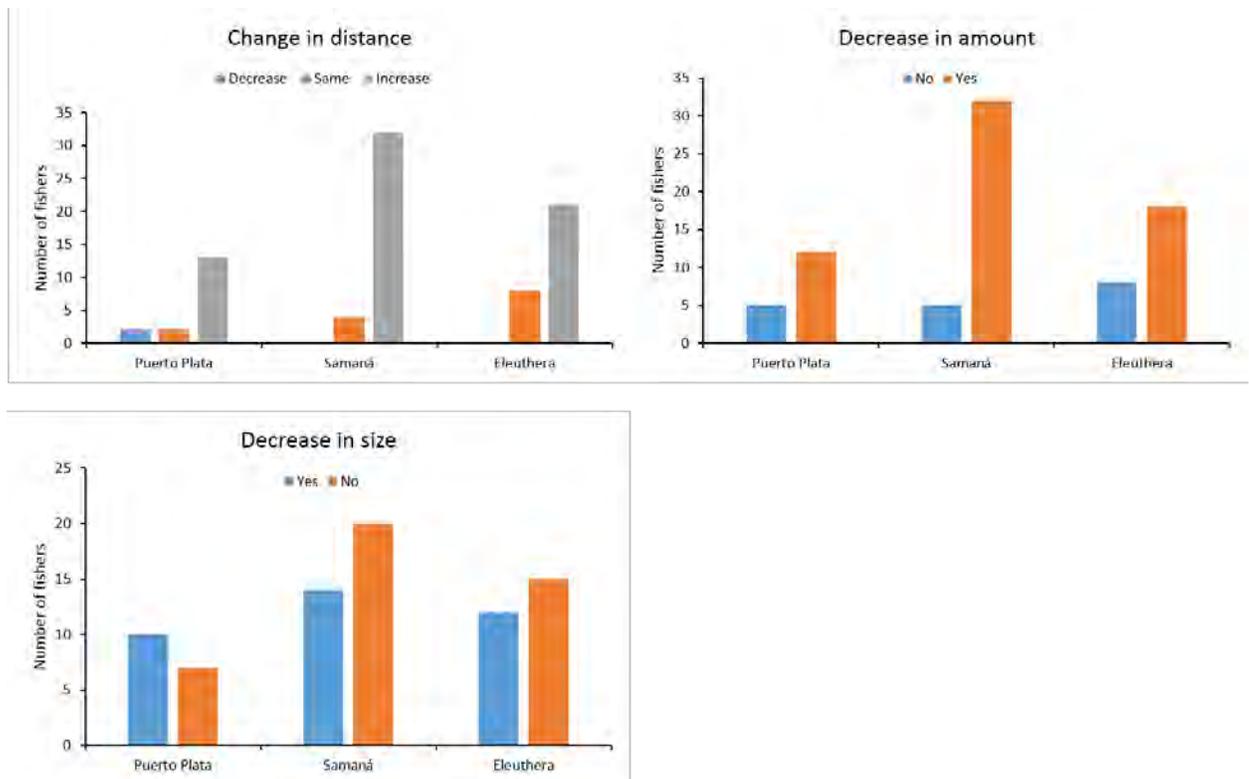


Figure 19. The fishers' perceptions in the change in fishing effort at Puerto Plata and Samaná in the Dominican Republic and Eleuthera, The Bahamas.

As reported by Schill et al. (2015), there is a strong demographic connectivity between the coral reefs along the north shore of Haiti and Cuba, Bahamas, Dominican Republic, and Puerto Rico. The juvenile and initial phase parrotfish that dominate the size groups in the Dominican Republic are most likely coming from other islands. Also, what is comparatively different between the Bahamas and Dominican Republic is that in the Dominican Republic, there is one species of parrotfish, *S. iseri*, which mainly contributes to the overall densities and biomass. The lack of male and the overall low diversity of parrotfish makes the fisheries in the Dominican Republic prone to collapse. Thus, giving even more reason to protect parrotfish as it is vital for the preservation of the fisheries in both countries.

In both countries, experts stated that lack of law compliance is an issue and regulations in place are not well enforced. In the Dominican Republic, between 20% and 50% of fishers are registered in their system, thus making it difficult to track the landings of the other 50%. In addition, CODOPESCA does not have any protocol regulate the origin of catch that is landed in the Dominican Republic. Thus making it difficult to prosecute fishers who catch fish in international waters. Poaching by fishers in the Dominican Republic is a major issue, especially in Bahamas waters. Regulations and enforcement need to be revisited and strengthened in both countries.

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A Guide to Bahamian Fisheries Regulations



A special thank you to our international partner



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Illegal Apparatus

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Spear Gun

Bleach



Dynamite



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OVERVIEW OF THE BAHAMAS NATIONAL TRUST

The Bahamas National Trust was created by an Act of Parliament in 1959. The efforts of two groups of conservationists brought about the drafting and passing of the Act. Both groups in different arenas had been rallying for the conservation of natural resources in The Bahamas.

In 1959, the Bahamas National Trust Act was passed which created the only statutory organization in The Bahamas charged with conservation and preservation of places of historic interest and natural beauty -- The Bahamas National Trust.

The decade of the 1970s saw tremendous growth. Membership was successfully cultivated, leaping from less than 88 to more than 1000 in a few years.

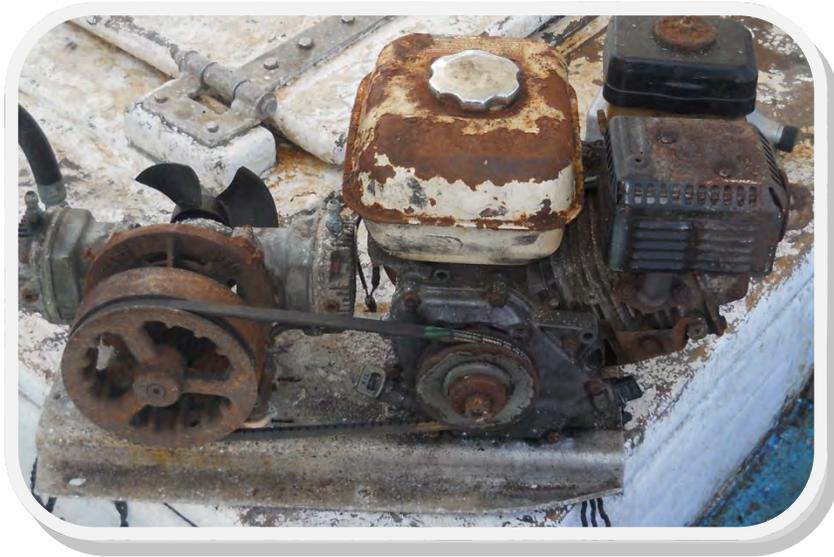
The Trust has continued with remarkable success to build the Bahamas National Parks System. During the 70s, 80s, and 90s new sites were steadily added and at the close of the 20th Century 12 National Parks existed, encompassing 315,000 marine and terrestrial acres.

On April 30, 2002 the system was doubled in size when 10 new sites were designated as National Parks and the total acreage jumped to more than 700,000 acres. Today there are 27 National Parks protecting well over 1 million acres.

The Bahamas National Trust has a proud history. It is due in part to the wisdom of its founders but also to the energy and dedication of its members and staff over the years.



Pole Spear



Compressor



OVERVIEW OF THE DEPARTMENT OF FISHERIES

THE ROLE OF THE DEPARTMENT

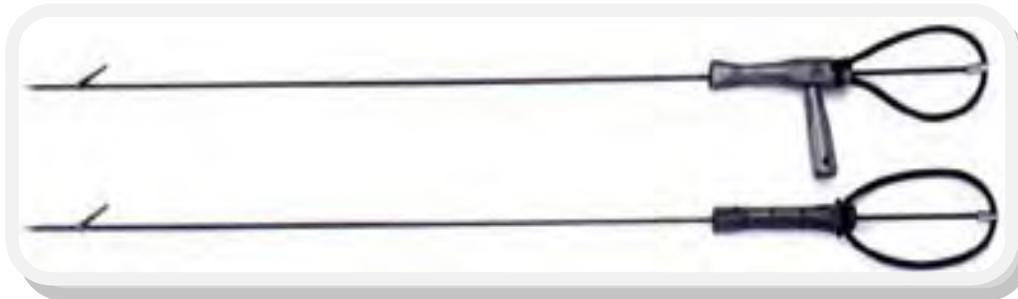
This department is responsible for the management and development of fisheries in The Bahamas, for the administration of the fishing industry and for the implementation of fisheries policies and development objectives.

OBJECTIVES

To ensure the sustainable utilization of the fisheries resources for the benefit of the Bahamian people;

To promote the development of local fisheries; and

To improve the well-being and technical capabilities of the local fishermen.



Hawaiian Sling Spear

CHAPTER 244

FISHERIES RESOURCES (JURISDICTION AND CONSERVATION)

FISHERIES RESOURCES (JURISDICTION AND CONSERVATION) REGULATIONS

(SECTION 19)

[Commencement 3rd March, 1986]

1. These Regulations may be cited as the Fisheries Resources (Jurisdiction and Conservation) Regulations.

2. (1) In these Regulations —

“aquaculture” means the cultivation of freshwater and marine organisms by exploiting their natural environment;

“explosives” has the meaning assigned to it by section 2 of the Explosives Act;

“firearm” has the meaning assigned to it by section 2 of the Firearms Act;

“fishery product” means any product intended for human consumption which consists wholly or mainly of a fishery resource;

“Hawaiian sling” means a device made of wood, or other suitable material, designed for the discharge of a missile under water by the force of a sling of rubber;

“prohibited apparatus” means —

(a) a device, other than a snorkel, designed to enable a person to breathe whilst under water;

(b) a device, other than an Hawaiian sling, designed to discharge a missile under water;

“snorkel” means a tube enabling a person whose face is beneath the surface of the water to breathe the air directly from the atmosphere and not assisted by a compressor;

S.I. 10/1986
S.I. 65/1988
7 of 1993
S.I. 98/1995
S.I. 22/1997
S.I. 101/2003
S.I. 109/2005
S.I. 79/2006
S.I. 67/2007
S.I. 71/2007
S.I. 98/2008
S.I. 85/2009
S.I. 115/2009
S.I. 116/2009

Citation.

Interpretation.

Ch. 215.

Ch. 213.



Scening Net



Gill Net



Crawfish Hook



Fish Pots

“spearfishing apparatus” means any of the following articles used in the activity commonly known as “spearfishing” —

- (a) a spear;
- (b) an Hawaiian sling;
- (c) a snorkel;
- (d) an underwater mask;
- (e) underwater goggles;
- (f) swim fins;

“take” means catch, capture or remove from the water;

“trap” includes any device designed or used for the trapping of fishery resource.

(2) In these Regulations, a reference to “commercial purposes” in relation to the exportation of any fishery resource or fishery produce is a reference to any act or transaction or the doing of anything for the purpose of effecting a sale or deriving a financial reward through the exportation of that resource or product.

PART I GENERAL

Possession and
use of poison
prohibited.

3. Except in such limited quantity as may be specified in a written permission of the Minister for scientific research or sanitation purposes as the case may be, no person shall use or have in his possession with intent to use, for fishing within the exclusive fishery zone —

- (a) dogwood or other poisonous bark;
- (b) quicklime;
- (c) household bleach; or
- (d) any other noxious or poisonous substance.

Use of firearms
prohibited.

4. (1) Subject to paragraph (2), no person shall use a firearm to fish within the exclusive fishery zone.

(2) Paragraph (1) does not apply to a person who uses —

- (a) a firearm for scientific or research purposes with the written permission of the Minister;
- (b) a firearm (commonly known as a “bang stick”) for self defence against sharks and other marine predators.

5. No person shall, except for scientific or research purposes and with the written permission of the Minister, have in his possession on a fishing vessel or use for fishing within the exclusive fishery zone any explosives.

Possession or use of explosives prohibited.

6. No person shall use any spearfishing apparatus to fish —

Spearfishing apparatus in certain areas prohibited.

- (a) within one mile of the coast at low water mark of New Providence; or
- (b) within one mile of the southern coast at low water mark of Freeport, Grand Bahama; or
- (c) within two hundred yards of the coast at low water mark of any other Family Island.

7. (1) No person shall use a net to fish within the exclusive fishery zone unless the net —

Nets.

- (a) is a gill net, drag net, cast net or seine net; and
- (b) has a mesh the gauge of which is two inches minimum.

(2) Subparagraph (b) of paragraph (1) shall not apply to —

- (a) nets used for the harvesting of cultured resources; or
- (b) hand nets used for capturing small species of fishery resource; or
- (c) nets used for catching goggle-eyes or members of the herring and silver-side families, and shall not have effect before the expiration of two years from the coming into operation of these Regulations.

8. No person shall use a wire mesh trap to fish within the exclusive fishery zone unless the wire mesh has the following minimum size —

Traps.

- (a) in the case of a hexagonal wire mesh, 1½ inches (greatest length of mesh);
- (b) in the case of welded or woven rectangular wire mesh, 1 inch by 2 inches, and one of the panels of the trap is made of a material that would deteriorate after use in water for a continuous period of not more than six weeks.

Fishing Apparatus



Crawfish Condominiums & Trap



Legal Apparatus

fishing for purposes other than commercial by persons who are not Bahamians.

S.I. 67/2007.

(3) A fishery inspector shall be permitted to enter and inspect a vessel that has engaged in sportsfishing.

S.I. 67/2007.

(4) For the purposes of this regulation permanent residents would be treated the same as Bahamians.

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FISHERIES RESOURCES (JURISDICTION AND CONSERVATION)

Spearfishing tournament etc. prohibited.

9. No person shall organize or engage in a spearfishing tournament or competition within the exclusive fishery zone.

Prohibited apparatus.

10. No person shall use, or have in his possession with intent to use, for fishing within the exclusive fishery zone any prohibited apparatus.

Fishery resource within two hundred yards of the coast of any Island.

11. No person shall —

(a) within two hundred yards of the coast at low water mark of New Providence or any Family Island fish for or take any fishery resource other than edible fish, edible conch or crawfish as food for himself and family in The Bahamas;

(b) save as provided in paragraph (a), fish for or take by means of a net in the harbour or at the entrance to the harbour of any place in The Bahamas any resource other than the species known as goggle-eyes or passing jacks.

Coral.

12. (1) No person shall uproot, destroy, or, without the written permission of the Minister, take or sell any hard or soft coral.

(2) Nothing in paragraph 1 shall apply to the sale of coral by any person who holds a licence for a shop under the provisions of the Shop Licences Act.

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Sea oats.

13. No person shall cut, harvest or remove from any beach or shore or from any area immediately adjacent thereto any sea oats except with the written permission of the Minister.

Artificial reef.

14. No person shall construct any artificial reef within the exclusive fishery zone except with the written permission of the Minister.

Sale of fishery resource.

15. (1) No person shall sell in New Providence fishery resource unless he is the holder of a permit granted by the Minister authorising him to sell fishery resource, or the latter is the result of fishing done by that person.

(2) No person shall sell fishery resource in New Providence other than at such places as the Minister may prescribe or by notice appoint:

Provided that the foregoing provisions of this paragraph shall not apply to the holder of a permit from

the Commissioner of Police permitting him to peddle and hawk articles along a public road and of a permit mentioned in paragraph (1).

(3) An application for a permit mentioned in paragraph (1) shall be made to the Minister in Form I in the First Schedule.

(4) The Minister may, upon payment of the respective fee specified in the Second Schedule, grant to the applicant a permit in Form 2 in the First Schedule, subject to such terms and conditions as the Minister thinks fit.

(5) Paragraphs (1) and (2) shall not apply to any person who for the purpose of such sale occupies any premises licensed as a shop under the provisions of the Shop Licences Act.

Ch. 377.

(4) The permit granted under paragraph (3) shall be in Form 8 in the First Schedule. *Form 8, First Schedule.*

(5) A foreign vessel engaged in a sportsfishing event or tournament shall be in possession of a valid permit granted under paragraph (3). *S.I. 67/2007.*

(6) No person shall sell or attempt to sell fishery products derived from sportsfishing under the terms and conditions of a permit granted under paragraph (3). *S.I. 67/2007.*

(7) No vessel shall engage in a sportsfishing event or tournament unless the owner or operator of that vessel — *S.I. 67/2007.*

(a) has been issued with a tournament decal by the organizer or tournament director; and

(b) has attached the tournament decal at the bottom of the sportsfishing permit granted under this regulation.

48. (1) In sportsfishing the following rules apply —

Sportsfishing rules. S. I. 67/2007.

(a) a person shall fish by the traditional method of angling with a hook or lure attached to a line held in the hand or attached to a pole, rod or reel;

(b) a person, unless otherwise authorised by the respective permit, shall not use a spear, a fish trap, or a net other than a landing net;

(c) each vessel shall use not more than 6 rods or reels unless the operator is in possession of a permit authorising the use of more rods or reels;

(d) any migratory fishery resource (such as Kingfish, Dolphin, Tuna or Wahoo) that is caught shall not in total exceed 18 fish aboard the vessel at any time; *S.I. 67/2007.*

(e) any Billfish (such as Marlin, Sailfish or Swordfish) caught shall be returned to the sea unharmed except where landed under the terms of an approved sportsfishing event or tournament; and *S.I. 67/2007.*

(f) no vessel shall have on board at any time — *S.I. 67/2007.*

(i) turtle;

(ii) conchs, exceeding 6;

(iii) crawfish, exceeding 10; or

(iv) other demersal fishery resources exceeding 60 pounds or 20 fish.

(2) The limitation specified in paragraph (1)(d), (e) and (f) shall also apply to a Bahamian vessel engaged in

Crawfish

(2) An application made under paragraph (1), shall be —

- Form 17,
First Schedule.
- (a) in Form 17 in the First Schedule; and
 - (b) accompanied by a copy of the proposed rules for the sportsfishing event or tournament.

(3) Where the Minister approves an application for a sportsfishing event or tournament, he shall —

- Form 18,
First Schedule.
- Third Schedule.
- (a) issue a permit to the organizer or the tournament director as set out in Form 18 in the First Schedule, specifying the terms and conditions of the approval, including the payment of fees as specified in the Third Schedule; and
 - (b) issue tournament decals to the organizer or the tournament director for each participant in the sportsfishing event or tournament and such decal must be attached at the bottom of the sportsfishing permit granted under regulation 47.

(4) In this Part, “sportsfishing” means foreign fishing within the exclusive fishery zone for sporting purposes or purposes other than commercial.

Vessels engaged
in sportsfishing.

47. (1) The owner or operator of a vessel shall not permit the vessel to be engaged in sportsfishing unless the owner or operator of the vessel —

- S.I. 67/2007.
- Third Schedule.
- (a) holds a permit granted by the Minister under this regulation authorising the vessel to be so engaged; and
 - (b) pays for the permit the fee prescribed in the Third Schedule.

(2) Paragraph (1) shall not apply to Bahamian owned and licensed charter vessels or a boat which is normally towed by or carried on a vessel to which that paragraph applies.

(3) An application for a permit under paragraph (1) shall be made to the Minister in Form 7 in the First Schedule and be submitted —

- Form 7,
First Schedule.
- (a) in the case of a vessel entering The Bahamas for the purpose of sportsfishing, to the customs officer at the Port of Entry at which the vessel first called;
 - (b) in any other case to the office of the Director of Fisheries.

PART II CRAWFISH

16. There shall be an annual closed season for crawfish extending from 1st April to 31st July (inclusive). Closed season for crawfish.

17. No person shall during the closed season fish for or have in his possession any live or fresh crawfish without first having obtained the written permission of the Minister or unless he has bought the crawfish from the holder of such a permit. To fish for live or fresh crawfish prohibited during closed season.

18. No person shall take, have in his possession or sell any crawfish which measures less than three and one-quarter inches from the base of the horns to the end of the jacket or which, if the tail is severed, has a tail measurement of less than five and one-half inches, not including any protruding muscle. Minimum size of crawfish.
S.I. 98/1995.

S.I. 98/1995.

19. The person in charge of vessel engaged in fishing for crawfish shall ensure that the vessel carries a measuring gauge of a type capable of determining the size for the purposes of regulation 18 of any crawfish taken. Vessel to have measuring gauge.

20. (1) No person shall take, capture, destroy or kill crawfish by means of traps (hereinafter referred to as “crawfish trapping”) other than those specified in paragraph (2). Permit for crawfish trapping.

(2) Traps used for crawfish trapping shall be as described below —

- (a) wooden slat traps not more than 3 feet in length, 2 feet in width and 2 feet in height with slats placed not less than 1 inch apart; or
- (b) traps of other such materials as approved by the Minister,

and in the case of traps other than wooden traps containing a panel made of a material that would, after use in water for a continuous period of not more than six weeks, deteriorate.

(3) Traps described in paragraph (2)(a) may be reinforced with mesh as mentioned in regulation 8 save that one panel of the trap shall retain the ability to deteriorate as referred to in paragraph (2).

(4) No vessel shall be used in crawfish trapping unless the operator has obtained a permit from the Minister authorising the vessel to be so used.

Form 3
First Schedule.

(5) An application for a permit mentioned in paragraph (4) shall be made to the Minister in Form 3 in the First Schedule.

Form 4
First Schedule.

(6) The Minister may, upon payment of the respective fee specified in the Third Schedule, grant a permit to the applicant in Form 4 in the First Schedule which permit shall be subject to such terms and conditions as the Minister thinks fit.

Permit to be kept
readily available.

21. (1) The permit granted under regulation 20 or a certified copy thereof shall be kept at all times readily available on the vessel from which crawfish trapping is conducted.

(2) The number of the permit granted under regulation 20 shall be painted or affixed in legible figures on every trap and on every buoy used in connection with that trap which belongs to the vessel to which the permit relates.

(3) A buoy bearing the number of the permit shall be attached to each trap except that where traps are tied together in a trot line, a buoy is not needed to be attached to each trap so long as a flag buoy, bearing the number of the permit on the flag, is attached to each end of the trot line or in the case of trot lines exceeding twenty traps, a buoy is attached at intervals of twenty traps.

Sportfishing

PART X SPORTSFISHING

46. (1) A person who wishes to organize or hold a sportsfishing event or tournament shall apply to the Minister for a permit to organize or hold such sportsfishing event or tournament.

Permit for
sportsfishing event
or tournament.
S.I. 67/2007.

Additional Marine Species

PART VIII SPONGE

Minimum size of sponges.

42. (1) No person shall take, have in his possession, buy or sell any of the following sponges that have less than the following minimum measurements when removed from the sea —

- (a) wool sponge - 5½ inches;
- (b) grass sponge - 5½ inches;
- (c) hard head sponge - 1 inch;
- (d) reef sponge - 1 inch.

(2) The person in charge of a vessel engaged in sponging shall ensure that the vessel is equipped with a set of measuring rings of the diameters specified in paragraph (1).

Export of sponge.

43. No person shall for commercial purposes export sponge unless —

- (a) the sponge is clipped and graded and also packaged and labelled in accordance with these Regulations;

- (b) it is presented to a fisheries inspector at the time of exportation; and
- (c) the export duty specified in the Second Schedule is paid. Second Schedule.

(4) Every buoy shall, except when it is intentionally submerged by a timed float release device, be of sufficient strength and buoyancy to remain continuously afloat and shall be of such colour and brilliance as to be easily seen.

22. (1) Subject to paragraph (2) no person shall, during the closed season —

- (a) have in his possession on board a vessel a trap or other device designed for crawfish trapping; or
- (b) set any trap or other device on or below the surface of the sea for the purpose of crawfish trapping.

(2) Paragraph (1) does not apply to the holder of a numbered permit granted under regulation 20 in respect of a vessel and who during the last two weeks of the closed season, soaks his traps which are tied in bunches in the vessel's home port.

23. (1) A person who holds a licence under regulation 76 and the owner or operator of every hotel, restaurant, supermarket or grocery store who buys or sells crawfish shall upon any request made of him by the Minister submit to the Minister a statement as to the quantity in weight of crawfish frozen or otherwise in his possession at the date of the statement.

(2) Every person mentioned in paragraph (1) shall, when requested by a fisheries inspector, allow the inspector to carry out any inspection of business premises occupied by such person for the purpose of enabling the inspector to ascertain the quantity of any crawfish in the possession of that person.

24. No person shall —

- (a) take, have in his possession or sell any egg-bearing crawfish;
- (b) clip or otherwise remove the eggs from an egg-bearing crawfish;
- (c) have in his possession or sell any crawfish from which eggs have been clipped or otherwise removed.

25. All crawfish gathered within the exclusive fishery zone shall be liable to inspection by a fisheries inspector.

Traps during closed season prohibited.

Statement of quantity of crawfish during closed season.

Egg-bearing crawfish.

Crawfish for sale to be inspected.

Licence to export
crawfish, etc.

26. No person shall for commercial purposes export any crawfish unless —

(a) it is submitted at the time of exportation to a fisheries inspector; and

Second Schedule.

(b) the export duty specified in the Second Schedule is paid.

Additional Marine Species

PART VI STONE CRAB

Stone crab closed
season.

37. There shall be an annual closed season for stone crab extending from 1st June to 15th October (inclusive).

Prohibition during
closed season.

38. No person shall, during the closed season, take, have in his possession, buy or sell fresh stone crab.

Minimum size.

39. No person shall take, have in his possession, buy or sell any stone crab the claw of which measures less than four inches in length.

Taking, etc., of
female stone crab
prohibited.

40. No person shall take, buy or sell any female stone crab.

PART VII MARINE MAMMALS

To fish for marine
mammal
prohibited.

41. (1) Subject to paragraph (2) no person shall, within the exclusive fishery zone, fish for, molest or otherwise interfere with any marine mammal.

(2) Paragraph (1) does not apply to a person who has the prior written permission of the Minister to capture marine mammals for scientific, educational or exhibitional purposes.

Caribbean and Florida Bonefish

Albula spp.

Knowledge of the bonefish life cycle is limited, but the best available information is presented. Ongoing research shows there are three distinct species in the Caribbean and Florida. *Albula vulpes* and *Albula Species B* are the most common species found here, however it is difficult to distinguish between the species based on physical appearance. Ten species of bonefish are found worldwide.

Bonefish feed primarily on bottom-dwelling organisms using their snout to root-out prey, and use specialized dental plates to grind hard-shelled prey.

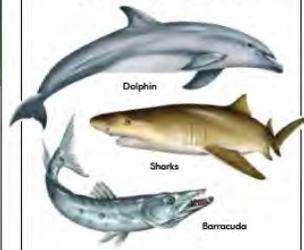
Juvenile Diet



Adult Diet



Natural Predators

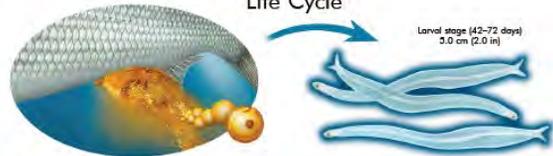


The Nature Conservancy



Loxahatchee River District
"Preserving Nature by Design"
Poster Series, No. 3
www.loxahatcheeriver.org

Life Cycle



1 Bonefish are believed to spawn in deep water between the months of November and April.

2 After hatching, transparent leptocephalus enter a complex larval stage.

Larval stage (42-72 days)
3.0 cm (2.0 in)

Juvenile stage (less than 1 year)
2-30 cm (0.8-11.8 in)



3 It is not clear where *Albula vulpes* juveniles live but research indicates that they may live in deep water.

Albula Species B juveniles live in shallow, sandy areas.



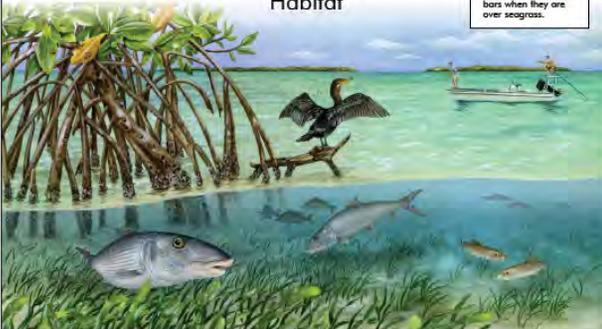
Subadult (1-3 years)
30-40 cm (11.8-15.7 in)

Adult (greater than 3 years)
Greater than 40 cm (15.7 in)

4 Adult bonefish in the Florida Keys reach sexual maturity between 3 and 5 years of age. Their size at maturity can vary by location.

Bonefish can alter their coloration to blend with the bottom environment, for example, dark vertical bars when they are over seagrass.

Habitat



Adult *Albula vulpes*, the most common species caught by recreational fishermen reside primarily in shallow water with a sandy or rocky bottom, over seagrass beds, or near mangrove roots. Juveniles of this species are rarely found here leaving their primary nursery habitat unknown.

In contrast, the juveniles of *Albula Species B* are abundant in shallow waters, but adults are rarely caught there. It is unknown where the largest populations of adult *Albula Species B* reside.

Ecological and Economic Significance

Because of their renown fighting ability, bonefish are a prized sportfish in Florida and throughout the Caribbean. They are a mid-size predator and provide a vital link in the food web. Bonefish populations are declining in some areas. Because bonefishing is largely a catch-and-release sport, their decline is believed to be related to habitat loss.

How You Can Help

- Avoid keeping fish out of water for a long period of time.
- Handle fish gently with wet hands.
- Release only in areas where predators are not present.
- Use barbless hooks and limit fight time; exhausted fish are vulnerable to predators.
- Learn about and participate in the bonefish tagging program.
- Learn about and comply with local bonefishing regulations. Netting and harvesting is illegal in most areas.
- Do not damage critical bonefish habitat such as seagrass beds and mangroves.



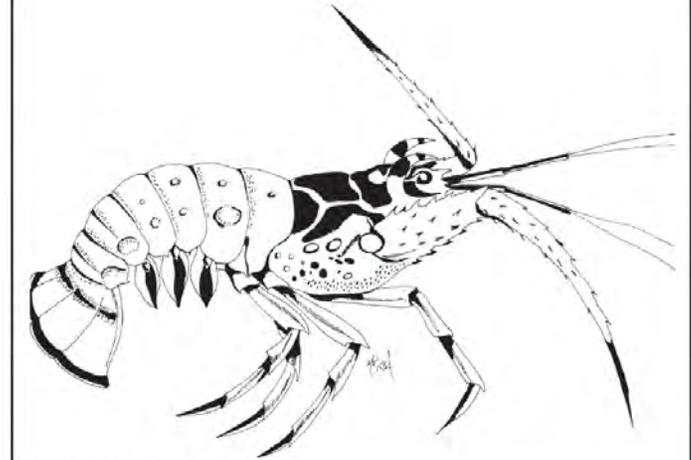
Practicing catch-and-release techniques help conserve bonefish populations.



The bonefish tagging program helps researchers manage healthy populations.



Netting bonefish is illegal in the Bahamas and the US.



Artwork by Melissa Maura

SPINY LOBSTER

SCIENTIFIC NAME

Panulirus argus

DESCRIPTION

The Spiny Lobster or Crawfish has a hard outer shell or carapace with shaded areas of brown and tan with a few dark spots, while the abdomen is brown and tan, banded with a few light spots. They have sharp horns over their eyes and a pair of long conical antennae, often called whips.

Caribbean Spiny Lobsters inhabit reefs where they hide in its protective recesses during the day, and forage in the open at night. When disturbed, they can swim backwards rapidly using powerful strokes of their tails.

Male lobsters have a padded opening at the base of each last leg. Female lobsters have two extra claws or "spurs" at the tip of each last leg which are used to scrape the tar spot and release the sperm to fertilize the eggs. She also has pleopods or swimmerettes underneath her tail. These are the flat leaf-like appendages on the abdomen that function in locomotion and reproduction.

DIET

By examining crawfish stomachs, it has been found that they feed on sea urchins, hermit crabs, starfish, worms and small mollusks, such as young conch and clams. In fact, crawfish will feed on almost any animal matter that they come across while foraging. They are able to detect food at some distance using special sensors on their antennae.



Marine Life of The Bahamas

REPRODUCTION/LIFE CYCLE

Most spiny lobsters breed and spawn when the ocean is warm during the spring and summer. Depending on their size, female crawfish produce eggs twice during the reproductive season. When lobsters mate, the male and female lie face to face. The male leaves a sticky fluid on the female's belly. This hardens into the black patch we call a "tar spot". This tar spot contains thousands of sperm. The female lobster lays the eggs and holds them on her body, under her tail for two to three weeks, until they are ready to hatch. The eggs are orange first and become dark brown when they are ripe. Egg bearing females usually stay on the deeper edges of a reef and when the eggs hatch the larvae are released into the open sea.

The newly hatched baby lobsters are called phyllosomes and look nothing like their parents. They have flat clear bodies with long thin legs, and float and swim on the ocean's surface in the company of baby conchs, crabs, clams and fish. All the tiny animals that float in the sea are called "plankton".

At approximately nine months, the phyllosomes undergo a complete change in shape called "metamorphosis". At metamorphosis the flat body of the baby lobster changes into the shape of a small, young lobster. These young lobsters can swim and they head for shore. They settle in shallow areas like mangroves, grass beds, or shallow reefs. They also hide in weeds, on boat bottoms, anchor ropes and dock pilings. Soon after they settle their clear bodies become colored – marked with yellow and dark brown.

Most lobsters begin to mate when they are 8 to 10 inches long from head to tail. In the Bahamas the minimum legal catch size is 3 3/8 inches measured at the head or carapace or, 5 1/2 inches in tail length. This size is considered to equal sexual maturity. Lobsters continue to grow larger throughout their lives. They can live more than 40 years and can reach more than three feet long from head to tail.

HOW DO LOBSTERS GROW?

From time to time lobsters "moult" or shed their outer shell for a larger one. Before moulting, a lobster grows a soft shell, like a second skin, underneath its hard shell. The lobster splits its hard shell open where the tail joins the main body. It backs out of the shell through this opening. The lobster is now wearing only its soft skin-like shell and is in danger from predators until it hardens. The soft shell swells to a larger size and slowly hardens. The lobster has room to grow inside this new, hard shell until it is time to moult again.

- An annual closed season from April 1 - 31 July.
- A minimum catch size of 3 3/8 inches measured at the head or carapace.
- The possession of egg-bearing female crawfish is prohibited as is the stripping or otherwise removing the eggs from the berried (egg-bearing) female.

These regulations also make illegal the use of bleach or other noxious or poisonous substances and the use of firearms or explosives for fishing.

swim rapidly toward the surface. Spawning continues for several days following the occurrence of the full moon.

Nassau grouper eggs are clear, less than 1 millimetre in diameter and they are buoyant. After they are fertilized they are carried away from the reef by the wind and tide. Within 20 - 45 hours baby fish called larvae hatch from these tiny eggs. After a month at sea, the ocean currents return the larvae to the reef. Of the million or so eggs released by each female, less than 1% will live and grow into adults.

Nassau Groupers can begin life as a female and then switch to male. Change can happen at any time after maturity - when they reach 10 to 24 inches long and 5 - 6 years old. Male groupers are larger and thus targeted by fishermen. This can result in a shortage of sperm. In response to heavy fishing pressure resulting in limited sperm, it is possible that a female may change to a male before reproducing as a female. In some groupers, there is no sex change.

VALUE

There is a strong local market for the Nassau Grouper. Traditional dishes such as Boiled fish and Grouper fingers, keep the Nassau Grouper in high demand. The fishing of Groupers provides hundreds of thousands of dollars in income to fishermen around The Bahamas.

THREATS

Nassau grouper is eaten by barracudas, lizard fish, dolphins, sharks and other large predators of the reef community. But the predators that have the biggest impact on the grouper population are humans. People are fishing groupers before they can grow to maturity and reproduce.

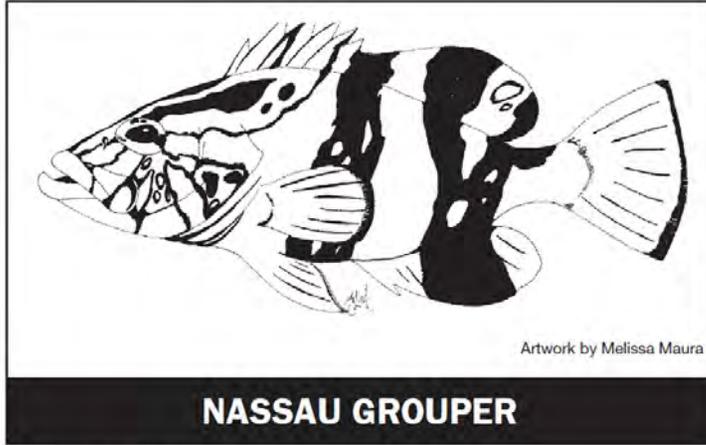
Sex change may also cause a problem. In undisturbed areas there are usually equal numbers of male and females. In heavily fished areas there are often three or more times more females than males. This means many eggs will not be fertilized during spawning. Other threats include, habitat destruction, coral breakage from divers, siltation from construction, runoff from logging and agriculture, dredging, sewage, oil spills and other contaminants that harm coral reefs where Nassau Groupers live.

CONSERVATION

There are a number of measures that can be taken to protect and manage the Nassau grouper:

- Establish Marine parks and Reserves where the fishing of grouper is prohibited.
- Establish a minimum harvestable size limit and enforce the minimum legal size for a grouper which is 3 pounds.
- Protect spawning aggregation sites - because of fishing at these sites, groupers are susceptible to overfishing.
- Develop alternative fishing strategies: encourage fishermen to catch other species of fish.
- Support the Closed Season for Grouper during the designated dates (December - February).





SCIENTIFIC NAME
Epinephelus striatus

DESCRIPTION

The Nassau Grouper belongs to the Seabass family of fish. All Seabass have strong, stout bodies and large mouths. Five dark brown bands, a black saddle-like spot near the tail fin, and a dark streak running from its nose through its eye are features that distinguish the Nassau Grouper from other groupers. The dorsal fin is notched between forward spines. The Nassau Grouper can change colour from pale to almost black to match its surroundings. It can grow to 1 to 2 feet long and can reach a maximum of 4 feet and weigh fifteen pounds or more. Nassau Groupers may live for more than 25 years.

The Nassau Grouper is a valuable fisheries resource and an important part of the coral reef community. The grouper is usually found in caves, crevices and cracks of the reef. It is rarely found deeper than 90 feet. This fish often rests on the sea bottom, blending with its surroundings. Nassau groupers are found throughout the Caribbean Sea.

DIET

Nassau Groupers, like most Seabass are predators. They sit camouflaged outside the openings of caves, and wait for unsuspecting prey to swim by. They see well without much light, and often hunt at dawn and dusk when other fish are looking for shelter or waking up. Groupers eat many animals such as lobster, crab, octopus and shrimp.

REPRODUCTION

Groupers spawn around the full moon during late December or early January after the seawater has begun to cool. They gather around banks by the thousands to spawn. Around this time they change colour: black on top and white on its belly. Spawning takes place at sunset when males and females move from the shallows and into deep water. Here they rise quickly to the surface in small groups releasing eggs and milt into the open sea. Males are often seen nudging the bellies of females as both sexes

Queen Conch

CONCH

Possession of undeveloped conch prohibited.

27. (1) No person shall take, have in his possession or sell any conch the shell of which does not possess a well formed flaring lip.

(2) No person shall sell any conch shell which does not possess a well formed flaring lip.

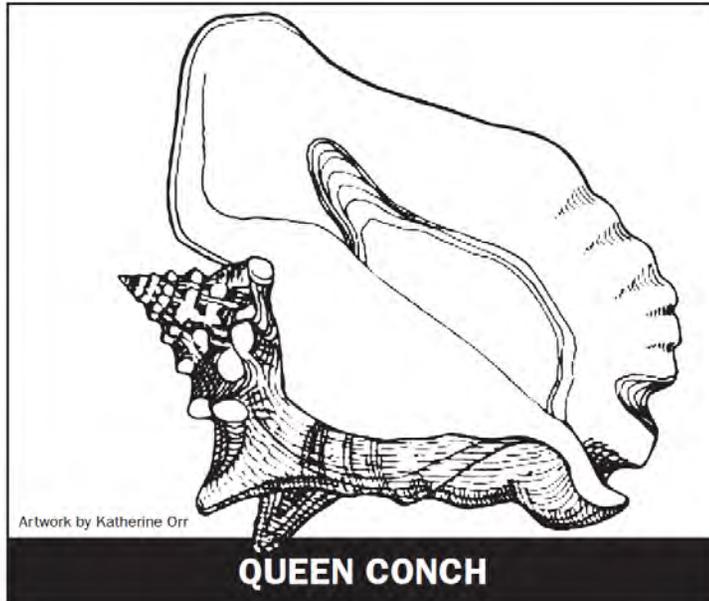
Export of conch, by-product or shell.

28. (1) No person shall for commercial purposes export and conch, by-product of conch or any whole conch shell unless —

- (a) he holds a licence in that behalf granted by the Minister under regulation 66;
- (b) the conch or by product of conch is submitted for inspection to a fisheries inspector at the time of exportation; and
- (c) the export duty specified in the Second Schedule is paid.

(2) Nothing in paragraph (1) shall apply to any conch in a quantity not exceeding ten pounds in weight and carried in the personal baggage of a person leaving The Bahamas.

Scale Fish



QUEEN CONCH

SCIENTIFIC NAME

Strombus gigas

DESCRIPTION

The Queen Conch is a large sea snail. It has a large shell with a short conical spire with blunt spikes. The shell's exterior is orangeish (not always apparent because of algal growth; the aperture (opening to the inside of the shell) is a shiny rosy pink colour. The mollusk itself has a mottled gray head with a large proboscis (like a nose or beak) and long eye stalks with eyes at the end. Beneath the shell is a strong foot with a "claw" like a pointed toenail. Conchs are either male or female just like people. The male has a black arm over his right eye. The female conch has a groove that runs down the right side of her foot.

DIET

The conch is a slow moving grazing herbivore. It eats plants or epiphytic algae.

REPRODUCTION/LIFE CYCLE

Conchs breed all months of the year except November to January. When conchs mate they sit close together with the male behind the female and their two shells touching. If one could look underneath their shells one can see the male's arm reach to the female passing sperm to fertilize the eggs. After mating, the female deposits an egg mass, which although only two or three inches long, contains up to half a million eggs! The mass is actually a tightly folded egg-filled tube up to ninety feet long made sticky by mucus. The eggs are laid in water ten to seventy feet deep on loose sand or in beds of turtle grass. Sand grains soon adhere to the mucus hiding the eggs from predators.

SCALE FISH

- 34. No person shall —
 - (a) buy or sell bone fish (*Albula vulpes*);
 - (b) fish for bone fish (*Albula vulpes*) within the exclusive fishery zone by means of nets.

Buying, selling, etc., of bone fish prohibited.

- 35. (1) No person shall take, buy or sell any fish commonly known as grouper or rockfish that weighs less than three pounds.

Minimum size of grouper.

- (2) Notwithstanding paragraph (1), no person shall take, land, process, sell or offer for sale any fish commonly known as "the Nassau Grouper" during the period 1st December, 2008 to the 28th February, 2009, except where such taking or landing is carried out with the written approval of the Director of Fisheries for scientific research purposes.

S.I. 98/2008.

- (3) Subject to paragraph (2), no person shall during the period 1st December, 2008 to the 28th February, 2009, land any fish commonly known as "grouper", unless its head, tail and skin is intact.

S.I. 98/2008.

- 36. No person shall for commercial purposes export scale fish, unless the scale fish is presented to a fisheries officer for inspection at the time of exportation.

Export of scale fish.

The fins are used in shark fin soup. Other products include liver oil for squalene, cartilage for medicinal purposes, and jaws for souvenirs. A. Shark fin soup purchased at one of the Chinese restaurants in The Bahamas prior to the new regulations. B. Jaws being sold for souvenirs. ©Fiona Ayerst Underwater Photography/Marine Photobank



After about three days, the eggs hatch into tiny free-swimming larvae. Ten baby conch can fit into one drop of water. These new baby conch do not look like conch at all. Their bodies have two round lobes like the ears of an elephant. Each lobe is rimmed with fine hairs, which beat back and forth very fast. These hairs help the conch swim and move food into its mouth. These baby conch are known as “veligers”. Baby conchs drift on the sea feeding on tiny plants.

After about 2 months, the baby conch sinks to the sea bottom. It is only a fraction of an inch long and its shell is very fragile. It now goes through a process called “metamorphosis”. Metamorphosis is when a body changes from one form to another – as when a caterpillar turns into a butterfly. During metamorphosis, the conch’s lobes disappear. It develops a long snout with a mouth at the end and a foot with a claw. It begins to look like the conch that we know. The baby conch buries itself in the sand and hides for about a year. It becomes nocturnal, meaning that it only comes out to feed in the night.

A conch grows its own shell and makes the shell larger as its body grows. When a conch is a few months old its shell is white, but by the time a conch is five or six months old its shell is white with streaks of dark brown. As the conch grows, we call it a “roller” because its shell is like a round spiral. As it grows it makes the spiral bigger. When the conch is nearly three years old it has reached full shell size. Now it grows a broad lip on its shell. This new broad lip is a sign that the conch will soon reach maturity.

VALUE

Conch is an important part of the marine food chain. Juvenile conch are eaten by crawfish, crabs, hermit crabs, sea snails, hogfish and queen triggerfish. Large conchs are eaten by sea turtles, octopus, stingrays and leopard rays.

Queen Conch has been a staple food in the diet of Bahamians for hundreds of years as well as an important fishery resource. Conch is a food product with status as a “Cultural symbol”. Popular food dishes include cracked conch, conch fritters, conch chowder, conch salad and scorched conch. Almost one million dollars is earned annually from catching and selling conch.

CONSERVATION

The harvesting and possession of conch with a shell that does not possess a well-formed lip is prohibited. Various researchers have concluded that Queen Conch are locally depleted in The Bahamas. The Department of Fisheries is very concerned about the status of conch fisheries and given that the status is not well known, export of conch has been limited.

Conch is listed in the Convention on the International Trade in Endangered Species (CITES) as Appendix II. This listing refers to the species as threatened and standing to become endangered. All international trade is prohibited among CITES signatory nations.



Turtles

PART IV TURTLE

Prohibition on taking, possessing, buying or selling of marine turtles, marine turtle parts or marine turtle eggs.
S.I. 85/2009, s. 2.

Prohibition against interfering with marine turtle nests.
S.I. 85/2009, s. 2.

29. Subject to Regulation 32, no person shall take, have in his possession, buy or sell —

- (a) marine turtles;
- (b) marine turtle parts; or
- (c) marine turtle eggs.

30. Subject to Regulation 32, no person shall interfere with any marine turtle nest.

31. Subject to Regulation 32, no person shall export from The Bahamas —

- (a) marine turtles;
- (b) marine turtle parts; or
- (c) marine turtle eggs.

32. (1) A person who wishes to take, have in his possession or export marine turtles, marine turtle parts or marine turtle eggs for educational, scientific or research purposes, shall apply to the Minister for a permit.

(2) An application made under paragraph (1), shall be made in the manner set out in Form 19 in the First Schedule.

(3) Where the Minister approves an application made under paragraph (1), he shall issue a permit as set out in Form 20 of the First Schedule, specifying the terms and conditions of the approval including the payment of fees as specified in the Third Schedule.

Prohibition on export of marine turtles, marine turtle parts or marine turtle eggs.
S.I. 85/2009, s. 2.

Permit to take, possess or export marine turtles, marine turtle parts or marine turtle eggs.
S.I. 85/2009, s. 2.

First Schedule.

First Schedule.

Third Schedule.

Sharks may be found completely whole or cut into parts. Pictured below: a. Sharks that have been caught and landed ©Shawn Heinrichs b. The bodies of sharks, with the head, fins and tail removed, to be used for meat. ©Shawn Heinrichs



Sharks are mainly targeted for their fins, which is the most expensive part of a shark.

A. A shark fin is being sliced off. ©Jeff Rotman

B. Bags of dried fins that are part of a shipment. ©Paul Hilton



Defining the Prohibition of Sharks, Shark Parts, and Shark Products
Insight into what is Now Illegal to Sell, Import, and Export in The Bahamas

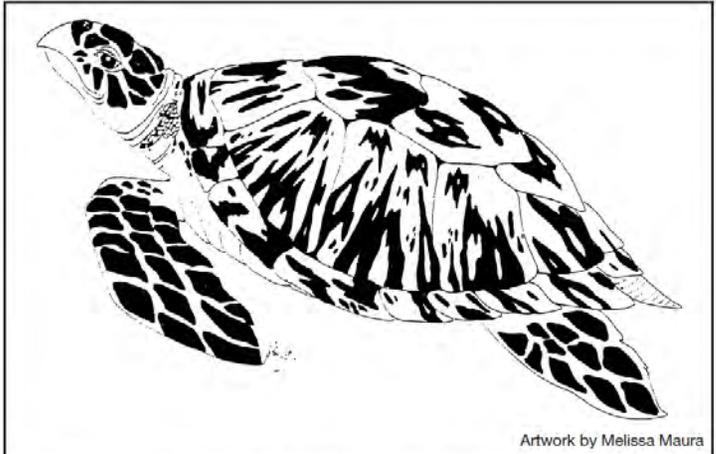
Prohibition on the sale, import, and export of all sharks, shark parts, and shark products within The Bahamas.

In July 2011, The Bahamas created new regulations that prohibit the commercial fishing and trade of sharks within The Bahamas. This document is designed to provide examples of shark items that are now illegal.

According to the regulations, no shark, shark part, or shark product can be sold, imported, or exported from The Bahamas or the exclusive fishery zone. In other words, it is illegal to offer for sale, import, or export any of the below items whether on the water, at docks, markets, restaurants, stores, or customs. These images are meant to provide examples but are not to be considered inclusive in the potential scenarios enforcement and customs officers may witness.

The demand for fins, meat, liver oil, and other products globally has driven many shark populations towards the brink of extinction. While sharks are mainly targeted for their fins, other products are possible. Markets, restaurants, stores, and shipments are all potential locations for sharks and their products to be sold or traded, which is now illegal.

Endangered Species of The Bahamas



Artwork by Melissa Maura

HAWKSBILL TURTLE

SCIENTIFIC NAME
Eretmochelys imbricata

DESCRIPTION
The Hawksbill is considered to be the most beautiful sea turtle. Its hard top shell, called *carapace*, is made up of dark brown, or yellow and brown scales. These scales overlap like shingles on a roof. The Hawksbill's bottom shell is yellow and is called the *plastron*. The skin of its head and flippers has brown patches rimmed in yellow. The hawksbill gets its name from its beak: the top of it hooks down over the lower jaw, much like the bill of a hawk. This sea turtle measures a little less than three feet long and usually weighs a little over one hundred pounds as an adult. Hawksbills and other sea turtles are reptiles.

DIET
The Hawksbill is an omnivore, eating both meat and plants. It feeds on algae, sea grasses, barnacles and fish, but sponges and sea urchins are its favourite food.

REPRODUCTION
Hawksbill sea turtles mate in the water. After mating, the female Hawksbill turtle usually nests at night. She drags herself out of the sea and onto a nesting beach up beyond the reach of high tide. Using her hind flippers like shovels she scoops out a bottle shaped hole and lays about one hundred white, leathery eggs that look like ping-pong balls. She covers the nest with sand and returns to sea, paying no further attention to it and never seeing her young.

The sun's rays heat the beach, warming the turtle eggs buried in the sand. Temperature will determine the sex of the young turtles. Females emerge from the eggs on top where warmer temperatures are found; males emerge from the bottom where cooler

temperatures are found. The eggs are ready to hatch in about two months. Almost all must hatch at the same time, for they all must share the work of digging out of the nest. When the hatchlings are an inch or two below the surface of the beach they become quiet and wait for the surface temperature to drop, usually indicating nightfall. Under the protection of darkness the baby turtles burst out of the nest and rush to the water. Phosphorescence, a light given off by organisms living in the sea, creates a glow that provides direction for these turtles as to the location of the ocean. The hatchling instinctively heads for this "bright" horizon. Tragically in settled areas, hatchlings are now attracted to the bright lights of highways, hotels and parking lots and head away from the sea instead of towards it. They are usually killed. Thousands of hatchlings are lost this way each year.

HABITAT

Hawksbills prefer warm tropical waters. They are usually found in coastal waters around coral reefs. Hawksbills nest in low numbers throughout The Bahamas and the Wider Caribbean. Areas of concentration (although numbers are always very low) are: Mona Island off Puerto Rico, Buck Island in U. S. Virgin Islands, Antigua, Panama, Los Roques, Venezuela and the Caribbean coast of Mexico.

STATUS

The Hawksbill is seriously endangered throughout the world and especially in the Caribbean region. It is listed in Appendix I of the Convention on the International Trade of Endangered Species (CITES) meaning that Hawksbills are near extinction or very endangered. The harm, capture or possession of any Hawksbill turtle is prohibited by law in The Bahamas.

THREATS

Commercial use: The Hawksbill is prized by man for its beautiful shell which is used to make tortoise shell combs, buttons, hair clips and jewelry, thus making man a major threat to its existence. It is also killed and stuffed to hang on walls as decoration.

Habitat destruction: Coastal development, and resulting pollution, is contributing to a decline in Hawksbill and other sea turtle populations world wide.

Natural threats: Adult sea turtles, which are both fast and heavily armoured, have few natural enemies, although sharks can do great damage to them. Young sea turtles have many enemies – ants, crabs, dogs, racoons, lizards, carnivorous fish and birds - that sometimes eat them immediately after hatching.

INTERESTING FACTS

- Sea turtles sleep at night, While sleeping or resting, they can remain underwater for hours without breathing.
- The taking of turtle eggs is prohibited by law in The Bahamas.
- It is believed that Hawksbills never move far from their nesting beaches.



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Sharks: Key to Healthy Oceans



Keeping Coral Reefs Healthy

The loss of sharks can be felt throughout the entire system, including through habitat shifts. In coral reef ecosystems, corals depend on herbivorous fish, such as parrotfish, to eat the algae, which allows space for coral to settle and grow.⁷ When sharks are removed from the system, the larger fish, which feed on herbivorous fish, increase in abundance.⁸ Without the smaller fish to eat the algae, coral can no longer compete for space. As a result, the ecosystem switches to an algae-dominated system, corals cannot thrive and the entire ecosystem changes to one lacking the diversity and abundance of species once found within the coral reef ecosystem.⁹

Sharks under Threat

Sharks have been swimming the world's oceans for more than 400 million years. They have survived multiple mass extinctions, but they are not equipped to withstand the threats now posed by humans. Their life history characteristics, such as slow growth, late maturation and production of few offspring, make them vulnerable to overfishing and slow to recover from decline. As a result, shark populations are in trouble globally.

The demand for shark fins, meat, liver oil and other products has driven numerous shark populations to the brink of extinction. The growing demand for the Asian delicacy, shark fin soup, has led to the killing of up to 73 million sharks a year and is impacting shark populations worldwide, which could potentially affect The Bahamas. The International Union for Conservation of Nature (IUCN) Red List of Threatened Species has assessed that 30 percent of shark and ray species around the world are threatened or near threatened with extinction. The loss of sharks could cause irreversible damage to the ocean—and to economic activities, such as dive tourism, that benefit from healthy marine habitats.



SHAWN HEIBRICH

Permanent Protection for Sharks

Time is of the essence – giving sharks permanent protection in The Bahamas will help to keep its coral reefs, fisheries and the economy healthy.

For more information please contact:

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⁷ Mumby, P.J., Harborne, A.R., Williams, J., Kappel, C.V., Brumbaugh, D.R., Micheli, F., Holmes, K.E., Dahlgren, C.P., Paris, C.B. and Blackwell, P.G. 2007. Trophic cascade facilitates coral recruitment in a marine reserve. *PNAS* 104(20): 8362-8367.
⁸ Bascompte, J., Melian, C.J. and Sala, E. 2005. Interaction strength combinations and the overfishing of a marine food web. *PNAS* 102(15): 5443-5447.
⁹ Bascompte, J., et al. 2005.



Sharks: Key to Healthy Oceans



Ecosystem Benefits

IMAGE: LOS STUART COVE/LOVE BAHAMAS WWW.LOVEBAHAMAS.COM

Globally, sharks are in trouble. But the waters around The Bahamas present a rare situation where shark populations still thrive.¹ As a result, The Bahamas provides a unique opportunity to conserve shark populations before it is too late. Healthy and biologically diverse shark populations are important to maintaining balance in marine ecosystems, including healthy habitats and fisheries. By establishing comprehensive protections for sharks, not only will sharks be permanently safeguarded, but the marine ecosystem and the economy of The Bahamas will be conserved for generations to come.

Keeping the Balance

As top predators in the food chain, sharks help maintain the balance of marine life in the ocean. They regulate the variety and abundance of the species below them in the food chain, including commercially important fish species.² In addition, sharks help to maintain the health of their marine habitats, including seagrass beds³ and coral reefs.⁴ Declines in shark populations can result in negative, broad cascading effects throughout the marine ecosystem.

The decline in shark populations could lead to unpredictable consequences, including the collapse of commercially important fisheries. In the northwest Atlantic, populations of sharks have declined to the point where they are no longer fulfilling their role as a top predator in the ecosystem.⁵ On the U.S. east coast, for example, without sharks to keep the ecosystem in balance, the cownose ray population exploded in North Carolina. With more cownose rays eating the scallops, clams and oysters, the bay scallop population collapsed and with it, an important North Carolina commercial fishery was terminated.⁶

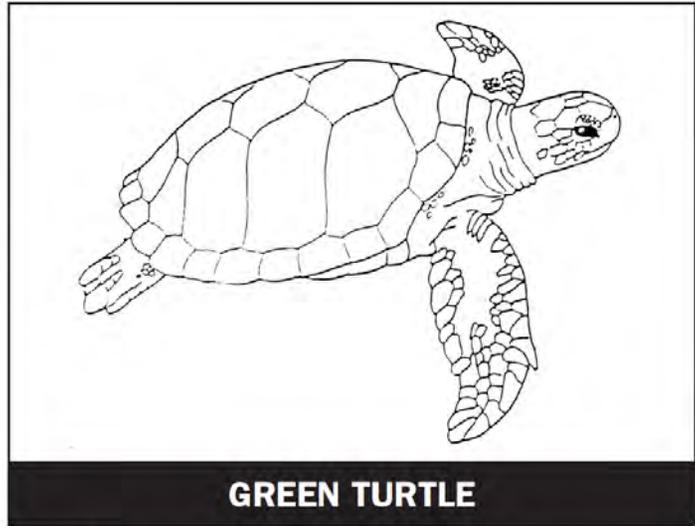


SHAWN HERRICKS

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Endangered Species of The Bahamas



GREEN TURTLE

SCIENTIFIC NAME

Chelonia mydas

DESCRIPTION

Green turtles get their name because of the color of their body fat which gives the turtle its characteristic color. The *carapace* (the hard top shell) is mottled light to dark brown streaked with olive green. Adults can weigh between 200 to 500 pounds. Fairly long flippers and an oval shell make Green turtles hydrodynamically suited to long-distance swimming. Green turtles and other sea turtles are reptiles.

DIET

Juvenile Green turtles are carnivorous (meat eating), until the age of six months to a year. However, adult Green turtles are largely vegetarian eating underwater grasses especially turtle grass (*Thalassia*) and sea weeds.

REPRODUCTION

Green turtles usually mate in the water. After mating, the female Green Turtle usually nests at night. She drags herself out of the sea and onto a nesting beach, up beyond the reach of high tide. Using her hind flippers like shovels, she scoops out a bottle shaped hole and lays about one hundred white, leathery eggs that look like ping-pong balls. She covers the nest with sand and returns to the sea, paying no further attention to it and never seeing her young.

The sun's ray heat the beach, warming the turtle eggs buried in the sand. Temperature will determine the sex of the young turtles. Females emerge from the eggs on top where warmer temperatures are found; males emerge from the bottom where cooler temperatures are found. The eggs develop in the nest and are ready to hatch in about

Sharks

two months. Almost all must hatch at the same time, for they all must share the work of digging out from the nest. When the hatchlings are an inch or two below the surface of the beach they become quiet and wait for the surface temperature to drop indicating nightfall. Under the protection of darkness the baby turtles burst out of the nest and rush to the water. Phosphorescence, a light given off by organisms living in the sea, creates a glow that provides direction for these turtles as to the location of the ocean. The hatchling instinctively heads for this "bright" horizon. Tragically, in settled areas, hatchlings are now attracted to the bright lights of highways, hotels and parking lots and head away from the sea instead of towards it. They are usually killed. Thousands of hatchlings are lost this way each year.

HABITAT

Green turtles can be found in waters between 35 degrees north and 35 degrees south latitude, The major nesting beaches for Green sea turtles in the Wider Caribbean are in Costa Rica, Aves Island off Venezuela, and in Surinam. They also nest in many other places including The Bahamas.

STATUS

The Green turtle has suffered great decline and is very endangered throughout its range. The world total for all remaining populations of green turtles may be fewer than 500,000. Green turtles are listed in Appendix 1 of the Convention on the International Trade of Endangered Species (CITES), meaning that they are near extinction or very endangered, Unfortunately, Green turtles can still be harvested in The Bahamas during open Season (August 1 - March 31),

THREATS

Commercial use: While all sea turtles have edible meat, the Green turtle is favored as the source of the best turtle meat for human consumption. Turtle cartilage, or calipee, used in the manufacture of clear turtle soup, is also obtained primarily from Green turtles. Turtle oil, used in cosmetics, is obtained primarily from Green turtles.

Incidental take: Adult turtles, are accidentally captured and frequently drowned in nets used for commercial fishing such as shrimps fishing.

Habitat destruction: Coastal development and resulting pollution is contributing to a decline in Green turtle and other sea turtle populations worldwide.

Natural threats: Adult sea turtles which are both fast and heavily armored have few natural enemies, although sharks can do great damage to them: Young sea turtles have many enemies - ants, crabs, dogs, raccoons, lizards, sometimes eat them immediately after hatching.

INTERESTING FACTS

- Green turtles are the most gentle of all sea turtles rarely attempting to bite, even if provoked
- Green turtles have good vision underwater, but are hopelessly nearsighted on land. They also have color vision and can see ultraviolet light.
- The taking of turtle eggs is prohibited by law in the Bahamas.
- Sea turtles sleep at night. While sleeping or resting, they can remain underwater for hours without breathing.



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SHARK

36A. Prohibition on possessing, fishing for or landing shark or shark parts.

Subject to Regulation 36D, no person shall possess, fish for or land, any shark or shark parts within The Bahamas or within the Exclusive Fishery Zone of The Bahamas.

368. Prohibition on the sale of shark, shark parts or shark products.

No person shall sell any shark, shark parts or shark products within The Bahamas or within the Exclusive Fishery Zone of The Bahamas.

36C. Prohibition on export or import of shark, shark parts or shark products.

Subject to Regulation 36D, no person shall export from, or import into, The Bahamas--

- (a) any shark;
- (b) shark parts; or
- (c) shark products.

360. Permit to fish for, possess or export any shark or shark parts for educational, scientific or research purposes.

- (1) A person who wishes to fish for, have in his possession or export any shark or shark parts for educational, scientific or research purposes, shall apply to the Minister for a permit.
- (2) An application made under paragraph (1), shall be made in the manner set out in Form 19A in the First Schedule.
- (3) Where the Minister approves an application made under paragraph (1), he shall issue a permit as set out in Form 20A of the First Schedule, specifying the terms and conditions of the approval including the payment of fees as specified in the Third Schedule_

36E. Catch and release of sharks.

A person who hooks or catches a shark while fishing shall promptly release the shark into the sea unharmed."

of darkness the baby turtles burst out of the nest and rush to the water. Phosphorescence, a light given off by organisms living in the sea, creates a glow that provides direction for these turtles as to the location of the ocean. The hatchling instinctively heads for this "bright" horizon. Tragically, in settled areas, hatchlings are now attracted to the bright lights of highways, hotels and parking lots and head away from the sea instead of towards it. They are usually killed. Thousands of hatchlings are lost this way each year.

HABITAT

Loggerheads dwell in warm temperate waters around the world, venturing further from the tropics than other sea turtles to lay their eggs. They breed along the entire southeastern coast of the United States, and Florida continues to be their most important nesting ground. Loggerheads also nest in the Wider Caribbean, including The Bahamas.

STATUS

The Loggerhead is declining in many parts of its range, especially in the Mediterranean, where it is nearly extinct. Its world population is probably no more than 100,000 adult females and males. It is listed in Appendix 1 of the Convention on the International Trade of Endangered Species (CITES) meaning it is near extinction or very endangered. Unfortunately, it can still be harvested in The Bahamas during open season (August 1 - March 31).

THREATS

Commercial use: Eggs are illegally collected by poachers for food.

Habitat destruction: Commercial development and resulting pollution is contributing to a decline in Loggerhead and other sea turtle populations worldwide.

Natural threats: Adult sea turtles which are both fast and heavily armoured have few natural enemies, although sharks can do great damage to them. Young sea turtles have many enemies - crabs, dogs, raccoons, carnivorous fish and birds - that sometimes eat them immediately after hatching.

INTERESTING FACTS

- Sea turtles sleep at night. While sleeping or resting they can remain underwater for hours without breathing.
- The taking of turtle eggs is prohibited by law in The Bahamas.

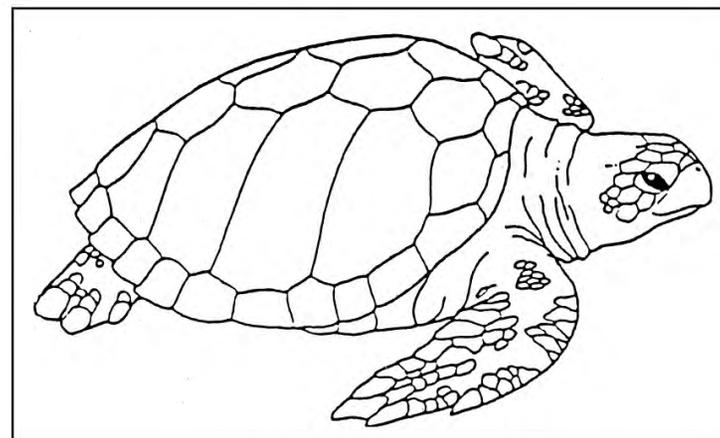


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Endangered Species of The Bahamas



LOGGERHEAD TURTLE

SCIENTIFIC NAME

Caretta caretta

DESCRIPTION

The Loggerhead was named by fishermen who thought that the head of this turtle on the surface of the water resembled a floating log. Loggerheads can weigh up to 230 pounds and measure up to 43 inches in length. They have a heart shaped reddish brown *carapace* (hard top shell) with a large head (10-12 inches long) and a hard horn-shaped beak. Loggerhead turtles and other sea turtles are reptiles.

DIET

Primarily a carnivore (meat eater), Loggerheads feed on mollusks, crabs, and jellyfish. The Loggerhead's powerful jaws are well suited for eating hard shelled food items.

REPRODUCTION

Loggerhead Sea turtles mate in the water. After mating, the female Loggerhead turtle usually nests at night. She drags herself out of the sea and onto a nesting beach, up beyond the reach of high tide. Using her hind flippers like shovels, she scoops out a bottle shaped hole and lays about one hundred white, leathery eggs that look like ping-pong balls. She covers the nest with sand and returns to the sea, paying no further attention to the nest and never seeing her young.

The sun's rays heat the beach, warming the turtle eggs buried in the sand. Temperature will determine the sex of the young turtles. Females emerge from the eggs on top where warmer temperatures are found; males emerge from the bottom where cooler temperatures are found. The eggs are ready to hatch in about two months. Almost all must hatch at the same time, for they all must share the work of digging out of the nest. When the hatchlings are an inch or two below the surface of the beach they become quiet and wait for the surface temperature to drop, indicating nightfall. Under the protection

Stakeholder Analysis Report

The Bahamas Queen Conch Fisheries Management and Sustainability Program

Prepared for The Nature Conservancy

Prepared by Blue Earth Consultants, LLC
June 23, 2016



Creating sustainable solutions

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Photo Credits

Left: Conch midden

Photo Credit: Kelsey Jacobsen

Middle: Fisher unloading conch in Nassau

Photo Credit: Brownpau, Flickr

Right: Conch shells ready to be bagged for shipment on Grand Bahama

Photo Credit: Charlotte Dohrn

Reference

Blue Earth Consultants, LLC. *Stakeholder Analysis Report: The Bahamas Conch Fisheries Management and Sustainability Program*. Rep. The Nature Conservancy, 23 June. 2016.

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Acronyms

BAIC	The Bahamas Agricultural and Industrial Corporation
BREEF	The Bahamas Reef Environment Educational Foundation
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CRFM	Caribbean Regional Fisheries Mechanism
DMR	The Bahamas Department of Marine Resources
KAP report	Knowledge, Attitude, and Practices Report
MPA	Marine protected area
mt	Metric tons
NGO	Non-governmental organization
TNC	The Nature Conservancy

Executive Summary

Purpose and Methods

Queen Conch, a mollusk that is harvested throughout the Caribbean, holds strong economic and cultural significance in The Bahamas. This Stakeholder Analysis Report describes information on the cultural and economic values and local and export markets for conch in The Bahamas.¹ To gather data and information for this Stakeholder Analysis Report, Blue Earth Consultants, LLC (Blue Earth) performed web-based and literature research to find existing information relating to conch markets in The Bahamas, and then worked with The Nature Conservancy to develop and administer interviews and questionnaires to individuals throughout The Bahamas. We traveled to four islands and conducted interviews with more than 30 experts (e.g., non-governmental organization and agency staff, scientists, and fishers) to gain targeted insight on particular aspects of the fishery. We also conducted more than 90 shorter questionnaires with key stakeholders (e.g., restaurateurs, fishers, vendors, processors, and buyers) and more than 170 with members of the public. While the questionnaire sample sizes are not necessarily statistically representative, they do shed light on public and stakeholder perceptions related to The Bahamas conch fishery and provide information for building future studies. Blue Earth compiled all interview and questionnaire responses and analyzed to calculate averages and ranges of responses and draw out trends in qualitative information.

The Bahamas Conch Fishery

Conch supports one of The Bahamas' largest fisheries, with commercial and artisanal fisheries feeding both export and national markets. Fishers harvest conch throughout The Bahamas by freediving or using hookah systems. The Bahamas conch fishery is governed primarily through the national Fisheries Resources (Jurisdiction and Conservation) Act and Regulations, which address fishing generally and have provisions relating specifically to conch. Because Queen Conch is listed as a threatened species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, The Bahamas sets annual export quotas of conch and manages export permits. The Bahamas is also a party to several international bodies within The Caribbean that address conch management.

Conch landings have contributed as much as \$3.8 million annually to The Bahamas in recent years according to The Bahamas Department of Marine Resources (DMR), but the economic effects of the fishery are likely greater than the landings value due to the impacts of related industries, as well as household spending by individuals in those industries. Despite its economic value, there are a number of threats facing conch populations in The Bahamas, including overharvesting, harvesting of juveniles, unsustainable fishing practices, export levels, habitat degradation, and illegal/foreign fishing. Stock density surveys in fishing sites throughout The Bahamas, as well as insights from fishers and experts in this stakeholder analysis, suggest declining conch stocks overall, with the possibility of healthy stocks in areas that are not fished.

¹ This report builds on a literature review focused on threats, population trends, landings, and data availability and gaps for the fishery (Blue Earth 2016). Findings from the literature review and this stakeholder analysis will inform an Evaluation Report that provides analysis and recommendations for improving management of The Bahamas conch fishery and supports The Nature Conservancy's work to develop a management and sustainability program for the fishery.

Although some data, most notably on conch exports, is collected by government agencies, there are several key data and information gaps that, if filled, could help improve management of the conch fishery. This includes data on landings and fishing patterns, conch life history and larval connectivity/molecular genetics, biological data, stock status and locations of conch populations.

Cultural Value and Livelihoods

Conch has been an important food source and cultural object in the Caribbean, including The Bahamas, for at least 400 years, and today two of the most important values of the species are still as food and a cultural icon. The total number of fishers and other professions supported by conch is unknown, but fisher surveys and research suggests that there are thousands of conch fishers in The Bahamas.

Conch Markets, Consumption, and Value

A large amount of The Bahamas conch is exported and tracked through processor reports. Conch meat exports peaked in 2013 at more than 410 metric tons and \$5.8 million, and some shell exports added a relatively small amount to this value. The export duty of three cents per pound contributes relatively little to overall export value. The amount of landed conch that feeds the market in The Bahamas is more difficult to estimate, given limited monitoring of landings and regulation of non-exported sales. DMR estimates that the national market was around twice the size of the export market in some years, but studies indicate that this may be a substantial underestimate. Conch may take various pathways in the chain of custody, including through buyer stations, processors/fish houses for export, or through restaurants/hotels, local vendors, or individuals. In general, prices increase through the chain of custody, ranging from \$2.20 at original sale for uncleaned meat to as much as \$16.25 for higher-value restaurant dishes. In The Bahamas, locals indicated that they consume conch 4.4 times per month on average, and fewer people purchase non-meat conch products such as trimmings, shells, opercula, and pearls. Using Customs Department data, estimated prices for conch meat, and an estimate of total catch, we calculated a possible value of the national conch market based on estimated profits to fishers, processors, and restaurateurs. This very rough estimate is \$2.5-\$7.7 million, compared to the \$3.7-\$5.9 million in export value in recent years.

Perceptions of Management Gaps and Potential Changes

About half of respondents in the stakeholder analysis believe that conch harvest regulations are not strong enough to ensure that there will be conch in The Bahamas in the future. Respondents identified management gaps including knowledge of existing and potential markets for conch products, data organization and sharing, information on alternative livelihood options for fishers, and an understanding of the extent of illegal harvesting. Overall, respondents said that enforcement needs to be improved and there is a need for enhanced stakeholder participation in conch fishery decision-making processes.

To address these gaps, experts identified potentially effective management changes including measures to reduce the harvest of juvenile conch; implementing marine protected areas; reducing or eliminating exports; implementing a conch closed season; and improving enforcement, education and awareness, and science-based management. Prioritizing public education may help build community support and political will as well as increase compliance with regulations. Government agencies, including DMR, the Bahamas Customs Department, and the Royal Bahamas Defense Force, may improve their actions by collaborating effectively.

Stakeholder Analysis: The Bahamas Queen Conch

Purpose and Methods

Queen Conch, a mollusk that is harvested throughout the Caribbean, holds strong economic and cultural significance in The Bahamas.² This Stakeholder Analysis Report describes information on the cultural and economic values of conch in The Bahamas as well as the local and export markets for conch products. This report builds upon a previous literature review that Blue Earth Consultants, LLC (Blue Earth) compiled, which focuses on threats to conch, trends and status of conch populations, landings, and data availability and gaps. Findings from the literature review and this stakeholder analysis will feed into a final Evaluation Report that provides analysis and recommendations for improving management of The Bahamas conch fishery. These deliverables collectively support The Nature Conservancy's (TNC) work to develop a management and sustainability program for The Bahamas conch fishery.

Stakeholder Analysis Methods

To prepare this Stakeholder Analysis Report, Blue Earth compiled information from primary research with individuals in The Bahamas and supplemented it with information gathered through web-based research on conch markets and values. Blue Earth staff traveled to The Bahamas to work with TNC to perform interviews and administer questionnaires with key experts, stakeholders, and members of the public on the islands of New Providence, Andros, Grand Bahama, and Abaco. Respondents primarily represented the islands that Blue Earth and TNC visited; however, several respondents reached through email and TNC's field partners represented islands including Eleuthera, Exumas, Cat Island, and the Ragged Islands.

Specifically, the research process included the following components:

- **Web-Based and Peer-Reviewed Journal Research:** Blue Earth performed keyword searches in Google, Google Scholar, and scholarly article databases to identify gray literature and peer-reviewed articles relating to conch markets in The Bahamas.
- **Key Expert Interviews:** TNC and Blue Earth performed a total of 33 semi-structured interviews with conch experts; the interview questions were tailored to suit each type of respondent (see Appendix C). Respondents included resource managers from The Bahamas Department of Marine Resources (DMR), The Bahamas Agricultural and Industrial Corporation (BAIC), and The Bahamas Customs Department; law enforcement staff from DMR and the Royal Bahamas Defense Force; conch scientists, fishers, processors, and buyers; and staff of non-governmental organizations (NGOs).
- **Stakeholder Questionnaires:** TNC, Blue Earth, and local partners administered a total of 92 short questionnaires to targeted respondents, including conch fishers, restaurateurs, vendors at small stalls, and processors. Questions were tailored to suit the expertise of each of these stakeholder groups (see Appendix D).

² Throughout this report, the term conch refers to Queen Conch (*Lobatus gigas*, formerly known as *Strombus gigas*), which is the primary species targeted in conch fisheries in The Bahamas.

- **Public Questionnaires:** TNC, Blue Earth, and local partners administered a total of 172 short questionnaires to members of the public at grocery stores, restaurants, The Fish Fry in New Providence and Freeport, and other locations (see Appendix D).

Table 1 lists the number of respondents and representation by island for each type of interview and questionnaire administered during the stakeholder analysis research process.

Table 1. Number of Each Type of Interview and Questionnaire and Representation of Respondents by Sector and Island

Survey Type	Sector Representation of Respondent	Number of Respondents	Representation by Island
Key Expert Interview	NGO	7	New Providence (3), Abaco (1), Andros (1), Unknown (2)
Key Expert Interview	Scientists	7	New Providence (1), Eleuthera (2), Exumas (1), Unknown (3)
Key Expert Interview	BAIC or Customs Department	6	New Providence (4), Abaco (1), Grand Bahama (1)
Key Expert Interview	Enforcement (DMR or Royal Defense Force)	6	New Providence (1), Abaco (3), Grand Bahama (2)
Key Expert Interview	DMR	2	New Providence (1), Grand Bahama (1)
Key Expert Interview	Fishers	2	New Providence (1), Abaco (1)
Key Expert Interview	Processors	2	New Providence (2)
Key Expert Interview	Non-Meat Conch Business Representatives	1	Grand Bahama (1)
Stakeholder Questionnaire	Restauranteurs	43	New Providence (8), Abaco (8), Andros (20), Grand Bahama (7)
Stakeholder Questionnaire	Fishers	40	Abaco (4), Andros (27), Cat Island (1), Grand Bahama (3), New Providence (5) ³
Stakeholder Questionnaire	Vendors	4	New Providence (1), Abaco (1), Grand Bahama (2)
Stakeholder Questionnaire	Processors	3	New Providence (2), Grand Bahama (1)
Stakeholder Questionnaire	Buyers	2	Abaco (1), Andros (1)
Public Questionnaire	Members of the Public	172	New Providence (66), Abaco (20), Grand Bahama (20), Andros (55), Ragged Islands (11)

Blue Earth compiled responses from all interviews and questionnaires in Excel databases and analyzed the responses. This analysis included making calculations for quantitative data (e.g., range, average, middle 50%) and identifying key themes in qualitative responses. We coded qualitative data to count and calculate the percentages of respondents who spoke to certain themes for each question. We also cross-referenced and compared with information from web-based research and the Literature Review Report. Throughout this report, we include the percentage of interview or questionnaire respondents

³ Fishers identified as representing “New Providence” were surveyed on New Providence, but may come from other islands including Andros, Eleuthera, or Long Island.

who gave specific types of responses; in some cases, percentages add to more than 100 because respondents provided more than one answer to the question.

Importantly, this study did not attempt to survey statistically significant samples of the population of The Bahamas, nor of any stakeholder or expert group. TNC and Blue Earth identified individual stakeholders to target for the stakeholder questionnaires, and administered the questionnaires to those and other individuals as they were available through convenience sampling. Similarly, we spoke with members of the public by approaching individuals as they were available, attempting to sample individuals from a range of islands and types of locations to gain insight on public perceptions. Expert interviews, on the other hand, were not meant to shed light on broad public or stakeholder perception, but rather to obtain specific information and data from experts in the field.

Given the goals and sampling methods for this study, the information provided is not meant to be comprehensive; however, it provides valuable baseline information for informing improvements to conch management in The Bahamas and a basis for future studies. For example, future studies could conduct questionnaires with statistically significant random samples of the population and stakeholder groups.

The Bahamas Queen Conch Fishery

This section provides a brief description of The Bahamas conch fishery, threats facing the fishery, trends and status of conch stocks, and needs and gaps for conch data. These sections summarize findings in the Queen Conch Literature Review Report and incorporate additional findings gathered through the stakeholder analysis research. Where appropriate, we provide a comparison of findings from the stakeholder analysis research with the literature review findings and findings of the 2015 Knowledge, Attitude, and Practices Report (KAP report) on Queen Conch prepared by TNC (TNC 2015).

Description of the Fishery

Conch is one of the top commercial fishery species in The Bahamas for export and national markets (Gittens and Braynen 2012).⁴ Conch fishers participate in the following fisheries:

- **Commercial:** Defined by The Bahamas' Fisheries Resources (Jurisdiction and Conservation) Act (2001), (hereafter referred to as "the Fisheries Resources Act") as fishing operations conducted using licensed commercial vessels over 20 feet in length, for the purpose of subsequent sale.
- **Artisanal:** Characterized by unlicensed, small-scale fishers utilizing vessels 20 feet or less in length (Fisheries Resources Act 2001; Hawkins and Roberts 2004). Artisanal fisheries may include subsistence fishers as well as fishers who may sell all or some of their catch (Cushion and Sullivan-Sealey 2007).
- **Sportfishing:** Defined by The Bahamas' Fisheries Resources (Jurisdiction and Conservation) Regulations (2010), (hereafter referred to as "the Fisheries Resources Regulations") as foreign fishing within the exclusive fishery zone for sporting purposes or purposes other than commercial. The law prohibits sportfishers from selling conch.

Conch fishers with vessels longer than 20 feet must hold a commercial fishing license, and in some cases groups of boats travel together and offload their catch to a large processing boat at sea (Gittens and

⁴ Although conch is typically The Bahamas' second or third largest fishery, it represents a significantly smaller percentage (8.2%) of commercial exports of marine products from The Bahamas compared to lobster (86.0%) (Deleveaux 2016).

Braynen 2012; Prada and Appeldoorn 2014). Commercially landed conch may be processed and exported or remain in the country to feed the national market. Artisanal fishers with vessels 20 feet or smaller (also called day fishers) may perform subsistence fishing and sell to restaurants or other buyers; they may also sell to processors, which leads to some ambiguity about whether they are participating in the commercial fishery despite not having a commercial fishing license (see the *Conch Markets, Consumption, and Value* section for more information on the chains of custody for the commercial and artisanal fisheries). Stakeholders perceived that relatively few people participate in the sport fishery. Foreign sportfishing vessels (or foreign sportfishers operating Bahamian-owned vessels) may have up to six conch onboard at any time, and are allowed to export those conch (Fisheries Resources Regulations 2010).

To harvest conch, divers free dive or use hookahs (surface-supplied compressed air) during the season when hookahs are permitted (Gittens and Braynen 2012; Caribbean Regional Fisheries Mechanism [CRFM] 2013a). According to The Bahamas' Fisheries Resources Act and Regulations, conch that are harvested or sold must "possess a well formed flaring lip," which is an indicator of sexual maturity.

Fishers harvest conch from many areas throughout The Bahamas, with some key fishing areas found on the Great Bahama Bank and Little Bahama Bank. On the Great Bahama bank, conch fishing areas include the Berry Islands Bank, Andros Island including the East Coast and Grassy Cays, Lee Stocking Island in the Exuma Cays, the Jumentos Cays and Ragged Islands, New Providence, Eleuthera, the Bimini Islands, and the Sand Bores. On the Little Bahama Bank are Abaco Island, including Sandy Point and Mores Island and the Matanilla Shoal. Other key fishing areas include Cay Sal Bank and the Southeastern Bahamas. Processors in this stakeholder analysis most commonly said that the conch they purchase comes from around Abaco and Andros Islands. However, this may reflect the processors' geographic proximity to fishing areas around those islands, and may not be indicative of where fishers most commonly harvest conch.

Existing Management Structures

The Bahamas conch fishery is governed primarily by national legislation, with influence also from international agreements such as through Caribbean-wide management bodies and the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). The Fisheries Resources Act and Regulations are the most prominent national law governing conch fisheries in The Bahamas, addressing fishing licenses, conservation and management principles and conditions, declaration of protected areas, procedures relating to fisheries offenses, foreign fishing, and other topics. Notably, the law enables The Bahamas' Governor-General and the Minister of Agriculture and Marine Resources to set optimum yield, fishing effort limits, and regulations to prevent overfishing. The regulations enumerate the costs for fishing permits and include some specific requirements for conch, including banning the harvest, possession, or sale of conch that do not have a well-formed flaring lip. The regulations also set limits on the amount of conch that sportfishers can catch and transport out of the country.

Conch exports from The Bahamas are controlled through CITES, to which The Bahamas is a party. CITES is a multilateral treaty aimed at protecting endangered animals and plants, and works by subjecting the international trade of endangered species to certain controls (CITES n.d.). Queen Conch is listed under CITES as an Appendix II species, indicating that it is "not necessarily threatened with extinction,

but...trade must be controlled in order to avoid utilization incompatible with their survival” (CITES n.d.).⁵ Therefore, DMR and the Minister of Agriculture and Marine Resources determine a maximum conch export quota annually and allocate permits for exporting conch from The Bahamas. The Wildlife Conservation and Trade Act implements CITES in The Bahamas, which designates the entities responsible for monitoring exports and permits and making scientifically-based recommendations for adjusting export quotas.

There are several international organizations and agreements focused on consolidation and cooperation among conch fishing nations in the Caribbean. The Bahamas is one of 17 members of the CRFM, an inter-governmental organization that drafted the legally binding Common Fisheries Policy. The policy is focused on collaboration among Caribbean people, fishermen, and their governments for the conservation, management, and sustainable use of fisheries and their related ecosystems (CRFM 2015). The Bahamas also participates in a working group between CRFM and other international organizations that aims to establish communications between its members, share data and collection methodologies, compile and analyze data, monitor changes in Queen Conch distribution, provide management advice to countries and regional organizations, and more (Western and Central Atlantic Fisheries Commission n.d.). The Bahamas is also a signatory on the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (also called the Cartagena Convention) (Caribbean Environment Program 2015). The convention is legally binding, and one of its protocols states that each party will protect, preserve, and manage areas that require protection and threatened or endangered species.

Economic Effects of the Fishery

In 2014, The Bahamas reported total landings of about 557 metric tons (mt) meat weight, which was worth \$3.8 million and represented about 17% of the value of all fishery landings (DMR 2014a). Based on these figures, the conch fishery’s contributions to The Bahamas’ economy are substantial. However, the true value may be underestimated by only considering the direct economic effect, in this case landings value, of the fishery (Jacobsen et al. 2014). This is because landings value alone does not take into account the more widespread economic activity that the fishery stimulates throughout the country’s economy.

For example, fishers require certain inputs such as boats and maintenance, hookah and free-diving gear, and other goods and services, and the trade of those goods and services stimulates economic activity within The Bahamas. Reaching one level farther, the people providing those goods and services spend their income on items within the local economy including food, clothing, building materials and labor, and other household expenses. The sum of the direct (conch landings), indirect (provision of goods and supplies), and induced (household spending) economic effects together provide an estimate of the total economic effect of the conch fishing industry (Leontief et al. 1965; Jacobsen et al. 2014). The comparison of this total economic effect to that of conch landings value alone reveals the industry’s “multiplier effect.”

Researchers have modeled and estimated multiplier effects for many industries in numerous countries worldwide, and their estimates of multipliers for fisheries range between one and greater than six (Jacobsen et al. 2014). Dyck and Sumaila (2010) estimate that the economic multiplier of fisheries in The

⁵ In addition, the International Union for Conservation of Nature and Natural Resources (IUCN) classified Queen Conch as “commercially threatened” in 1994 (Groombridge 1994), although the IUCN Red List currently states that the species has not been assessed (IUCN 2015).

Bahamas is 1.22, indicating that the total economic effect of fisheries to The Bahamas' economy is 1.22 times the landings value. While this multiplier value is relatively low compared to some other countries, possibly due in part to The Bahamas' status as a developing country, it indicates that the true economic value of The Bahamas conch fishery may be even larger than landings values suggest.

Threats to Conch in The Bahamas

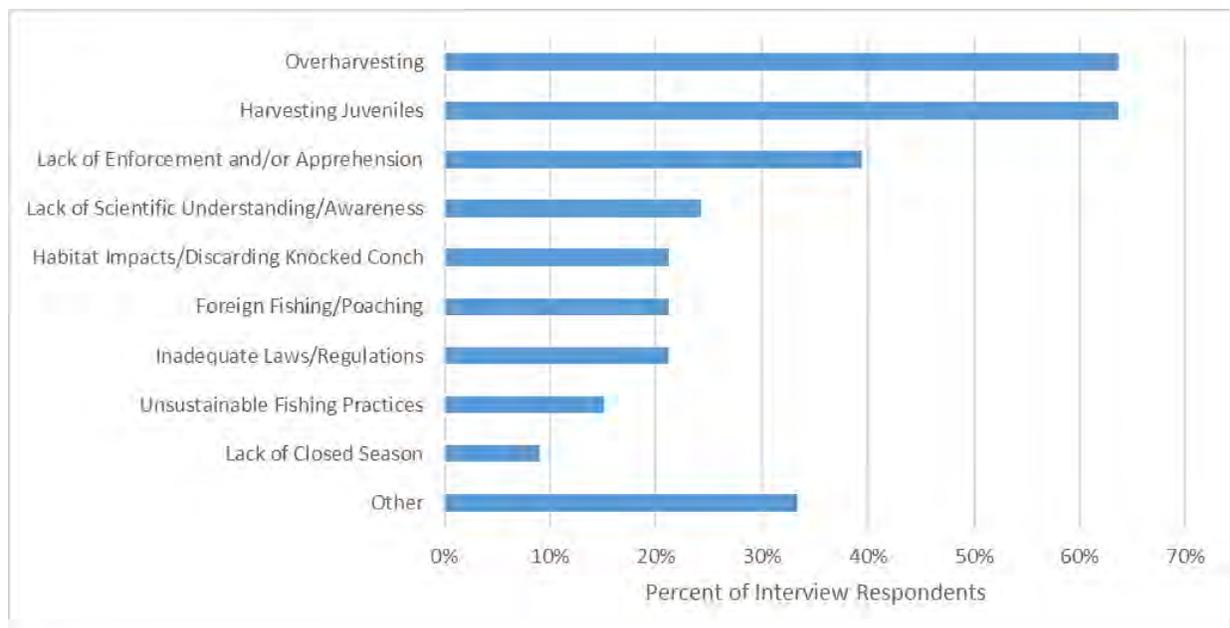
Despite the economic importance of conch in The Bahamas, a number of factors threaten the sustainability of conch stocks. When asked to rate their level of concern about the fishery on a scale of one to 10 (where one is not at all concerned and 10 is extremely concerned), members of the public reported an average level of 7.4, indicating a high level of concern. Fifty percent of respondents reported a level of concern between 6 and 10.

We asked all interview respondents to list the top threats facing conch populations in The Bahamas, and their responses are illustrated in Figure 1 below. Respondents most frequently identified the following top threats:

- **Overharvesting (64%):** Referring to the large numbers of conch fishers, the volumes of conch harvested each year to feed the national and export demand, and the resulting lower densities of conch in the water. Identified by nearly all scientists, NGO staff, and fishers.
- **Harvesting of juvenile conch (64%):** Identified by most enforcement and NGO staff.
- **Lack of enforcement (39%):** Referring to the lack of oversight to ensure that landed conch are sexually mature, especially since there is no requirement to land conch in the shells; and the lack of follow-up to apprehend offenders and impose penalties.

In addition to these top threats, more than one third of respondents mentioned threats that were unique among other responses; these included unregulated take by visiting pleasure craft, lack of listing status on the United States endangered species list, climate change, and the existence of the export market.

Figure 1. Top Threats to Conch Fisheries in The Bahamas Identified by Interview Respondents.



Comparison of Threats Identified through Three Research Methods

Comparing the threats identified by multiple sources can help hone in on the top perceived threats to conch in The Bahamas. Table 2 below lists the top threats (in no particular order) identified through the Literature Review Report (Blue Earth 2016), the KAP report (TNC 2015), and expert interviews for this stakeholder analysis. Based on these findings, top threats identified by all sources include overfishing, harvesting of juveniles, unsustainable fishing practices, export levels, habitat degradation, and illegal/foreign fishing. With regards to unsustainable fishing practices, practices mentioned included harvesting adults while they are in mating aggregations and the use of hookah, including in the season when it is not allowed. While many of the threats listed in the table are interrelated and based in part on perception, this overview highlights some important areas that would need to be addressed to improve conch sustainability.

Among the threats identified by all sources in the table, there are two that would need further investigation to determine whether they are in fact key threats to the fishery. Although foreign and illegal fishing was mentioned somewhat frequently by interview respondents (21%), there is some disagreement about the extent to which it is affecting conch populations in The Bahamas. Two experts indicated that although it is widely believed that foreign fishing is leading to conch declines, there are fishing grounds that foreign fleets likely do not reach that are showing signs of decline. Therefore, while it is possible that foreign fishing is depleting some conch populations, there may not be evidence that conch declines across The Bahamas are predominantly caused by foreign fishing. In addition, interview respondents (21%) and sources citing habitat degradation as a threat often associate this with the discarding of “knocked” conch shells on the seafloor. Some believe that the presence of empty conch shells deters live conch from inhabiting the area; however, research is ongoing and currently not conclusive regarding whether this effect exists (see the Literature Review Report for more information).

Table 2. Top Threats Identified through Three Research Methods

	Literature Review	KAP Report	Stakeholder Analysis
Overharvesting	✓	✓	✓
Harvesting of Juveniles	✓	✓	✓
Unsustainable Fishing Practices	✓	✓	✓
Export Levels	✓	✓	✓
Discarding Knocked Conch on the Seafloor	✓	✓	✓
Illegal/Foreign Fishing	✓	✓	✓
High Demand		✓	✓
Lack of Enforcement	✓		✓
Lack of Understanding/Awareness			✓
Inadequate Laws/Regulations			✓
Lack of Closed Season			✓
Depletion of Female/Egg-Laying Conch		✓	
Pollution		✓	

The Bahamas Conch Stock Trends and Status

Long-term, consistent stock assessment data for conch populations throughout The Bahamas do not exist, largely due to the vast geographical extent of The Bahamas and limited funding to support large-scale and regular stock assessments. However, there are a number of conch density surveys at specific

fishing locations throughout The Bahamas, most notably performed by the NGO Community Conch. Beginning in the 1990s, studies showed strong signs of depletion in fished areas compared to unfished areas (Stoner and Ray 1996). Community Conch stock surveys conducted between 2009 and 2015 found low densities of adult conch at 11 out of 12 primary fishing grounds, indicating that they have been overfished to densities incapable of reproduction. Only one site appeared to be functioning as a healthy and mature population (Stoner et al. 2015). In addition to the stock surveys, rapid ecological assessments of species presence have reported low conch populations and signs of overfishing in locations throughout The Bahamas (Dahlgren 2009; Deleveaux et al. 2013; Haley-Benjamin 2013; Thomas et al. 2015), leading some to suggest that the fishery may be near collapse (Kough 2015).

Exuma Cays Land and Sea Park, the oldest protected area in The Bahamas, is one of few sites that have been resurveyed. Surveys conducted in 2011 showed that populations had declined compared to studies conducted 17 years prior (Stoner and Ray 1996; Stoner et al. 2011; Stoner et al. 2012a); some interview respondents supported this finding, stating that stocks are not rebuilding in the no-take area of the park. The Bahamas is expanding its network of marine protected areas (MPAs) with the conservation goal of protecting at least 11 million acres of terrestrial and marine environment by 2020 (The Bahamas Reef Environment Educational Foundation [BREEF] 2014a). Given that MPAs may take decades to show effects on the species within them, this effort may support the health of The Bahamas' conch stocks in the future.

Interviews capture experts' perceptions of the current status and trends of conch stocks in The Bahamas, with respondents reporting the following perceptions:

- No stocks known to be rebuilding (70%);
- Stocks are in poor condition overall (55%);
- Stocks are in stable condition overall (45%);
- Condition of stocks dependent on location (26%);
- Stocks are in healthy condition overall (13%); and
- Insufficient information available to judge stock condition (10%).

Among respondents, scientists and NGO staff were most likely to rate the condition at poor, while the two fishers interviewed rated the condition as either stable or healthy. Findings from the KAP report shed more light on fishers' perceptions: the majority of fishers surveyed believed that conch resources were declining, evidenced by the need to travel farther and into deeper waters to harvest conch (TNC 2015).

Interview respondents also shared their perceptions on which areas of The Bahamas have stocks that are healthy, declining, or rebuilding. There were many different responses for areas that are healthy, with the most commonly mentioned including the Jumentos Cays, Ragged Islands, Andros, South Bahamas, Abaco, and the Sand Bores. Perceptions of declining stocks were similarly widespread and some conflicting with the perceived healthy areas, and included the Abaco Islands, Berry Islands, Andros, Exuma Cays, Grand Bahama, Eleuthera, South Bahamas, and New Providence. Some respondents also suggested that most areas are declining overall. There were fewer ideas about areas that are rebuilding, but respondents mentioned the Abacos, Grand Bahama, and possible areas where fishers have not discovered. A majority of respondents (70%) did not know of any areas that are rebuilding. Together, stock surveys, the stakeholder analysis research, and the KAP report findings suggest that The Bahamas conch stocks are declining in some key fishing grounds, although there may be some areas that are less impacted by fishing and still have healthy populations.

Data Gaps and Needs

To effectively manage conch fisheries in The Bahamas, there are several gaps in data and information that would ideally need to be filled. Below are the top gaps in data and information identified through the literature review and stakeholder analysis research; **bold** indicates gaps identified through both research methods.⁶

- **Stock status and locations of conch populations, including deep water stocks**
- **Life history/biology and larval connectivity/molecular genetics**
- **Landings amount and composition/fishing patterns**
- Effects of knocked conch on existing conch populations
- Extent of illegal fishing/illegal removal from the country
- Impacts of climate change and other environmental factors
- Markets (existing and potential) and consumption rates, including export and national sale amount and value
- Alternative livelihood options for fishers (e.g., aquaculture, agriculture, or other fisheries)
- Reliable and well-organized data

Regarding the top identified gaps, interview respondents suggested that there is a need for more stock status data, including where conch do and do not exist. Other information they suggested would be useful included size and age structure of conch populations, life history information, catch and effort by fishers, and enhanced landings information including the number and age class of landed conch. The main barrier that they identified to collecting this information was a lack of staff capacity and training. Other barriers included the vast geographic area over which conch exist and are fished and lack of resources and equipment for collecting data. They also highlighted the need for consistent data collection protocols and data storage frameworks to provide reliable and well-organized data, and the importance of using that data in future ecological and social studies. Respondents suggested overcoming these barriers by prioritizing research and monitoring by allocating staff time, resources, and equipment within DMR and other agencies.

Data availability also varies across islands and fishing grounds in The Bahamas. Interview respondents commented on the specific geographic locations where they believe there are the biggest gaps in data. Respondents mentioned many locations at different scales, with the most commonly mentioned locations including the following:

- Abaco (29%);
- Southern Bahamas (29%);
- Andros (24%);
- Grand Bahama (24%);
- Eleuthera (18%);
- New Providence (18%);
- Bimini to Berry Islands (12%); and
- Cay Sal Bank (12%).

⁶ Note that although all of the areas below were mentioned by respondents in the stakeholder analysis as issues relating to various questions, the list below refers to their responses regarding the most important data gaps and needs.

Despite these perceived geographical gaps, researchers have conducted recent studies at locations in some of these areas, including stock surveys conducted by Community Conch in Abaco (Stoner et al. 2012b), Andros (Stoner and Davis 2010), and the Berry Islands (Stoner et al. 2009); rapid ecological assessments in the Southeastern Bahamas (Deleveaux et al. 2013), New Providence (Dahlgren 2009), and Abaco (Haley-Benjamin 2013); and habitat surveys on Eleuthera (Cash 2013; Thomas et al. 2015). Researchers are also addressing some molecular genetics topics, including studying conch population connectivity within and among Caribbean countries; results of this research are anticipated in August, 2016 (Truelove 2016).

Section Summary: The Bahamas Queen Conch Fishery

Description of the Fishery: Queen Conch is one of The Bahamas' largest fisheries, feeding both export and national markets. Fishers participate primarily in the commercial and artisanal conch fisheries, with some visitors participating in the sport fishery. Fishers harvest conch from many areas within the vast waters of The Bahamas, including areas on the Great Bahama and Little Bahama Banks, and freedive or use hookah systems.

Existing Management Structures: The Bahamas conch fishery is governed primarily through the national Fisheries Resources Act and Regulations, which address fishing generally including conservation management principles, optimum yield and regulations to prevent overfishing, licenses and fees, procedures relating to offenses, foreign fishing, and more. Because Queen Conch is listed as a threatened species under CITES, conch exports are controlled by CITES via the national Wildlife Conservation and Trade Act. As a party to CITES, The Bahamas sets annual export quotas of conch and manages export permits. The Bahamas is also a party to several international bodies within The Caribbean that address conch, including the CRFM, a working group comprised of CRFM and several other international bodies, and the Cartagena Convention that focuses, among other issues, on protecting, preserving, and managing areas and threatened or endangered species.

Economic Effects of the Fishery: According to DMR data, conch landings have contributed as much as \$3.8 million per year to The Bahamas in recent years, but the economic effects of the fishery are likely greater than the landings value. The economic multiplier captures economic activity such as diving equipment sales and household spending that the fishery drives; the multiplier for fisheries in The Bahamas has been estimated at 1.22, indicating that the economic effect is 1.22 times the landings value.

Threats to Queen Conch in The Bahamas: There are a number of threats facing conch populations in The Bahamas, as identified through a previous literature review and this stakeholder analysis. Some of the top threats identified through these methods included overharvesting, harvesting of juveniles, unsustainable fishing practices, export levels, habitat degradation, and illegal/foreign fishing.

The Bahamas Conch Stock Trends and Status: Since the 1990s, stock density surveys in key fishing locations throughout The Bahamas have suggested declining conch stocks in most survey sites. Expert interview respondents corroborated this finding, with the majority indicating that The Bahamas conch stocks overall are in poor condition; however, they indicated that stock health can vary widely among different locations.

Data Gaps and Needs: Together, the literature and this stakeholder analysis indicate that the most useful types of data needed to effectively manage conch in The Bahamas include data on landings and fishing patterns, conch life history and larval connectivity/molecular genetics, and stock status and locations of conch populations. The main barriers to collecting this data, according to interview respondents, include a lack of capacity and staff training at the managing agencies, the large geographical area of The Bahamas, lack of equipment and resources, and lack of organizational structure for managing the data. However, some of these data may be available, including through DMR/Ministry of Agriculture and Marine Resources, Customs Department, Department of Statistics, and exporters, fishers, or buyers.

Cultural Value and Livelihoods

This section describes findings from Blue Earth and TNC's research on conch's historical and current cultural value in The Bahamas, as well as its role in supporting the livelihoods of Bahamians. Information on the historical value and livelihoods comes from literature and web research, whereas current cultural value also includes findings from interviews and questionnaires.

Historical Use

Conch is an important fishery resource and cultural symbol across the Caribbean (Prada and Appeldoorn 2014), including The Bahamas. Local peoples have harvested conch for centuries (CITES 2003; Chakallal et al. 2004), as evidenced by middens⁷ dating back to Pre-Columbian times (Brownell and Stevely 1981; Theile 2001; Burton 2015; Posada et al. 2007). Archaeological evidence suggests that conch was an important food source for early inhabitants of the Caribbean region and also used for ceremonial objects, ornaments, trumpets, and tools, all made primarily from shells (Wyman 1875; Steward et al. 1948; Randall 1964; Rogers 2014). Because of this long history of consumption and use of conch in the Caribbean, some say that it is one of the region's most beloved species (Prada and Appeldoorn 2014).

In The Bahamas specifically, conch has provided an important source of food for generations (TNC 2015) and residents of the islands have fished conch since the time of the earliest Lucayan inhabitants (BREEF 2014b). Chalwell (2013) reports that conch harvest was one of the primary ways that 17th century residents of New Providence supported themselves. Supporting these findings, Posada et al. (2007) collected conch shells from the bottom of large middens in the Exuma Cays, dating two shells at more than 400 years old.

Current Cultural Value

Conch has continued to serve as an important cultural icon and resource for Bahamians since the time of the earliest settlers. TNC's KAP report found that among households surveyed, conch is valued primarily as a food source and also linked with Bahamian identity. As a food source, Bahamians value conch as a low-fat and easily accessible source of protein; as part of their identity, many Bahamians said they take pride in conch as a national symbol and were willing to change their behavior to improve management of the conch fishery. Questionnaire respondents in this stakeholder analysis supported findings of the KAP study, with the majority of respondents identifying the top values of conch as a food item (53%) or cultural icon (31%), including as a national dish. Respondents who identified food as the reason that conch is important to them frequently stated that they simply like the taste and enjoy eating conch dishes. Respondents for whom conch is an important cultural icon or national dish emphasized that conch is symbolic of The Bahamas, is unique to the region, and is part of their heritage. Other reasons that members of the public said conch is important to them include the following:

- Source of income (17%);
- Health benefits (12%; although some mentioned negative health effects of consuming conch);
- Importance to natural ecosystems (10%);
- Not important (8%); and
- Tourism (6%).

⁷ Conch shell middens are large accumulations of discarded conch shells that indicate the presence of an active historical or contemporary fishery (Stoner 1997).

To compare among all islands surveyed, one of the most frequent responses was that that conch is important for food. Regarding other values of conch, respondents from the Ragged Islands indicated the importance of conch as a source of income more frequently than respondents from other islands, and respondents from New Providence mentioned its importance as a cultural icon or national dish most frequently compared to other islands.

Livelihoods

Closely linked with conch's cultural value is its provision of jobs, such as for fishers, processors, buyers, restaurateurs, vendors, boat makers, and other positions throughout the chain of custody. The exact number of conch fishers and other livelihoods supported by conch in The Bahamas is not well documented, as confirmed by DMR representatives during interviews. The most recent fisheries censuses, conducted in 1995, estimated 9,300 commercial fishers in The Bahamas, although the exact proportion of fishers targeting conch is not known (Gittens and Braynen 2012; CRFM 2013a; CRFM 2013b; Clavelle and Jylkka 2013; Prada and Appeldoorn 2014). Given that conch is typically the country's second largest fishery, it is likely that a large proportion of these fishers spend at least part of their time fishing for conch. Furthermore, this figure does not include non-commercial conch fishers who sell their catch, although DMR estimates that the artisanal fishery is smaller than the commercial fishery.

Nine percent of Bahamian households surveyed in the 2015 KAP study reported fishing conch, and 0.2% of households reported that conch fishing, processing, or exporting is their primary source of income. This low percentage likely stems in part from the nature of the conch fishery: fishermen commonly target both lobster and conch during part of the year, but because lobster is more valuable than conch and fishers harvest it preferentially over conch, conch may not serve as the primary source of income even for conch fishers. Even though conch may not always be the primary source of income for fishers, the KAP report suggests that it supports employment for thousands of Bahamians through fishing and related industries (TNC 2015).

Section Summary: Cultural Value and Livelihoods

Historical Use: Conch has been an important food source for local peoples in the Caribbean and The Bahamas specifically for at least 400 years, as evidenced by midden surveys and other archaeological evidence. Early inhabitants of the islands also crafted objects such as ornaments and tools out of conch shell.

Current Cultural Value: Conch continues to be an important food source and cultural icon for Bahamians today, with more than 90% of questionnaire respondents stating that conch is important to them in some way. In addition to food and as a cultural icon, conch is important for supporting income, health, natural ecosystems, and tourism.

Livelihoods: The total number of fishers and other professions supported by conch is unknown, but fisher surveys and research studies suggest that there are thousands of conch fishers in The Bahamas. Some of those fishers target other fisheries as well, such as lobster, so conch may account for a portion of their livelihood.

Conch Markets, Consumption, and Value

This section summarizes available information on the relative sizes of the export and national markets for The Bahamas conch, conch sales and consumption in The Bahamas, and the market values of various conch products in The Bahamas and abroad. Overall, expert interview respondents indicated most often that the markets for conch are growing (45%), while slightly fewer (36%) indicated that they are remaining constant. Only one respondent believed that conch markets are declining, suggesting that the demand for conch may increase or remain stable into the future.

Export Market

A substantial amount of conch originating from The Bahamas is exported each year. According to the Fisheries Resources Act of 1977, it is unlawful to take more than 10 pounds of conch out of The Bahamas without an export permit, allowing inspection, and payment of an export duty. Beginning in 1995, DMR and the Minister of Agriculture and Marine Resources set a total annual export quota conch, historically between 110-310 mt (meat weight; that is, not including shells) (Theile 2001; BREEF 2014b). Table 3 below shows annual export quotas for 1995 to 2014, where available. To the authors' knowledge, there is no single publicly available source providing annual conch export quotas for The Bahamas, and in some cases different sources indicate different quotas for the same year. To standardize as much as possible, Table 3 draws first from the export quotas reported to CITES where available, and secondarily from other sources to provide information for missing years. Some quotas are the same over two years because the quota was reported by fishing season instead of by year.

Table 3. Annual Export Quotas for Conch Meat

Year	Quota (mt)	Source
2014	249.5 (estimate) ⁸	BREEF 2014b
2013	258.5 (estimate) ⁹	McKenzie 2013
2011	270.0 (estimate) ¹⁰	Gittens and Braynen 2012; CRFM 2013a
2008	181.0	CRFM 2013b
2003	136.0	CITES 2003
2002	308.4	CITES 2003
2001	308.4	CITES 2003
2000	136.1	CITES 2003
1999	158.8	CITES 2003
1998	204.1	CITES 2003
1997	204.1	CITES 2003
1996	201.8	CITES 2003
1995	113.5	Deleveaux 1997

Exports are tracked through conch processors, who report to DMR on the amounts and values of the conch they process and export. Due to this reporting structure, exports are likely the most reliable type of information available relating to The Bahamas conch markets. In 2011, the export quota was

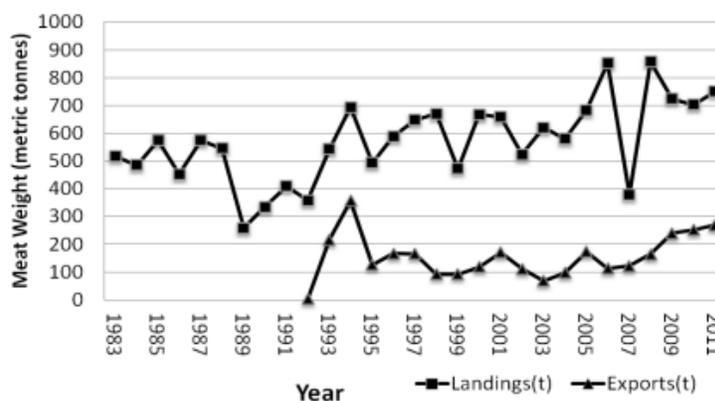
⁸ BREEF (2014b) states that the export quota has been approximately 550,000 pounds (249.5mt) per year in recent years.

⁹ In a 2013 news article written by McKenzie, the Minister of Agriculture and Marine Resources is quoted stating that The Bahamas export quota allowed by CITES is 570,000 pounds (258.5mt).

¹⁰ CRFM (2013a) states that the 2011 export quota was 36% of the landings. Landings information for 2011 was drawn from Gittens and Braynen (2012) to calculate the export quota.

estimated to be approximately 36% of the total catch (CRFM 2013a), although total catch figures may be underestimates (see *National Market* section below). Figure 2 illustrates DMR data on conch landings and exports from 1983 to 2011. In separate datasets, DMR estimated that total landings fell slightly to 556.9 mt in 2014 (DMR 2014a) and rose to 870.9 mt in 2016 (Deleveaux 2016). Data from The Bahamas Customs Department indicates that exports in recent years have peaked and then declined, with approximately 419.5 mt, 279.1 mt, and 272.7 mt in 2013, 2014, and 2015, respectively (Customs Department 2016).¹¹ Notably, these data indicate a steep increase in exports, especially in 2013, exceeding the estimated export quotas in those years. The largest portion of conch exports are frozen, with relatively less exported fresh/chilled or live (Customs Department 2016).

Figure 2. The Bahamas Conch Landings and Exports (Gittens and Braynen 2012)



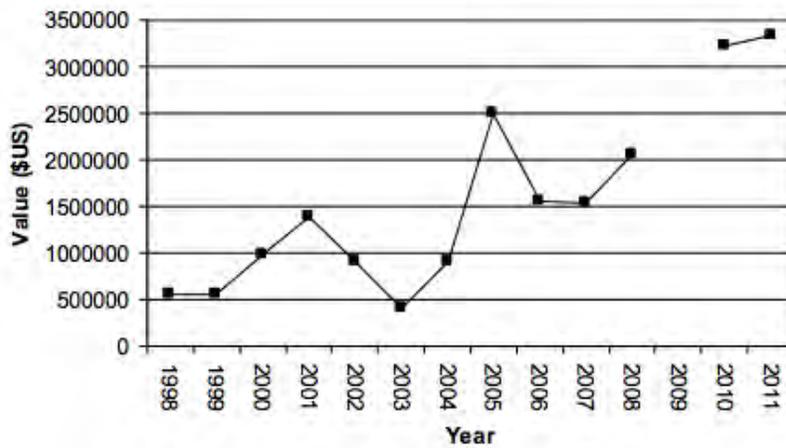
The Bahamas exports non-meat conch products as well, including mostly shells. Customs Department data shows that in 2013-2015 The Bahamas exported approximately 48.3 mt, 228.9 mt, and 139.9 mt of conch shells, respectively (Customs Department 2016).¹² The stakeholder analysis research did not reveal clear records of exports of other conch products such as pearls, opercula (also called horns), or trimmings (i.e., skin and other tissue left over after processing; also called slop or bobbies), although one interview respondent indicated that both pearls and opercula are exported from The Bahamas.

Conch exports form an important part of the economic benefits of fisheries in The Bahamas, with 2011 conch exports valued at nearly \$3.5 million (Figure 3). More recent Customs Department data indicate that, like export amounts, values peaked and then declined in recent years, with export values for conch meat in 2013-2015 amounting to approximately \$5.8 million, \$3.6 million, and \$3.5 million, respectively. Note that DMR’s estimates of conch meat export values in recent years are somewhat different, estimating \$3.3 million in 2014 and \$2.3 million in 2015 (DMR 2014b; 2015). In addition to the value of exports, The Bahamas gains revenue through export duties and export permits for conch products. Exporters pay a duty of three cents per pound of conch at the time of export (Fisheries Resources Regulations 2010), and these fees typically go to the public treasury. In addition to the duty, there is a fee for obtaining a license to export conch, which according to law is granted by the Minister of Agriculture and Marine Resources.

¹¹ The Customs reports reporting these statistics do not report the units of conch export amounts, so the authors assumed that the values are in pounds and converted them to metric tons. Values represent exports of the following types of shellfish: conch, live (strombus); conch, fresh or chilled (strombus); conch, frozen (strombus), and other conch (strombus). These figures do not include the category of “other” because the source did not state whether that category includes conch.

¹² Customs Department data of exported shells describes helmet shells, conch shells, and other. The statistics reported here are for conch shells, since helmet shells come from the King Conch, which is not typically targeted in the Queen Conch fishery.

Figure 3. The Bahamas Conch Export Value (Gittens and Braynen 2012)

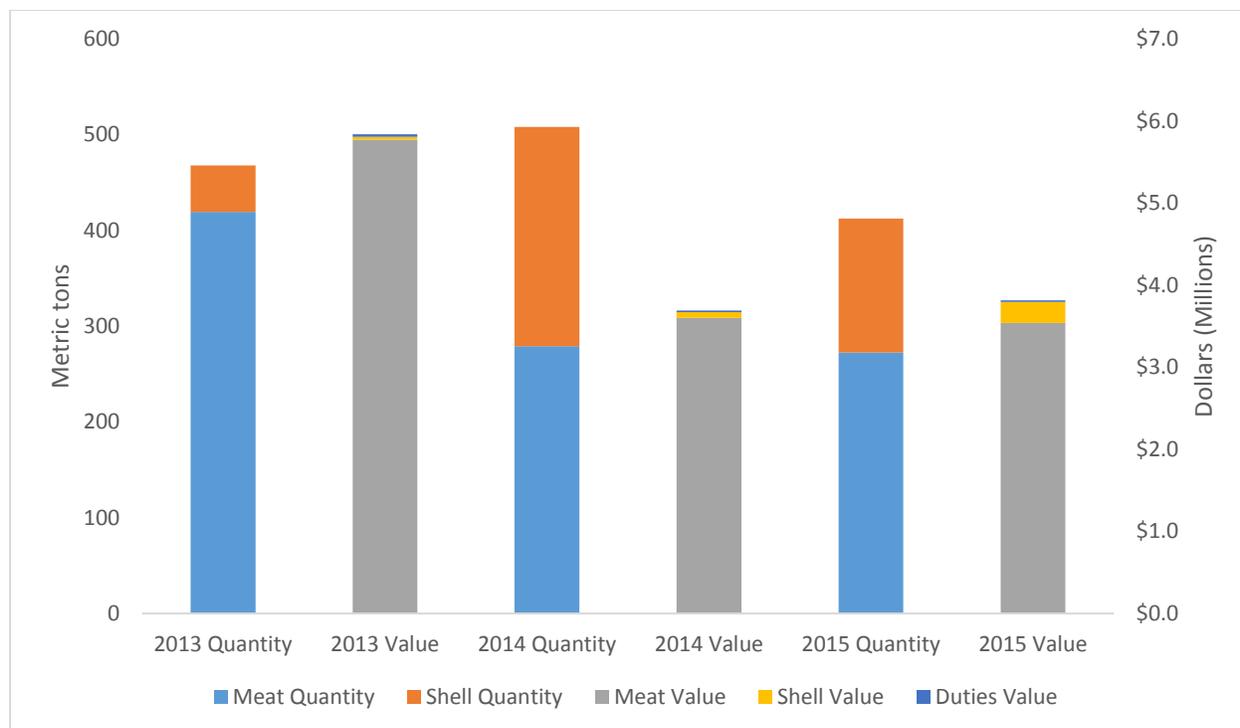


The conch fishery feeds some export of non-meat conch products as well, and those exports contribute to the value of conch to The Bahamas. In 2013-2015, export values for conch shells amounted to approximately \$33,900, \$71,960, and \$257,100, respectively. While these values are low compared to the values of conch meat exports, the increasing values in recent years and possible markets for shells and other non-meat conch products outside The Bahamas highlight the possibility of increasing revenue to the country through exports of non-meat products.

Figure 4 below illustrates Customs Department data discussed above for the years 2013-2015. Based on this data, conch export revenues from meat, shells, and export duties amounted to \$5.8 million in 2013, \$3.7 million in 2014, and \$3.8 million in 2015. Although relatively large amounts of conch shells were exported, their value is less than that of meat; therefore, the vast majority of value was attributed to meat exports, with much less revenue from shells and export duties.¹³

¹³ Export duties displayed in the figure represent those documented in available Customs Department data, which were not reported and assumed to be zero for some exported conch products; the Customs Department data reported no export duties on exported shells in any of the three years.

Figure 4. Quantities and Values of Exported Conch Products (Data from Customs Department 2016)¹⁴



National Market

In addition to exports, consumers within The Bahamas comprise the other major market for The Bahamas conch. Although DMR collects and reports annual landings and exports data of Bahamas conch (Figure 2), findings from the literature review revealed that this data, especially regarding total landings, may be incomplete (Talaue-McManus and Hazell 2008; National Marine Fisheries Service 2014). Literature sources suggest that more conch is consumed nationally than is exported (CITES 2012; CRFM 2013a; Appeldoorn and Baker 2013; Gittens 2014; Queen Conch Working Group 2014), which aligns with the DMR data. However, Talaue-McManus and Hazell (2008) estimated during their 2003-2004 study that “the fisheries monitoring system in The Bahamas did not document 86% of the estimated total conch catch based on consumption and trade statistics.” This same study estimated the annual consumption of conch in The Bahamas at 4,200 mt in 2003-2004 based on a seafood consumption survey of locals and tourists. This estimate is nearly seven times the landings reported by DMR in that time period.

This possible underreporting of non-exported conch landings, as well as the lack of understanding of total landings, is also reflected in the perceptions of interview and questionnaire respondents. When asked whether the export or national market was larger, interview respondents stated the following (see Appendix B for a more detailed summary of responses by island and by type of respondent):

- National market is larger (53%);
- Export market is larger (42%); and

¹⁴ Note that DMR’s estimates of conch meat export amounts and values in 2014 and 2015 are somewhat different than the export data from the Customs Department illustrated in this graph. DMR reported conch meat exports totaling 251.0 mt (553,410 pounds) and valued at \$3,266,577.50 in 2014, and conch meat exports totaling 182.3 mt (401,838 pounds) and valued at \$2,343,142.00 in 2015 (DMR 2014b; 2015).

- National and export markets are equal size (5%).

In addition, several respondents said that there is insufficient data to accurately estimate the relative sizes. The average estimate of the size of the national market was 54% of all landings; however, estimates ranged between 20% and 80%. Notably, scientists indicated that the national market is larger, while fishers believed that the export market is larger. Although some DMR respondents indicated that they believe the export market to be larger, DMR later clarified that the national market is larger (Deleveaux 2016). For each island surveyed, respondents divided fairly evenly on the question of which market they believed to be larger, which further highlights the lack of knowledge about the relative sizes of the national and export markets.

We also asked processors and buyers to estimate the proportions of processed conch that are destined for sale within the country versus export. Responses averaged 68% destined for export (ranging between 36% and 95%), although these estimates may vary depending on the processors' individual business practices and demand in the locality of the processing facility.

Based on this information, it is clear that the national market for conch is large, and possibly larger than the export market. However, there is considerable ambiguity about how much conch is actually landed and consumed within The Bahamas. Interview and questionnaire respondents suggested that part of the lack of clarity may stem from the way the conch fishery is executed in The Bahamas, where fishers commonly collect conch for their own use or sell directly to restaurants and vendors without any requirement to document those sales. In addition, conch landing sites can be informal and dispersed throughout many islands, some of which are very remote, which inhibits monitoring by DMR. Therefore, although DMR may accurately capture conch export statistics and collect some information on other landings, their data likely does not account for all conch harvested within The Bahamas.

Conch Sales and Consumption

Historically, with the exception of exports there has been little documentation of conch sales at the various points throughout the chain of custody within The Bahamas. This section reports on available information and insights from the stakeholder analysis regarding the chains of custody for The Bahamas conch fisheries, proportions of conch destined for processors versus other purchasers, frequency and volume of sales by restaurants, and the frequency of consumer consumption and likelihood of purchasing conch products.

Conch Sales

We collected information from stakeholders regarding several aspects of conch sales to shed light on the supply chains for conch products. First, we asked interview respondents to describe the chains of custody for conch in The Bahamas. Figure 5 and Figure 6 below illustrate the chains of custody for the commercial and artisanal conch fisheries; in general, the chains of custody for conch are dispersed and, based on this stakeholder analysis research as well as the literature review, not strongly regulated or monitored (Future of Fish 2015). The one exception is the tracking of exports through large processing facilities with export permits.

Commercially licensed fishers typically sell their conch to buyer stations or directly to processors/fish houses or restaurants/hotels.¹⁵ Buyers may sell to either restaurants/hotels or to processors/fish houses

¹⁵ One interview respondent noted that some fishermen may manage their own exports, which increases their profits by avoiding middle-men. The extent of this practice is unknown to the authors.

for sale within the country or export. Some artisanal fishers may similarly participate in conch markets by selling to buyers, who in turn sell to restaurants and/or processors. By selling to processors, artisanal fishers may contribute to conch exports in addition to national consumption. Artisanal fishers may also sell directly to small local vendors, restaurants, or individuals. The chain of custody for the sport fishery consists of visitors who harvest conch and transport it out of the country in accordance with the sportfishing regulations discussed above in *The Bahamas Queen Conch Fishery* section.

Figure 5. Chain of Custody for The Bahamas Commercial Conch Fishery

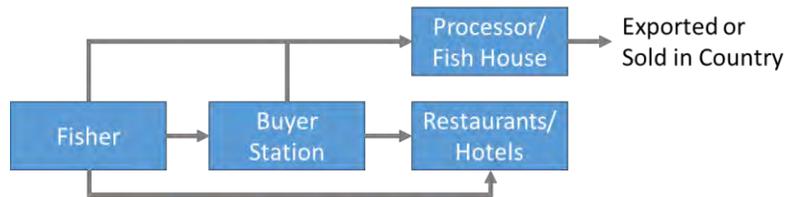
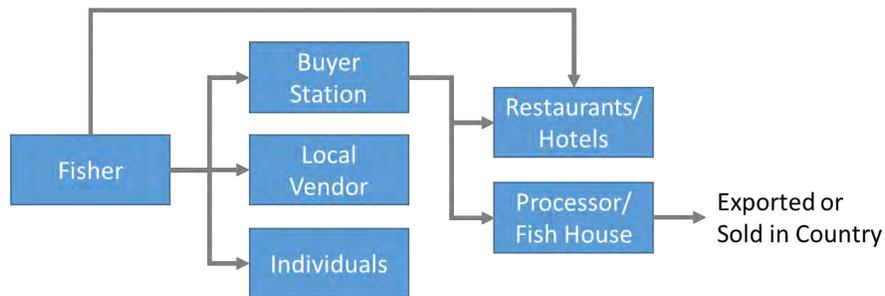


Figure 6. Chain of Custody for The Bahamas Artisanal Conch Fishery



In addition to learning about the chains of custody, we gathered perceptions of the proportion of landings that go through processors versus being sold directly to hotels, restaurants, vendors, or individuals within The Bahamas. A strong majority of respondents (70%), including DMR staff, fishers, processors, and NGO staff, stated that more than half of landed conch is sold to processors. However, among those respondents there was wide variation in the estimated proportions, ranging from 90% processors and 10% other to 60% processors and 40% other. Processors also reported the proportion of their business that is made up of conch sales, with responses of the four processors and buyers surveyed ranging between less than 5% and 40%.

We also asked restaurateurs and vendors from whom they source their conch, and asked fishers to whom they sell their conch. Among restaurateurs, 74% source conch directly from fishers, 19% from fish houses, and smaller numbers of restaurateurs source from wholesale agencies or supply their own restaurants. Restaurateurs on New Providence were more likely to source their conch from fish houses or wholesalers than restaurants on other islands, who primarily source directly from fishers. Among fishers, 55% reported selling directly to individuals or locals, 39% to restaurants or resorts, and 39% to buyer stations or fish houses. Some fishers also reported selling to vendors, tourists, processing plants, and wholesalers.

Restaurateurs reported selling an average of 41 pounds of conch per day, with responses ranging widely from 1.3 to 350 pounds per day. Restaurants that reported conch sales in terms of individual conch reported selling an average of 23 conch per day, with responses ranging from 3.5 to 60 conch per

day. The largest portion (44%) of restaurateurs and vendors said that they sell most of their conch to visitors or tourists, but many (38%) also reported selling a majority of their conch to locals. About 22% of restaurateurs and vendors said that they sell equally to tourists and locals. In their 2003-2004 study, Talaue-McManus and Hazell (2008) estimated that tourists consumed only 17% of conch available within The Bahamas.

Consumer Consumption Rates

As evidenced through interview and questionnaire responses and literature sources, conch is an integral part of the traditional diet in The Bahamas. A previous study by TNC found that 40-50% of Bahamians consume conch every day (Future of Fish 2015), and the KAP study found that 26% of Bahamian households consume conch at least once per week. Gittens and Braynen (2012) calculated annual consumption of conch in The Bahamas at 1.3 kg per capita in 2010 and 2011, and CRFM (2013b) estimated per capita fish consumption (including conch) to be 11.9 kg per year. In this stakeholder analysis, members of the public reported their frequency of consuming conch at an average of 4.4 times per month. The middle 50% of respondents reported consuming conch between one and five times per month. Frequency of conch consumption varied slightly by island, with respondents from each island surveyed reporting the following frequencies:

- **Andros Island:** 7.2 times per month
- **Ragged Islands:** 4.8 times per month
- **Grand Bahama:** 3.6 times per month
- **New Providence:** 3.2 times per month
- **Abaco:** 1.5 times per month

Members of the public also reported their likelihood of purchasing specific types of conch products. Table 4 below shows the total percent of respondents that indicated high, medium, or low likelihood of purchasing each of the listed conch products within the next year. Respondents reported the highest likelihood of purchasing conch meat, either in a prepared dish or raw. They were less likely to purchase conch trimmings, pearls, shells, or opercula. However, some respondents noted that they would be more likely to purchase a pearl if they had the financial means to do so. Most respondents would not purchase conch shells because they are so readily available at landing sites, and the most commonly mentioned reason for purchasing opercula was for jewelry.

Table 4. Reported Likelihood of Members of the Public Purchasing Conch Products

Conch Product	High Likelihood	Medium Likelihood	Low Likelihood
Meat (prepared/cooked)	46%	26%	28%
Meat (raw)	40%	21%	39%
Trimmings	22%	14%	65%
Pearl	14%	13%	73%
Shell	13%	12%	76%
Operculum	10%	9%	81%

Market Value of Conch Products

To gain a stronger understanding of the value of conch to The Bahamas, we gathered information on the market prices of conch meat and other conch products from key players in the conch chain of custody, which can be used to extrapolate a possible total value of conch to The Bahamas.

Market Prices of Conch Meat

Fishers, buyers, processors, restaurateurs, and vendors shared information about the prices they pay and charge for conch. Although they were asked to report prices per pound, many respondents could only report prices per individual conch, so the information provided in

Table 5 below is reported in the units that respondents supplied (see Appendix B for results reported by island). Overall, cleaned conch brings in higher prices than uncleaned conch. After fishers make the first sale for an average of \$2.20-3.26 per pound (\$2.32-3.02 per conch), vendors, restaurants, and processors sell the conch for higher prices. Overall, buyers and processors who sell processed conch are selling for a greater profit margin than vendors, especially given that some vendors may sell conch supplemented by other ingredients such as the vegetables and fruits that are ingredients in conch salad. Restaurants may also have some of the largest profit margins, as discussed below. Of the restaurants surveyed, restaurants on New Providence pay the most on average for raw conch meat compared to restaurants on other islands, and charge higher prices on average for most conch dishes.

Table 5. Prices of Conch Meat Reported by Fishers, Buyers, Processors, Restaurateurs, and Vendors

	Price Collected by Fishers		Price Paid by Buyers		Price Paid by Processors		Price after Processing	Price Paid by Restaurants		Price Collected by Vendors	
	Cleaned	Uncleaned	Cleaned	Uncleaned	Cleaned	Uncleaned	Processed	Cleaned	Uncleaned	Cleaned	Uncleaned
Average Price Per Pound	\$3.26	\$2.20	\$2.83	\$2.50	\$3.42	N/A	\$5.80	\$4.72	\$3.33	\$4.38	\$3.38
Price Range Per Pound	\$2.50-\$5.00	\$1.50-\$4.00	\$2.50-\$3.00	\$2.25-\$2.75	\$2.75-\$4.50	N/A	\$3.50-\$7.25	\$2.75-\$14.00	\$1.50-\$6.25	\$3.00-\$6.50	\$2.50-\$5.00
Average Price Per Conch	\$3.02	\$2.32	N/A	N/A	N/A	N/A	N/A	\$2.64	\$1.96	N/A	N/A
Price Range Per Conch	\$1.50-\$5.00	\$1.00-\$5.00	N/A	N/A	N/A	N/A	N/A	\$1.00-\$5.00	\$0.75-\$3.00	N/A	N/A

Restaurateurs shared information about the prices they currently charge for various conch dishes. Table 6 below contains the average and range of prices shared by restaurateurs, organized by frequency of appearing on restaurant menus (see Appendix B for results reported by island). Overall, cracked conch is the most popular dish with a relatively high price, but dinner dishes such as pasta with conch bring in the largest price per serving. Conch fritters were the second most commonly sold dish in surveyed restaurants, but bring in the lowest average price. Due to the value added of conch bought and then sold by restaurants, restaurants may have one of the highest profit margins in the supply chain and contribute substantially to local economies. For example, if 25 restaurants in New Providence each sell 40 conch dishes in a day, their combined profits from those conch dishes would exceed \$6,100.¹⁶

Table 6. Prices of Common Conch Dishes

Type of Dish	# of Restaurants Reported Selling	Average Price	Price Range
Cracked Conch	36	\$12.86	\$6.00-\$25.00
Conch Fritters ¹⁷	29	\$4.94	\$1.40-\$12.25
Conch Burger	25	\$9.35	\$5.00-\$17.00
Conch Salad	24	\$9.83	\$6.00-\$15.00
Conch Stew	17	\$10.67	\$7.00-\$16.15
Conch Chowder	7	\$6.25	\$5.00-\$7.00
Grilled Conch	6	\$13.17	\$8.00-\$22.00
Conch and Rice	4	\$13.33	\$12.00-\$14.00
Steamed Conch	3	\$13.33	\$12.00-\$15.00
Pasta with Conch	2	\$16.25	\$15.00-\$17.50

Market Prices of Non-Meat Conch Products

In addition to conch meat, other conch products have market value, as illustrated in Table 4 about locals' buying preferences above (see Appendix B for results reported by island). When asked what non-meat conch products have market value in The Bahamas, conch fishers and vendors most often identified conch pearls, followed by trimmings, shell, and operculum. Responses were similar when asked about the market for non-meat conch products abroad, except that trimmings were the least likely to have value abroad.

We asked fishers and vendors to estimate the market value of several non-meat conch products, and their average and range of responses are displayed in Table 7 below (see Appendix B for more detailed findings by island). We also asked fishers to estimate the percent of their conch catch that is used to derive each of the conch products; that is, the percent of all conch shells, pearls, opercula, and trimmings landed that are sold versus discarded. Results demonstrate that all of these non-meat products may have more market potential than they are realizing because, with the exception of pearls, large proportions are being discarded instead of sold. Shells in particular may have strong potential for

¹⁶ This calculation of restaurant profits uses the average prices for cleaned conch meat, cracked conch, conch fritters, conch burger, and conch salad reported by restaurants in New Providence. It assumes that each dish uses one pound of conch, and that each restaurant sells 10 of each dish per day. The estimation accounts for the price that restaurants pay for conch, but does not take into account other expenses, such as additional ingredients in the conch dishes.

¹⁷ Some respondents shared prices per individual fritter, so we standardized prices based on an average serving size of seven fritters, whenever possible.

increasing revenues given the relatively high price that shells can sell for and the small proportion of shells that are currently being sold.

Interview and questionnaire respondents commented on the possibility of increasing the value of conch by developing or expanding markets for non-meat products, including for tourists and export. This input reflects comments from the KAP report, in which fishers suggested creating a market for conch shell products to increase the value of conch to the local economy (TNC 2015). Currently, BAIC is working to diversify conch markets by encouraging the use of all parts of the conch.

Table 7. Reported Market Prices for Conch Products and Percent of Conch Catch Used to Derive those Products

	Shell	Pearl ¹⁸	Operculum	Trimmings
Average Price	\$8.27 per shell	Low: \$967.77 per pearl High: \$7,698.42 per pearl ¹⁹	\$2.73 per pound	\$2.41 per pound
Price Range	\$0.00-\$50.00 per shell	\$17.50-\$60,000 per pearl	\$0.25-\$4.50 per pound	\$0.25-\$7.25 per pound
Percent of Catch Used to Derive	17.8%	Percent of catch containing pearls: 1.7% Percent of fishers who would sell a pearl if found: 97.5%	37.0%	43.6%

Comparison of National and Export Markets

Based on information from the literature review and comments made by respondents in the stakeholder analysis, there is interest in understanding the relative values of the conch export and national markets, especially given indications of declines in conch stocks and the desire to sustain those stocks for local consumption. Notably, despite the value of conch exports, some experts (e.g., Stoner et al. 2014) cite exports as a threat to the sustainability of conch stocks in The Bahamas; Community Conch recommends considering ending conch exports as a potential conservation measure (Stoner et al. 2014). Comparing the values of the export and national markets can help shed light on the implications of this suggestion.

The value of exported conch is tracked through DMR and Customs Department data, valued at a total of \$5.8 million, \$3.7 million, and \$3.8 million in 2013-2015, respectively, as reported in Figure 3 above (however, as noted previously, there is some discrepancy in export values between recent DMR and Customs Department data). The total value to The Bahamas of conch that is consumed within the country is more difficult to estimate due in large part to the uncertainty regarding total landings. Using the information reported in this stakeholder analysis, we performed rough calculations to estimate the possible value of conch meat consumed within The Bahamas (see Appendix A for calculations). These calculations sum the following estimated values: 1) revenue to fishers from selling non-exported conch, 2) profit to Bahamian restaurateurs/vendors from selling conch food products, and 3) profit to

¹⁸ Respondents reported the percent of catch used for conch pearls in one of two ways: 1) the percent of harvested conch that contain a pearl, and 2) the likelihood that, if found, they would sell a conch pearl. Here report on both types of responses.

¹⁹ Respondents typically reported price per pearl in a range, with the lower end representing low quality pearls and the upper end representing the highest quality pearls. We have provided an average of the low and high numbers reported in the ranges to illustrate the price difference between low and high quality pearls.

processors from selling non-exported processed conch. We used the most recent data available to feed into the calculations and made assumptions where necessary (see Appendix A for further explanation).

We calculated an estimated value range of the national market by using the low, average, and high values for prices of conch products as reported in

Table 5 and Table 6, 2015 export data from the Customs Department, and an assumed total catch based on the exports representing 36% of the total catch. These very rough calculations suggest a total value of approximately \$4.7 million, with an estimated range of \$2.5-\$7.7 million, representing the local economic benefits from conch consumed within the country. To help validate this calculation, we performed different calculations with the available data to estimate the total value of non-exported conch. Using only the range of prices paid to fishers when they land non-exported conch and the economic multiplier of 1.22, the estimated value is between \$2.0 and \$6.5 million. Using Talaue-McManus and Hazell's (2008) estimate of 4,200 mt of conch consumed in the Bahamas in one year, which is much higher than the DMR estimate of 36% of total catch, the value using average prices is estimated to be around \$41 million.

Overall, these calculations, although rudimentary, indicate that the national market for conch could be nearly as, or more, valuable to The Bahamas as the export market. Pound for pound, it is possible that conch destined for the national market is worth as much or more than exported conch; for the range of \$2.5-\$7.7 million calculated above, the value per pound of conch would be \$2.36-\$7.25, whereas the value of exported conch in 2015 was \$5.89 per pound (calculated from DMR and Customs Department data). Furthermore, these calculations do not include the value of selling non-meat conch products, including curios such as jewelry and souvenirs, within The Bahamas. This market is at present likely quite low, but could rise if national sales of non-meat products increase in future years. These findings suggest that further developing national markets for conch products could lead to potentially higher value to the country than conch exports.

Section Summary: Conch Markets, Consumption, and Value

Export Market: A large portion of Bahamas conch is exported, with annual export quotas set by DMR and the Minister of Agriculture and Marine Resources. Exports are tracked through reporting by processors, with conch meat exports peaking in 2013 at more than 410 mt and \$5.8 million. Some conch shells are also exported, but contribute relatively little to total conch export value. The export duty of three cents per pound also contributes relatively little to overall export value.

National Market: The amount of landed conch that feeds the market in The Bahamas is more difficult to estimate, given the dispersed nature of the fishery and lack of monitoring and regulation of non-exported sales. Studies have indicated that total landings reported by DMR, which suggest that the national market is around twice the size of the export market in some years, are underestimates.

Conch Sales and Consumption: Conch may enter the market through the commercial or artisanal fishery, including by passing through buyer stations and/or processors/fish houses before being exported or sold in the country. Respondents indicated that more than half of landed conch is sold to processors, but fishers also sell directly to restaurants/hotels, local vendors, or individuals; sales by restaurants and hotels may provide substantial value added and economic activity to Bahamian economies. The largest proportion of restaurants surveyed sell primarily to tourists, still others sell mostly to locals. Members of the public reported consuming conch an average of 4.4 times per month. The conch products that they were most likely to purchase were prepared or cooked meat and raw meat, with fewer stating they would be likely to purchase conch trimmings, pearls, shells, and opercula.

Market Value of Conch Products: Prices for conch meat increase through the chain of custody, with fishers reporting selling conch for an average of \$2.20 (uncleaned) to \$3.26 (cleaned) per pound. Processed conch brings in an average of \$5.80 per pound, and conch sold in restaurants range on average from \$4.94-\$16.25 per dish. Among conch shells, pearls, opercula, and trimmings, pearls have the highest individual value, but are rare to find. Respondents estimated on average that conch shells could be worth \$8.27 each, but currently shells are the least utilized portion of conch catch.

Comparison of National and Export Markets: Using Customs Department data, estimated prices for conch meat, and an estimate of total catch, we calculated a possible value of the national conch market. This very rough estimate is \$2.5-\$7.7 million, compared to the \$3.7-\$5.9 million in export value in recent years.

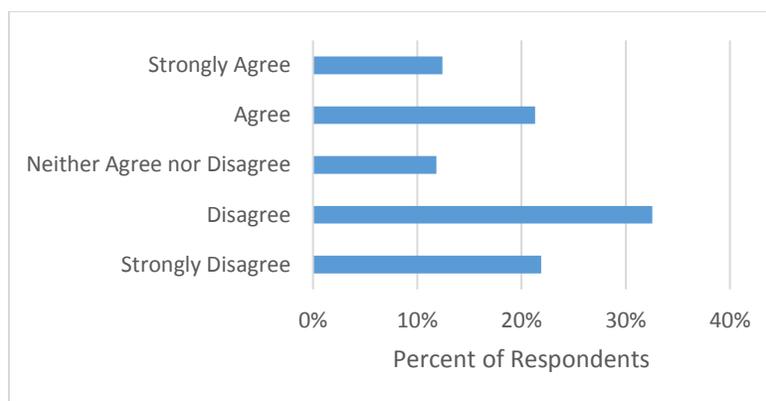
Perceptions of Management Gaps and Potential Changes

We asked interview respondents to tell us what, if any, change in management would be the most effective at improving the environmental and socioeconomic sustainability of The Bahamas conch fisheries. Respondents also shared the main barriers to achieving those changes and possible methods for overcoming those barriers.

Perceived Gaps in Conch Management

When asked about their level of agreement with the statement: “Conch harvest regulations are strong enough to ensure that there will be conch in The Bahamas for years to come,” members of the public were somewhat divided. However, as Figure 7 illustrates, about half of all respondents either disagree or strongly disagree with the statement, indicating that they do not think that current harvest regulations are adequate (see the *Data Gaps and Needs* section above for a detailed list of respondents’ input on what would be needed to improve management of the fishery). Top responses included information about stock status and locations of conch populations, including deep water stocks; life history and larval connectivity/molecular genetics; and landings amount and composition/fishing patterns.

Figure 7. Level of Public Agreement that Conch Regulations Are Adequately Strong



We asked interview respondents specifically about their perceptions of the effectiveness of enforcement of conch harvesting. On a scale from 1 to 10 (where 1 is very poor/virtually nonexistent and 10 is complete enforcement and detection of all violations), the average response was 3.1 (50% of respondents rated enforcement between 2 and 4). The largest identified gaps in enforcement included lack of resources, inadequate laws, and the need for a reliable method for determining sexual maturity in landed conch.

We also asked interview respondents about their perceptions of the level of stakeholder involvement in decision-making processes for the conch fishery. Across all respondents, the majority (58%) highlighted a need for enhanced stakeholder consultation or involvement, indicating that stakeholders are not engaged on a consistent basis and the engagement that occurs is often with specific groups. Respondents indicated that fishers and other stakeholders can be involved such as by attending DMR meetings in Nassau, but there are not always proactive efforts to allow them to comment on potential management changes or the impacts of existing regulations. The main players in the decision-making process, according to respondents, are DMR, the Cabinet, and key NGOs, with some processors, exporters, and fishers participating in meetings.

Suggested Management Changes

Approximately 90% of interview and questionnaire respondents had suggestions for possible management changes to improve conch sustainability in The Bahamas, with only about 10% of respondents indicating that no change was necessary. Figure 8 illustrates the management changes

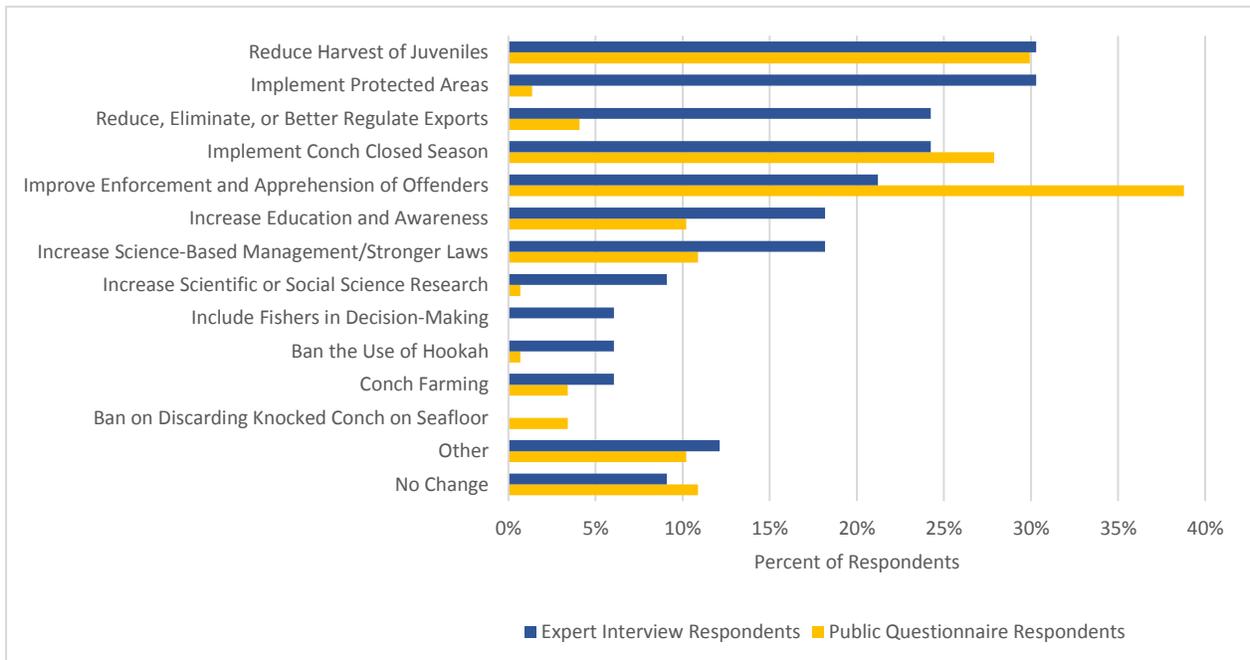
suggested by expert respondents and by the public. Some of the most frequently suggested management changes captured in expert interviews and public questionnaires included the following:

- Improve enforcement of regulations (39% public, 21% expert respondents);
- Reduce juvenile harvest (30% public, 30% expert respondents);
- Implement a closed season (28% public, 24% expert respondents);
- Implement protected areas (1% public, 30% expert respondents); and
- Reduce, eliminate, or better regulate exports (4% public, 24% expert respondents).

Regarding the top suggestions, respondents noted that increased apprehension of offenders and greater enforcement of MPAs are needed to improve enforcement of regulations. To reduce juvenile harvest, experts suggested implementing restrictions on minimum shell lip thickness or operculum size, which would require landing conch in their shells to enable monitoring of these aspects, while members of the public spoke more generally about the need to reduce juvenile harvest and ensure that managers are able to enforce regulations. One respondent suggested that DMR could pay co-ops of fishers to collect catch, lip thickness, and fishing effort data. Regarding a conch season, respondents suggested that closing the conch fishery for a period of time each year, as has been done for the lobster and grouper fisheries, would allow conch populations to replenish. However, they also pointed out that a closed season would negatively impact the livelihoods of fishers and restaurateurs. This impact could be partially alleviated by implementing staggered conch, grouper, and lobster closed seasons.

Other management changes suggested included implementing protected areas and reducing or eliminating conch exports. Notably, few members of the public suggested implementing protected areas or restricting exports. However, these findings differed from the findings of the KAP study, which found that 69% of KAP survey respondents strongly favored closures when asked directly if they support the government closing conch nursery areas to fishing (TNC 2015). This difference could highlight that members of the public are not opposed to closures or protected areas, but do not immediately think of this option as a management measure. Regarding area-based management, respondents suggested protecting conch nursery, feeding, or breeding grounds, increasing enforcement of existing MPAs, and improving the effectiveness of MPAs by implementing them in a network. For exports, several respondents suggested banning exports altogether to reduce pressure on the resource, and others suggested increasing taxes on exports or setting lower annual export quotas.

Figure 8. Percent of Interview and Public Questionnaire Respondents Suggesting Possible Management Changes



Barriers and Methods for Overcoming Them

Interview respondents shared their perceptions on barriers that may inhibit their suggested management changes from being realized. The majority of responses related to political will, education, and community involvement. Respondents most frequently reported the following barriers:

- Lack of political will, including the need for government leadership and staff to prioritize these issues (58%);
- Inadequate capacity or resources for effective implementation, monitoring and research, enforcement, and training and education (35%);
- Lack of involvement of fishers and community members in fishery management (31%); and
- Public concern about the impact of management changes on fisher livelihoods (15%).

To overcome these barriers, many respondents (58%) suggested focusing on public education, as this could help build political will through community support and also improve compliance with regulations. Science-based education could focus on schools as well as consumers and people involved in the industry, with an emphasis on how sustainable management measures can benefit both conch populations and Bahamian communities. One specific suggestion is to identify individuals who will act as advocates to bring people together to support unified sustainable management goals. Relatedly, some respondents (29%) had suggestions for how to increase community involvement in fisheries management. Suggestions included consulting with fishers when developing management plans or developing a comprehensive fisher participatory process that would generate management solutions as well as alternative livelihood possibilities. Education could also target politicians to ensure they are knowledgeable about the fishery and willing to implement regulations. A number of respondents (38%) also made general suggestions to increase enforcement or improve existing management frameworks,

and one potential way to fund these efforts would be to increase fines for offenses and prioritize apprehension of offenders.

With respect to enforcement specifically, the primary barrier to effective management that respondents mentioned most often (84% of respondents) was the lack of adequate human capacity, equipment, or funding, especially given the large geographical areas to cover. To overcome this barrier, suggestions included prioritizing fisheries enforcement in the relevant agencies, hiring additional enforcement staff, and investing more resources in training those staff. Notably, several respondents pointed out the need for enforcement agencies to work more effectively together, such as by establishing fisheries units in the Royal Bahamas Police Force and the Royal Bahamas Defense Force and engaging to a greater extent with the Bahamas Customs Department.

Section Summary: Perceptions of Management Gaps and Potential Changes

Perceived Gaps in Conch Management: About half of respondents believe that conch harvest regulations are not strong enough to ensure that there will be conch in The Bahamas in the future. Respondents identified management gaps including knowledge of existing and potential markets for conch products, a data organization and sharing system, information on alternative livelihood options for fishers, and an understanding on the extent of illegal harvesting. Respondents also highlighted the need for increased enforcement, with the average rating of enforcement effectiveness of 3.1 on a scale from 1 to 10. The majority of respondents also indicated a need for enhanced stakeholder participation in conch fishery decision-making processes.

Suggested Management Changes: Expert interview respondents identified potentially effective management changes. These include measures to reduce the harvest of juvenile conch, implementing MPAs, reducing or eliminating exports, implementing a conch closed season, and improving enforcement, education and awareness, and science-based management. Members of the public suggested similar types of management changes, but did not mention MPAs or changes to exports nearly as often.

Barriers and Methods for Overcoming Them: Barriers that interview respondents mentioned revolved around inadequate political will, education, and community involvement. These are related to the barrier of inadequate staff capacity and resources to improve aspects including enforcement and education/outreach. To overcome these barriers, respondents suggested prioritizing public education to help build community support and political will as well as increase compliance with regulations. Government departments including DMR, Customs Department, and the Defense Force may also enhance their efforts by engaging more effectively with each other.

Conclusion

This study helps build knowledge about the markets, uses, and values of Queen Conch in The Bahamas. However, the study has some limitations that users of this information should take into consideration. For example, the study did not attempt to determine statistically significant sample sizes and attain those samples for the stakeholder or public questionnaires. As a result, the responses summarized in this report are not necessarily representative of the populations sampled. In addition, there may be sampling bias towards different islands and/or types of respondents (e.g., among fishers,

restauranters, members of the public, etc.). In places where we found differing information from different sources, we attempted to utilize the most reliable or standardized source, but it is possible that more accurate information exists than is included in this report.

The information shared in this report about the value of conch in The Bahamas reconfirms the strong economic and cultural significance of the species. There are some gaps in data and knowledge about the fishery that, to some extent, inhibit effective management. To improve conch management, DMR and other relevant agencies may prioritize certain actions or management changes that draw upon the gaps, needs, and proposed changes summarized in this report. A follow-on Evaluation Report to be prepared by Blue Earth will recommend areas for data collection and management changes for the agencies to consider to help ensure a sustainable conch fishery for years to come.

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Appendix A: Calculations of National Conch Value

In the *Comparison of National and Export Markets* section, we provided a rough estimate of the possible value of The Bahamas national conch market, for comparison with the value of the export market. We performed these calculations using three methods based on available data and information.

Importantly, these calculations were not performed with economic rigor and utilize assumed values and estimates based on stakeholder perceptions. Therefore, they are meant to provide a rough snapshot of the possible order of magnitude of value of the national market for comparison with information available on the value of the export market. Here we provide an overview of how we made those calculations as well as a list of values used.

Calculation 1

To calculate the range of \$2.5-7.7 million, we performed the following basic calculations to estimate the value of conch to the main players in the supply chain (fishers, vendors/restaurants, and processors):

$$\begin{aligned} & (\text{Nationally consumed conch}^{20} \times \text{Price paid to fishers}) + \\ & (\text{Nationally consumed conch} \times \text{Restaurant/vendor profit}^{21} \times \% \text{ sold to restaurants/vendors}) + \\ & (\text{Nationally consumed conch} \times \text{Processor profit}^{22} \times \% \text{ sold to processors}) \end{aligned}$$

To obtain the range and average estimated values, we performed this calculation three times:

Low end of range: We used DMR catch estimates and the lowest estimates of prices paid per pound for cleaned or uncleaned conch along the supply chain, as reported by stakeholder respondents and summarized in

1. Table 5. Given DMR data on exports in 2015, we assumed that exports are 36% of total catch to estimate the amount of conch that feed the national market, based on the most recent estimate from CRFM 2013a.

Average: We used the average price per pound for cleaned and uncleaned conch along the supply chain, as reported by stakeholder respondents and summarized in

2. Table 5. Given DMR data on exports in 2015, we assumed that exports are 36% of total catch to estimate the amount of conch that feed the national market, based on the most recent estimate from CRFM 2013a.

High end of range: We used DMR catch estimates and the highest estimates of prices paid per pound for cleaned or uncleaned conch along the supply chain, as reported by respondents and summarized in

3. Table 5. There was one exception, in which we did not use the value of \$14 per pound of cleaned conch paid by restaurants since this seemed to be an outlier. Given DMR data on exports in 2015, we assumed that exports are 36% of total catch to estimate the amount of conch that feed the national market, based on the most recent estimate from CRFM 2013a.

²⁰ *Nationally consumed conch = Total catch – Exports*

²¹ *Restaurant/vendor profit = Price paid to restaurants/vendors – Price paid by restaurants/vendors*

²² *Processor profit = Price paid to processors – Price paid by processors*

Table 8 contains the values we used to make the calculations in the equation above for the low, average, and high estimates.

Table 8. Values Used in Calculation 1 of the Total Value of the National Conch Market

Term	Value Used	Source
Exports	601,100/lb	Customs Department
Total catch	1,669,722/lb	Calculated using Exports and CRFM 2013a
Price paid to fishers - low	\$1.50/lb	Stakeholder analysis questionnaires
Price paid to fishers - average	\$2.79/lb	Stakeholder analysis questionnaires
Price paid to fishers - high	\$5.00/lb	Stakeholder analysis questionnaires
Price paid by restaurants - low	\$1.50/lb	Stakeholder analysis questionnaires
Price paid by restaurants - average	\$4.14/lb	Stakeholder analysis questionnaires
Price paid by restaurants - high	\$8.00/lb	Stakeholder analysis questionnaires
Price paid to restaurants - low²³	\$4.94/lb	Stakeholder analysis questionnaires
Price paid to restaurants - average	\$9.81/lb	Stakeholder analysis questionnaires
Price paid to restaurants - high	\$16.25/lb	Stakeholder analysis questionnaires
Percent of catch sold to restaurants/vendors²⁴	21%	Calculated based on percent of catch that is sold to processors, gathered through stakeholder analysis questionnaires
Price paid by processors - low	\$2.75/lb	Stakeholder analysis questionnaires
Price paid by processors - average	\$3.42/lb	Stakeholder analysis questionnaires
Price paid by processors - high	\$4.50/lb	Stakeholder analysis questionnaires
Price paid to processors - low	\$3.50/lb	Stakeholder analysis questionnaires
Price paid to processors - average	\$5.80/lb	Stakeholder analysis questionnaires
Price paid to processors - high	\$7.25/lb	Stakeholder analysis questionnaires
Percent of catch sold to processors	58%	Stakeholder analysis questionnaires

Calculation 2

To obtain the estimated range of \$2.0-6.5 million, we simply used the estimated landings that feed the national market (extrapolated from 2015 exports assumed to be 36% of total catch) and multiplied by the low and high prices paid to fishers. We then multiplied this dollar value by the multiplier of 1.22.

Calculation 3

To obtain the estimate of \$41 million, we performed calculations similar to Calculation 1 using the average estimates for prices along the value chain. We used the Talaue-McManus and Hazell (2008) estimate of conch consumption within The Bahamas in 2003 and 2004 instead of that value calculated using the 2015 exports and assumption that exports represent 36% of all landings.

²³ Because restauranteurs reported the prices they sell conch for by the price of the dish instead of the price per pound, these calculations assume that there is one pound of conch in each dish sold.

²⁴ Because the authors did not have information on the percent of catch that is sold to restaurants/vendors versus to individuals, we assumed that equal percentages of the catch are sold to restaurants/vendors and individuals.

Appendix B: Survey Responses by Island

Tables 9 and 10 below provide results, by island and by type of interview respondent, respectively, of perceptions of the relative sizes of the national and export conch markets. In Table 9, Respondents identified as other/unknown include respondents from Eleuthera, respondents whose location is unknown, and respondents who do not reside in The Bahamas.

Table 9. Respondents' Perceptions by Island of National and Export Market Relative Sizes

Response	Abaco	Andros	Grand Bahama	New Providence	Other/ Unknown	Total Percent across Islands
National Market is Larger	33%	100%	50%	43%	67%	53%
Export Market is Larger	67%	0%	50%	43%	33%	42%
National and Export Markets are Equal Size	0%	0%	0%	14%	0%	5%
Sample Size	3	1	2	7	6	19

Table 10. Respondents' Perceptions by Type of Respondent of National and Export Market Relative Sizes

Response	DMR	BAIC/Customs Department	Scientists	Fishers	Processors	NGO	Total Percent across Respondents
National Market is Larger	0%	67%	100%	0%	0%	60%	53%
Export Market is Larger	100% ²⁵	33%	0%	100%	50%	40%	42%
National and Export Markets are Equal Size	0%	0%	0%	0%	50%	0%	5%
Sample Size	2	3	5	2	2	5	19

Table 11 below provides results by island and by type of respondent of the prices of cleaned and uncleaned conch meat reported by questionnaire respondents. Prices are listed as either per pound or per conch, based on how respondents answered the survey question. Because the questionnaire asked for price ranges rather than single typical prices, we calculated average prices using the low and high prices that respondents reported. Price ranges represent the lowest and highest responses across respondents when asked to provide a typical price range. "N/A" indicates that no questionnaire respondents provided the given type of information. In addition, "N/A" is occasionally used when there

²⁵ Note that this question included responses from two DMR staff. During the review process of this report, DMR clarified that they believe the national market to be larger than the export market (Deleveaux 2016).

was only one response or responses were identical, so there was no data range to report. The sample size of each respondent group is included in parentheses in the header row.

Table 11. Conch Meat Prices Reported by Respondents by Island

		Price Collected by Fishers (40) ²⁶		Price Paid by Buyers (2)		Price Paid by Processors (3)		Price after Processing (5)	Price Paid by Restaurants (43)		Price Collected by Vendors (2)	
		Cleaned	Uncleaned	Cleaned	Uncleaned	Cleaned	Uncleaned	Processed	Cleaned	Uncleaned	Cleaned	Uncleaned
Average Price Per Pound	Abaco	\$2.97	\$2.10	\$3.00	\$2.50	N/A	N/A	\$3.50	\$4.58	\$4.00	N/A	N/A
	Andros	\$3.47	\$1.96	\$2.75	\$2.50	N/A	N/A	\$6.50	N/A	N/A	N/A	N/A
	Grand Bahama	\$3.00	\$2.38	N/A	N/A	\$3.13	N/A	\$6.00	\$4.04	N/A	\$5.25	\$3.00
	New Providence	N/A	\$2.25	N/A	N/A	\$3.56	N/A	\$6.50	\$5.33	\$2.31	\$3.50	\$3.75
	All Islands	\$3.26	\$2.20	\$2.83	\$2.50	\$3.42	N/A	\$5.80	\$4.72	\$3.33	\$4.38	\$3.38
Price Range Per Pound	Abaco	\$2.50-\$3.75	\$1.50-\$3.00	N/A	N/A	N/A	N/A	N/A	\$3.00-\$7.25	\$1.50-\$6.25	N/A	N/A
	Andros	\$2.50-\$5.00	\$1.50-\$2.50	\$2.50-\$3.00	\$2.25-\$2.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Grand Bahama	\$2.50-\$4.00	\$2.00-\$2.50	N/A	N/A	\$2.75-\$3.50	N/A	N/A	\$3.25-\$5.00	N/A	\$4.00-\$6.50	N/A
	New Providence	N/A	\$2.00-\$2.50	N/A	N/A	\$2.75-\$4.50	N/A	\$5.75-\$5.25	\$2.75-\$14.00	\$1.50-\$3.00	\$3.00-\$4.00	\$2.50-\$5.00
	All Islands	\$2.50-\$5.00	\$1.50-\$4.00	\$2.50-\$3.00	\$2.25-\$2.75	\$2.75-\$4.50	N/A	\$3.50-\$7.25	\$2.75-\$14.00	\$1.50-\$6.25	\$3.00-\$6.50	\$2.50-\$5.00
Average Price Per Conch	Abaco	N/A	\$2.00	N/A	N/A	N/A	N/A	N/A	N/A	\$2.00	N/A	N/A
	Andros	\$3.02	\$2.33	N/A	N/A	N/A	N/A	N/A	\$2.64	\$1.96	N/A	N/A
	Grand Bahama	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	New Providence	\$4.05	\$2.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

²⁶ Includes one respondent from Cat Island not represented in the individual island results. Fishers included in the “New Providence” row were surveyed on New Providence, but may come from other islands including Andros, Eleuthera, or Long Island.

		Price Collected by Fishers (40) ²⁶		Price Paid by Buyers (2)		Price Paid by Processors (3)		Price after Processing (5)	Price Paid by Restaurants (43)		Price Collected by Vendors (2)	
		Cleaned	Uncleaned	Cleaned	Uncleaned	Cleaned	Uncleaned	Processed	Cleaned	Uncleaned	Cleaned	Uncleaned
Price Range Per Conch	All Islands	\$3.02	\$2.32	N/A	N/A	N/A	N/A	N/A	\$2.64	\$1.96	N/A	N/A
	Abaco	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Andros	\$1.50-\$5.00	\$1.00-\$5.00	N/A	N/A	N/A	N/A	N/A	\$1.00-\$5.00	\$0.75-\$3.00	N/A	N/A
	Grand Bahama	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	New Providence	\$3.50-\$5.00	\$1.50-\$3.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	All Islands	\$1.50-\$5.00	\$1.00-\$5.00	N/A	N/A	N/A	N/A	N/A	\$1.00-\$5.00	\$0.75-\$3.00	N/A	N/A

Table 12 shows average prices and price ranges of the most common conch dishes, reported by restaurants on each island. “N/A” indicates that no restaurants on the island reported selling the dish, or there was only one respondent who did not provide a range. The sample size of each respondent group is included in parentheses in the header row.

Table 12. Restaurant Prices by Island for Common Conch Dishes

Type of Dish	Abaco (8)			Andros (20)			Grand Bahama (7)			New Providence (8)			All Islands (43)		
	# Reported Selling	Average Price	Price Range	# Reported Selling	Average Price	Price Range	# Reported Selling	Average Price	Price Range	# Reported Selling	Average Price	Price Range	# Reported Selling	Average Price	Price Range
Cracked Conch	7	\$14.79	\$11.83-\$17.20	17	\$10.22	\$6.00-\$20.00	6	\$12.77	\$11.50-\$14.95	7	\$17.43	\$9.00-\$25.00	37	\$12.86	\$6.00-\$25.00
Conch Fritters ²⁷	6	\$5.27	\$2.33-\$7.50	14	\$3.17	\$1.40-\$6.00	4	\$6.96	\$5.75-\$8.00	6	\$7.41	\$3.50-\$12.25	30	\$4.94	\$1.40-\$12.25
Conch Burger	7	\$11.86	\$6.00-\$15.50	9	\$6.38	\$5.00-\$9.00	6	\$10.60	\$6.95-\$14.95	4	\$9.75	\$5.00-\$17.00	26	\$9.35	\$5.00-\$17.00
Conch Salad	4	\$9.13	\$6.00-\$12.50	12	\$9.04	\$6.00-\$11.00	3	\$10.67	\$8.00-\$14.00	6	\$11.46	\$10.00-\$15.00	25	\$9.83	\$6.00-\$15.00
Conch Stew	4	\$10.41	\$7.50-\$16.15	8	\$10.38	\$7.00-\$14.00	3	\$10.27	\$7.63-\$13.17	2	\$13.00	N/A	17	\$10.67	\$7.00-\$16.15
Conch Chowder	1	\$6.50	N/A	1	\$6.00	N/A	1	\$6.72	N/A	4	\$6.13	\$5.00-\$7.00	7	\$6.25	\$5.00-\$7.00
Grilled Conch	1	\$12.00	N/A	4	\$11.25	\$8.00-\$13.00	0	N/A	N/A	1	\$22.00	N/A	6	\$13.17	\$8.00-\$22.00
Conch and Rice	0	N/A	N/A	4	\$13.33	\$10.75-\$14.00	0	N/A	N/A	0	N/A	N/A	4	\$13.33	\$12.00-\$14.00
Steamed Conch	0	N/A	N/A	2	\$12.50	\$12.00-\$13.00	0	N/A	N/A	1	\$15.00	N/A	3	\$13.33	\$12.00-\$15.00
Pasta with Conch	0	N/A	N/A	0	N/A	N/A	2	\$16.25	\$15.00-\$17.50	0	N/A	N/A	2	\$16.25	\$15.00-\$17.50

²⁷ Some respondents shared prices per individual fritter, so we standardized prices based on an average serving size of seven fritters, whenever possible.

Table 13 shows the average price, price range, and the percent of catch used to derive each product for common conch byproducts as reported by fishers and vendors who responded to the questionnaires on each island. “N/A” indicates that fishers and vendors from the island did not report selling the product.

Table 13. Prices and Catch Percentage by Island of Non-Meat Conch Products

Type of Product	Abaco (5)			Andros (27)			Grand Bahama (5)			New Providence (6) ²⁸			Across Islands (44) ²⁹		
	Average Price	Price Range	% of Catch to Derive	Average Price	Price Range	% of Catch to Derive	Average Price	Price Range	% of Catch to Derive	Average Price	Price Range	% of Catch to Derive	Average Price	Price Range	% of Catch to Derive
Shell ³⁰	\$6.75	\$1.00-\$12.50	12.5%	\$5.94	\$0.25-\$25.00	22.4%	\$7.38	\$3.00-\$15.00	21.3%	\$15.58	\$6.00-\$50.00	13.6%	\$8.27	\$0.00-\$50.00	17.8%
Pearl ³¹	Low: \$292.50 High: \$4,750	\$17.50-\$10,000	100% 0.5%	Low: \$1,143 High: \$5,960	\$150.00-\$20,000	100% 2.4%	Low: \$344.00 High: \$3,440	\$20.00-\$10,000	45% 1.0%	Low: \$1,525 High: \$24,000	\$25.00-\$60,000	100% N/A	Low: \$967.70 High: \$7,698	\$17.50-\$60,000	1.7% 97.5%
Operculum ³²	\$3.19	\$2.50-\$4.50	5.0%	\$2.54	\$0.25-\$4.00	70.0%	\$2.50	N/A	30%	N/A	N/A	N/A	\$2.73	\$0.25-\$4.50	37.0%
Trimming ³³	\$3.50	N/A	75.0%	\$2.02	\$0.25-\$7.25	25.4%	\$3.25	\$1.00-\$5.50	83%	N/A	N/A	N/A	\$2.41	\$0.25-\$7.25	43.6%

²⁸ Fishers included in the “New Providence” row were surveyed on New Providence, but may come from other islands including Andros, Eleuthera, or Long Island.

²⁹ Includes one respondent from Cat Island not represented in the individual island results.

³⁰ Prices are reported per shell.

³¹ Prices are reported per pearl. Respondents typically reported price per pearl in a range, with the lower end representing low quality pearls and the upper end representing the highest quality pearls. We provide averages of the low and high values reported to illustrate the price difference between low and high quality pearls. For the percent of catch used to derive pearls, we report two percentages due to differences in how respondents interpreted the question. The first percentage represents the percent of the catch that contains pearls, the second percentage represents the percent of fishers who would sell a pearl if found.

³² Prices are reported per pound.

³³ Prices are reported per pound.

TNC Bahamas Conch

Key Informant Interview Survey Tools

This document contains draft survey tools, based on the objectives in the “DRAFT Survey Objectives” document, for members of the stakeholder groups that Blue Earth plans to interview while in The Bahamas. Because different groups likely have different types of knowledge about conch fisheries, management, and markets, we created a separate survey tool for each group. Notably, we anticipate asking Department of Marine Resources staff the full suite of questions associated with all objectives, while the surveys for other groups include subsets of the questions. In all survey tools, we organized questions by the themes of Description of the Fishery, Management, and Markets.

Survey Introduction

Blue Earth will state the following introduction at the beginning of each interview, modified slightly based on the informant.

Opening Script: I want to thank you for taking the time to speak with me today – your input will be very important for The Nature Conservancy’s (known as TNC) work on management and sustainability of The Bahamas’ Queen conch fisheries. As you may know, TNC engages with Bahamian government agencies and local non-profit organizations on a number of sustainable fisheries issues. TNC hired Blue Earth Consultants, LLC (Blue Earth) to perform research on The Bahamas conch fisheries, their management and markets, and to develop recommendations based on these findings for improving conch management and sustainability. These recommendations will take into consideration the best interests of those who collect, eat, and sell conch. A literature review and web based research were conducted to assess the fishery, existing management structures, and the market for Bahamas conch products. The purpose of this interview is to fill key data gaps, validate findings, and gather your opinions on challenges and possible ideas for improving conch management and sustainability in The Bahamas. In this process, we wanted to make sure to capture your feedback as a member of the conch research/fishing/management community.

Before we begin, I would like you to know that any information you share with me today will only be shared between Blue Earth and TNC Bahamas. So, while TNC Bahamas staff will have access to your individual answers, they, nor Blue Earth, will share this information with anyone else. We will, however, share trends in findings that do not quote any individual respondents in reports that TNC may share publically. The benefit of participating in this interview is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the interview is voluntary. You may stop participating at any time or choose not to answer any question.

If there are any questions that do not apply to you or your organization, please let us know and we will skip over those questions.

Do you have any questions before we begin? If you do not wish to proceed, feel free to let me know and we can discontinue the survey. Are you willing to participate? For more information after the

questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

Survey Tools

Department of Marine Resources

1. Can you please briefly state your affiliation (e.g., the division of DMR that you work for)?
2. In this role, what is the nature of your involvement with conch? For example, are you primarily involved with conch through enforcement, data collection, policy development, or another area?

Description of the Fishery

3. Can you please describe the relative sizes (catch and number of fishers involved) in different conch fisheries in The Bahamas – including for example commercial, artisanal, and recreational?
4. In your opinion, what are the main threats facing conch fisheries in The Bahamas?
5. Based on your understanding, are conch stocks in The Bahamas in healthy, stable, or poor condition?
6. To your knowledge, which conch fishing grounds in The Bahamas have conch stocks that are:
 - a. Healthy
 - b. Declining
 - c. Rebuilding
7. What are the best types of information to use that will describe or reflect conch numbers in The Bahamas?
 - a. Landings amount
 - b. Exports (amount and value)
 - c. National sales (amount and value)
 - d. Size composition of landed catch
8. For which islands or fishing grounds within The Bahamas do you think there are the biggest gaps in data on conch populations?
 - a. What types of data would be most important to gather in these areas?
 - b. What, if any, are the main barriers to data collection?
 - c. How do you think these barriers could be overcome?
9. Is there anything else important about the conch fishery that we should be aware of?

Management

10. What are the primary laws, policies, or other management frameworks in place for conch in The Bahamas on the following scales?
 - a. Bahamas
 - b. Caribbean
 - c. International (beyond the Caribbean)
11. Can you describe any laws or policies governing import and export of conch products into and out of The Bahamas?
12. Are there any additional laws or policies, not directly related to fisheries that affect or could affect the conch fishery in the future?
13. Are there any laws, policies, or management frameworks that you are aware of that relate to conch shells or pearls?

14. Can you please describe the decision-making process relating to conch management in The Bahamas? This would include key decision-makers, decision-making processes, and timing/frequency.
 - a. Can you please describe how, if at all, stakeholders are involved in the decision-making process?
15. In your opinion, how would you rate the effectiveness of enforcement of conch harvesting in The Bahamas on a scale from 1-10 where 1 is very poor/virtually nonexistent and 10 is complete enforcement and detection of all violations?
 - a. What, if any, are the main barriers to effective enforcement of the conch fishery in The Bahamas?
 - b. How do you think these barriers could be overcome?
16. In your opinion, what change in management, if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?
 - a. What are the main barriers to making this change?
 - b. How do you think these barriers could be overcome?
17. Please provide any additional recommendations that you think would help to improve the management of the conch fishery.
 - a. What is your agency willing and capable of doing to facilitate these changes?

Markets

18. To your knowledge, please describe the chain of custody for conch fisheries, from the point of harvest to the end user in The Bahamas, or export?
 - a. Commercial fishery
 - b. Artisanal fishery
 - c. Recreational fishery
19. To your knowledge, please estimate the percent of conch landed in The Bahamas that is sold to processors versus the percent sold directly to hotels, restaurants, vendors, individuals, etc.
20. To your knowledge, please estimate the percent of conch landed in The Bahamas that is destined for local markets versus export.
21. Is there an export tax or any other revenue-generating mechanism on conch fisheries, other than direct revenue from conch sales?
22. Can you please estimate the annual amount and value to The Bahamas of conch sold locally or exported as clean and dirty meat?
 - a. Clean meat
 - i. Amount
 - ii. Value
 - b. Dirty meat
 - i. Amount
 - ii. Value
23. Can you please estimate the annual amount and value to The Bahamas of exported non-meat conch products?
 - a. Amount
 - b. Value
24. In your opinion, is the market for conch growing, shrinking, or remaining constant?
 - a. More specifically, is there a market for the use of conch byproducts such as shells, horns, opercula, etc.? If so, please provide examples.

Wrap Up

25. Are there any information, data, or management gaps (in the natural or social sciences) that need to be addressed to improve the decision-making process and management of the conch fishery?
26. Is there anything else you would like to add before we wrap up?

Bahamas Agricultural & Industrial Corporation/The Bahamas Customs Staff

Opening Script: I want to thank you for taking the time to speak with me today – your input will be very important for The Nature Conservancy’s (known as TNC) work on management and sustainability of The Bahamas’ Queen conch fisheries. As you may know, TNC engages with Bahamian government agencies and local non-profit organizations on a number of environmental efforts including sustainable fisheries issues. TNC hired Blue Earth Consultants, LLC (Blue Earth) to perform research on The Bahamas conch fisheries, their management and markets, and to develop recommendations based on these findings for improving conch management and sustainability. These recommendations will take into consideration the best interests of those who collect, eat, and sell conch. A literature review and web based research were conducted to assess the fishery, existing management structures, and the market for Bahamas conch products. The purpose of this interview is to fill key data gaps, validate findings, and gather your opinions on challenges and possible ideas for improving conch management and sustainability in The Bahamas. As a member of the conch management community, your input is invaluable in this process.

Before we begin, I would like you to know that any information you share with me today will only be shared between Blue Earth and TNC Bahamas. So, while TNC Bahamas staff will have access to your individual answers, they, nor Blue Earth, will share this information with anyone else. We will, however, share trends in findings that do not quote any individual respondents in reports that TNC may share publically. The benefit of participating in this interview is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the interview is voluntary. You may stop participating at any time or choose not to answer any question.

If there are any questions that do not apply to you or your organization, please let us know and we will skip over those questions.

Do you have any questions before we begin? Are you willing to participate? For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

1. Can you please briefly state your affiliation (e.g., the organization that you work for)?
2. In this role, what is the nature of your involvement with conch? For example, are you primarily involved with conch through law enforcement, sales, market research, or another area?

Description of the Fishery

3. In your opinion, what are the main threats affecting conch fisheries in The Bahamas?
4. Based on your understanding, are conch stocks in The Bahamas in healthy, stable, or poor condition?
5. What are the best sources of data containing the following statistics on conch in the Bahamas?

- a. Landings amount
- b. Exports (amount and value)
- c. National sales (amount and value)
- d. Size composition of landed catch

Management

6. What are the primary laws, policies, or other management frameworks in place for conch in The Bahamas on the following scales?
 - a. Bahamas
 - b. Caribbean
 - c. International (beyond the Caribbean)
7. Can you describe any laws or policies governing import and export of conch products into and out of The Bahamas?
8. Are there any laws, policies, or management frameworks that you are aware of that relate to conch shells or pearls?
9. In your opinion, how would you rate the effectiveness of enforcement of conch harvesting in The Bahamas on a scale from 1-10 where 1 is very poor/virtually nonexistent and 10 is complete enforcement and detection of all violations?
 - a. What, if any, are the main barriers to effective enforcement of the conch fishery in The Bahamas?
 - b. How do you think these barriers could be overcome?
10. In your opinion, what change in management, if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?
 - a. What are the main barriers to making this change?
 - b. How do you think these barriers could be overcome?

Markets

11. To your knowledge, please describe the chain of custody for conch fisheries, from the point of harvest to the end user in The Bahamas, or export:
 - a. Commercial fishery
 - b. Artisanal fishery
 - c. Recreational fishery
12. To your knowledge, please estimate the percent of conch landed in The Bahamas that is destined for local markets versus export.
13. Is there an export tax or any other revenue-generating mechanism on conch fisheries, other than direct revenue from conch sales?
14. Can you please estimate the annual amount and value to The Bahamas of conch sold locally or exported as clean and dirty meat?
 - a. Clean meat
 - i. Amount
 - ii. Value
 - b. Dirty meat
 - i. Amount
 - ii. Value
15. Can you please estimate the annual amount and value to The Bahamas of exported non-meat conch products?

- a. Amount
 - b. Value
16. In your opinion, is the market for conch growing, shrinking, or remaining constant?
- a. More specifically, is there a market for the use of conch byproducts such as shells, horns, opercula, etc.? If so, please provide examples.

Wrap Up

17. Are there any information, data, or management gaps (in the natural or social sciences) that need to be addressed to improve the decision-making process and management of the conch fishery?
18. Is there anything else you would like to add before we wrap up?

Law Enforcement Staff

Introduction

Opening Script: I want to thank you for taking the time to speak with me today – your input will be very important for The Nature Conservancy’s (known as TNC) work on management and sustainability of The Bahamas’ Queen conch fisheries. As you may know, TNC engages with Bahamian government agencies and local non-profit organizations on a number of environmental efforts including sustainable fisheries issues. TNC hired Blue Earth Consultants, LLC (Blue Earth) to perform research on The Bahamas conch fisheries, their management and markets, and to develop recommendations based on these findings for improving conch management and sustainability. These recommendations will take into consideration the best interests of those who collect, eat, and sell conch. A literature review and web based research were conducted to assess the fishery, existing management structures, and the market for Bahamas conch products. The purpose of this interview is to fill key data gaps, validate findings, and gather your opinions on challenges and possible ideas for improving conch management and sustainability in The Bahamas. As a member of the conch management community, your input is invaluable in this process.

Before we begin, I would like you to know that any information you share with me today will only be shared between Blue Earth and TNC Bahamas. So, while TNC Bahamas staff will have access to your individual answers, they, nor Blue Earth, will share this information with anyone else. We will, however, share trends in findings that do not quote any individual respondents in reports that TNC may share publicly. The benefit of participating in this interview is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the interview is voluntary. You may stop participating at any time or choose not to answer any question.

If there are any questions that do not apply to you or your organization, please let us know and we will skip over those questions.

Do you have any questions before we begin? Are you willing to participate? For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

1. Can you please briefly state your affiliation (e.g., the department and/or division that you work for)?
2. In this role, what is the nature of your involvement with conch? For example, are you primarily involved in patrols, reporting violations, etc.?

Description of the Fishery

3. In your opinion, what are the main threats facing conch fisheries in The Bahamas?
4. Based on your understanding, are conch stocks in The Bahamas in healthy, stable, or poor condition?
5. To your knowledge, which conch fishing grounds in The Bahamas have conch stocks that are:
 - a. Healthy
 - b. Declining
 - c. Rebuilding
6. For which islands or fishing grounds in The Bahamas do you think there are the biggest gaps in data on conch populations
 - a. What types of data would it be most important to gather in these areas?
 - b. What, if any, are the main barriers to data collection?
 - c. How do you think these barriers could be overcome?

Management

7. What are the primary laws, policies, or other management frameworks in place for conch in The Bahamas on the following scales?
 - a. Bahamas
 - b. Caribbean
 - c. International (beyond the Caribbean)
8. Can you describe any laws or policies governing import and export of conch products into and out of The Bahamas?
9. In your opinion, how would you rate the effectiveness of enforcement of conch harvesting in The Bahamas on a scale from 1-10 where 1 is very poor/virtually nonexistent and 10 is complete enforcement and detection of all violations?
 - a. What are some of the key enforcement gaps that need to be addressed to improve management of the conch fishery?
 - b. What, if any, are the main barriers to effective enforcement of the conch fishery in The Bahamas?
 - c. How do you think these barriers could be overcome?
10. In your opinion, what change in management, if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?
 - a. What are the main barriers to making this change?
 - b. How do you think these barriers could be overcome?

Wrap Up

11. Are there any information, data, or management gaps (in the natural or social sciences) that need to be addressed to improve the decision-making process and management of the conch fishery?
12. Is there anything else you would like to add before we wrap up?

Conch Scientists

Introduction

Opening Script: I want to thank you for taking the time to speak with me today – your input will be very important for The Nature Conservancy’s (known as TNC) work on management and sustainability of The Bahamas’ Queen conch fisheries. As you may know, TNC engages with Bahamian government agencies and local non-profit organizations on a number of environmental efforts including sustainable fisheries issues. TNC hired Blue Earth Consultants, LLC (Blue Earth) to perform research on The Bahamas conch fisheries, their management and markets, and to develop recommendations based on these findings for improving conch management and sustainability. These recommendations will take into consideration the best interests of those who collect, eat, and sell conch. A literature review and web based research were conducted to assess the fishery, existing management structures, and the market for Bahamas conch products. The purpose of this interview is to fill key data gaps, validate findings, and gather your opinions on challenges and possible ideas for improving conch management and sustainability in The Bahamas. As a member of the conch research community, your input is invaluable in this process.

Before we begin, I would like you to know that any information you share with me today will only be shared between Blue Earth and TNC Bahamas. So, while TNC Bahamas staff will have access to your individual answers, they, nor Blue Earth, will share this information with anyone else. We will, however, share trends in findings that do not quote any individual respondents in reports that TNC may share publically. The benefit of participating in this interview is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the interview is voluntary. You may stop participating at any time or choose not to answer any question.

If there are any questions that do not apply to you or your organization, please let us know and we will skip over those questions.

Do you have any questions before we begin? Are you willing to participate? For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

1. Can you please briefly state your affiliation (e.g., the university or other entity that you work for)?
2. In this role, what is the nature of your involvement with conch? For example, broadly speaking are there certain aspects of conch that you research, or certain geographies that you focus on, etc.?

Description of the Fishery

3. In your opinion, what are the main threats facing conch fisheries in The Bahamas?
4. Based on your understanding, are conch stocks in The Bahamas in healthy, stable, or poor condition?
5. To your knowledge, which conch fishing grounds in The Bahamas have conch stocks that are:
 - a. Healthy
 - b. Declining
 - c. Rebuilding
6. What are the best sources of data containing the following statistics on conch in The Bahamas?
 - a. Landings amount

- b. Exports (amount and value)
 - c. National sales (amount and value)
 - d. Size composition of landed catch
7. For which islands or fishing grounds in The Bahamas do you think there are the biggest gaps in data on conch populations
- a. What types of data would it be most important to gather in these areas?
 - b. What, if any, are the main barriers to data collection?
 - c. How do you think these barriers could be overcome?

Management

8. In your opinion, how would you rate the effectiveness of enforcement of conch harvesting in The Bahamas on a scale from 1-10 where 1 is very poor/virtually nonexistent and 10 is complete enforcement and detection of all violations?
- a. What, if any, are the main barriers to effective enforcement of the conch fishery in The Bahamas?
 - b. How do you think these barriers could be overcome?
9. In your opinion, what change in management, if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?
- a. What are the main barriers to making this change?
 - b. How do you think these barriers could be overcome?
10. Please provide any additional recommendations that you think would help to improve the management of the conch fishery.

Markets

11. To your knowledge, please estimate the percent of conch landed in The Bahamas that is destined for local markets versus export.

Wrap Up

12. Are there any information, data, or management gaps (in the natural or social sciences) that need to be addressed to improve the decision-making process and management of the conch fishery?
13. Is there anything else you would like to add before we wrap up?

Conch Fishers

Introduction

Opening Script: I want to thank you for taking the time to speak with me today – your input will be very important for The Nature Conservancy’s (known as TNC) work on management and sustainability of The Bahamas’ Queen conch fisheries. As you may know, TNC engages with Bahamian government agencies and local non-profit organizations on a number of environmental efforts including sustainable fisheries issues. TNC hired Blue Earth Consultants, LLC (Blue Earth) to perform research on The Bahamas conch fisheries, their management and markets, and to develop recommendations based on these findings for improving conch management and sustainability. These recommendations will take into consideration the best interests of those who collect, eat, and sell conch. A literature review and web based research were conducted to assess the fishery, existing management structures, and the market for Bahamas conch products. The purpose of this interview is to fill key data gaps, validate findings, and gather your

opinions on challenges and possible ideas for improving conch management and sustainability in The Bahamas. As a member of the conch fishing community, your input is invaluable in this process.

Before we begin, I would like you to know that any information you share with me today will only be shared between Blue Earth and TNC Bahamas. So, while TNC Bahamas staff will have access to your individual answers, they, nor Blue Earth, will share this information with anyone else. We will, however, share trends in findings that do not quote any individual respondents in reports that TNC may share publically. The benefit of participating in this interview is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the interview is voluntary. You may stop participating at any time or choose not to answer any question.

If there are any questions that do not apply to you or your organization, please let us know and we will skip over those questions.

Do you have any questions before we begin? Are you willing to participate? For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

1. Can you please briefly describe your occupation?
2. In this role, what is the nature of your involvement with conch? For example, do you harvest mostly conch, or other species as well?

Description of the Fishery

3. In your opinion, what are the main threats facing conch fisheries in The Bahamas?
4. Based on your understanding, are conch stocks in The Bahamas in healthy, stable, or poor condition?
5. To your knowledge, which conch fishing grounds in The Bahamas have conch stocks that are:
 - a. Healthy
 - b. Declining
 - c. Rebuilding
6. For which islands or fishing grounds in The Bahamas do you think there are the biggest gaps in data on conch populations
 - a. What types of data would it be most important to gather in these areas?
 - b. What, if any, are the main barriers to data collection?
 - c. How do you think these barriers could be overcome?

Management

7. Are there any additional laws or policies, not directly related to fisheries, that affect or could affect the conch fishery in the future?
8. Can you please describe the decision-making process relating to conch management in The Bahamas? This would include key decision-makers, decision-making processes, and timing/frequency.
 - a. Can you please describe how, if at all, stakeholders are involved in the decision-making process?
9. In your opinion, how would you rate the effectiveness of enforcement of conch harvesting in The Bahamas on a scale from 1-10 where 1 is very poor/virtually nonexistent and 10 is complete enforcement and detection of all violations?

- a. What, if any, are the main barriers to effective enforcement of the conch fishery in The Bahamas?
 - b. How do you think these barriers could be overcome?
10. In your opinion, what change in management, if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?
 - a. What are the main barriers to making this change?
 - b. How do you think these barriers could be overcome?

Markets

11. To your knowledge, please describe the chain of custody for conch fisheries, from the point of harvest to the end user in The Bahamas, or export?
 - a. Commercial fishery
 - b. Artisanal fishery
 - c. Recreational fishery
12. To your knowledge, please estimate the percent of conch landed in The Bahamas that is sold to processors versus the percent is sold directly to hotels, restaurants, vendors, individuals, etc.
13. To your knowledge, please estimate the percent of conch landed in The Bahamas that is destined for local markets versus export.
14. In your opinion, is the market for conch growing, shrinking, or remaining constant?
 - a. More specifically, is there a market for the use of conch byproducts such as shells, horns, opercula, etc.? If so, please provide examples.

Wrap Up

15. Are there any information, data, or management gaps (in the natural or social sciences) that need to be addressed to improve the decision-making process and management of the conch fishery?
16. Is there anything else you would like to add before we wrap up?

Conch Processors

Introduction

Opening Script: I want to thank you for taking the time to speak with me today – your input will be very important for The Nature Conservancy’s (known as TNC) work on management and sustainability of The Bahamas’ Queen conch fisheries. As you may know, TNC engages with Bahamian government agencies and local non-profit organizations on a number of environmental efforts including sustainable fisheries issues. TNC hired Blue Earth Consultants, LLC (Blue Earth) to perform research on The Bahamas conch fisheries, their management and markets, and to develop recommendations based on these findings for improving conch management and sustainability. These recommendations will take into consideration the best interests of those who collect, eat, and sell conch. A literature review and web based research were conducted to assess the fishery, existing management structures, and the market for Bahamas conch products. The purpose of this interview is to fill key data gaps, validate findings, and gather your opinions on challenges and possible ideas for improving conch management and sustainability in The Bahamas. As a member of the conch fishing community, your input is invaluable in this process.

Before we begin, I would like you to know that any information you share with me today will only be shared between Blue Earth and TNC Bahamas. So, while TNC Bahamas staff will have access to your

individual answers, they, nor Blue Earth, will share this information with anyone else. We will, however, share trends in findings that do not quote any individual respondents in reports that TNC may share publically. The benefit of participating in this interview is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the interview is voluntary. You may stop participating at any time or choose not to answer any question.

If there are any questions that do not apply to you or your organization, please let us know and we will skip over those questions.

Do you have any questions before we begin? Are you willing to participate? For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

1. Can you please briefly state your affiliation?
2. In this role, what is the nature of your involvement with conch? For example, do you purchase conch from fishers, do you handle exports, etc.?

Description of the Fishery

3. In your opinion, what are the main threats facing conch fisheries in The Bahamas?
4. What are the best sources of data containing the following statistics on conch in the Bahamas?
 - a. Landings amount
 - b. Exports (amount and value)
 - c. National sales (amount and value)
 - d. Size composition of landed catch
5. For which islands or fishing grounds in The Bahamas do you think there are the biggest gaps in data on conch populations
 - a. What types of data would it be most important to gather in these areas?
 - b. What, if any, are the main barriers to data collection?
 - c. How do you think these barriers could be overcome?

Management

6. Can you please describe the decision-making process relating to conch management in The Bahamas? This would include key decision-makers, decision-making processes, and timing/frequency.
 - a. Can you please describe how, if at all, stakeholders are involved in the decision-making process?
7. In your opinion, what change in management, if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?
 - a. What are the main barriers to making this change?
 - b. How do you think these barriers could be overcome?

Markets

8. To your knowledge, please describe the chain of custody for conch fisheries, from the point of harvest to the end user in The Bahamas, or export?
 - a. Commercial fishery
 - b. Artisanal fishery
 - c. Recreational fishery

9. To your knowledge, please estimate the percent of conch landed in The Bahamas that is sold to processors versus the percent is sold directly to hotels, restaurants, vendors, individuals, etc.
10. Can you please estimate the annual amount and value to The Bahamas of conch sold locally or exported as clean and dirty meat?
 - a. Clean meat
 - i. Amount
 - ii. Value
 - b. Dirty meat
 - i. Amount
 - ii. Value
11. Can you please estimate the annual amount and value to The Bahamas of exported non-meat conch products?
 - a. Amount
 - b. Value
12. Please provide an estimate of the amount of conch your processing facility receives and processes each year.
13. In your opinion, is the market for conch growing, shrinking, or remaining constant?
 - a. More specifically, is there a market for the use of conch byproducts such as shells, horns, opercula, etc.? If so, please provide examples.

Wrap Up

14. Are there any information, data, or management gaps (in the natural or social sciences) that need to be addressed to improve the decision-making process and management of the conch fishery?
15. Is there anything else you would like to add before we wrap up?

NGOs

Introduction

Opening Script: I want to thank you for taking the time to speak with me today – your input will be very important for The Nature Conservancy’s (known as TNC) work on management and sustainability of The Bahamas’ Queen conch fisheries. As you may know, TNC engages with Bahamian government agencies and local non-profit organizations on a number of environmental efforts including sustainable fisheries issues. TNC hired Blue Earth Consultants, LLC (Blue Earth) to perform research on The Bahamas conch fisheries, their management and markets, and to develop recommendations based on these findings for improving conch management and sustainability. These recommendations will take into consideration the best interests of those who collect, eat, and sell conch. A literature review and web based research were conducted to assess the fishery, existing management structures, and the market for Bahamas conch products. The purpose of this interview is to fill key data gaps, validate findings, and gather your opinions on challenges and possible ideas for improving conch management and sustainability in The Bahamas. As a member of the conch research and management community, your input is invaluable in this process.

Before we begin, I would like you to know that any information you share with me today will only be shared between Blue Earth and TNC Bahamas. So, while TNC Bahamas staff will have access to your individual answers, they, nor Blue Earth, will share this information with anyone else. We will, however,

share trends in findings that do not quote any individual respondents in reports that TNC may share publicly. The benefit of participating in this interview is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the interview is voluntary. You may stop participating at any time or choose not to answer any question.

If there are any questions that do not apply to you or your organization, please let us know and we will skip over those questions.

Do you have any questions before we begin? Are you willing to participate? For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

1. Can you please briefly state your affiliation (e.g., the organization that you work for)?
2. In this role, what is the nature of your involvement with conch? For example, are you involved in conch research, conservation efforts and campaigns, policy advocacy, etc.?

Description of the Fishery

3. In your opinion, what are the main threats facing conch fisheries in The Bahamas?
4. Based on your understanding, are conch stocks in The Bahamas in healthy, stable, or poor condition?
5. To your knowledge, which conch fishing grounds in The Bahamas have conch stocks that are:
 - a. Healthy
 - b. Declining
 - c. Rebuilding

Management

6. Can you please describe the decision-making process relating to conch management in The Bahamas? This would include key decision-makers, decision-making processes, and timing/frequency.
 - a. Can you please describe how, if at all, stakeholders are involved in the decision-making process?
7. In your opinion, how would you rate the effectiveness of enforcement of conch harvesting in The Bahamas on a scale from 1-10 where 1 is very poor/virtually nonexistent and 10 is complete enforcement and detection of all violations?
 - a. What, if any, are the main barriers to effective enforcement of the conch fishery in The Bahamas?
 - b. How do you think these barriers could be overcome?
8. In your opinion, what change in management, if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?
 - a. What are the main barriers to making this change?
 - b. How do you think these barriers could be overcome?

Markets

9. To your knowledge, please describe the chain of custody for conch fisheries, from the point of harvest to the end user in The Bahamas, or export:
 - a. Commercial fishery
 - b. Artisanal fishery
 - c. Recreational fishery

10. To your knowledge, please estimate the percent of conch landed in The Bahamas that is sold to processors versus the percent is sold directly to hotels, restaurants, vendors, individuals, etc.
11. To your knowledge, please estimate the percent of conch landed in The Bahamas that is destined for local markets versus export.

Wrap Up

12. Are there any information, data, or management gaps (in the natural or social sciences) that need to be addressed to improve the decision-making process and management of the conch fishery?
13. Is there anything else you would like to add before we wrap up?

TNC Bahamas Conch Stakeholder Questionnaires

This document contains draft questionnaires, based on the objectives in the “DRAFT Survey Objectives” document that Blue Earth will distribute to stakeholder groups as well as the general public at strategic locations in The Bahamas.

Stakeholder Group Questionnaires

This section contains draft questions to be included in brief questionnaires for several stakeholder groups. We will include the introduction below on all questionnaires to provide respondents with some background on the purpose of the questionnaires.

Questionnaire Introduction

Thank you for participating in this brief questionnaire regarding Bahamas Queen Conch! Blue Earth Consultants, LLC, based in California, is assisting The Nature Conservancy (known as TNC) in The Bahamas with collecting information about local conch markets. TNC will use this information to help guide the government in making management decisions that sustain Bahamian livelihoods. The benefit of participating in the questionnaire is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the questionnaire is voluntary. You may stop participating at any time or choose not to answer any question. Please note that the specific information you provide will only be shared between Blue Earth and TNC Bahamas, and with no one else. TNC will, however, will share trends in findings across all respondents in reports that they may share publically. Please let us know if you have any questions or are not willing to participate. For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com.

We ask that you answer each of the below questions to the best of your ability. When we ask about typical prices or frequencies, please consider the past 12 months.

Conch Fishers

1. What are typical range of prices per pound of raw conch meat (cleaned and/or uncleaned), at the first point of sale upon landing?
Price per pound of CLEANED conch ranges between \$B_____ (low) and \$B_____ (high)
Price per pound of UNCLEANNED conch ranges between \$B_____ (low) and \$B_____ (high)
2. Who do you typically sell conch to? _____

3. Please circle the following conch products, in addition to meat, that you are aware have market value in The Bahamas:

Shell Pearl Operculum Trimmings Other- please describe

4. Please circle the following conch products, in addition to meat, that you are aware have market value abroad:

Shell Pearl Operculum Trimmings Other- please describe

5. *For the products circled above*, please indicate a typical price (in Bahamian dollars), at the first point of sale upon landing.

Shell	Pearl	Operculum	Trimmings	Other
Price for 1 shell =	Price for 1 pearl =	Price for 1 operculum =	Price per pound =	Price (please specify units) =

6. *For the same products circled above (in Q2)*, please estimate the percent of conch landings that are used to derive the above products:

Shell	Pearl	Operculum	Trimmings	Other
% of catch used for shell =	% of catch used for pearls =	% of catch used for opercula =	% of catch used for trimmings =	% of catch (please specify product) =

Market/Harbor Stall Vendors

1. What is a typical price per pound that you or other vendors would charge for *raw* conch meat (cleaned and/or uncleaned), if applicable?

Price per pound of CLEANED conch ranges between \$B _____ (low) and \$B _____ (high)

Price per pound of UNCLEANED conch ranges between \$B _____ (low) and \$B _____ (high)

2. Do you sell more conch to locals or to visitors?

3. What is a typical price per pound that you or other vendors would charge for *cooked* conch meat (if applicable)?

Price per pound = \$B _____

4. Please circle the following conch products, in addition to meat, that you are aware have market value in The Bahamas:

Shell Pearl Operculum Trimmings Other- please describe

5. Please circle the following conch products, in addition to meat, that you are aware have market value abroad:

Shell Pearl Operculum Trimmings Other- please describe

6. *For the products circled above*, please indicate the typical price (in Bahamian dollars), that you or other vendors charge.

Shell	Pearl	Operculum	Trimmings	Other
Price for 1 shell =	Price for 1 pearl =	Price for 1 operculum =	Price per pound =	Price (please specify units) =

7. Please estimate the percent of your revenue from conch sales that came from each of the following products over the past 12 months (note that all percents together should add to 100%).

Meat	Shell	Pearl	Operculum	Trimmings	Other
% of revenue from meat =	% of revenue from shells =	% of revenue from pearls =	% of revenue from opercula =	% of revenue from trimmings =	% of revenue (please specify product) =

Conch Processors

1. What percentage of your business is made up of conch sales?

Percent of business of conch sales=_____%

2. Where do you source your conch from?

- a. Abaco
- b. Andros Island
- c. Berry Islands
- d. Eleuthera
- e. The Exumas
- f. Jumentos Cays
- g. Ragged Islands
- h. Little Bahama Bank
- i. Eastern Sand Bores
- j. Other _____

(Please list)

3. What is the typical range of price per pound that your company or other processors pay for raw landed conch meat (cleaned and uncleaned, as applicable)?
Price per pound of CLEANED conch ranges between \$B_____ (low) and \$B_____ (high)
Price per pound of UNCLEANED conch ranges between \$B_____ (low) and \$B_____ (high)
4. What is a typical price per pound of conch after processing?
Price per pound = \$B_____
5. Approximately what percent of processed conch is destined for local markets in The Bahamas versus export?
Percent of processed conch consumed in The Bahamas = _____%
Percent of processed conch exported = _____%

Restauranteurs

1. What is a typical price per pound that your restaurant or other restaurants in The Bahamas would pay for raw landed conch meat (cleaned and/or uncleaned)?
Price per pound of CLEANED conch ranges between \$B_____ (low) and \$B_____ (high)
Price per pound of UNCLEANED conch ranges between \$B_____ (low) and \$B_____ (high)
2. What is a typical price for a conch dish sold at your restaurant?
Price of conch fritters = \$B_____
Price of conch salad = \$B_____
Price of cracked conch = \$B_____
Price of conch stew = \$B_____
Price of conch burger = \$B_____
Price of _____ (fill in other conch dish) = \$B_____
Price of _____ (fill in other conch dish) = \$B_____
3. How many pounds of conch does your restaurant typically sell on an average day? Please consider the past 12 months to estimate an average.
Pounds of conch sold per day = _____ pounds
4. Who do you source your conch from?
 - a. Fishers
 - b. Fish houses
 - c. Wholesale agency
5. Who is your biggest consumer base?
 - a. Locals

- b. Tourists
- c. Neither (equivalent sales to each group)

Public Questionnaire

Below is a draft questionnaire that Blue Earth will administer to members of the public (including most likely some visitors) to gain insight on public perception of conch and consumption.

Questionnaire Introduction

Thank you for participating in this brief questionnaire regarding Bahamas Queen Conch! Blue Earth Consultants, LLC, based in California, is assisting The Nature Conservancy (known as TNC) in The Bahamas collect information about local conch markets. TNC will use this information to help guide the government in making management decisions that sustain Bahamian livelihoods. The benefit of participating in the questionnaire is the potential to help positively influence conch management. The risks are minimal, such as loss of time or boredom. Participation in the questionnaire is voluntary. You may stop participating at any time or choose not to answer any question. Please note that the specific information you provide will only be shared between Blue Earth and TNC Bahamas, and with no one else. TNC will, however, will share trends in findings across all respondents in reports that they may share publically. Please let us know if you have any questions or are not willing to participate. For more information after the questionnaire, please contact Felicity Burrows from The Nature Conservancy at fburrows@tnc.org or 242-326-0024 OR Kelsey Jacobsen from Blue Earth Consultants at kelsey@blueearthconsultants.com[CONTACT INFO].

We ask that you answer each of the below questions to the best of your ability.

1. How many times in a typical month do you consume conch? Please think about the past 12 months to estimate an average.

Times per month: _____

2. On a scale from 1 to 10, please indicate your level of concern about the future sustainability of Queen Conch in The Bahamas:

1	2	3	4	5	6	7	8	9	10
Not at all concerned									Extremely concerned

3. For each conch product listed below, please rate your likelihood of purchasing that item within the next year, using a checkmark in the appropriate column:

Conch Product	Likelihood of Purchasing		
	Low (0-30% likelihood)	Medium (30-60% likelihood)	High (60-100% likelihood)

Meat (raw)			
Meat (in a prepared dish)			
Shell			
Pearl			
Operculum			
Trimming (meat left over after processing)			
Other (please specify)			

4. Why is conch important to you? _____

5. Please rate your level of agreement with this statement:
 Conch harvest regulations are strong enough to ensure that there will be conch in The Bahamas for years to come.

Strongly Disagree **Disagree** **Neither Agree nor Disagree** **Agree** **Strongly Agree**

6. In your opinion, what change in management (for example, on the water, at the docks, sales within The Bahamas, exports, etc.), if any, would be most effective at improving the environmental and socioeconomic sustainability of Bahamas conch fisheries?

Evaluation Report

The Bahamas Queen Conch Fisheries Management and Sustainability Program

Prepared for The Nature Conservancy

Prepared by Blue Earth Consultants, LLC
June 23, 2016



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Photo Credits

Left: Conch midden

Photo Credit: martinvarsavsky, Flickr

Top Right: Andros Island

Photo Credit: scubaduder, Flickr

Bottom Right: Nassau Fish Fry

Photo Credit: r0sss, Flickr

Reference

Blue Earth Consultants, LLC. *Evaluation Report: The Bahamas Conch Fisheries Management and Sustainability Program*. Rep. The Nature Conservancy, 23 June. 2016.

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Disclaimer

Blue Earth Consultants' research and analysis presented in this report are drawn from information and data available online as well as based on perceptions from interview and questionnaire respondents. While we have made every effort to ensure that the information contained in this report is accurate, complete, and obtained from reliable sources, Blue Earth Consultants, LLC makes no guarantee of the completeness or accuracy of information provided.



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Acronyms

BAIC	The Bahamas Agricultural and Industrial Corporation
Blue Earth	Blue Earth Consultants, LLC
BREEF	The Bahamas Reef Environment Educational Foundation
CFMC	Caribbean Fishery Management Council
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CRFM	Caribbean Regional Fisheries Mechanism
DMR	The Bahamas Department of Marine Resources
EEZ	Exclusive economic zone
ETP	Endangered, threatened or protected
FAO	Food and Agriculture Organization of the United Nations
MPA	Marine protected area
MSC	Marine Stewardship Council
mt	Metric tons
NGO	Non-governmental organization
NMFS	The United States National Marine Fisheries Service
OSPESCA	The Central American Fisheries and Aquaculture Organization
PRI	Point of recruitment impaired
SPAW	Specially protected areas and wildlife
TAC	Total allowable catch
TNC	The Nature Conservancy
UoA	Unit of assessment
WECAFC	Western Central Atlantic Fishery Commission

Executive Summary

Purpose and Methods

Queen Conch is an economically and culturally important species in The Bahamas, and the target of commercial, artisanal, and sport fisheries. However, evidence of declining conch stocks in recent years has led to concerns about the long-term sustainability of the fisheries. This Evaluation Report describes the key existing fishery management structures for The Bahamas conch fisheries and assesses those management structures against the Marine Stewardship Council (MSC) Fisheries Standard and other fishery sustainability syntheses. Based on these assessments, we provide recommendations that The Nature Conservancy (TNC) may share with management authorities and work with them to prioritize and implement.

To prepare this report and develop recommendations, Blue Earth Consultants, LLC (Blue Earth) conducted web research on national and international regulatory frameworks. We also reviewed the MSC Fisheries Standard and other relevant fishery synthesis reports. We assessed the existing conch fishery management structures, along with information gathered through a previous literature review and stakeholder analysis, against each Performance Indicator in the MSC Fisheries Standard to identify areas where The Bahamas conch fisheries may need improvement. We also performed a comparative analysis with two other documents – a fishery synthesis and a conch management guidance document – to provide additional insight on potential management gaps.

Summary of Key Findings from Literature Review and Stakeholder Analysis

We provide a summary of findings that are presented in detail in the Literature Review Report and Stakeholder Analysis Report (Blue Earth 2016a; 2016b), including findings on conch’s cultural value in The Bahamas; landings, markets, consumption, and economic value; threats facing the fishery; stock trends and status; and gaps in data, information, and understanding.

Existing Conch Fishery Management Structures

The Bahamas conch fisheries are managed primarily through national laws, as well as through several regional bodies within the Caribbean and relevant United States regulations. The Fisheries Resources (Jurisdiction and Conservation) Act of 1977 and corresponding regulations are the primary management framework for conch fisheries in The Bahamas. Perhaps the most significant provision in the act and regulations is the restriction against taking, possessing, or selling conch that do not have a “well-formed flaring lip.” In addition, the Act and regulations grant agencies the power to perform surveillance and enforcement of conch fisheries, set fishing and export permit costs and requirements, and identify penalties for infractions.

The Wildlife Conservation and Trade Act also has relevance for conch fisheries in The Bahamas; the Act implements the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in The Bahamas and identifies the government agencies that are responsible for ensuring consistency with CITES for the country’s conch fisheries. The Act also contains provisions calling for science-based decision-making and coordination among managing agencies.

The Bahamas also has some foundational documents that outline the national approach to fisheries management, notably a 2010-2014 strategic plan for the Department of Marine Resources. This plan, although now outdated, sets forth core values, highlights the intent to reserve commercial fishing within The Bahamas to Bahamian nationals, suggests gaps in current regulations regarding fisheries including conch, commits to ongoing field research, and highlights the need for enhanced public education, engagement, and a more standardized and transparent decision-making process.

The Bahamas participates in several fisheries-focused international organizations and agreements relating to conch fisheries. It is one of 17 members of the inter-governmental Caribbean Regional Fisheries Mechanism and is party to the Caribbean Community Common Fisheries Policy. The Bahamas is also a member of the Food and Agriculture Organization of the United Nations' (FAO) Western Central Atlantic Fishery Commission (WECAFC) working group on Queen Conch, which aims to streamline information and management of conch throughout the Caribbean. In addition, The Bahamas is one of 25 signatories on the Cartagena Convention, which includes a protocol focused on protecting, preserving, and managing protected areas and wildlife. Finally, the United States has some regulations that affect conch in The Bahamas, including state regulations in Florida that prohibit sportfishers from transporting conch from The Bahamas into Florida by boat.

Assessment against the Marine Stewardship Council Fisheries Standard

While The Bahamas is not seeking to attain MSC certification, TNC recognizes that MSC guidelines, which are based on internationally agreed-upon standards, will help identify areas where improvements may be needed. Therefore, we provide an assessment of existing Bahamian conch fisheries management structures against the MSC Fisheries Standard. MSC uses an ecolabel and a fishery certification program to recognize and reward sustainable fishing practices. The MSC Fisheries Standard is comprised of three core Principles, listed below. Our analysis assesses The Bahamas' existing conch fishery management structures against the finer-scale Performance Indicators that comprise each of the MSC Principles.

Principle 1: Sustainable target fish stocks – The Bahamas conch fishery is not fulfilling Performance Indicators relating to stock status, stock rebuilding, and harvest control rules and tools. The fishery is partially fulfilling Performance Indicators relating to harvest strategy, information/monitoring, and assessment of stock status. Overall, there is limited stock status information and the regulations regarding harvest rules are insufficient to ensure that the stocks are sustainable.

Principle 2: Environmental impact of fishing – Environmental impacts relate to primary species, secondary species (not relevant to this fishery), endangered species, habitats, and ecosystems. As conch is the primary species and potentially endangered or threatened, The Bahamas conch fishery is not fulfilling some Performance Indicators and partially fulfilling other Performance Indicators related to outcome status of the fishery, its management strategy, and fishery information. To the author's knowledge, there are not many concerns regarding the impacts of conch fishing practices or gear on habitats and the ecosystem as a whole.

Principle 3: Effective management – The Bahamas conch fishery is partially fulfilling some Performance Indicators and largely fulfilling other Performance Indicators relating to governance and policy and the fishery-specific management system. It is performing most strongly on Performance Indicators relating

to long-term objectives and fishery-specific objectives. However, improvement is needed in the following areas:

- Legal and/or customary framework;
- Consultation, roles, and responsibilities of those involved in decision-making;
- Decision-making process;
- Compliance and enforcement; and
- Management performance evaluations.

Comparative Analysis with Other Fishery Sustainability Surveys and Standards

We compared the existing management structures with the findings and guidelines of two other documents that highlight some areas that are not emphasized in the MSC Fisheries Standard.

Characteristics of Effective Fisheries Managing Regimes Worldwide: A 2009 study by Mora et al. assessed the effectiveness of national fisheries management regimes around the world and identified management attributes that are most commonly associated with fishery sustainability (see Appendix A for more information). They found that transparency in decision-making is one of the most important indicators of fishery sustainability; this includes that managers consider and follow scientific advice, all parties are consulted, and external economic pressures are minimal. The Bahamas conch fishery could improve on the scientific advice and consultation aspects in particular, with less concern regarding economic and political pressure in the fishery.

Monitoring and Managing Queen Conch Fisheries: The FAO developed a document in 2008 to summarize guidelines for responsible management of Caribbean Queen Conch fisheries, with an emphasis on achieving compliance with CITES regulations. The guidelines provide two general requirements: 1) harvesting and processing capacity should be proportional to the productivity of conch populations, and 2) monitoring should show that the fishery management system and policies are effective. The Bahamas could improve in order to meet both of these requirements.

Recommendations

Based on the MSC Fisheries Standard assessment, comparative analysis with the Mora et al. 2009 study and the 2008 FAO guidance document, additional documents, and our previous Literature Review and Stakeholder Analysis Reports, we developed recommendations that TNC may consider further developing and working with The Government of The Bahamas to implement. These recommendations relate to areas including science and monitoring; political will, buy-in, and market demand; fishing restrictions and alternative livelihoods; and enforcement, surveillance, and compliance. We also provide suggestions for how TNC may participate in implementing each of the recommendations.

Queen Conch Evaluation Report

Purpose and Methods

The Queen Conch, an economically and culturally important mollusk, is the target of commercial, artisanal, and sport fisheries in The Bahamas and regarded by locals as a cultural icon and source of national pride.¹ However, in recent years there has been evidence of reduced conch stocks, which leads to concerns about the long-term sustainability of The Bahamas conch fisheries. This Evaluation Report describes the key existing fishery management structures for conch in The Bahamas and assesses the existing management structures against the Marine Stewardship Council (MSC) Fisheries Standard and other fishery sustainability syntheses. Based on those assessments, this report provides recommendations that The Nature Conservancy (TNC) may share with management authorities with the goal of improving the sustainability of the conch fishery. The analysis and recommendations build upon findings from previous literature review and stakeholder analysis research on The Bahamas conch fishery that Blue Earth Consultants, LLC (Blue Earth) conducted (Blue Earth 2016a; 2016b). Together, these deliverables support TNC's collaboration with resource managers and other stakeholders to develop a management and sustainability program for the conch fisheries in The Bahamas.

Evaluation Report Methods

To prepare this Evaluation Report, Blue Earth first conducted web research to review existing national and international regulations, management bodies, agreements, and management plans regarding conch in The Bahamas. We also reviewed the MSC Fisheries Standard (version 2.0, which came into effect in 2014) as well as other fishery sustainability standards, syntheses, and guidelines to identify any other reports that would offer useful frameworks for analyzing against The Bahamas conch management. We assessed the existing Bahamas conch management information from the web research, as well as information gathered during the literature review and stakeholder analysis, against the Principles, Standards, and Performance Indicators that comprise the MSC Fisheries Standard to identify management gaps. While The Bahamas is not seeking MSC certification for the conch fishery, this assessment helps identify areas where improvements to conch fishery management may lead to greater ecological and socioeconomic sustainability. Through our web research, we also identified two reports in addition to the MSC Fisheries Standard that provide useful frameworks for assessing fishery sustainability. We performed a comparative analysis of the findings of these reports with the existing management information about conch to identify any additional gaps in The Bahamas conch fishery management.

Based on the assessments and gap analysis, as well as findings from the Literature Review and Stakeholder Analysis Reports, Blue Earth developed recommendations for improving the sustainability of The Bahamas conch fisheries. These recommendations are intended for TNC to share with resource managers as appropriate to address the identified management gaps as they work to develop a conch management plan and sustainability program.

¹ Throughout this report, the term conch refers to Queen Conch (*Lobatus gigas*, formerly known as *Strombus gigas*), which is the primary species targeted in conch fisheries in The Bahamas.

Summary of Key Findings from Literature Review and Stakeholder Analysis

The following sections briefly summarize relevant findings from the Literature Review Report and Stakeholder Analysis Report that Blue Earth previously developed for TNC. These two reports and the summaries below provide background information and context to complement our evaluation of the conch fishery in this report. For more detail on the topics discussed in the sections below as well as referenced sources, please refer to the Literature Review and Stakeholder Analysis Reports.

Cultural Value

Conch is widely recognized in The Bahamas as one of the country's most culturally significant natural resources. In The Bahamas, the use of conch for food and ornaments dates back at least 400 years, as evidenced by shell middens² and other archaeological findings. Today, conch continues to be important to Bahamians; among members of the public surveyed during our stakeholder analysis research, more than 90% stated that conch is important to them in some way, with the most mentioning its importance as a food item and/or cultural icon. In addition to these values, the conch fishery supports thousands of livelihoods for fishers and in related industries.

Landings, Markets, Consumption, and Economic Value

In The Bahamas, conch is valuable as an export commodity and for national sales and consumption. Conch meat is the most common product of the conch fishery, although other products including pearls, shells, and to a lesser extent opercula and trimmings, also hold economic value. Below is a brief overview of The Bahamas conch markets and value:

- **Landings:** Over recent decades, reported conch landings have fluctuated between about 250 and 850 metric tons (mt) of conch meat. However, a significant amount of landed conch may go unreported because it is not sold through processors, which are required to report exports to Department of Marine Resources (DMR). DMR does not collect data for conch sold through informal channels, sold directly to restaurants and vendors, or harvested for personal consumption, making it difficult to accurately account for total amount and value of landings.
- **Export market:** DMR and the Minister of Agriculture and Marine Resources set annual export quotas in accordance with The Bahamas' party status to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In 2014, exports of conch meat peaked at over 410 mt, with a value of \$5.9 million, according to data collected by DMR from processor reports. The Bahamas Customs Department collects data on the amount and value of exported conch shells as well as the amount of duties collected on shells and meat. Compared with meat exports, exports of shells and export duties contribute relatively little to the overall export value.
- **National market:** The dispersed nature of the fishery and the lack of monitoring and regulation of non-exported sales make the amount and value of the national conch market difficult to estimate. In 2011, DMR reported that the national market represented 64% of total landings; however, studies suggest that the national market is significantly underreported. Based on very

² Conch shell middens are large accumulations of discarded conch shells that indicate the presence of an active historical or contemporary fishery (Stoner 1997).

rough calculations and some assumptions, we estimate the national conch market could be worth between \$2.5 million to \$7.7 million.

- **Conch sales and consumption:** The conch supply chain is complex; conch is landed by both commercial and artisanal fishers (and to a smaller extent sportfishers, who do not participate in conch markets), and sold to buyer stations, processors, fish houses, restaurants, hotels, local vendors, and individuals. Members of the public reported consuming conch an average of 4.4 times per month, and are more likely to purchase prepared or raw conch meat than non-meat conch products such as shells, pearls, opercula, and trimmings.
- **Market value of conch products:** Conch meat generally increases in value through the chain of custody, with fishers reporting the lowest average prices per pound (\$2.20-\$3.26 for dirty and clean conch, respectively) and restaurants selling conch dishes for \$4.94 to \$16.25 per dish on average. Other conch products, including shells and particularly pearls, can have relatively high market values, with an average estimated price for a shell at \$8.27 and between \$967 and \$7,698 for pearls of low and high quality, respectively. However, pearls are rare to find, and the vast majority of shells are discarded instead of sold. Other non-meat conch products such as opercula and trimmings have less value, with respondents reporting average values of \$2.73 and \$2.41 per pound, respectively.

Threats Facing the Fishery

Despite the importance of conch to export and local markets, a number of factors threaten the sustainability of conch stocks in The Bahamas. The Literature Review and Stakeholder Analysis Reports identified the following threats, with more commonly reported threats listed in bold:

- Depletion of Female/Egg-Laying Conch
- **Discarding Knocked Conch on the Seafloor**
- Habitat Degradation
- **Harvest of Juveniles**
- High Demand
- **Illegal/Foreign Fishing**
- **Export Levels**
- Inadequate Laws/Regulations
- Lack of Closed Season
- **Lack of Enforcement**
- Lack of Understanding/Awareness
- **Overharvesting**
- Pollution
- **Unsustainable Fishing Practices**

Stock Trends and Status

The Bahamas conch fishery does not have a standardized or consistent method of assessing stock trends and status, such as country-wide stock assessments. However, researchers have performed a number of stock surveys at important fishing grounds and other locations throughout the country, which suggest declines in conch stocks at most survey sites. Interviews with conch scientists and managers corroborated these findings, with the majority of experts surveyed indicating that overall conch stocks are in poor condition in The Bahamas. However, participants in the stakeholder analysis mentioned that stock health can vary widely among different locations, including based on the level of harvesting occurring.

Gaps in Data, Information, and Understanding

There are significant gaps in data, information, and understanding about the conch fishery and species biology in The Bahamas that complicate effective fishery management. Below are the top gaps in data and information identified through the literature review and stakeholder analysis research:

- Stock status and locations of conch populations, including deep water stocks;
- Life history and larval connectivity/molecular genetics;
- Total landings amount and composition/fishing patterns;
- Effects of knocked conch on existing conch populations;
- Extent of illegal fishing/illegal removal from the country;
- Impacts of climate change and other environmental factors; and
- Markets and consumption rates, including export and national sale amount and value.

Barriers to collecting this data include a lack of staff capacity and training, lack of resources and equipment for data collection, and the vast geographic area over which conch exist and are fished. Management agencies such as DMR would require more staff time, resources, and equipment, as well as the support of other agencies, to overcome these barriers and address some of the gaps highlighted above.

Existing Conch Fishery Management Structures

The Bahamas conch fisheries are managed primarily through national laws, including to maintain consistency with the international CITES standards. There are also several regional bodies within the Caribbean as well as United States regulations that address The Bahamas conch fisheries. We describe the relevant aspects of those laws and regulations below.

Fisheries Resources (Jurisdiction and Conservation) Act and Regulations

The most prominent national law governing conch fisheries is the Fisheries Resources (Jurisdiction and Conservation) Act of 1977 and accompanying regulations, which are described below.

Fisheries Resources (Jurisdiction and Conservation) Act

The Fisheries Resources (Jurisdiction and Conservation) Act of 1977 (hereafter “the Fisheries Resources Act”) applies to several Bahamian fisheries including conch, and addresses fishing licenses, conservation and management principles and conditions, declaration of protected areas, procedures relating to fisheries offenses, foreign fishing, and other topics. The act requires fishing permits from the Minister of Agriculture and Marine Resources for anyone using a Bahamian fishing vessel that is greater than 20 feet in length, which includes much of The Bahamas’ commercial conch fishery. The act gives fisheries inspectors the ability to inspect fishing vessels within the Bahamian exclusive fishery zone, with the repercussions of violating provisions of the act including seizure of the fishing vessel and a fine determined by the courts (Sections 14-18). With respect to foreign fishing, the Act prohibits commercial fishing by non-Bahamian vessels within its exclusive fishery zone unless The Bahamas is party to a relevant treaty and the fishing is authorized by the Minister. However, foreign sportfishing is allowed (Section 7).

The Fisheries Resources Act also states that the Governor-General may determine the capacity of the fishing industry of The Bahamas as well as set optimum yields for Bahamian fishery resources, taking into account both environmental and economic factors (Section 10). The Minister may also make other regulations including for the purposes of preventing overfishing while achieving optimum yield from specific fisheries; the act states that those regulations shall be based on the best available scientific information (Section 19). However, the authors did not find evidence of either optimum yields or fishing capacity being set to date for The Bahamas conch fisheries.

Fisheries Resources (Jurisdiction and Conservation) Regulations

The Fisheries Resources (Jurisdiction and Conservation) Regulations of 1986 (hereafter “the Fisheries Resources Regulations”) provide more specific information on allowable activities for Bahamian fisheries in general, as well as specifically for crawfish, conch, turtle, scale fish, stone crab, marine mammals, sponges, aquaculture, and sportfishing. The regulations also address fish processing, fishing permits and licenses, and penalties for offenses against the regulations. The regulations state the fees for obtaining fishing permits, including a fee of \$10.00 for a commercial fishing permit, \$10.00 to use a compressor, and \$5.00 to sell a fishery resource (Third Schedule). The regulations also state that a permit is required to sell fisheries resources in New Providence, and that they must be sold in specific locations identified by the Minister (Section 15). The regulations state that the use of compressors (also known as “hookahs”) is allowed during the period of August through March and only at depths within 30 to 60 feet (Fisheries Resources Regulations 2010).

Regarding conch specifically, one of the central provisions of the regulations states that “no person shall take, have in his possession or sell any conch the shell of which does not possess a well-formed flaring lip” (Section 27). Offenses against the Fishery Resources Regulations may be liable for a fine of \$3,000, imprisonment for up to one year, or both, as well as confiscation of the gear used on the offense (Section 68).

The Fisheries Resources Regulations also address conch processing and exports, stating that exporting of conch products for commercial purposes may only occur if the person exporting holds a license granted by the Minister, the products are submitted for inspection by a fisheries inspector, and the export duty is paid (Section 28). The license fees for exporting a fishery resource or product are \$50.00 and \$300.00, respectively (Third Schedule).³In addition, there is a license fee for \$300.00 to process and preserve fishery resources and fishery products for commercial purposes (Third Schedule). To facilitate record-keeping and monitoring of conch exports, “the licensee of every factory shall keep accurate records of the quantities of fishery resource or fishery product purchased, produced, sold or exported as the case may be, and the names and addresses of the persons from whom the fishery resource was purchased and to whom the fishery resource or fishery product was sold by wholesale or exported” (Section 54).The regulations also grant fisheries inspectors the ability to ensure that processors comply with the regulations, such as by entering processing facilities, taking samples of fisheries products, and requesting information from the processors.

³ While the Fisheries Resources Regulations define fishery products as “any product intended for human consumption which consists wholly or mainly of a fishery resource” (Section 2), the regulations do not explicitly define fishery resource. Based on the content of the regulations the authors infer that a fishery resource is the whole or unprocessed resource harvested, such as whole unprocessed conch.

Regarding sportfishing, the regulations require the owner or operator of vessels engaged in sportfishing to hold a permit granted by the Minister and pay the permit fee (Section 47). For vessels entering The Bahamas, there is a flat fee of \$150 for vessels under 30 feet and \$300 for vessels over 30 feet. These entry fees include a fishing permit for three months.⁴ Sportfishers may be Bahamians or visitors, but no sportfishing vessel shall have more than six conch on board at any time (Section 48). People leaving The Bahamas may take as much as 10 pounds of conch in their baggage without requiring an export permit, inspection, or duty payment (Section 70); however, it is illegal to sell conch caught through sportfishing (Section 47).

CITES and the Wildlife Conservation and Trade Act

CITES is a multilateral treaty aimed at protecting endangered animals and plants, and works by subjecting the international trade of endangered species to certain controls (CITES, n.d.). Species addressed by CITES are listed in one of three appendices based on the degree of protection they need. Queen Conch is listed in Appendix II, indicating that it is “not necessarily threatened with extinction, but...trade must be controlled in order to avoid utilization incompatible with their survival” (CITES, n.d.). Therefore, CITES is an important influence on The Bahamas’ conch fisheries by providing guidance on exports. Because Queen Conch is a CITES listed species, permits are required for entities exporting conch from the country. Furthermore, The Bahamas must appoint Management and Scientific Authorities to oversee conch exports. The Management Authority ensures that listed species are harvested in accordance with national laws and that the risks of injury, damage, reduced health, or cruel treatment are minimized. The Scientific Authority is responsible for ensuring that exports will not be detrimental to the survival of the species. More specifically, CITES states that harvesting of Appendix II species should be limited to maintain the species throughout its range at a level “consistent with its role in the ecosystems in which it occurs...” (CITES 1983). According to CITES, the Scientific Authority may recommend to the Management Authority when the export of listed species should be limited to ensure its populations remain at this level.

The Wildlife Conservation and Trade Act implements CITES in The Bahamas, including by designating the Ministry of Agriculture and Marine Resources as the Management Authority and DMR as the Scientific Authority. In addition to advising the Ministry of Agriculture on whether exports will be detrimental to listed species’ health, the act requires DMR as the Scientific Authority to monitor export permits and actual exports (Section 7). As the Management Authority, the act requires the Ministry of Agriculture and Marine Resources to coordinate with other relevant authorities to enforce legislation relating to species conservation, grant permits, maintain records of international trade in listed species, and prepare and submit annual and biennial reports to the CITES Secretariat (Section 6). The Ministry of Agriculture and Marine Resources also grants export permits for listed species (Section 16). The act directs the Minister of Agriculture and Marine Resources to appoint a National Advisory Committee made up of public and private sector representatives to advise the Minister and the Scientific and Management Authorities on any matters relating to the act (Section 9). The act states that it “shall be the duty of all public authorities to cooperate fully with the Management Authority” to enforce the act

⁴ Fees may vary depending on the duration of the visit and whether the foreign-owned vessel is registered in The Bahamas (Gittens and Braynen 2016).

(Section 8). It also calls for the establishment of a special fund to be used for conservation of wildlife and implementation and enforcement of CITES and the act (Section 30).

National Management and Strategic Plans

The Bahamas has some foundational documents that outline the national approach to fisheries management. For example, DMR developed a five-year strategic plan in 2010. Although now outdated, the plan sets forth core values, highlights the intent to reserve commercial fishing within The Bahamas to Bahamian nationals, suggests gaps in current regulations regarding fisheries including conch, commits to ongoing field research of species including conch, and highlights the need for enhanced public education, engagement, and a more standardized and transparent decision-making process. The Ministry of Agriculture and Marine Resources prepared a draft Fisheries and Aquaculture Policy under an ongoing Technical Cooperation Project with the Food and Agriculture Organization of the United Nations (FAO), but the draft has not yet been presented to the Cabinet for approval (Gittens and Braynen 2016).

Bahamian non-governmental organizations (NGOs) have also developed fishery plans and recommendations, including a Fisheries Management Action Plan for The Bahamas produced for DMR by The Bahamas Reef Environment Educational Foundation (BREEF) in 1998. The plan describes the conservation and commercial fishery status and management for crawfish, Queen Conch, and Nassau Grouper, and highlights the lack of management capacity by DMR (BREEF 1998). It calls for a fundamental review of fisheries policy and enhanced dialogue with the fishing industry, increased funding for fisheries management, data collection, and management measures such as increased licensing and cost of licenses, setting of total allowable catch, and implementation of a network of marine protected areas (MPAs) (BREEF 1998).

International Organizations and Agreements

In addition to The Bahamas' position as a party to CITES, they also participate in other fisheries-focused international organizations and agreements. For example, The Bahamas is one of 17 members of the Caribbean Regional Fisheries Mechanism (CRFM), an inter-governmental organization that aims to "promote and facilitate the responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region" (CRFM n.d.). CRFM worked with fisheries officers from the member nations to develop the Caribbean Community Common Fisheries Policy, which is a binding treaty focused on collaboration among Caribbean people, fishermen, and their governments for conservation, management, and sustainable use of fisheries and their related ecosystems (CRFM2015).

CRFM is also a partner of a working group on Queen Conch, in which the other primary partners are the Caribbean Fishery Management Council (CFMC), the Central American Fisheries and Aquaculture Organization (OSPESCA), and the FAO's Western Central Atlantic Fishery Commission (WECAFC), of which CRFM and OSPESCA are sub-regional organizations (Prada and Appeldoorn 2014). Given the large number of countries and national and regional bodies dealing with conch, the working group aims to establish communications between its members, share data and collection methodologies, compile and analyze data, monitor changes in Queen Conch distribution, provide management advice to countries and regional organizations, and more (WECAFC n.d.). In 2012, the first WECAFC working group meeting

produced the Panama Declaration, which included recommendations to improve the management and conservation of Queen Conch (Prada and Appeldoorn 2014). Following its first meeting, the CFMC/OSPESCA/WECAFC/CRFM working group developed a draft regional fishery management and conservation plan for Queen Conch based on these recommendations (Prada and Appeldoorn 2014). The plan proposes regional conch management objectives and specific management measures relating to improving data collection, performing credible data analysis, defining control rules, and applying scientific recommendations using the control rules (Prada and Appeldoorn 2014). In the seventh meeting of the WECAFC Science Advisory Group in 2015, representatives of the Queen Conch working group reported on current actions including scientific training for underwater surveys, analysis of management approaches and development of management options for regional-scale consideration, and agreement on a regional and national conch processing conversion factors (WECAFC 2015). They also suggested future research priorities on minimum conch sizes and the relevant geographic range for shared management based on source and sink populations. In addition, working group experts developed the format for non-detriment findings assessments for Queen Conch, as is required by CITES (CITES 2015).

Furthermore, The Bahamas is one of 25 signatories on the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (also called the Cartagena Convention) (Caribbean Environment Programme 2015). The Convention and its protocols constitute a legal commitment by the signatory countries to protect and manage their coastal and marine resources individually, jointly, and sustainably. One of its protocols concerns specially protected areas and wildlife (the SPAW Protocol), stating that each party to the Protocol shall take necessary measures to protect, preserve, and manage: 1) areas that require protection to safeguard their special value, and 2) threatened or endangered species (SPAW Protocol 1990). According to the Protocol, each country is responsible for managing species with the objective of preventing them from becoming endangered or threatened (SPAW Protocol 1990).

United States Laws and Regulations

In addition to laws, regulations, and agreements in The Bahamas and the greater Caribbean region, there are some regulations within the United States that have the potential to affect The Bahamas conch fisheries. For example, listing of Queen Conch as threatened or endangered under the United States Endangered Species Act could have implications on The Bahamas conch fisheries. Although the United States recommended in 1992 that Queen Conch be listed by CITES (CITES 2014), the United States National Marine Fisheries Service (NMFS) responded to a petition by an environmental conservation group in 2012 that the Queen Conch was not in danger of extinction throughout all or a significant portion of its range, nor was it likely to become so within the foreseeable future (NMFS 2014). Therefore, conch is not considered a threatened or endangered species by the United States. On a state scale, the Florida Fish and Wildlife Conservation Commission summarizes regulations for sportfishers traveling by boat from The Bahamas to the United States. According to the Commission, it is unlawful to transport species that are prohibited from harvest in United States waters, which includes Queen Conch, by boat to the United States (Florida Fish and Wildlife Conservation Commission n.d.).

Assessment against the Marine Stewardship Council Fisheries Standard

In developing a management and sustainability program for Queen Conch in The Bahamas, TNC is interested in learning from existing standards for sustainable fisheries to identify areas where The Bahamas may improve management to sustain the conch fishery into the future. In this section we assess the existing Bahamian conch fisheries management structures against the MSC Fisheries Standard, one of the preeminent standards globally for sustainable fisheries. While The Bahamas is not seeking to attain MSC certification, TNC recognizes that MSC guidelines will help identify areas where improvements may be needed. Therefore, TNC, in consultation and agreement with stakeholders, selected Blue Earth Blue Earth to conduct this review of the conch fishery as an external, impartial body. Below, we first provide a brief summary of the MSC Fisheries Standard and then provide an assessment of The Bahamas conch fishery management against the three principles of the standard to highlight potential gaps. Importantly, this analysis was not performed with the level of rigor of a true MSC evaluation or pre-assessment process due to cost and time constraints, and therefore may not capture details that would be included in a more in-depth analysis. This analysis provides an initial review to identify areas where The Bahamas conch management may have gaps relative to the MSC Fisheries Standard.

Introduction to the Marine Stewardship Council Fisheries Standard

MSC uses an ecolabel and a fishery certification program to recognize and reward sustainable fishing practices, thereby influencing consumers' seafood buying choices and contributing to the health of the world's oceans (MSC 2014). The certification and ecolabel, which are based on extensive and rigorous science, offer a way to confirm the sustainability of the seafood's source using a third-party assessment process (MSC 2014). The MSC Fisheries Standard that is used to determine eligibility for the ecolabel is composed of the three core principles described below, taken verbatim from MSC's Fisheries Standard and Guidance 2.0 (MSC 2014):

Principle 1: Sustainable target fish stocks - A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

Principle 2: Environmental impact of fishing - Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Principle 3: Effective management - The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Each Principle contains two or more finer-scale Components as well as Performance Indicators and additional guidance for assessing against each of the Performance Indicators. The Components and Performance Indicators are listed in full in **Error! Reference source not found.**-8 in the following section. In addition, the technical and detailed nature of the MSC Fisheries Standard leads to the need for specific terminology; Table 1 below contains a selection of relevant terms for this analysis, as defined by MSC.

Table 1. MSC Terms and Definitions

Term	Definition
Endangered, Threatened or Protected (ETP) Species	Species recognized by national legislation and/or binding international agreements to which the jurisdictions controlling the fishery under assessment are party. Species listed under Appendix I of CITES shall be considered ETP species for the purposes of the MSC assessment, unless it can be shown that the particular stock of the CITES listed species impacted by the fishery under assessment is not endangered.
Habitat Structure	The arrangement of physical and biogenic formations that support plant and animal communities.
Habitat Function	The range of services provided to an organism, including, but not limited to, mediating trophic interactions, reproduction, shelter, and feeding, and influencing the behavior of organisms.
Harvest Control Rule	A set of well-defined pre-agreed rules or actions used for determining a management action in response to changes in indicators of stock status with respect to reference points.
Harvest Strategy	The combination of monitoring, stock assessment, harvest control rules and management actions, which may include a management procedure or a Management Procedure (MP) (implicit) and be tested by management strategy evaluation.
Management Review	Review carried out by the top management of an entity on its own organizational units to determine the on-going suitability of its management systems to meet its desired objectives.
Management Procedure	The combination of pre-defined data, together with an algorithm to which such data are input to provide a value for a total allowable catch (TAC) or effort control measure; this combination has been demonstrated, through simulation trials, to show robust performance in the presence of uncertainties. Additional rules may be included, for example to spread a TAC spatially to cater for uncertainty about stock structure.
Management Procedure (Implicit)	A set of rules for management of a resource that contains the elements of an MP, but has not yet been evaluated through simulation trials.
Management Strategy Evaluation	Usually synonymous with MP approach; often used to describe the process of testing generic MPs or harvest strategies.
Overfished	The stock may remain overfished (i.e. with a biomass well below the agreed limit) for some time even though fishing pressure might be reduced or suppressed.
Precautionary Approach	The precautionary approach shall be interpreted to mean being cautious when information is uncertain, unreliable or inadequate and that the absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures
Point of Recruitment Impaired (PRI)	The stock level below which recruitment may be impaired.
Stock	The living resources in the community or population from which catches are taken in a fishery. Use of the term stock implies that the particular population

Term	Definition
	is a biologically distinct unit. As noted in the FAO Fisheries Glossary, some species form a single stock (e.g. southern bluefin tuna) while others are composed of several stocks (e.g. albacore tuna in the Pacific Ocean comprises separate Northern and Southern stocks).
Stock Assessment	An integrated analysis of information to estimate the status and trends of a population against benchmarks such as reference points.
Surveillance	Set of activities, except re-assessment, to monitor the continued fulfilment by accredited conformity assessment bodies of requirements for accreditation, or of certificate holders of requirements for certification.
Unit of Assessment (UoA)	The target stock(s) combined with the fishing method/gear and practice (including vessel type/s) pursuing that stock, and any fleets, or groups of vessels, or individual fishing operators or other eligible fishers that are included in an MSC fishery assessment. In some fisheries, the UoA and unit of certification may be further defined based on the specific fishing seasons and/or areas that are included.

Assessment against The Bahamas Conch Fishery

In this section, we provide an assessment of The Bahamas conch fishery against the elements of the MSC Fisheries Standard. For each Principle, we provide a table that includes the Components (dark blue headers) and Performance Indicators (light blue headers) that comprise that Principle (MSC 2014). We provide an assessment of The Bahamas conch fishery against each Performance Indicator using a high-level ranking system described in Table 2 below. For each Performance Indicator we also include a more detailed narrative following the tables. For a combined table containing the full assessment, see Appendix B.

Table 2. Performance Indicator Assessment Key

Assessment	Symbol
Performance Indicator is minimally or not at all achieved	
Performance indicator is achieved to a small extent	
Performance Indicator is somewhat achieved	
Performance Indicator is achieved to a medium extent	
Performance Indicator is mostly or fully achieved	

Principle 1: Sustainable Target Fish Stocks

Table 3 and the following narratives provide Blue Earth’s assessment of The Bahamas’ existing conch fishery management against Principle 1 of the MSC Fisheries Standard.

Table 3. Assessment of The Bahamas Conch Fishery against MSC Fisheries Standard Principle 1

Outcome		Harvest Strategy (Management)			
Stock Status <i>The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing.</i>	Stock Rebuilding <i>Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe.</i>	Harvest Strategy <i>There is a robust and precautionary harvest strategy in place.</i>	Harvest Control Rules and Tools <i>There are well defined and effective harvest control rules in place.</i>	Information/Monitoring <i>Relevant information is collected to support the harvest strategy.</i>	Assessment of Stock Status <i>There is an adequate assessment of the stock status.</i>
					

Outcome

Stock Status

Although no comprehensive stock assessment exists for The Bahamas as a whole (CRFM 2013a), researchers have performed site-specific stock surveys at 12 locations, including most major fishing grounds (Stoner et al. 2009, 2011, 2012b, 2013, 2014, 2015; Stoner and Davis 2010). These surveys revealed insufficient spawning stock at most of the sites to support recruitment within fished or protected areas (Stoner et al. 2015). In addition, rapid ecological assessments conducted at several locations noted signs of overfishing and low conch abundance (Dahlgren 2009; Haley-Benjamin 2013; Deleveaux et al. 2013). These studies reveal declining populations, particularly near human population centers (Stoner et al. 2014). One aspect that may be leading to these declines is harvesting of juvenile conch, as reported by researchers (e.g., Stoner et al. 1998, 2011; Cash 2013; Thomas et al. 2015) who surveyed conch middens or landed conch catches in specific locations. These findings are also supported by fisher, expert, and public perceptions respondents in the 2015 Knowledge, Attitude, and Practices Report on Queen Conch (TNC 2015), as well as by public and expert perceptions from the stakeholder analysis research and the TNC and Blue Earth’s observations of conch catches and middens in several locations throughout The Bahamas.

Stock Rebuilding

There is little time series stock survey information for conch in The Bahamas that could be used to assess rebuilding status, with the only two areas formally re-surveyed being the Exuma Cays and South Eleuthera. Surveys conducted in 2011 in the Exuma Cays Land and Sea Park, which is the oldest MPA in The Bahamas and a designated no-take area, showed that conch populations had declined compared to studies just under two decades earlier (Stoner and Ray 1996; Stoner et al. 2011; Stoner et al. 2012a). In non-protected areas including areas near Lee Stocking Island

where surveys have shown stock depletion, there is little evidence of stock rebuilding based on survey data (Stoner et al. 2012a). Similarly, surveys conducted in South Eleuthera in 2014 showed declines compared to population densities found in 1993 (Stoner et al. 1998; Thomas et al. 2015).

[Harvest Strategy \(Management\)](#)

Harvest Strategy

According to the MSC Fisheries Standard, harvest strategies consist of monitoring, stock assessment, harvest control rules, and management actions, which may include data and an algorithm that are used to determine total allowable catch or fishing effort controls. The Bahamas does not have a robust harvest strategy in place for the conch fishery, although there are some management measures in place that could provide the first steps toward these elements:

- **Monitoring and Stock assessment:** Efforts to survey fished and protected conch stocks provide some information relevant to stock assessments.
- **Harvest control rules:** Although the authority exists to set harvest regulations, there are no robust harvest control rules in place (see *Harvest Control Rules and Tools* section below).
- **Management actions:** To the authors' knowledge there is no algorithm and set of corresponding data that would be used to simulate scenarios and determine total allowable catch and limits to fishing effort.

In the face of substantial uncertainty regarding landings, stocks, and fishing effort, and other factors such as illegal or foreign fishing, The Bahamas has not demonstrated a precautionary approach for the conch fishery (CRFM 2013a). The requirement for conch to possess a well-formed flaring shell lip is the most significant restriction, but is not clearly defined nor adequately enforced, and would not necessarily represent a precautionary approach even if it were clear and well-enforced.

Harvest Control Rules and Tools

There are some authorities available through which harvest control rules or limits on catch or effort may be implemented, but those authorities have not been exercised for the conch fishery (CRFM 2013a). The Fisheries Resources Act states that the Governor-General may determine optimum yields for Bahamian fishery resources by taking into account both environmental and economic factors, as well as determine the capacity of the fishing industry of The Bahamas (Section 10). The Minister may also make regulations including for the purposes of preventing overfishing while achieving optimum yield from specific fisheries; the Act states that those regulations shall be based on the best available scientific information (Section 19). The CFMC/WCAFC/CITES/OSPESCA/CRFM Working Group recommended implementing harvest control rules for conch fisheries throughout the Caribbean region, noting that this is a significant management gap (CITES 2015). Despite the legal provisions and recent recommendations, to the authors' knowledge there are no harvest or effort limits in place in The Bahamas conch fishery, such as minimum adult conch densities that would trigger a spatial or temporal closure of the fishery.

Information/Monitoring

Because there is no harvest strategy in place, the specific types of information needed to support a harvest strategy are unknown. In a review of Queen Conch fisheries, the CRFM found that the lack of a consistent approach and regular assessment is a concern for The Bahamas' conch fishery (CRFM 2013a). However, the stock surveys and rapid ecological assessments shed some light on the status of harvested and protected conch populations and could be used as general indicators to guide management decisions in the current data-limited situation. Additional information such as landings is available to some extent, especially with respect to exports, but landings data across all locations are not collected in a consistent or comprehensive manner, and thus total landings and national consumption are difficult to estimate (CRFM 2013a). There is no focused effort to collect other types of data that may be used in a harvest strategy, such as fishing effort or biological and life history parameters for The Bahamas conch populations.

Assessment of Stock Status

As discussed previously, there is no Bahamas-wide stock assessment available to estimate the status and trends of the entire stock (CRFM 2013a), but the site-specific conch surveys have collected information on density (conch per hectare), abundance, structure, and reproductive behavior of conch populations. Although only two fishing sites have been re-surveyed to the author's knowledge, the data collected during these initial stock surveys can serve as a baseline for future surveys at the same locations to assess stock trends. It is worth noting that some researchers suggest that despite the lack of comprehensive stock assessment and modeling, there is sufficient information about conch populations to suggest that management action should be taken in fished areas (CRFM 2013a).

Principle 2: Environmental Impact of Fishing

Table 4 and the following narratives provide Blue Earth's assessment of The Bahamas' existing conch fishery management against Principle 2 of the MSC Fisheries Standard.

Table 4. Assessment of The Bahamas Conch Fishery against MSC Fisheries Standard Principle 2

Primary Species			Secondary Species		
<p>Outcome Status The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI.</p>	<p>Management Strategy There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species; and the UoA regularly reviews and implements measures, as appropriate, to minimize the mortality of unwanted catch.</p>	<p>Information Information on the nature and amount of primary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species.</p>	<p>Outcome Status The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biologically based limit.</p>	<p>Management Strategy There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species; and the UoA regularly reviews and implements measures, as appropriate, to minimize the mortality of unwanted catch.</p>	<p>Information Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.</p>
			N/A	N/A	N/A

ETP Species		
<p>Outcome Status The UoA meets national and international requirements for protection of ETP species. The UoA does not hinder recovery of ETP species.</p>	<p>Management Strategy The UoA has in place precautionary management strategies designed to:</p> <ul style="list-style-type: none"> • meet national and international requirements; and • ensure the UoA does not hinder recovery of ETP species. <p>Also, the UoA regularly reviews and implements measures, as appropriate, to minimize the mortality of ETP species.</p>	<p>Information Relevant information is collected to support the management of UoA impacts on ETP species, including:</p> <ul style="list-style-type: none"> • information for the development of the management strategy; • information to assess the effectiveness of the management strategy; and • information to determine the outcome status of ETP species
		

Habitats			Ecosystem		
Outcome Status <i>The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.</i>	Management Strategy <i>There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.</i>	Information <i>Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.</i>	Outcome Status <i>The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.</i>	Management Strategy <i>There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.</i>	Information <i>There is adequate knowledge of the impacts of the UoA on the ecosystem.</i>
					

Primary Species

Outcome Status

Results from stock surveys suggest that stocks in 11 out of 12 of the surveyed locations may lack sufficient densities of adults and age structure to sustain healthy populations (Stoner et al. 2015). Low densities of “subadults” observed in 2014 and 2015 could indicate a general decline in recruitment and a risk of recruitment failure (Stoner et al. 2015). Furthermore, there is no formal mechanism in place, such as a harvest control rule, to limit fishing activity and allow depleted populations to recover.

Management Strategy

We address the two primary components of this Performance Indicator below:

- Management strategy:** The regulation regarding the well-formed flaring lip is intended to maintain conch populations; however, this regulation is not based on adequately robust scientific data to ensure that the fishery will maintain, or at least not hinder, conch populations from rebuilding. The regulation is also imprecise with regards to what constitutes a well-formed flared lip, and difficult to monitor and enforce because the majority of conch are landed without their shells (CRFM 2013a). As evidenced by declining populations and recruitment in some fished areas, the regulations in place are not maintaining natural populations of conch; and
- Review and measures to reduce unwanted catch:** Given that fishers collect conch by hand, they can be selective and there is little concern about mortality of unwanted catch. However, there is a concern about the mortality of juvenile conch. Fisheries managers and key stakeholders meet to discuss fishery management and regulations, but these meetings may not necessarily include discussions of reducing catch of juvenile conch. While DMR indicated that fisheries meetings may occur monthly, other sources suggest that meetings occur infrequently and in an ad hoc manner (MRAG Americas 2009).

Information

The data that DMR and the Customs Department collect on landings and exports represents a substantial portion of conch landings reported in The Bahamas. However, overall there is poor information about the fishery (CRFM 2013a). Given that the extent of total landings are not captured by DMR data, this data is likely not adequate to accurately determine the risk posed by the fishery. DMR and the Customs Department, to the authors' knowledge, do not collect data on the nature of the catch, such as size, age, condition, or other information, in part because it is not possible to collect this data on conch landed without the shell. In addition, current data collection methods do not allow managers to confirm exactly where the conch was caught. Given the data available, it may be possible to extrapolate and make assumptions to estimate total catch and use those estimations to help determine the risk posed by the fishery to conch populations. However, this determination could be greatly improved if there were stronger coverage of landings data collection as well as other relevant information such as whether landed conch are mature or immature.

Secondary Species

Because the conch fishery is performed by divers who can selectively harvest individual conch, there is not a significant concern regarding impacts to secondary species. Therefore, Performance Indicators in this Component are not relevant to The Bahamas conch fishery.

ETP Species

Although MSC may not consider Queen Conch to be an ETP species because it is not listed on CITES Appendix I, below we provide insight on The Bahamas' management of the conch fishery with respect to MSC's ETP-related Performance Indicators.

Outcome Status

The Bahamas is generally meeting international requirements for protecting Queen Conch through its participation in CITES (see *CITES and the Wildlife Conservation and Trade Act* section above). However, there are some areas where The Bahamas is falling short on its CITES commitment; for example, the Management Authority is responsible for ensuring that the species is harvested in accordance with national laws, which is not occurring currently given the common harvesting of juvenile conch and the exceedance of export quotas in recent years. As the Scientific Authority, DMR is responsible for ensuring that exports are not detrimental to the survival of the species. Given the declining populations and stable or increasing export quotas, DMR is not entirely fulfilling these requirements and the fishery may be hindering recovery of conch populations in The Bahamas.

Management Strategy

There is no precautionary management strategy in place for conch in The Bahamas to meet national or international requirements or to ensure that the fishery does not hinder the recovery of conch populations. To the authors' knowledge, regular reviews of the management measures in place do not occur and there have been no significant adjustments of management measures based on data or information on the condition of the fishery. The management measures in place, with the exception of export quotas, are static and have not been updated in recent years (CRFM 2013a).

[Information](#)

Some information is available that could inform a management strategy, including site-specific population densities and average size of individual conch in the populations. However, this information may not be adequate to inform a robust management strategy. Stock density data, if collected over time in a consistent manner, could help assess the effectiveness of conch management and whether The Bahamas is meeting the CITES goal of maintaining the species and its role in the ecosystem.

[Habitats](#)

[Outcome Status](#)

Because of the selective nature of the conch fishery and because fishers do not use destructive fishing gear, there are few concerns about the fishery harming habitat structure and function. However, there is the possibility that discarding “knocked” conch shells in areas where conch inhabit causes those conch to move out of the area. Researchers have not yet confirmed this phenomenon, but laboratory and field research is under way to determine whether knocked conch do in fact degrade habitat for live conch (Thomas n.d.). Preliminary findings from this research suggest that conch do not show an automatic behavioral avoidance response when introduced to a freshly knocked conch shell (Thomas 2016). It is also possible that divers disturb habitats while collecting conch, but because conch commonly live on sand and seagrass substrates (Stoner 1988) this disturbance may not have great effect on habitat structure and function.

[Management Strategy](#)

There is no strategy in place to ensure that the fishery does not put habitats at risk of serious or irreversible harm; however, given the nature of the fishery there is not a strong need for such a strategy. If research shows that there is a strong effect of knocked conch shells on conch habitat, then there would be the need for a strategy to reduce discards of knocked conch shells on these areas.

[Information](#)

To the authors’ knowledge, there is no focused effort to collect information describing the risk that the fishery poses to the habitat. This is with the exception of Thomas’ study mentioned in the *Management Strategy* section above, which aims to determine whether there is an effect of knocked conch on live conch populations.

[Ecosystem](#)

[Outcome Status](#)

There are few reports of any serious or irreversible harm that the fishery may be causing to ecosystem structure and function. However, it is possible that the removal of large numbers of conch may be altering ecosystems in conch fishing areas.

[Management Strategy](#)

The management measures in place for the fishery are not focused on minimizing risk to the ecosystem structure and function, although by aiming to reduce juvenile catch the regulations may help to minimize this risk.

Information

Although there is no focused effort to collect information on the impacts of the conch fishery to the ecosystem (except for studies regarding the possible effects of knocked conch on existing conch populations), there is not a strong need for this information given the likelihood of minimal impacts of the fishery.

Principle 3: Effective Management

Table 5 and the following narratives provide Blue Earth’s assessment of The Bahamas’ existing conch fishery management against Principle 3 of the MSC Fisheries Standard.

Table 5. Assessment of The Bahamas Conch Fishery against MSC Fisheries Standard Principle 3

Governance and Policy		
<p>Legal and/or Customary Framework <i>The management system exists within an appropriate and effective legal and/or customary framework which ensures that it:</i></p> <ul style="list-style-type: none"> • <i>Is capable of delivering sustainability in the UoA(s)</i> • <i>Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and</i> • <i>Incorporates an appropriate dispute resolution framework.</i> 	<p>Consultation, Roles, and Responsibilities <i>The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organizations and individuals who are involved in the management process are clear and understood by all relevant parties.</i></p>	<p>Long-Term Objectives <i>The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach.</i></p>
		

Fishery-Specific Management System			
<p>Fishery-Specific Objectives <i>The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC’s Principles 1 and 2.</i></p>	<p>Decision-Making Process <i>The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives and has an appropriate approach to actual disputes in the fishery.</i></p>	<p>Compliance and Enforcement <i>Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.</i></p>	<p>Monitoring and Management Performance Evaluation</p> <ul style="list-style-type: none"> • <i>There is a system for monitoring and evaluating the performance of the fishery-specific management system against its objectives.</i> • <i>There is effective and timely review of the fishery-specific management system.</i>

Governance and Policy

Legal and/or Customary Framework

Management of The Bahamas conch fishery exists within the legal framework of The Bahamas’ national government, including legislation and agency implementation through management measures. Because the conch fishery occurs at a national scale, includes thousands of fishers, and contributes substantially to the country’s economy, it is appropriate for the fishery to be managed at this level. The following address the other relevant components of the legal framework:

- **Delivering sustainability:** There are some gaps in the government’s ability to ensure that the fishery is sustainable. These gaps may be related to political will and lack of sufficient resources, such as equipment and trained personnel to monitor and enforce conch fishery regulations. There are also some data gaps that would need to be filled to deliver science-based management measures, in addition to the political will to apply scientific information to management decisions.
- **Legal rights:** DMR “reserves the commercial fishing industry, as far as is practical, for the exploitation by Bahamian Nationals. Only commercial fishing vessels that are 100% Bahamian owned and operated by Bahamian captain and crew are...allowed to fish within the country’s Exclusive Economic Zone (EEZ)” (DMR 2010). DMR also has a core value focused on maximizing fishing employment of Bahamians to the extent that the fishery resources are available (DMR 2010). However, the Fisheries Act does allow foreign persons to participate in commercial fishing if the Immigration Department approves their employment. DMR reports that an unknown number of foreigners who are authorized by the Immigration Department work in commercial fishing in The Bahamas. Non-Bahamians are also allowed to sportfish for conch given proper permits or by fishing from a Bahamian-owned vessel.

- **Dispute resolution:** There is little emphasis on a dispute resolution framework, although fisheries violators can be brought to court for their offenses. Members of the public and experts indicated, however, that there is a lack of follow-through to apprehend violators.

Consultation, Roles, and Responsibilities

DMR's 2010-2014 strategic plan recognized that the public was unhappy with the current level of consultation and outreach, and thus includes a priority on public education, consultation, and outreach and a creating general process for all Bahamian fisheries. The proposed process includes establishing a DMR public website, educating the public on the importance of commenting, identifying necessary regulatory changes, drafting proposed legislation, public and Fisheries Advisory Committee review, and revisions to provide draft legislation to the Minister (DMR 2010). According to perceptions from the stakeholder analysis, however, there is room for improvement on realizing this process for the conch fishery. More than half of respondents in the stakeholder analysis indicated that there is a need for enhanced stakeholder engagement, including through a consistent process to engage and solicit input from the public and stakeholders. This includes during the initial decision-making processes for policy or management as well as to follow up to learn about the impacts and how to improve upon those decisions. There are some opportunities for stakeholders to provide comment, such as by attending agency meetings, but stakeholders said that these meetings take place in Nassau so may be difficult for some to attend.

Furthermore, stakeholders may not fully understand the opportunities available to engage, nor their role in the decision-making process. The CRFM states that there is no standard process in which stakeholders can represent their views or participate in decisions in a transparent way (CRFM 2013a). Similarly, a summary of the regional Queen Conch fisheries management and conservation plan states that, for the Caribbean in general, decisions regarding the conch fishery are made by high-level government officials with little involvement from stakeholders in most places (Queen Conch Working Group 2014). Fishers may express their concerns, but those concerns were not being taken on by the decision-makers; this may be due in part to insufficient organization among fishers and low levels of empowerment of the fishers (Queen Conch Working Group 2014). Furthermore, the Wildlife Conservation and Trade Act directs the Minister to appoint a National Advisory Committee, comprised of representatives of the public and private sectors, to advise the Minister and the Management and Scientific Authorities relating to CITES (Section 9), but the authors did not find indications that this body is in place or active.

Long-Term Objectives

In its 2010-2014 strategic plan, DMR outlines a vision, goals, and objectives for The Bahamas' fisheries as a whole. DMR's vision is "to optimize sustainable utilization of the fishery resources, in particular, for the maximum benefit of the Bahamian people." The two goals are focused on developing the potential of marine living resources to meet human nutritional and socioeconomic needs and maintaining or restoring populations of marine species so they can produce maximum sustainable yield. There is a larger number of specific objectives, including ensuring that the fishing industry is integrated into policy and decision-making processes, taking into account traditional knowledge and community interests, ensuring effective monitoring and enforcement, promoting scientific research and collaboration, protecting and restoring endangered species, promoting selective fishing gear, cooperating with other nations on stock management, and preserving rare or fragile ecosystems and habitats (DMR 2010). Therefore, the management policy does have clear long-term objectives that can be used to guide decision-making, and the

objectives align with many aspects of the MSC Fisheries Standard. The objectives do not explicitly incorporate a precautionary approach, although such an approach would be consistent with the objectives. To ensure that these objectives are upheld into the future, DMR will need to publish an updated version of the strategic plan for the coming years, such as through the ongoing Technical Cooperation Project with the FAO (Gittens and Braynen 2016).

Fishery-Specific Management System

Fishery-Specific Objectives

According to a summary by Gittens and Deleveaux, available management plans, policies, and legislation outline the following operational objectives for The Bahamas conch fishery, which align to a great extent with MSC's Principles 1 and 2 (Gittens and Deleveaux 2006):

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

However, it is worth noting that these objectives are not consolidated in a government document and may not all be formally adopted (CRFM 2013a). There are objectives for conch fisheries throughout the Caribbean described in the CFMC/WECAFC/OSPESCA/CRFM/CITES draft regional Queen Conch fisheries management and conservation plan, which focus on aspects including the following (Prada and Appeldoorn 2014):

- Conservation measures to increase densities;
- Adopting regional sustainable harvest strategies;
- Incorporating CITES components into national management plans;
- Implementing regulations to reduce illegal, unreported, and unregulated fishing;
- Introducing precautionary principles in regional fisheries;
- Incorporating policies that improve fishers' health and sanitary conditions; and
- Increasing coordination and collaboration on outreach, monitoring and research, and implementing a multi-national ecosystem approach.

Decision-Making Process

DMR's 2010-2014 strategic plan emphasizes the importance of a regular decision-making process and procedures for management actions, including the process outlined in the *Consultation, Roles, and Responsibilities* section above. However, the plan does not provide a specific structure for the decision-making process (DMR 2010). CRFM (2013) states that there is a need for a process through which to achieve objectives specific to the fishery, and for a fishery management plan that outlines this process as well as existing management systems and stock

information. Aside from the meetings convened in Nassau, the authors did not find information specific to a fisheries dispute resolution approach.

Compliance and Enforcement

Aside from monitoring of exports, there is relatively little surveillance and enforcement effort put toward The Bahamas conch fishery, due in part to scarce resources and competing needs at the responsible agencies. The Fisheries Resources Act states that fisheries inspectors may stop, board, and search any fishing vessel within the EEZ, and specifies that every member of the Defense Force, officer of revenue, peace officer, and officer of the Department of Agriculture and Marine Resources may exercise the functions of a fisheries inspector (Fisheries Resources Act 2001). However, to exercise this power and increase enforcement presence and compliance, these individuals would require ongoing training on fisheries regulations. Fisheries inspectors may also take samples and copies of records (Fisheries Resources Regulations 2010). The Fisheries Resources Regulations state that persons found to be guilty of an offense may incur a fine of \$3,000 and/or imprisonment for one year, as well as confiscation of fishing gear in some cases. As the CITES Management Authority, the Ministry of Agriculture and Marine Resources is charged with advising the Minister on enforcement relating to CITES (Wildlife Conservation and Trade Act 2006).

Despite these provisions, enforcement of The Bahamas conch fishery is incomplete. DMR carries out surveillance near major population centers with patrol crafts or automobiles, whereas in more remote areas with little DMR presence there is greater reliance on police, customs, and Defense Force officers (Gittens and Deleveaux 2006, CRFM 2013a). This is especially true in the southern Bahamas, where these officers may not have adequate training in fisheries enforcement (Gittens and Deleveaux 2006). DMR has historically been challenged by limited human capacity, and the Defense Force has to some extent prioritized non-fisheries issues for enforcement efforts (Gittens and Deleveaux 2006; CRFM 2013a). However, The Royal Bahamas Defense Force began construction of a Southern Bahamas Station in 2015, and have rolled out a decentralization plan that will distribute enforcement resources throughout the country (RBDF 2015).

There are some specific challenges with enforcing the conch fishery. For example, it is very difficult to enforce the maximum depth restriction for the use of compressors or prosecute potential offenders due to a lack of evidence (Gittens and Deleveaux 2006). As of 2013, there were no prosecutions for conch fishers in The Bahamas using illegal gears (CRFM 2013a). The widely dispersed range of the conch fishery across the Bahamian islands also poses serious obstacles to effective on-the-water enforcement (Gittens and Deleveaux 2006). Additionally, since fishers are not required to land conch in the shell and there is no other current method for assessing age without the shell in place, officers are not able to effectively enforce the conch maturity regulation.

Monitoring and Management Performance Evaluation

DMR's 2010-2014 strategic plan called for an annual review and implementation of modifications to existing rules and regulations, including a process where the Fisheries Advisory Committee and the public have an opportunity to provide input at open meetings on the major islands (DMR 2010). It also states that DMR should gather written public comments through its website. Based on public comment, DMR would work with the Fisheries Advisory Committee to coordinate draft revisions and hold further meetings to gain public input, and provide a summary of how input was addressed in a final public notice (DMR 2010). Despite this general process recommended in the strategic plan, this process may

not be adequately realized to date. Reviews may take place and include presentations by conch scientists and consultation with CRFM, but not on a regular schedule and do not necessarily provide opportunities for public comment (Gittens and Deleveaux 2006). Furthermore, a 2013 CRFM technical document states that most management measures and controls had not been evaluated (CRFM 2013b). Few regulatory changes have come out of these meetings, with perhaps the only modification occurring in 2005 when there was a necessary change to CITES export permit requirements (Gittens and Deleveaux 2006). Experts and members of the public interviewed during the stakeholder analysis corroborated this finding, stating that there have been no revisions to conch management in recent years. Overall, these findings suggest that there is not a timely or effective evaluation process in place for the fishery-specific management system.

Comparative Analysis with Other Fishery Sustainability Surveys and Standards

In addition to management standards such as MSC, high-level assessments of fisheries management regimes as well as existing management guidelines can shed light on the attributes associated with sustainable fisheries. This section provides summaries of the relevant aspects of two documents related to fishery management and conch management specifically, and provides a comparative analysis of their findings and The Bahamas conch fishery to highlight further possible areas for improvement.

Characteristics of Effective Fisheries Management Regimes Worldwide

Summary of the Study

In a 2009 study, Mora et al. used a survey, empirical data, and conversations with more than 1,100 fisheries experts to assess the effectiveness of national fisheries management regimes worldwide within all nations with an EEZ (see Appendix A for the rationale for selecting this study). For each EEZ, they quantitatively estimated the sustainability of reported catches and assessed how the fisheries rank on several management attributes that are well-recognized as conditions necessary for sustainable fisheries. These management attributes were scientific robustness; policy transparency; implementation capability; and extent of subsidies, overcapacity, and foreign fishing.

Mora et al. (2009) compared the estimation of sustainability with the management attributes in place to find the attributes that are most commonly associated with fishery sustainability. They found that fisheries are most likely to be sustainable when there is a high degree of transparency in the decision-making process; that is, managers consider and follow scientific advice, all parties are consulted, and corruption and external economic and political pressure are minimal. Economic and political pressures can include corruption, pressure to increase allowable catches, or pressure to implement regulations that favor risk over caution. Fisheries in policy transparent EEZs had an 88% probability of sustainability compared to 73% in others. Part of the reason for the importance of policy transparency is that it can affect the other attributes tested. For example, even if robust scientific data exist to inform a sustainable total allowable catch for a fishery, that total allowable catch may not be adopted if the policy-making process does not consider and follow that advice. Similarly, a country may have adequate enforcement of fishery regulations, but if the regulations were not well-informed through scientific advice and stakeholder input then they may not lead to sustainable outcomes.

Comparative Analysis with The Bahamas Conch Fishery

The findings of the Mora et al. (2009) study bring to the forefront the importance of the process for decision-making regarding The Bahamas conch fishery, and the opportunity for improving the sustainability of the fishery by enhancing transparency. The Bahamas has addressed the three components that comprise transparency in the Mora et al. study to some extent, but there is room for improvement in all. Below we provide a brief overview of the three components of transparency with respect to The Bahamas conch fishery:

- **Managers consider and follow scientific advice:** Although the Fisheries Resources Act gives the Minister the power to make science-based regulations to prevent overfishing, the authors did not find evidence of any such regulations being developed or implemented. CRFM (2013) found

that The Bahamas management system does not demonstrate a clear link between scientific advice and management decisions. For example, in recent years managers increased the export quota without a scientific basis for the decision (CRFM 2013). To date, the primary regulation aimed at sustainability – the requirement for a fully-formed flaring lip – is neither clear in its interpretation nor strongly enforced.

- **All parties are consulted:** As discussed in the *Consultation, Roles, and Responsibilities* section of MSC Principle 1 above, there is dissatisfaction with the level of consultation with the public and stakeholders in conch fishery management. There is room for improvement in enabling public and stakeholder participation, such as by implementing a standard procedure for public comment and revisions.
- **External economic and political pressure are minimal:** Based on the literature and stakeholder research, the authors did not find strong evidence of economic or social pressures, although they may be present to some extent. Very few stakeholders or members of the public mentioned corruption as a key barrier to sustainable conch fishery management. However, international demand for exported conch has increased in recent decades (NMFS 2014), which may lead to some economic pressure to increase catches and/or exports. There were no specific indications of pressure to implement risky regulations over more precautionary approaches.

This comparative analysis with the key aspects identified in the Mora et al. (2009) paper highlights areas that are not emphasized in the MSC Fisheries Standard. Specifically, MSC does not address economic and political pressures and the overall importance of policy transparency as explicitly, yet Mora and colleagues found that these aspects have some of the greatest bearing on fishery sustainability. Therefore, TNC and conch managers in The Bahamas may consider these aspects in addition to the gaps identified through the assessment against the MSC Fisheries Standard.

Monitoring and Managing Queen Conch Fisheries

Summary of the Guidance Document

The FAO developed a document to summarize guidelines for responsible management of Caribbean Queen Conch fisheries, with an emphasis on achieving compliance with CITES regulations (Medley 2008). The document states two requirements that any conch fishery would need to meet. First, the harvesting and processing capacity should be proportional to the productivity of the conch populations. Second, it should be possible to show through monitoring that the fishery management system and policies in place are effective. The document provides technical guidelines for an approach to effective conch management, and summarizes the issues that should be considered when managing a conch fishery. Table 6 below lists and describes those issues.

Table 6. Checklist of Issues to Consider for Conch Fisheries Management (adapted from Medley 2008)

Consideration	Further Description
The fishery is clearly defined	<ul style="list-style-type: none"> • Management unit should be clearly identified, including using depth contours • Fishery unit should be clearly identified, including the fleets, gear, and a best guess on poaching
An effective monitoring system is in place	<ul style="list-style-type: none"> • Reliable monitoring indicators and reference points should be available for: quantity of stock remaining, quantity of conch being caught, and revenue, costs, and profits from fishing

Consideration	Further Description
The effects on the ecosystem have been considered	<ul style="list-style-type: none"> • Stock should be maintained at a level where it will not adversely affect the ecosystem, such as through damage from gears, discarded shells, and disposal of conch processing waste • Since little is known on this topic, utilize the usual definitions of overfishing as an indicator of ecosystem effects
Uncertainty has been characterized	<ul style="list-style-type: none"> • To reduce uncertainty regarding the outcomes of management decisions, implement an active research program of routine data collection and research projects
A harvest strategy and decision rules exist	<ul style="list-style-type: none"> • Develop decision rules based on the monitoring program • Decision rules are specific plans of what to do when the state of the resource changes, such as from sustainable to overfished
Independent reviews are undertaken	<ul style="list-style-type: none"> • Stock assessment and management system should meet international standards and independent review should ensure that this is the case
An adequate legal basis exists	<ul style="list-style-type: none"> • Law should provide for monitoring, control, and enforcement • Laws implementing policy not only exist, but are being applied • There should be a method for resolving conflicts and disputes
There is an effective management system	<ul style="list-style-type: none"> • There should be clear lines of responsibility from policy-making down to technical and enforcement for day-to-day management • The management structure should be documented in a management plan, which will improve transparency and allows for external review • Co-management is desirable, where stakeholders are actively involved in decision-making

Comparative Analysis with The Bahamas Conch Fishery

The Bahamas conch fishery could improve on both of the requirements that the FAO says sustainable conch fisheries need to meet, listed above. Those gaps are described below:

- **Harvesting and processing capacity should be proportional to the productivity of conch populations:** Given that there are no existing controls on the number of conch fishers or boats or of total conch fishing effort in The Bahamas, conch fishing that is taking place in The Bahamas is not necessarily proportional to conch populations. In fact, based on population declines identified through stock surveys, fishing effort may be disproportionate to the productivity of the stocks.
- **Monitoring should show that the fishery management system and policies are effective:** Given the existing information on the status of surveyed stocks, there is the potential for ongoing monitoring to reveal changes in conch population densities by re-surveying those sites into the future. However, to date there is little knowledge about the trends in populations through time.

Regarding the checklist of issues to consider for conch fisheries management, many of these align with the principles and components of the MSC Fisheries Standard, and are addressed in the *Assessment against the Marine Stewardship Council Standard* section above. However, the FAO has some more specific recommendations with regards to an effective management system (the last consideration in Table 6 above), including an emphasis of clear lines of reporting, developing a management plan, and favoring co-management. To the authors’ knowledge, the government agencies responsible for

managing and enforcing The Bahamas conch fishery have a level of organization that can enable an effective management system. However, issues relating to internal priorities and level of training and resources may impact the effectiveness of the agencies' work on conch management. In addition, the management effectiveness consideration highlights the possible need for a fishery management plan specific to The Bahamas conch, which does not currently exist (Gittens and Braynen 2016). Finally, the FAO emphasizes co-management; co-management could take many different forms, all of which would necessitate greater involvement of stakeholders in decision-making for the fishery.

Recommendations

Based on existing information and data about The Bahamas conch fishery (as summarized in the Literature Review Report), stakeholder perceptions and market information (as summarized in the Stakeholder Analysis Report), and the assessment of the fishery against the MSC Fisheries Standard and other syntheses in this report, Blue Earth developed several recommendations that may help improve management of The Bahamas conch fishery. The recommendations are grouped below by topical theme. Given the relatively large number of recommendations below and limited resources for advocating for and implementing them, we recommend that TNC works with partners to undertake a feasibility analysis of each recommendation. Based on this analysis they can prioritize opportunities to pursue, potentially considering opportunities for both the short and long terms. TNC may share these recommendations with management authorities and work with them to implement the most promising opportunities, with the goal of improving the sustainability of the fishery.

Science and Monitoring

- **Conduct targeted stock monitoring:** TNC and managing agencies can work with scientific groups such as Community Conch, Cape Eleuthera Institute, and other researchers to support repeated, regular monitoring of fished and unfished conch sites. Re-surveying sites that have been surveyed in the past will allow for comparison of conch population densities through time. Furthermore, time series data will help The Bahamas work toward the ability to develop harvest control rules based on understanding of threshold densities or fishing levels that lead to depleted and unsustainable stocks. This information can also be useful for setting scientifically-based export quotas. If needed based on funding and capacity, researchers in collaboration with DMR could prioritize future surveys on a subset of sites that can be assessed regularly with standardized data collection protocols.
- **Develop methods for assessing conch maturity:** To help address one of the primary issues facing The Bahamas conch fishery – the harvest of juvenile conch – DMR and TNC can work with scientists, such as Dr. Alan Stoner and Dr. Karl Mueller, who are developing and testing methods for determining conch maturity even when the shell is not present (Mueller and Stoner 2013). DMR has collected additional data to explore the link between operculum size, lip thickness, and maturity, and DMR and the Conchervation Campaign have plans to further expand data and analyses in hopes of proposing management measures to the government (Gittens and Braynen 2016), such as a minimum size at 50% sexual maturity. If researchers can identify a simple and reliable method for determining whether an individual conch has reached reproductive maturity, they can then work with DMR to develop straightforward guidelines for monitoring and enforcement officers and fishers to determine sexual maturity of conch. Depending on the

method, DMR and/or its partners could develop a simple tool, such as a small device to measure dimensions of conch opercula that is easy to use on shore, onboard a boat, or underwater, and distribute it to officers and fishers.

Political Will, Buy-In, and Market Demand

- **Build public understanding and political will:** TNC can work with local partners under The National Trust through the Conchervation Campaign to increase understanding of the threats, status, and regulations regarding conch in The Bahamas. This process could involve identifying target audiences, which may include fishers, their families, and consumers of conch. TNC and its partners can then determine the key messages to convey to these groups and the best media and communication platforms to use. They could draw from existing examples elsewhere in the world to support the development of locally-relevant messaging campaigns. For example, in Belize several NGOs collaborated to secure grant funding and develop a focus group-tested radio drama to build local support and change in behaviors toward MPAs.⁵ Other methods for building public awareness and support include working with teachers to create lesson plans that focus on conch within school curricula, identifying and developing leaders within fishing communities that will champion conch sustainability issues through their social and professional networks, and enhancing the public-facing agency webpages that provide information on conch fisheries. Enhancing public support can help lead to political will, for example through individuals' voting choices.
- **Implement a process for public input and regulatory revisions:** DMR can take action to realize recommendations in its 2010-2014 strategic plan regarding the development of a public process for review and revision of fishery regulations. The process should focus on aspects including status of the stock (including information-sharing by conch scientists), the effects of current regulations (both ecological and socioeconomic), and potential changes needed to improve environmental and social outcomes of the fishery. DMR will need to advertise the process to ensure that the public and stakeholders understand their roles and the importance of participating. This process can also be utilized to develop long-term objectives for the conch fishery, which will provide structure to the review process.
- **Develop a conch fishery management plan:** TNC can work with DMR to create a process and priorities for developing a fishery management for The Bahamas conch. The fishery management plan can draw from the guidelines provided in the FAO document discussed above, take into consideration the gaps and requirements in the MSC Fisheries Standard, and build off the format and lessons learned from other fishery management plans in The Bahamas and beyond. The fishery management plan can also link to and institutionalize activities such as science and monitoring.
- **Create supply chain pressure for sustainable fishing:** TNC can work with major conch buyers and processors to develop a purchasing standard, such as an agreement to purchase only adult conch. TNC could work with other entities such as restaurants in The Bahamas to develop similar agreements, like a pledge to purchase and sell only adult conch. This strategy will require some

⁵ More information on the Belize radio drama project is available here: <https://www.globalgiving.org/projects/my-island-my-community-conservation-for-6million/reports/?subid=42869>

education of the buyers, processors, and restaurateurs to build their buy-in and understanding of their incentives for participating. This education may focus on the need to better manage The Bahamas conch fishery in order to ensure the availability of conch in the future. In addition, TNC and other NGO and industry partners could assist DMR with designing and maintaining a reporting system in which restaurants and other seafood buyers report the amount of conch they purchase during a given time period (e.g., pounds of conch per month). This would provide much-needed information on conch sold within The Bahamas that does not pass through the primary processors.

- **Research and develop new conch markets:** The Bahamas Agricultural and Industrial Corporation (BAIC) and its partners can continue their efforts to research and develop new markets for non-meat conch products. In addition, they could identify incentives for the private sector to develop new markets for non-meat conch products. This will allow fishers and others in the chain of custody to gain more financial benefit from harvested conch and potentially reduce fishing pressure if non-meat products contribute substantially to conch revenue. Based on the results from the stakeholder analysis, there may be the greatest opportunity to develop markets for conch shell products, as shells were perceived as being valuable abroad and had relatively high estimated prices. In addition, conch shells may have many different uses including whole shells as decorative items, processed shells in jewelry or other items, and ground shells for building materials. BAIC could build upon current research to identify what countries or cities abroad may have the highest demand for non-meat products, and also what types of products those markets would favor. Through BAIC and the Ministry of Agriculture and Marine Resources, The Bahamas Government could lead these efforts to promote conch shell exports as a revenue source, in compliance with CITES restrictions.

Fishing Restrictions and Alternative Livelihoods

- **Implement closed areas:** Drawing on the legislative authority to declare protected areas through the Fisheries Resources Act, the Minister of Agriculture and Marine Resources could implement an approach to closing areas to conch fishing. Implementing protected areas may be preferable to a conch closed season because unlike protected areas, a closed season would have direct negative effects on local businesses selling conch meat. The Ministry and/or DMR could work with conch scientists to develop an approach to closing fishing areas in a biologically and socioeconomically feasible manner. This could include implementing protected areas on a rotating basis to allow time for conch populations to replenish in given areas without placing a permanent disadvantage to fishers for whom MPAs affect their typical fishing grounds. Coupling protected areas with a focus on developing alternative livelihoods for fishers (discussed below) will help reduce a concentration of conch fishing outside of protected areas.
- **Reduce fishing effort and develop alternative livelihoods:** To limit effort in the conch fishery and take a more precautionary approach to management of the fishery, the Ministry of Agriculture and Marine Resources could consider implementing a limit on the number of people fishing conch. The Ministry could consider a program to limit the number of licenses renewed for conch fishing or place a cap on new entrants, until a target maximum number of fishers is reached. The Ministry could also buy licenses back from fishers who agree to exit the industry. Each of these methods would require DMR to track the number of licensed fishers who are

fishing for conch. Prior to implementing a renewal reduction, entrant cap, or buy-back program, decision-makers would need more information about the status of conch populations and sustainable harvest levels to avoid setting limits that are unsustainably high or unnecessarily low. If such a program were implemented, some fishers may need to find new livelihoods, so partners (e.g., the Ministry, DMR, the Department of Social Services, the Ministry of Tourism, Police Force, Defense Force, BAIC, and the private sector) could develop an approach to identify viable alternative livelihoods, such as through public meetings and job market research. This approach may require a formal public-private partnership. DMR and other managing agencies could develop a program where some fishers transition to perform paid work conducting conch patrols and monitoring of MPAs and landing sites. There may also be opportunities, for example in partnership with BAIC, for former fishers to transition to jobs relating to non-meat conch markets.

Enforcement, Surveillance, and Compliance

- **Inventory and bolster surveillance and enforcement capacity:** In the face of limited financial and human resources, DMR may work with other surveillance and enforcement agencies, such as the Defense Force, Police Force, Customs Department and Ministry of Agriculture and Marine Resources, to assess their collective resources on the ground throughout The Bahamas. With an understanding of where personnel and resources, such as boats and vehicles, are available, the agencies can then identify personnel who may assist with conch surveillance and enforcement. These may be personnel who are already performing patrols or surveillance activities for other purposes and, with proper training, could integrate conch surveillance and enforcement into their duties. Surveillance would include checking landed conch for sexual maturity, ensuring fishers possess valid fishing licenses, and also patrolling from shore and/or on the water for illegal fishing activity. It will be important to collect surveillance and enforcement information in a standardized fashion and compile information from throughout the country in a well-maintained, centralized database. This may build off the objectives of the forthcoming national Fisheries and Aquaculture Policy, which calls for a new fisheries data collection and statistics system. DMR may also consider legislation prohibiting fishers to have compressors onboard during the lobster closed season, which could increase compliance and enforcement of the existing regulation on the use of compressors. In addition, agencies could consider implementing a policy requiring foreign boats to check out of The Bahamas when they leave, and subjecting them to boarding as is required in other Caribbean countries to combat infractions or illegal harvest by non-Bahamians.
- **Increase fines and develop a conch sustainability fund:** Stakeholders and members of the public surveyed in the stakeholder analysis and other studies have suggested that raising the fines for conch fishing violations may be effective for increasing fishers' compliance with regulations. Therefore, the Ministry of Agriculture and Marine Resources could consider amending the Fisheries Resources Regulations, possibly through a public process described above, to raise fines and other penalties. Given increased fines and more effective enforcement, there could be a substantial pool of funds generated. A portion of these monies could go to a conservation fund separate from the public treasury that can be used specifically for marine conservation management efforts, such as outreach and education, enforcement, and scientific

research. Such a fund may be structured similarly to the Bahamas Protected Areas Fund. Alternatively, fines could contribute to a CITES fund permitted under the Wildlife Protection Act.

Opportunities for TNC and Local Partners to Support Recommendations

There may be specific opportunities for TNC and local partners⁶ to engage to support implementation of the recommendations described above. Table 7 below summarizes some of those opportunities.

Table 7. Opportunities for TNC and Local Partners to Support Implementation of Management Recommendations

Management Recommendation	Opportunities for TNC and Local Partners to Support Implementation
Conduct targeted stock monitoring	<ul style="list-style-type: none"> • Assist conch researchers with prioritizing areas for re-surveying • Help scientists understand scientific information needs for setting harvest control rules, caps on fishing licenses, and export quotas
Develop methods for assessing conch maturity	<ul style="list-style-type: none"> • Continue to support research to develop viable methods for determining sexual maturity • Assist with securing funding for producing conch measuring devices for fishers and surveillance and enforcement officers • Perform outreach and education to fishers to raise awareness of the impacts of harvesting juvenile conch and buy-in for using the measuring device to determine whether conch are above an acceptable minimum size
Build public understanding and political will	<ul style="list-style-type: none"> • Assist with securing funding for producing a locally-relevant messaging campaign focused on conch • Support and build on the efforts of the Conchervation Campaign to identify key audiences and perform outreach and education with those audiences
Implement a process for public input and regulatory revisions	<ul style="list-style-type: none"> • Support DMR in outreach to the public regarding opportunities to participate in public processes • Continue to participate in discussions and provide recommendations regarding long-term fishery management objectives
Develop a Bahamas Conch Fishery Management Plan	<ul style="list-style-type: none"> • Convene key managers and stakeholders and facilitate a fishery management plan development workshop • Provide management agencies with literature, best practices, examples, and other materials required to support development of a draft fishery management plan • Provide financial assistance for the planning process
Create supply chain pressure for sustainable fishing	<ul style="list-style-type: none"> • Develop talking points and any materials to build buy-in and highlight incentives for processors and restaurateurs to participate in a pledge for sustainable buying choices • Hold meetings with key processors and restaurateurs, prioritizing those that would be likely to participate and have influence on other processors and restaurateurs • Develop a purchasing standard and/or pledge for processors and restaurateurs to review and adopt

⁶ Local partners may include BNT, BREEF, Community Conch, Friends of the Environment, Cape Eleuthera Institute, and others.

Management Recommendation	Opportunities for TNC and Local Partners to Support Implementation
	<ul style="list-style-type: none"> • Follow up with processors and restaurateurs to ensure accountability and identify and address any challenges they are having with keeping to the standard or pledge
Research and develop new conch markets	<ul style="list-style-type: none"> • Work with BAIC to develop research questions and a process to identify promising markets for conch products abroad • Provide contacts based on TNC’s global network in countries with identified market potential, as appropriate
Implement closed areas	<ul style="list-style-type: none"> • Support the Oceans 5 project by helping to compile and contribute scientific information that can be used to recommend areas to designate as MPAs or rotating closed areas • Compile scientific information about conch life history to inform decisions on the timing of rotating closures and MPA size and spacing
Reduce fishing effort and develop alternative livelihoods	<ul style="list-style-type: none"> • Share best practices and lessons learned from work conducted by TNC and other conservation organizations elsewhere in the world to reduce fishing effort • Work with fishery scientists to develop recommendations on maximum conch fishing effort/target number of conch fishing permits • Convene stakeholders and facilitate discussions regarding the development of alternative livelihoods for fishers • Research case studies in other geographies to learn about successes and best practices for the development of alternative livelihoods for fishers
Inventory and bolster monitoring and enforcement capacity	<ul style="list-style-type: none"> • Convene key agency leadership and facilitate initial discussions to plan an inventory of existing personnel • Continue to support enforcement, surveillance, and data collection personnel trainings • Support personnel trainings by sharing scientific information about sustainable fishing and threats to conch in The Bahamas
Increase fines and develop a fisheries management fund	<ul style="list-style-type: none"> • Perform or commission research to identify appropriate levels of fines that will deter fishers against illegal/unsustainable practices and generate revenue while still being feasible to implement and collect • Work with government officials to identify priority fishery management investments toward which to channel funds

Conclusion

The literature as well as members of the public, stakeholders, and experts in The Bahamas highlight the need for improving management of The Bahamas conch fishery to ensure its sustainability into the future. There are several pieces of legislation and management frameworks in place to manage the fishery, but there is room for reviewing and revising these approaches to help enhance both ecological and socioeconomic outcomes of the fishery. Assessment of the existing structures against the MSC Fisheries Standard, as well as comparative analyses with other fisheries guidelines and, best practice syntheses illuminate areas where the fishery may have gaps in management and information. This

report makes recommendations for how TNC and its partners could help address those gaps to improve conch fisheries management in The Bahamas. TNC may further develop these recommendations and work with DMR, BAIC, The Bahamas National Trust, and other partners to prioritize efforts and identify feasible and effective next steps.

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Appendix A: Selection of Mora et al. Paper as a Comparative Study

In the *Comparative Analysis with other Fishery Sustainability Surveys and Standards* section, we provided a summary and analysis of The Bahamas conch fishery compared to findings of Mora et al. (2009). Blue Earth and TNC initially planned to select another fishery sustainability certification program to compare with the MSC Fisheries Standard and The Bahamas conch fishery. Blue Earth performed a rapid analysis of seven programs that clearly defined their criteria and metrics and had the potential to be relevant to the conch fishery, and found that their criteria aligned closely with MSC.⁷ Therefore, these programs added little value to the analysis for this Evaluation Report. We selected the Mora et al. (2009) study as a secondary comparative analysis because it provides a synthesis of best practices across fisheries and highlights areas that do not come through as strongly in the MSC Fisheries Standard.

⁷ The seven programs assessed were the following: Australia Southern Rocklobster Clean Green Program, Draft Cape Cod Fisheries Trust, KRAV, Marine Ecolabel Japan, MSC, Naturland, and the Responsible Fishing Alliance/World Forum Fish Harvesters and Workers

Appendix B: Assessment Against The Bahamas Conch Fishery

Principle 1: Sustainable Target Fish Stocks					
Outcome		Harvest Strategy (Management)			
Stock Status <i>The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing.</i>	Stock Rebuilding <i>Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe.</i>	Harvest Strategy <i>There is a robust and precautionary harvest strategy in place.</i>	Harvest Control Rules and Tools <i>There are well defined and effective harvest control rules in place.</i>	Information/Monitoring <i>Relevant information is collected to support the harvest strategy.</i>	Assessment of Stock Status <i>There is an adequate assessment of the stock status.</i>
					
Principle 2: Environmental Impact of Fishing					
Primary Species			Secondary Species		
Outcome Status <i>The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI.</i>	Management Strategy <i>There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species; and the UoA regularly reviews and implements measures, as appropriate, to minimize the mortality of unwanted catch.</i>	Information <i>Information on the nature and amount of primary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species.</i>	Outcome Status <i>The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biologically based limit.</i>	Management Strategy <i>There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species; and the UoA regularly reviews and implements measures, as appropriate, to minimize the mortality of unwanted catch.</i>	Information <i>Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.</i>
			N/A	N/A	N/A
ETP Species					
Outcome Status		Management Strategy		Information	

<p><i>The UoA meets national and international requirements for protection of ETP species. The UoA does not hinder recovery of ETP species.</i></p>		<p><i>The UoA has in place precautionary management strategies designed to:</i></p> <ul style="list-style-type: none"> <i>meet national and international requirements; and</i> <i>ensure the UoA does not hinder recovery of ETP species.</i> <i>Also, the UoA regularly reviews and implements measures, as appropriate, to minimize the mortality of ETP species.</i> 		<p><i>Relevant information is collected to support the management of UoA impacts on ETP species, including:</i></p> <ul style="list-style-type: none"> <i>information for the development of the management strategy;</i> <i>information to assess the effectiveness of the management strategy; and</i> <i>information to determine the outcome status of ETP species</i> 	
					
Habitats			Ecosystem		
<p>Outcome Status <i>The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.</i></p>	<p>Management Strategy <i>There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.</i></p>	<p>Information <i>Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.</i></p>	<p>Outcome Status <i>The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.</i></p>	<p>Management Strategy <i>There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.</i></p>	<p>Information <i>There is adequate knowledge of the impacts of the UoA on the ecosystem.</i></p>
					
Principle 3: Effective Management					
Governance and Policy					
<p>Legal and/or Customary Framework <i>The management system exists within an appropriate and effective legal and/or customary framework which ensures that it:</i></p>		<p>Consultation, Roles, and Responsibilities <i>The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organizations and individuals who are involved</i></p>		<p>Long-Term Objectives <i>The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach.</i></p>	

<ul style="list-style-type: none"> • <i>Is capable of delivering sustainability in the UoA(s)</i> • <i>Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and</i> • <i>Incorporates an appropriate dispute resolution framework.</i> 	<p><i>in the management process are clear and understood by all relevant parties.</i></p>		
			
Fishery-Specific Management System			
<p>Fishery-Specific Objectives <i>The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.</i></p>	<p>Decision-Making Process <i>The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives and has an appropriate approach to actual disputes in the fishery.</i></p>	<p>Compliance and Enforcement <i>Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.</i></p>	<p>Monitoring and Management Performance Evaluation</p> <ul style="list-style-type: none"> • <i>There is a system for monitoring and evaluating the performance of the fishery-specific management system against its objectives.</i> • <i>There is effective and timely review of the fishery-specific management system.</i>
			



GACETA OFICIAL

Fundada el 2 de junio de 1851

Director Administrativo: Dr. César Pina Toribio
Consultor Jurídico del Poder Ejecutivo

Santo Domingo de Guzmán, D. N., República Dominicana
15 de diciembre del 2004

INDICE

ACTOS DEL PODER LEGISLATIVO

Ley No. 307-04 que crea el Consejo Dominicano de Pesca y
Acuicultura (CODOPESCA).

Pág. 05

EL CONGRESO NACIONAL

EN NOMBRE DE LA REPUBLICA

307-04

3 de diciembre de 2004

ASUNTO:	Proy. de ley que crea el Consejo Dominicano de Pesca y Acuicultura (CODOPESCA), modifica y deroga disposiciones legales relativas a la pesca, la acuicultura y el medio ambiente y los recursos naturales.
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CONSIDERANDO: Que son propiedad del Estado, de dominio común y uso público, todos los recursos hidrobiológicos contenidos en el mar territorial, en la zona contigua, en la zona económica exclusiva y en sus aguas interiores, lacustres y fluviales;

CONSIDERANDO: Que compete al Estado administrar, fomentar y regular la actividad pesquera y la explotación de estos recursos, con el fin de asegurar su aprovechamiento sostenible;

CONSIDERANDO: Que es deber del Estado proteger, conservar y regular la explotación de los recursos biológicos acuáticos para la satisfacción de las necesidades alimentarias de la población y para el desarrollo sostenible de este sector de la economía nacional;

CONSIDERANDO; Que es de interés nacional el establecimiento de medidas eficaces para evitar la extinción de determinadas especies marinas, fluviales y lacustres, cuya pesca y extracción indiscriminada va en detrimento de la riqueza pesquera nacional y su valor patrimonial;

CONSIDERANDO: Que el gobierno nacional, en cumplimiento de sus deberes, se empeña en desarrollar y tecnificar al sub-sector pesquero, para beneficio de los habitantes del país;

CONSIDERANDO: Que estas medidas deben ajustarse a los conocimientos acumulados sobre el estado de los recursos biológicos acuáticos del país y a sus posibilidades de desarrollo así como responder a los nuevos principios vigentes sobre el ejercicio de una actividad pesquera responsable, compatible y con enfoque precautorio para asegurar la protección de los ecosistemas y del medio ambiente y su uso racional;

CONSIDERANDO: Que, en este contexto, debe prestarse también especial atención a los aspectos relativos a la gestión integrada de las zonas costeras y la interconexión de los mismos transfrontera;

CONSIDERANDO: Que el nivel de explotación de los recursos biológicos acuáticos de la República Dominicana está próximo a imponer una carga máxima a la base de los recursos pesqueros tradicionales y que el aumento de la producción solamente puede lograrse de un modo sostenible, mediante el desarrollo de las pesquerías artesanales para la captura de especies pelágicas y mediante el incremento de la repoblación y la acuicultura;

CONSIDERANDO: Que es necesario simplificar los requisitos establecidos para el ejercicio de la pesca y la acuicultura, determinar con mayor claridad las obligaciones que incumben a quienes se

dedican a estas actividades y actualizar las sanciones que les serán impuestas en caso de infracción, a fin de conseguir una aplicación más efectiva de las disposiciones vigentes;

CONSIDERANDO: Que es también necesario regular con mayor precisión las cuestiones relativas a las condiciones de acceso de embarcaciones pesqueras extranjeras a las aguas de la República Dominicana, así como a las sanciones que les puedan ser impuestas en caso de infracción, de conformidad con el derecho internacional;

CONSIDERANDO: Que debe incrementarse la capacidad de la administración pesquera para cumplir con los cometidos que le corresponden, así como fomentar la participación de los sectores productivos involucrados;

CONSIDERANDO: Que los arrecifes de coral y sus ecosistemas asociados (manglar y ceibadales) son comunidades biológicas que constituyen ecosistemas de gran valor económico pesquero y que la extracción de corales, corte de manglar y degradación de los pastizales marinos o ceibadales atentan contra la sostenibilidad del potencial ictiológico y pesquero del país;

CONSIDERANDO: Que debido a la intensificación de la captura sin control de las especies marinas ornamentales y especies comestibles en otras pesquerías se ven afectadas, al igual que algunas poco comunes y otras de gran valor para el ecosistema coralino;

CONSIDERANDO: Que el país es signatario de acuerdos internacionales que tienen que ver con la planificación, gestión, conservación y producción de los recursos hidrobiológicos;

CONSIDERANDO: Que prácticas desaprensivas de captura de especies de mamíferos marinos, tales como el manatí (*Trichechus manatus*), de reptiles como el cocodrillo americano (*Crocodylus acutus*), las diferentes especies de tortugas marinas y de peces e invertebrados acuáticos y con valor comercial y otras como las hembras del mero (*Epinephelus* spp) las ponen en peligro de desaparecer;

CONSIDERANDO: Que la legislación existente necesita ser actualizada y sistematizada, mediante la elaboración de una nueva normativa que dé respuesta adecuada a las necesidades, objetivos y principios mencionados en los párrafos precedentes;

CONSIDERANDO: Que se hace necesario la creación de un organismo autónomo del Estado que se encargue de regular, fiscalizar y ordenar, entre otras cosas, las actividades pesqueras y de acuicultura en el país.

VISTA; La ley 3342, del 13 de julio de 1952, sobre Extensión de las Aguas Territoriales;

VISTA; La ley 3003, del 12 de julio de 1951, sobre Policía de Puertos y Costas;

VISTA: La ley 5852, del 29 de marzo de 1962, sobre Dominio de Aguas Terrestres y Distribución de Aguas Públicas y leyes que la modifican y complementan;

VISTA: La ley 186, del 13 de septiembre de 1967, sobre la Zona del Mar Territorial de la República;

VISTA: La ley 305, del 23 de mayo de 1968, que regula el uso de una; zona de 60 metros de ancho en costas, playas, ríos, lagos y lagunas;

VISTA: La ley 573, del 1 de abril de 1977, que establece una Zona Contigua al Mar Territorial, de la Zona Económica Exclusiva y la Plataforma Continental;

VISTA: La ley 67, del 8 de noviembre de 1974, que constituye la Dirección Nacional de Parques.

VISTO: El decreto 1088-01, del 3 de noviembre del 2001.

HA DADO LA SIGUIENTE LEY:

CAPÍTULO I OBJETIVO Y ALCANCES

OBJETIVO

Art. 1.- El objetivo de la presente ley es establecer en la República Dominicana, un sistema pesquero sostenible de producción pesquera y de la acuicultura basado en los principios de la pesca responsable y el uso racional y sostenible del ambiente. Para tal fin, las disposiciones legislativas, reglamentarias y administrativas relativas al ejercicio de las actividades de explotación de los recursos pesqueros y acuícolas deberán inspirarse en los mejores criterios científicos que se posean, aplicar la mejor tecnología disponible y la mejor práctica ambiental, de manera tal que garantice el desarrollo del sector, la sostenibilidad de la explotación y el mantenimiento del equilibrio del ecosistema.

CAPÍTULO II ALCANCE Y ÁMBITO DE APLICACIÓN

Art. 2.- Esta ley es de aplicación a. todas las actividades de explotación y/o extracción de los recursos biológicos marinos y acuáticos existentes.

Párrafo I.- Todas las modalidades de pesca así como todas las formas de acuicultura, tanto si estas actividades se realizan con, ánimo de lucro como si no, quedan sometidas a la regulación establecida en esta ley, sin perjuicio de las reglas especiales que puedan establecerse para cada una de ellas en razón de sus peculiaridades.

Párrafo II.- Las disposiciones relativas a la explotación y extracción de los recursos biológicos acuáticos se aplicarán a todas las actividades que se realicen en los espacios marinos sometidos a la soberanía o jurisdicción de la República Dominicana, tanto por embarcaciones u operaciones pesqueras nacionales, como por embarcaciones de pabellón extranjero admitidas a faenar en aguas dominicanas.

Párrafo III.- Las mismas disposiciones se aplicarán también, cuando proceda, a las embarcaciones matriculadas en la República dominicana que faenen en aguas marinas situadas fuera de la jurisdicción nacional, es decir, en las aguas de alta mar o en las aguas de terceros estados.

CAPÍTULO III
DE LA CREACIÓN DEL CONSEJO DOMINICANO
DE PESCA Y ACUICULTURA (CODOPESCA)

Art. 3.- Se crea el Consejo Dominicano de Pesca y Acuicultura (CODOPESCA), como una entidad pública dotada de personería jurídica, autonomía administrativa y patrimonio independiente, encargado de regular, desarrollar, fomentar y fiscalizar las actividades, explotación e investigación pesquera y acuícolas y/o extracción de los recursos bióticos del país, según los lineamientos de la presente ley y reglamentos de convenios internacionales.

Art. 4.- El CODOPESCA tendrá duración indefinida y jurisdicción en todo el territorio nacional y podrá establecer estaciones de administración, investigación, de extensión y servicios pesqueros y desarrollo de la acuicultura en las zonas con mayor potencial pesquero.

Art. 5.- El CODOPESCA cumplirá las funciones siguientes;

- a) Contribuir a la formulación de la política pesquera nacional, a través del Consejo Nacional Agropecuario, del cual formará parte, así como en la elaboración y ejecución del Plan Nacional de Desarrollo;
- b) Formular y ejecutar la política pesquera y acuícola nacional;
- c) Representar al Estado en la ejecución de convenios o proyectos relacionados con la actividad pesquera y la acuicultura y la explotación de la biodiversidad acuática;
- d) Promover la actividad pesquera artesanal, con miras a elevar el nivel socioeconómico del pescador y aliviar la presión de la pesca sobre los recursos costeros someros y ecosistemas que allí se encuentran;
- e) Estimular y apoyar económicamente la constitución de cooperativas y otras formas asociativas, con el fin de lograr niveles más altos de productividad en el sub-sector pesquero, facilitar la explotación sostenible de los recursos y mejorar el ingreso real de los pescadores;
- f) Coordinar las investigaciones que permitan identificar y cuantificar los recursos pesqueros, así como aquellas dirigidas a perfeccionar los procesos tecnológicos para mejorar y optimizar en las fases de extracción, cultivo, procesamiento y comercialización;
- g) Registrar las investigaciones en proyecto relacionadas al sub-sector pesca y acuicultura;
- h) Determinar la magnitud de los recursos pesqueros y bióticos susceptibles de extracción, incluyendo su volumen de captura, especies y talla mínima permitidos;
- i) Fijar periódicamente el número, tamaño y tipo de embarcaciones pesqueras con el fin de no exceder los límites de captura permisible;
- j) Organizar, desarrollar y regular la pesca en los embalses de las presas construidas, así como ríos, lagos y lagunas en el país;

- k) Estimular, regular, supervisar, fomentar y controlar, las actividades de acuicultura;
- l) Establecer convenios de co-manejo con organizaciones comunitarias y ONGs para la gestión y explotación pesquera de los embalses de las presas construidas y lagos en el país;
- m) Fomentar y regular la actividad pesquera y acuícola, expedir las normas para su ejercicio y establecer los trámites y requisitos para el otorgamiento de licencias, permisos y patentes;
- n) Otorgar autorizaciones, permisos, patentes, concesiones y salvoconductos para la investigación, extracción, pesca, procesamiento y comercialización de los recursos pesqueros, así como para la producción y ejercicio de la acuicultura;
- o) Organizar sistemas eficaces de control y vigilancia de los desembarcos, producción y explotación para asegurar el cumplimiento de las regulaciones pesqueras e imponer las sanciones correspondientes, en materia de control y vigilancia de la pesca marina, lacustre y fluvial y la acuicultura;
- p) Proponer al Poder Ejecutivo el establecimiento de vedas, prohibiciones y áreas de reservas para asegurar el rendimiento sostenido del recurso pesquero. Asimismo, delimitar las áreas que, con exclusividad, se destinen a la pesca artesanal;
- q) Coordinar programas de capacitación del personal vinculado a las diferentes fases de la actividad pesquera y de explotación de recursos bióticos incluyendo la acuicultura, en forma directa o en coordinación con otros organismos especializados;
- r) Promover la comercialización de los productos pesqueros y acuícolas, fomentar su consumo interno, en coordinación con otras entidades competentes;
- s) Promover la capitalización, la inversión y el otorgamiento de créditos para el desarrollo de la actividad pesquera y acuícola en concordancia con las regulaciones vigentes;
- t) Garantizar los recursos para la asistencia técnica y financiera a pequeños productores pesqueros y acuícolas;
- u) Regular y fiscalizar la actividad pesquera comercial y deportivas en aguas territoriales y la zona económica exclusiva;
- v) Proteger y conservar los ecosistemas costeros marinos que se encuentren fuera de las áreas naturales protegidas;
- w) Las demás que le sean asignadas por ley, decreto, resoluciones y el reglamento que expida el Poder Ejecutivo;
- x) Promover la industria de procesamiento de los productos de la pesca y de la acuicultura;

- y) Fomentar el desarrollo de la acuicultura a nivel de pequeños y medianos productores, tanto en tierras propias como de uso común y en las aguas de los embalses y lagos y lagunas;
- z) Apoyar la investigación y capacitación pesquera, y en acuicultura y de ecología aplicada a los ecosistemas de interés del sector;
- aa) Producir materiales educativos para la capacitación en el área de pesca y acuicultura para profesionales y técnicos y públicos en general;
- bb) Establecer programas eficaces de extensión pesquera y de acuicultura.

Art. 6.- El CODOPESCA ejercerá sus funciones en coordinación con las entidades competentes para la administración y manejo de los recursos naturales renovables y el medio ambiente, en especial, con la Secretaría de Estado de Medio Ambiente y Recursos Naturales.

Art. 7.- Las instancias de dirección y administración de CODOPESCA serán:

- a) El Consejo Directivo
- b) El Director Ejecutivo

El Consejo Directivo será la máxima autoridad y organismo de dirección, decisión y fiscalización del CODOPESCA, y estará compuesto por entidades públicas y privadas que inciden en el sector.

El Director Ejecutivo designado por el Poder Ejecutivo será el funcionario administrativo de mayor jerarquía dentro del CODOPESCA, quien como su representante legal tendrá la responsabilidad del buen funcionamiento de la institución, del personal técnico y administrativo bajo su dirección. Asimismo, proteger los bienes muebles e inmuebles propiedad del CODOPESCA, y tendrá la obligación de presentar informes periódicos sobre sus ejecutorias al Consejo Directivo.

Párrafo I.- Es de la incumbencia del Director Ejecutivo la preselección de los funcionarios y empleados del CODOPESCA para ser presentada al Consejo Directivo para su aprobación. Después de aprobadas las designaciones, el Director Ejecutivo las podrá suspender o sustituir temporalmente, hasta que la decisión final sea adoptada por el Consejo Directivo en su próxima sesión.

Párrafo II.- Para la selección del personal inicial del CODOPESCA, se tomará en cuenta de manera prioritaria a los empleados y técnicos del Departamento de Pesca y Acuicultura de la Secretaría de Estado de Agricultura y de la Dirección Nacional de Recursos Pesqueros de la Secretaría de Estado de Medio Ambiente y Recursos Naturales que califiquen para los cargos.

DEL CONSEJO DE DIRECTORES DEL CODOPESCA

Art. 8.- El Consejo Directivo del CODOPESCA estará integrado por las siguientes entidades.

- La Secretaría de Estado de Agricultura, quien lo presidirá;
- La Secretaría de Medio Ambiente y Recursos Naturales;
- Instituto Dominicano de Investigación Agropecuaria y Forestales;
- La Marina de Guerra;
- Banco Agrícola;

- El Instituto de Estabilización de Precios;
- Instituto de Desarrollo y Crédito Cooperativo;
- El Instituto Superior de Agricultura;
- El Centro de Investigación y Mejoramiento de la Producción Animal.
- El Consejo Nacional de Producción Pecuaria.
- Un Representante de las Empresas Pesqueras;
- Un Representante de la Asociación de Acuicultores;
- Un representante de la Asociación de Pescadores;
- El Director Ejecutivo de CODOPESCA, quien fungirá como Secretario del Consejo con voz pero sin voto;

Párrafo.- Los representantes de las empresas pesqueras y acuicultores deberán estar debidamente incorporados y ser propuestos por las entidades que representan al Consejo Directivo de CODOPESCA para su designación honorífica por un período de dos (2 años).

Art. 9.- El Consejo del CODOPESCA elaborará los estatutos del organismo y los reglamentos de esta ley. Dentro de ellos se establecerán las funciones de dicho Consejo.

Art. 10.- Tanto los estatutos del CODOPESCA como el reglamento de esta ley, serán enviados al Poder Ejecutivo, vía su Consultoría Jurídica, para su aprobación.

DEL PATRIMONIO DEL CODOPESCA

Art. 11.- El patrimonio del CODOPESCA estará formado por:

- a) Las sumas que se le asignen en el presupuestó nacional;
- b) Los bienes transferidos por la Secretaría de Estado de Agricultura, la Secretaría de Estado de Medio Ambiente y Recursos Naturales y los proyectos sectoriales que ésta ejecute;
- c) El valor de la venta de los productos pesqueros y acuícolas, obtenidos durante las operaciones de pesca exploratoria, experimental y científica;
- d) Los recursos provenientes de la cooperación técnica nacional o internacional;
- e) Las utilidades que obtenga de las inversiones que realice;
- f) Los recursos económicos que se obtengan a través de los impuestos a la exportación e importación de pescados y mariscos no elaborados o de otros bienes relacionados;
- g) Los bienes que adquiera a cualquier título, como las licencias de pesca.

Art. 12.- Se crea el Fondo de Pesca y Acuicultura con las partidas del patrimonio del CODOPESCA descritas en el artículo anterior, el cual será depositado en una cuenta en el Banco Agrícola o en el Banco de Reservas.

Art. 13.- La Secretaría, de Estado de Agricultura y la Secretaría de Estado de Medio Ambiente y Recursos Naturales transferirán al CODOPESCA todos los bienes y recursos presupuestales, tanto operacionales como de inversión y, en general, todos los activos que tenga asignados para el desarrollo de la pesca y la acuicultura en todo el país. Igualmente, transferirá al CODOPESCA los centros, estaciones y proyectos acuícolas y pesqueros con todos sus equipos y dotación, en los primeros treinta (30) días a partir de la fecha de la promulgación de esta ley.

CAPÍTULO IV

EJERCICIO DE LA ACTIVIDAD PESQUERA

Art. 14.- El CODOPESCA establecerá un registro de pescadores, empresas de explotación y comercialización de productos pesqueros, embarcaciones y aparejos de pesca. Ninguna persona o entidad podrá dedicarse a la pesca, ni ninguna embarcación ni ningún aparejo podrá ser dedicado a la pesca en la República Dominicana, si previamente no se hubieran inscrito en el registro que al efecto y de conformidad con las reglas que se dicten, llevará el CODOPESCA.

Art. 15.- Para el ejercicio de la actividad pesquera y explotación de los recursos bióticos comercial y con fines de lucro en las aguas de la República Dominicana será necesario la obtención de una licencia de pesca y un permiso de inspección según el caso:

1. Las personas físicas o jurídicas domiciliadas en la República que se dediquen a la pesca artesanal, industrial, deportiva o científicas deberán estar en posesión de la correspondiente licencia de pesca, expedida por el CODOPESCA;
2. Las embarcaciones extranjeras antes de ser objeto de evaluación para otorgarle el permiso de faena, en República Dominicana, deben de estar autorizadas o tener documento de no objeción por la Marina de Guerra y la Dirección Nacional de Control de Drogas y registrarse en un puerto hábil y autorizado por estos organismos del Estado Dominicano;
3. Las licencias de pesca tendrán una validez de dos (2) años y serán renovables por sucesivos períodos iguales. Cada licencia expresará la actividad pesquera para la que se concede, los tipos artes utilizables y el lugar de operación. Para cambios o traslados de lugar de operación se, deberá solicitar el permiso correspondiente al CODOPESCA;
4. La concesión y renovación de las licencias de pesca será efectuada por el CODOPESCA en función del estado de los recursos para cuya explotación se solicita la licencia y habida cuenta el objetivo de mantener una pesca sostenible. Las renovaciones de licencias se otorgarán con prioridad a las nuevas concesiones de licencias a expedir;
5. La concesión y renovación de las licencias de -pesca estará sometida al pago de la tarifa que reglamentariamente se determine ante los productores y el Estado;
6. El CODOPESCA mantendrá un registro actualizado de las licencias de pesca concedidas;
7. Las licencias de pesca son intransferibles, no pudiendo ser utilizadas más que por las personas que figura como titular de la misma.

Art. 16.- Para dedicarse a la pesca en cualquiera de sus modalidades, las embarcaciones dominicanas deberán poseer el permiso de embarcación pesquera, otorgado por el CODOPESCA. Este organismo no concederá ningún permiso de embarcación pesquera si los solicitantes no acreditan ser personas físicas o jurídicas poseedoras de una licencia de pesca vigente. Para cambio o traslados del lugar de operación se deberá solicitar el permiso correspondiente al CODOPESCA. También se requiere que las embarcaciones estén debidamente registradas por la Marina de Guerra y tengan el permiso de navegación al día.

Párrafo I.- Los permisos de embarcación tendrán una validez de dos (2) años y serán renovables por sucesivos períodos iguales. Cada permiso expresará el tipo de embarcación de que se trata, el material de construcción, tamaño y potencia de la misma, las actividades pesqueras para la que se concede el permiso, los tipos de artes utilizables y el lugar de operación.

Párrafo II. La concesión y renovación de los permisos de embarcación pesquera estará sometida al pago de la tarifa que reglamentariamente se determine.

Párrafo III.- El CODOPESCA mantendrá un registro actualizado de los permisos de embarcación pesquera a expedir.

Párrafo IV.- Toda persona física o jurídica que se dedique a las actividades pesqueras deberá mantener registros organizados de su producción y someter al CODOPESCA toda la información pertinente acerca de las capturas, esfuerzo, tamaño, frecuencia, así como cualquier otra información necesaria. El CODOPESCA tendrá un formulario de estadísticas para someter esta información. La información será confidencial y en ningún caso será utilizada para fines de estimar ingresos económicos derivados de esta actividad.

Art. 17.- Quienes se dedican a la actividad pesquera estarán obligados a cumplir la presente ley y las disposiciones reglamentarias y administrativas adoptadas para su aplicación; dichas personas deberán

- a) Ser titulares de una licencia de pesca y faenar a bordo de una embarcación que posea el permiso correspondiente a la actividad pesquera practicada;
- b) Respetar todas las medidas de conservación de los recursos establecidas conforme a la presente ley y a las disposiciones reglamentarias y administrativas adoptadas para su desarrollo, especialmente las relativas a zonas reservadas o prohibidas, limitaciones de capturas, especies y ejemplares protegidos y artes y medios de pesca prohibidos;
- c) Devolver a las aguas mientras estén todavía vivos y con el menor daño posible, los ejemplares capturados que no respondan a las condiciones de veda o regulaciones establecidas, no pudiendo dichos ejemplares ser objeto de consumo o comercialización en ningún caso;
- d) Traer a tierra las capturas realizadas y declarar a las autoridades correspondientes del CODOPESCA las especies y cantidades obtenidas;
- e) Cumplir todas las medidas de seguridad establecidas por el CODOPESCA para el ejercicio de la pesca, tanto en lo que afecta a las embarcaciones como a la protección de la integridad física de los pescadores;
- f) Respetar todas las disposiciones relativas a la prohibición de la contaminación y otras medidas protectoras de la calidad de las aguas, las zonas costeras y el medioambiente.

Art. 18.- Como medida precautoria para la pesca, se exige que todas las actividades de pesca estén sometidas a examen y autorización previa, que se establezca un plan de ordenación en que se especifiquen, claramente, los objetivos de la ordenación y la manera en que se evaluarán, supervisarán y abordarán los efectos sobre la pesca, y que se adopten medidas provisionales concretas de ordenación a

todas las actividades de pesca mientras no se establezca un plan de ordenación pesquero por el CODOPESCA.

CAPÍTULO V ACCESO DE EMBARCACIONES PESQUERAS EXTRANJERAS EN AGUAS DE LA REPÚBLICA DOMINICANA

Art. 19.- El acceso de embarcaciones pesqueras extranjeras a las aguas de la República Dominicana requerirá la posesión de un permiso que será concedido, según los casos, en las condiciones siguientes:

- a) Si las personas físicas o jurídicas que explotan la embarcación extranjera estuvieran domiciliadas en la República Dominicana, el permiso de embarcación pesquera será concedido en las mismas condiciones legales que rigen para las embarcaciones pesqueras nacionales. En este caso, todos los miembros de la tripulación deberán estar domiciliados en la República Dominicana y las capturas deberán ser desembarcadas y comercializadas en el país;
- b) Si las embarcaciones pertenecen a Estados con los que la República Dominicana hubiera celebrado convenios u otros arreglos de pesca, el permiso de embarcación pesquera será concedido en las condiciones que se hubiera convenido en el correspondiente acuerdo o arreglo;
- c) En los demás casos, el permiso de embarcación pesquera podrá ser concedido en las condiciones que para cada embarcación establezca el CODOPESCA, siempre que la actividad del buque extranjero no perjudique los intereses pesqueros dominicanos y resulte compatible con los objetivos de la presente ley.

Art. 20.- Las embarcaciones extranjeras admitidas a faenar en aguas de la República Dominicana deberán respetar las medidas de ordenación pesquera aplicables en estas aguas, sin perjuicio de las disposiciones especiales que el CODOPESCA pudiera establecer para dichas embarcaciones.

CAPÍTULO VI EJERCICIO DE LA ACUICULTURA

Art. 21.- El CODOPESCA fomentará el ejercicio de la acuicultura, mediante el establecimiento, asistencia técnica y financieras, ayudas e incentivos que estime convenientes. Las personas físicas y jurídicas nacionales o extranjeras podrán utilizar espacios terrestres, fluviales, lacustres, costeros o marítimos, para la construcción de instalaciones destinadas al cultivo y la explotación de toda clase de recursos biológicos acuáticos, en las condiciones establecidas en la presente ley y la ley 64-00, que crea la Secretaría de Estado de Medio Ambiente y Recursos Naturales;

Art. 22.- El ejercicio de la acuicultura requerirá de la correspondiente autorización del CODOPESCA. En el caso de que la explotación se realice en espacios de dominio público, además de la autorización del CODOPESCA, se requerirá la obtención de las concesiones administrativas necesarias de acuerdo con la legislación vigente en el país. Las autorizaciones de la acuicultura serán otorgadas por el CODOPESCA en las condiciones que reglamentariamente se establezcan, debiéndose en todo caso respetar los requisitos siguientes:

- a) Las solicitudes de autorización deberán ir acompañadas de una evaluación ambiental, en la que se determine, en particular, el impacto potencial que pueden producir en ese ecosistema y su medio y sobre las especies. Adoptando las recomendaciones de la investigación ambiental producida en la evaluación ambiental;
- b) No se otorgará la autorización a los proyectos de acuicultura con intenciones de ser ejecutados en zonas que gozan de protección especial dadas en virtud de las leyes, decretos o reglamentaciones vigentes de la República Dominicana o en virtud dada por los convenios internacionales en los que el país sea parte, ni en las zonas de especial interés que reglamentariamente el Estado y sus dependencias determinen.

OBLIGACIONES DE LOS ACUICULTORES

Art. 23.- Quienes se dedican a la acuicultura. Están obligados a cumplir la presente ley y las disposiciones ' reglamentarias y administrativas adoptadas para su aplicación. En particular, dichas personas deberán:

- a) Cumplir estrictamente las condiciones establecidas en la autorización;
- b) No introducir en las aguas instalaciones dedicadas a la acuicultura, especies endémicas o exóticas que no hubieran sido autorizadas por la autoridad competente.
- c) No obstaculizar indebidamente otros usos legítimos de los espacios terrestres o acuáticos en los que se realiza la explotación;
- d) Cumplir las medidas establecidas por el CODOPESCA para garantizar la seguridad de las instalaciones y la integridad física de las personas;
- e) Cumplir las medidas de protección del medio ambiente dictadas por la autoridad competente y, en particular, no proceder a descargas o vertidos resultantes del proceso de producción y procesamiento que puedan resultar contaminantes o nocivos.

CAPÍTULO VII MODIFICACIÓN, SUSPENSIÓN Y CANCELACIÓN DE LA 'AUTORIZACIÓN

Art. 24.- El CODOPESCA podrá modificar las condiciones de autorización, así como suspender o cancelar su aplicación, en los siguientes casos:

1. Si los términos de la autorización hubieran sido incumplidos;
2. Si sobreviniera una situación en la que la modificación, suspensión o cancelación de la autorización resultara necesaria para preservar los recursos biológicos, prevenir la difusión de enfermedades o proteger ;el medio ambiente.

CAPÍTULO VIII IMPUESTOS

Art. 25.- Se establecen los siguientes impuestos a la exportación de pescados y mariscos:

- a) Pescado en su estado natural 0.5% ad-valórem;
- b) Moluscos y crustáceos en su estado natural..... 5% ad-valórem;
- c) Pescados y mariscos elaborados.....libre;
- d) Producto de acuicultura.....libre.

Párrafo I.- Como incentivo a la producción y a la exportación, quedarán libre de impuesto por cinco años los productos producidos de forma empresarial en acuicultura o maricultura y por tres años los de captura marina, estos últimos si reciben algún valor agregado.

Párrafo II.- Para los fines de aplicación de los impuestos indicados, se considerarán como elaborados los pescados y mariscos que hayan sido objeto de los procesamientos de salar, secar, deshidratar, filetear, ahumar, curar, conservar en, salmuera y/o vinagre, y/o envasar en latas o en vidrios. Todas las otras formas de preparación de dichas especies marinas se considerarán como estado natural.

Art. 26.- Se establecen los siguientes impuestos a la importación:

Todos los productos pesqueros procesados, o no/pagan un impuesto único especializado de 0.5% ad valórem, el cual se dedicará para apoyar el desarrollo del CODOPESCA..

- a) Pescado en su estado natural..... 0.5% ad-valórem;
- b) Mariscos en su estado natural..... 0.5% ad-valórem;
- c) Productos pesqueros enlatados, ahumados, embutidos, reestructurados..... 0.5% ad-valórem;
- d) Productos pesqueros en salmuera o salados 0.5% ad-valórem
- e) Productos de acuicultura padrotes y semillas e insumos como alimentos, hormonas, hilos, anzuelos, aereadores, equipos de, navegación y refrigeración, motores etc. utilizados en la acuicultura y pesca, estarán libres de estos impuestos. Cuando se trate de acuicultores y pescadores registrados por el CODOPESCA o a centros de investigación.

Párrafo.- El Poder Ejecutivo, por razones excepcionales, podrá exonerar el pago de estos impuestos, previa no objeción del CODOPESCA.

Art. 27.- Los importadores y exportadores deberán obtener del CODOPESCA, el Certificado de no Objeción para las importaciones y las exportaciones, sin cuyo documento, la Dirección General de Aduanas no le dará entrada ni salida a la mercancía. Al hacer la solicitud, los importadores deberán entregar al CODOPESCA una copia del Certificado de Origen y/o Certificado Sanitario de los productos importados.

Párrafo.- Quedan exceptuados del pago de impuesto de exportación los productos de la acuicultura marina y de agua dulce y otros cultivos en cautiverio debidamente autorizados en el territorio nacional y sus aguas dulces.

CAPÍTULO IX
EMBALSES DE LAS PRESAS
MEDIDAS GENERALES

Art. 28.- El CODOPESCA regularizará, ordenará, supervisará y fomentará; en cogestión con el INDRHI, las actividades de pesca y acuicultura en y alrededor de los embalses de las presas construidas y por construirse, así como en lagos y lagunas en el territorio nacional.

Art. 29.- Sólo se considerarán elegibles para ejecutar convenios de acuerdo de co-manejo a las organizaciones comunitarias y privadas no comunitarias, constituidas sin fines de lucro de acuerdo a la ley 520 y sus modificaciones.

Art. 30.- Con los fines de promover el co-manejo de los embalses de, las presas del país, se faculta al CODOPESCA a establecer convenios de acuerdos con las organizaciones indicadas en el artículo anterior. El co-manejo estará contenido en convenios de acuerdos en las siguientes modalidades:

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- a) **MANEJO COMPARTIDO:** Esta modalidad o forma de co-manejo implica la ejecución de uno o más programas o sub-programas establecidos en el plan de manejo del recurso natural (embalse presa y su entorno);
- b) **ADMINISTRACIÓN Y MANEJO EN FIDEICOMISO:** Esta modalidad de co-manejo entraña la delegación por parte del CODOPESCA en una o más organizaciones comunitarias o no comunitarias constituidas sin fines de lucro, de la responsabilidad de administrar y desarrollar el embalse de una presa dada y su entorno, de ejecutar su plan o programa de manejo y de cubrir todos los costos que ello conlleve. El CODOPESCA mantendrá la supervisión y vigilancia al cumplimiento de las estipulaciones del convenio, de la ejecución del plan o programa de manejo y de los reglamentos establecidos para la gestión sostenible del embalse.

Art. 31.- Las actividades no pesqueras de las instituciones públicas (INDRHI, CDE y otras), que tienen a su cargo realizar labores de mantenimiento, reconstrucción, aprovechamiento hidroeléctrico, control de aprovechamiento de agua y otras, en las presas del país, no se verán afectadas por el cumplimiento de esta ley.

Párrafo.- Las instituciones públicas indicadas en el artículo precedente y el CODOPESCA deberán coordinar sus actividades en los embalses de las presas, de manera que las mismas se realicen sin ninguna fricción o interferencia.

Art. 32.- Las organizaciones de base comunitarias o. privadas que deseen establecer convenios de contratos de co-manejo en la modalidad o forma de manejo compartido, para involucrarse en acciones, programas o sub-programas de aprovechamiento sostenible, de educación, promoción y otros, deberán cumplir con las leyes establecidas para tales tipos de organizaciones.

Art. 33.- Las organizaciones que deseen convenir contratos en la modalidad de administración y manejo en fideicomiso, deberán cumplir con los requisitos establecidos por la ley para organizaciones sin fines de lucro.

Art. 34.- Los convenios de contratos de co-manejo y las modalidades se establecerán por reglamento y cumplirán con requisitos comunes.

Art. 35.- Copia de los convenios de contrato de co-manejo será enviada por el CODOPESCA al INDRHI, a la CDEEE y cualquier otra institución del Estado cuyas actividades •incidan en los embalses de las presas.

CAPÍTULO X SOBRE LA INVESTIGACIÓN Y LA CAPACITACIÓN

Art. 36.- Los programas de investigación y de capacitación que se implementan en el CODOPESCA deberán estar dirigidos a garantizar la producción sostenible, tanto de los sistemas de aguas dulces como marino costero.

Art. 37.- El CODOPESCA podrá coordinar trabajos de investigación con otras instituciones del gobierno u otras entidades de la sociedad civil nacionales o internacionales, que hayan demostrado capacidad en la investigación en esta área.

Art. 38.- El CODOPESCA tendrá un programa permanente de capacitación para los inspectores, técnicos y profesionales relacionados con el área; además establecerá coordinaciones con organismos nacionales, universidades y organismos internacionales para proveer de becas y cursos especializados al personal y técnicos relacionados con el área.

CAPÍTULO XI MEDIDAS DE CONSERVACIÓN Y PROTECCIÓN DE LOS RECURSOS BIOLÓGICOS ACUÁTICOS

PROHIBICIONES GENERALES.

Art. 39.- Queda prohibido realizar cualquier actividad pesquera que resulte contraria a las disposiciones contenidas en la presente ley. En todo caso queda prohibido:

- a) Realizar actividades pesqueras comerciales sin poseer la licencia de pesca y el permiso de embarcación pesquera o dedicarse a la acuicultura comercial sin poseer la respectiva autorización;
- b) Pescar en zonas no autorizadas;
- c) Pescar especies no autorizadas;
- d) La captura de especies acuícola en acuíferos subterráneos, exceptuando las realizadas con propósitos científicos. En estos casos, deberá estar provisto de un permiso expedido por la Secretaría de Estado de Medio Ambiente y Recursos Naturales;
- e) Pescar cantidades superiores a las autorizadas;
- f) Realizar capturas de ejemplares en períodos de veda, de tamaño menor del autorizado, en cantidades mayor a las autorizadas en período de apareamiento o desove;

- g) Utilizar artes y medios de pesca no autorizados;
- h) El uso de redes de enmalle de superficie o media agua;
- i) Distraer el producto de la pesca o transbordarlo a otras embarcaciones, sin la autorización del CODOPESCA;
- j) Introducir, trasplantar, cultivar o propagar especies perjudiciales para la conservación de los recursos biológicos acuáticos, para la subsistencia de especies endémicas o para el mantenimiento del equilibrio ecológico.

Art. 40.- Por razones de salud pública, queda prohibida la comercialización, bajo cualquier forma y presentación de las especies señaladas por el CODOPESCA y que puedan producir intoxicación por biotoxinas marinas, las cuales serán señaladas por el CODOPESCA.

CAPÍTULO XII

ZONA DE RESERVA PESQUERA Y ZONAS ESPECIALMENTE PROTEGIDAS

Art. 41.- Las pesquerías en las aguas dulces, así como en las aguas marinas de la República Dominicana en un radio de 100 Km. de la costa (54 millas náuticas), con excepción de los bancos de La Plata y de La Navidad, se reservarán a la pesca de subsistencia, artesanal, deportiva y científica, quedando prohibida en dicha zona toda actividad pesquera industrial.

Art. 42.- Queda prohibida la actividad pesquera en las zonas de apareamiento, en las zonas de desove y en los criaderos, naturales o artificiales, que sean designadas por el CODOPESCA, así como toda alteración en los suelos y en la flora de estos lugares, siendo responsabilidad del mencionado organismo la localización delimitación y señalización de las mismas, en coordinación con la Secretaría de Estado de Medio Ambiente y Recursos Naturales.

Art. 43.- En las aguas marinas o dulces que se encuentren dentro de los límites de área naturales protegidas, toda actividad pesquera deberá contar con el permiso correspondiente de la Secretaría de Estado de Medio Ambiente y Recursos Naturales, o institución rectora de las áreas protegidas y deberá ser coordinada con el CODOPESCA, quien otorgará la licencia de pesca.

Art. 44.- El CODOPESCA tendrá potestad de solicitar al Poder Ejecutivo de cuantas áreas de reserva pesquera considere y fuere necesario en la zona costero marina y aguas jurisdiccionales dominicanas. Estas reservas pesqueras servirán para cuidar y preservar especies importantes durante sus períodos de apareamiento y reproducción. Estas reservas pesqueras estarán bajo jurisdicción y administración del CODOPESCA. Cuando las mismas se encuentren dentro de áreas protegidas, se harán las coordinaciones necesarias con la Dirección Nacional de Parques.

CAPÍTULO XIII

LIMITACIÓN DEL ESFUERZO

Art. 45.- El CODOPESCA adoptará medidas para limitar el esfuerzo en las pesquerías que lo requieran, a fin de evitar su sobre explotación, y podrá establecer el Total Admisible de Capturas (TAC) para las

especies, en las áreas y durante el tiempo que se determine, para asegurar la protección de las poblaciones pesqueras y la sostenibilidad de su explotación.

CAPÍTULO XIV

ESPECIES PROTEGIDAS Y EXPLOTACIÓN DE RECURSOS NO PESQUEROS

Art. 46 Queda prohibida la explotación no autorizada de todos los recursos biológicos acuáticos, tanto marinos como lacustres, así como de aquellos que gozan de protección legal en la República Dominicana o en virtud de convenios internacionales en los que el país es signatario y de los que el CODOPESCA pueda emitir por resolución en virtud de esta ley. Entran en esta categoría los mamíferos marinos y tortugas, tanto marinos como de agua dulce.

Art. 47.- Se prohíbe la destrucción, extracción y comercialización en las aguas territoriales de la República Dominicana de todas las especies de corales vivos o muertos. La extracción sólo se hará previo permiso de la Secretaría de Estado de Medio Ambiente y Recursos Naturales.

Art. 48.- Se regula para fines de aprovechamiento las especies de langostas siguientes: langosta pinta (*Panulirus guttatus*), langosta verde (*Panulirus laevicauda*), langosta de piedra o plana (*Scyllarides sp'*), langosta caribe o espinosa (*Panulirus argus*), así como también las diferentes especies de equinodermos existentes. El CODOPESCA, de acuerdo a los estudios y muestreos biológicos que realice determinará las épocas de veda y captura de esas especies.

Art. 49.- La captura de langosta podrá realizarse mediante la utilización de trampas que permitan extraerlas vivas y devolver a su medio natural a los ejemplares menores a las tallas, mínimas establecidas y a las hembras con hueva. Cualquier otro equipo y/o método de captura requerirá de autorización del CODOPESCA.

Párrafo.- Los ejemplares de langostas que no cumplan con las especificaciones de la talla mínima, así como langostas hembras en estado de madurez reproductiva (langostas con hueva) deberán ser devueltos al mar en las mejores condiciones de sobre vivencia posible.

Art. 50.- Las langostas capturadas deberán desembarcarse enteras sin descabezarlas;

Art. 51.- Queda prohibido el uso de ganchos y arpones para la pesca y captura de langostas en las aguas territoriales de la República Dominicana.

Art. 52.- Las tallas mínimas de captura serán de 10 cm. de longitud abdominal para la langosta pinta (*Panulirus guttatus*), de 18cm. de longitud abdominal para la langosta caribe (*Panulirus argus*).

Párrafo.- Las tallas mínimas podrán ser modificadas por el CODOPESCA sobre la base de evidencias científicas disponibles.

Art. 53.- Las personas físicas o jurídicas domiciliadas en la República Dominicana que deseen dedicarse a la captura de langostas y lambí deberán estar en posesión de una licencia de pesca otorgada por el CODOPESCA.

Art. 54.- Los titulares de licencias de pesca y captura de langostas y lambí quedan obligados a cumplir con esta ley, a colaborar y participar en los programas para hacer más eficiente el aprovechamiento sostenible del recurso y a facilitar las labores de verificación del personal del CODOPESCA sobre su captura.

Art. 55.- Las personas físicas o jurídicas con domicilio abierto en el país que quieran dedicarse a la captura de especies ornamentales, deberán poseer una licencia de pesca otorgada por el CODOPESCA.

Art. 56.- La solicitud de la licencia para la captura de especies ornamentales debe hacerse por escrito y en la misma deben indicarse las especies, los sitios, las profundidades, métodos de capturas y cantidades a ser colectadas. Después que un equipo técnico del CODOPESCA haya evaluado los riesgos ecológicos de la captura, se determinará el otorgamiento o no de la licencia de pesca otorgada por el CODOPESCA.

Párrafo.- En aguas marinas ubicadas dentro de los límites de las áreas protegidas se actuará de acuerdo a lo indicado en la ley que rige esos espacios.

Art. 57.- El CODOPESCA determinará las limitaciones de captura o extracción del lambí (*Strombus gigas*) por tamaño y/o peso de la carne y época de reproducción.

Art. 58.- Queda prohibida la captura de los juveniles de *Strombus gigas* denominados futay y cotorrón.

Art. 59.- Se prohíbe la posesión, procesamiento y comercialización de los ejemplares de lambí cuyo peso sea menor de 227 gramos de carne (0,5 libras) y/o menos de 20cm. de longitud desde el ápice al canal sifonal de su concha.

Art. 60.- Toda extracción de cualquier recurso biótico acuático no destinado a la alimentación humana que se realice en las aguas dominicanas, deberán contar con la previa autorización del CODOPESCA de acuerdo a las leyes y reglamentos establecidos.

CAPÍTULO XV

VEDAS, TALLAS MÍNIMAS Y OTRAS MEDIDAS DE PROTECCIÓN AVALADAS POR EL PROTOCOLO DEL CONVENIO DE LA DIVERSIDAD BIOLÓGICA

Art. 61.- El CODOPESCA establecerá las prohibiciones, vedas, limitaciones de tamaño y cantidad de las capturas y otras medidas que sean necesarias para la conservación y protección de los recursos biológicos acuáticos. En todo caso, queda prohibida la captura de ejemplares en gestación, es decir, con huevos adheridos, o en época de desove.

Art. 62.- El Consejo Directivo del CODOPESCA, determinará por resoluciones las prohibiciones, vedas, limitaciones de tamaño y otras medidas que sea necesario tomar en un momento dado, las cuales serán enviadas al Poder Ejecutivo para ser decretadas.

CAPÍTULO XVI

ARTES Y MEDIOS DE PESCA PROHIBIDAS, MEDIDAS GENERALES

Art. 63.- Queda prohibida la importación y el uso de cualquier arte o instrumento de pesca que no haya sido previamente autorizado por el CODOPESCA, así como el uso de explosivos, venenos, sustancias

químicas u otros medios de pesca nocivos para los recursos biológicos acuáticos, la salud humana o el medio ambiente, como también el uso de chinchorros de arrastre y de redes de arrastre en las desembocaduras de cursos de agua, en los estuarios, en las bahías, praderas marinas y en las zonas arrecifales.

Art. 64.- En las zonas de pesca reservada establecidas en la presente ley, queda prohibido:

- a) El uso de palangres horizontales de superficie o media agua, derivantes o fijos, con más de 100 anzuelos ó 5 Km. de longitud;
- b) El uso de redes de enmalle de superficie o media agua, la utilización de compresores para la pesca de buceo y el ejercicio de la pesca submarina nocturna;
- c) La utilización de compresores para la pesca de buceo.

Art. 65.- En las aguas de los lagos, lagunas, estanques y presas, queda prohibida la utilización de redes de enmalle cuya malla sea menor de 10 cm. o cuya longitud sea mayor de 75m.

Párrafo.- La aplicación de cualquier medida, en cuanto a artes y medios de pesca, deberá coordinarse con la Dirección Nacional de Parques, cuando los cuerpos de aguas internas se encuentren, dentro de las áreas naturales protegidas.

Art. 66.- Por vía reglamentaria se dictarán las disposiciones relativas a las dimensiones y características técnicas de las artes de pesca que pueden ser utilizados para cada pesquería.

CAPÍTULO XVII

MEDIDAS DE COMERCIALIZACIÓN

REGLAS GENERALES

Art. 67.- Las personas físicas y jurídicas domiciliadas en la República Dominicana podrán dedicarse a la comercialización de los recursos pesqueros, sujeto a las disposiciones contenidas en este artículo:

- a) Los productos de la pesca, de la acuicultura sólo' podrán comercializarse si han sido obtenidos legalmente y siempre que respondan a las normas de calidad y sanitarias que reglamentariamente se determinen;
- b) Los productos de la pesca serán traídos a tierra y comercializados en la República Dominicana, salvo en los casos de las disposiciones aplicables a las embarcaciones extranjeras;
- c) En ningún caso podrán comercializarse, importarse o exportarse ejemplares o partes de los mismos, pertenecientes a especies cuya captura esté prohibida en virtud de la legislación de la República Dominicana o de convenios internacionales de los que el país sea parte.

CAPÍTULO XVIII DE LAS IMPORTACIONES

Art. 68.- Los productos de la pesca y de la acuicultura podrán ser importados siempre que se cumplan los siguientes requisitos:

- a) Que la producción nacional no alcance a satisfacer la demanda del país;
- b) Que los productos de que se trata sean de comercio legal en la República Dominicana. La importación de ejemplares o partes de especies cuya captura está sometida a vedas u otras restricciones en la República Dominicana requerirá la autorización previa del CODOPESCA; previa consulta y aprobación de las instituciones encargadas de velar por el cumplimiento de las convenciones y acuerdos internacionales.
- c) Que las operaciones de importación hayan sido autorizadas por los organismos sanitarios y aduaneros competentes y que el importador haya pagado las tasas aplicables y cumplido en el artículo 15 de esta ley;
- d) Que el importador obtenga el Certificado de no Objeción del CODOPESCA.

CAPÍTULO XIX EXPORTACIÓN

Art. 69.- Los productos de la pesca y sus derivados y los productos de la acuicultura podrán ser exportados siempre que se cumplan los siguientes requisitos:

Que los productos de que se trata sean de comercio legal en la República Dominicana, dando preferencia al consumo local teniendo en cuenta las reglas del mercado;

Que las operaciones de exportación hayan sido autorizadas por los organismos sanitarios, aduaneros, y CEDOPEX y otras instituciones competentes. Que el exportador, haya pagado las tasas aplicables de acuerdo con la legislación vigente, previa consulta y aprobación de las instituciones encargadas de velar por el cumplimiento de las convenciones y acuerdos internacionales;

Que el exportador obtenga el Certificado de no Objeción del CODOPESCA.

CAPITULO XX APLICACIÓN Y CONTROL

REGISTRO DE ACTIVIDADES PESQUERAS

Art. 70.- El CODOPESCA mantendrá un registro actualizado de las actividades pesqueras que se desarrollen en el país, en el que se incluirá;

- a) El censo de personas físicas o jurídicas que poseen la "licencia de pesca", con indicación de todos los datos que figuran en dicha licencia;

- b) El censo de embarcaciones que poseen el "permiso de embarcación" para dedicarse a la actividad pesquera, con indicación de todos los datos que figuran en dicho permiso;
- c) El censo de buques extranjeros autorizados a faenar en aguas de la República Dominicana, con las'.indicaciones y permisos pertinentes;
- d) El censo artes y de los aparejos y equipos de pesca dedicados a esta actividad.

Párrafo.- El registro de estas embarcaciones deberá tenerse por duplicado en el CODOPESCA y en la Marina de Guerra, para los fines de lugar.

CAPÍTULO XXI REGISTRO DE ACTIVIDADES DE ACUICULTURA

Art. 71.- El CODOPESCA mantendrá un registro actualizado de las instalaciones de acuicultura que gozen de autorización. Este registro incluirá

- a) El censo de personas físicas o jurídicas titulares de la explotación;
- b) La indicación de todos los datos que figuran en la autorización.

Párrafo.- El CODOPESCA elaborará una ficha informativa con los detalles necesarios.

Art. 72.- El CODOPESCA mantendrá un inventario de las cantidades de productos obtenidos, señalando si proceden de la pesca en aguas dulces, de la pesca en aguas marinas o de la acuicultura, con indicación de las cantidades correspondientes a cada una de las especies capturadas, así como de los precios obtenidos por su venta, y mantendrá actualizado el sistema nacional de estadísticas pesqueras con el inventario permanente de la composición de especies, talla y peso, valores de captura y esfuerzo y otros datos biológicos pesqueros de interés y que el CODOPESCA considere.

Párrafo.- Esta información deberá ser coordinada y transmitida a los departamentos correspondientes, tales como Economía Agropecuaria y Estadísticas de la Secretaría de Estado de Agricultura y otras instituciones relacionadas.

CAPÍTULO XXII ARREGLO DE CONTROVERSIAS

Art. 73.- Las controversias que surjan entre pescadores o comunidades pesqueras y otros usuarios de las aguas, riberas y espacios costeros, serán resueltas preferentemente por acuerdo entre los mismos, con la intervención del CODOPESCA, que ejercerá sus buenos oficios y aplicará las recomendaciones de lugar, siempre y cuando estas controversias no lleguen a ser infracciones penales, las cuales serán tratadas por el Código Penal de la República Dominicana.

CAPÍTULO XXIII VIGILANCIA E INSPECCIÓN

Art. 74.- El CODOPESCA tendrá a su cargo la vigilancia, inspección, y control de las actividades de pesca y de acuicultura, con el auxilio de las autoridades policiales y de la Marina de Guerra y de la Sociedad Civil.

Art. 75.- El CODOPESCA mantendrá un servicio de inspectores de pesca y de acuicultura, los cuales deberán poseer la calificación profesional necesaria para el cumplimiento de sus funciones y disponer de los medios necesarios para su actuación y determinará mediante resolución, el perfil que deben poseer respectivamente, los inspectores de pesca y los inspectores de acuicultura.

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Art. 76.- Los inspectoras de pesca y los inspectores de acuicultura se ocuparán en particular de las siguientes funciones:

Recopilar semanalmente la información sobre las capturas de pesca y la producción de acuicultura en su zona de actuación y elaborar un informe semanal que será remitido al CODOPESCA.

Recibir las denuncias presentadas directamente por los pescadores y la Sociedad Civil o a través de sus asociaciones profesionales, relativas a las infracciones a la presente ley o a las disposiciones adoptadas para su desarrollo, verificar su certeza y comunicarlas inmediatamente al CODOPESCA;

Vigilar directamente el cumplimiento de la presente ley, así como de las disposiciones adoptadas para su desarrollo, levantar acta de las infracciones cometidas y comunicarlas inmediatamente al CODOPESCA;

Comunicar al CODOPESCA cualquier otra información relevante en relación con el cumplimiento de las disposiciones de la presente ley, así como de las disposiciones adoptadas para su desarrollo y sus reglamentos;

Desempeñar cualesquiera otras funciones de vigilancia que les encomiende el CODOPESCA.\

Párrafo.- El CODOPESCA coordinará con las autoridades gubernativas y de la Marina de Guerra el auxilio de estas instituciones al ejercicio de las funciones de vigilancia y policía.

CAPÍTULO XXIV INFRACCIONES Y SANCIONES

Art. 77.- La violación de las disposiciones de la presente ley o de las disposiciones reglamentarias y administrativas adoptadas para su desarrollo constituirá una infracción. Las infracciones serán clasificadas como muy graves, graves o leves, de acuerdo con lo establecido en la presente ley.

Art. 78.- Las infracciones que se contemplen en los reglamentos dictados por el Poder Ejecutivo tendrán las mismas sanciones previstas en la presente ley para cada categoría de las mismas.

Art. 79.- Las penas privativas de libertad contempladas en esta ley solamente podrán ser impuestas por la autoridad judicial competente y con arreglo a los procedimientos y garantías establecidos por las leyes de la República Dominicana.

INFRACCIONES MUY GRAVES

Art. 80.- Constituyen infracciones muy graves las siguientes conductas:

- a) Violar las prohibiciones relativas a la pesca, captura y recolección, de especies protegidas, de acuerdo con lo previsto en el capítulo IV del título VIII de esta ley;
- b) Importar o usar artes o instrumentos de pesca cuya importación haya sido expresamente prohibida por el CODOPESCA;
- c) Usar chinchorros de arrastre o redes de arrastre en las zonas prohibidas, una vez entre en vigor la prohibición establecida en la presente ley;
- d) Utilizar explosivos, sustancias venenosas, sustancias químicas u otros medios de pesca nocivos;
- e) Cometer actos vandálicos que atenten gravemente contra la flora o la fauna acuática o realizar actuaciones que supongan un grave daño ecológico para las aguas, el medio marino o las zonas costeras.
- f) Destruir, extraer y comercializar especies de corales vivos o muertos;
- g) Cortar o destruir manglares y zonas de praderas marinas, así como la flora y fauna asociadas;
- h) Captura de langostas y lambí de tallas prohibidas y durante los períodos de veda sin una licencia que así lo especifique;
- i) Violar las prohibiciones relativas a las vedas y tallas mínimas establecidas por el CODOPESCA o capturar ejemplares en gestación;
- j) No pagar los impuestos de importación y exportación, en cuyo caso se confiscará la mercancía. La importación y exportación sin los permisos correspondientes, en cuyo caso se confiscará la mercancía;
- k) La realización de actividades pesqueras en aguas dominicanas por embarcaciones de matrícula extranjera, sin el debido permiso del CODOPESCA;
- l) No cumplir con los convenios de contratos de co-manejo en la modalidad de Administración y Manejo en Fideicomiso;
- m) Extracción de recursos no pesqueros sin autorización previa del CODOPESCA.

Art. 81.- Las infracciones muy graves serán sancionadas con una multa de diez (10) sueldos mínimos a doscientos (200) sueldos mínimos del sector público y/o penas de prisión de dos (2) años a diez (10) años.

INFRACCIONES GRAVES

Art. 82.- Constituyen infracciones graves las siguientes conductas:

- a) Practicar la pesca industrial en la zona de pesca reservada o realizar actividades pesqueras en las zonas prohibidas en virtud de lo dispuesto en esta ley;

- b) Pescar sin licencia o permiso de embarcación o realizar instalaciones de acuicultura sin la previa autorización del organismo competente;
- c) Utilizar palangres de más de 250 anzuelos, usar compresores para la pesca de buceo o realizar pesca submarina nocturna en la zona de pesca;
- d) Utilizar redes de enmalle cuya luz de malla sea menor de 10 cm y cuya longitud sea mayor de 75m, en las aguas de los lagos, lagunas, estanques y presas;
- e) Utilizar artes de pesca que hubieran sido prohibidos por el CODOPESCA;
- f) Distraer el producto de la pesca o transbordarlo a otras embarcaciones, sin autorización del CODOPESCA;
- g) Trasvasar especies de un cuerpo de agua público a otro sin la previa autorización del CODOPESCA;
- h) Obstaculizar el trabajo de los inspectores de pesca o de los inspectores de acuicultura, negarse a proporcionar la información requerida o proporcionar información falsa;
- i) Destruir, robar o dañar embarcaciones pesqueras o artes o instrumentos de pesca pertenecientes a terceros, obras de infraestructura pesquera o instalaciones de acuicultura;
- j) Captura, comercio o posesión de langostas de tallas prohibidas o durante los períodos de veda.
- k) Captura de lambí sin una licencia que así lo especifique;
- l) No cumplir con los convenios de contratos de co-manejo en la modalidad de Manejo Compartido.

Art. 83. Las infracciones graves serán sancionadas con multas de diez (10) sueldos mínimos a setenta y cinco (75) sueldos mínimos del sector público y/o penas mínimas de diez (10) meses a dos (2) años.

INFRACCIONES LEVES

Art. 84.- Constituyen infracciones leves:

- a) Cualquier otra violación de las disposiciones de la presente ley o de sus normas de aplicación, que no constituya una infracción muy grave o una infracción grave;
- b) Captura o posesión de langostas sin una licencia que así lo especifique.

Art. 85.- Las infracciones leves serán sancionadas con multas de cinco (05) sueldos mínimos a treinta (30) sueldos mínimos del sector público y/o penas de prisión de tres (3) meses a un (1) año, o ambas penas a la vez.

Art. 86.- Por cada sueldo mínimo dejado de pagar, .el infractor condenado pasará dieciocho (18) días en la cárcel.

REINCIDENCIA, SANCIONES ADICIONALES Y RESPONSABILIDADES

Art. 87.- En los casos de reincidencia se podrá imponer hasta el doble de la sanción establecida para cada tipo de infracción en los artículos precedentes.

Art. 88.- En todos los casos de infracción, la autoridad competente decretará el decomiso de las capturas ilegales, así como de las artes y medios de pesca prohibidos que estuvieran en posesión del infractor.

Art. 89.- En los casos de infracciones muy graves, así como en los casos de reincidencia, el CODOPESCA rescindirá la licencia de pesca, el permiso de embarcación o la autorización de acuicultura utilizadas.

Art. 90.- Quienes contravinieren las disposiciones anteriores y, en su caso, el capitán de la embarcación de pesca o el gerente de la instalación de acuicultura serán responsables de las infracciones cometidas, asumiendo las sanciones pecuniarias y penales que se les impongan. Dichas personas asumirán también la responsabilidad civil que se les pudiera exigir ante los tribunales de justicia, por los daños y perjuicios que, con el hecho punible, hubieran ocasionado.

Art. 91.- El propietario de la embarcación y, en su caso, el propietario de la instalación de acuicultura. responderán conjunta y solidariamente con los anteriores de las sanciones pecuniarias impuestas y de la responsabilidad civil que pudiera derivarse.

Art. 92.- A las sanciones establecidas en la presente ley, no se aplicará el artículo 463 del Código Penal.

INFRACCIONES COMETIDAS POR EMBARCACIONES EXTRANJERAS

Art. 93.- Las sanciones aplicables en los casos de infracciones cometidas en aguas de la República Dominicana por embarcaciones extranjeras serán las que se establecen en esta ley o en los reglamentos dictados por el Poder Ejecutivo en aplicación de la misma, con las salvedades siguientes:

- a) Las sanciones aplicables a los buques extranjeros podrán incluir la incautación de las capturas, así como de las artes y medios de pesca, pero las embarcaciones y sus tripulantes serán liberados con prontitud, previa constitución de una fianza razonable u otra garantía, excepto los capitanes de las embarcaciones, a los que se aplicarán las sanciones determinadas en esta ley, de acuerdo a la o las violaciones cometidas;
- b) En los casos de apresamiento o retención de buques extranjeros, el Estado Dominicano notificará con prontitud al Estado de pabellón, por los conductos apropiados, las medidas tomadas y cualesquiera sanciones impuestas subsiguientemente.

CAPÍTULO XXV
COMPETENCIA LEGISLATIVA Y REGLAMENTARIA
ORGANIZACIÓN ADMINISTRATIVA

Art. 94.- El ejercicio de las competencias legislativas y reglamentarias para el desarrollo de esta ley corresponderá al Congreso Nacional y al Poder Ejecutivo, de acuerdo con los poderes de que cada uno de ellos dispone con arreglo a la Constitución de la República Dominicana.

Art. 95.- El CODOPESCA podrá adoptar, mediante resolución las medidas necesarias para la ordenación de las actividades de fomento, explotación, conservación y comercialización de los recursos biológicos acuáticos, de acuerdo con las disposiciones de esta ley y de las normas que la desarrollen.

ORGANIZACIÓN ADMINISTRATIVA

Art. 96.- El CODOPESCA efectuará todas las tareas administrativas que conlleva la aplicación de esta ley y las disposiciones legislativas y reglamentarias adoptadas para su ejecución.

Art. 97.- El CODOPESCA vigilará por el cumplimiento de las disposiciones establecidas e impondrá las sanciones administrativas correspondientes en caso de infracción. También realizará cualesquiera otras acciones que resulten necesarias para la ejecución de esta ley y de las medidas reglamentarias que adopte.

CAPÍTULO XXVI
DISPOSICIÓN TRANSITORIA Y DISPOSICIÓN DEROGATIVA

Art. 98.- La prohibición de utilizar chinchorros de arrastre y redes de arrastre en las desembocaduras de los cursos de agua, en los estuarios y en las bahías contempladas en la presente ley, se aplicará efectivamente tres meses después de la entrada en vigor de la presente ley. Durante el período transitorio, los pescadores que todavía utilicen dichas artes podrán solicitar del CODOPESCA su asistencia para el adiestramiento en el uso de otras artes de pesca alternativas.

Art. 99.- Se modifica el acápite a) del artículo 16 de la ley 3003, del 12 de julio de 1951, sobre Policía y Costas, el que a partir de la promulgación de esta ley, regirá del modo siguiente:

- “a) Vigilar el litoral de su jurisdicción y denunciar inmediata y directamente, por la vía más rápida y apropiada a las autoridades correspondientes más próximas, cualquier anomalía que observen en las costas o en las aguas territoriales, así como el tránsito de buques y aeronaves de nacionalidad extranjera”.

Art. 100.- Se modifican los artículos 119, 149 y 192 de la ley No.64-00, del 18 de agosto del año 2000, que crea la Secretaría de Estado de Medio Ambiente y Recursos Naturales (SEMARENA), para que en lo adelante digan:

“Art. 119.- Las leyes sectoriales y/o especiales que regulen el dominio, la conservación, uso y aprovechamiento de los recursos naturales deberán enmarcarse en lo establecido en la presente ley, excepto la pesca y acuicultura por tratarse de actividades de producción agropecuaria.

"Art. 149.- El Estado Dominicano regulará, mediante ley especial, la actividad pesquera de subsistencia, comercial e industrial; determinará los métodos y prácticas de pesca, la introducción, transplante, cultivo y cría, los lugares y las fechas, las especies que puedan capturarse, su tamaño, su sexo y el número de ejemplares que sea permitido capturar. Estas actividades serán responsabilidad del Consejo Dominicano de Pesca y Acuicultura (CODOPESCA) y la Secretaría de Estado de Medio Ambiente y Recursos Naturales.

"Art. 192.- Las leyes sectoriales o especiales, decretos y demás disposiciones legales, relativas al medio ambiente y los recursos naturales, deberán enmarcarse dentro de los principios y disposiciones de la presente ley y se considerarán complementarias de la misma, excepto la pesca y la acuicultura por tratarse de actividades de producción agropecuaria".

Art. 101.- Quedan derogados los artículos 194 y 201 de la ley No. 64-00, del 18 de agosto del año 2000, que crea la Secretaría de Estado de Medio Ambiente y Recursos Naturales.

Art. 102.- Se derogan el literal a) del decreto No.562-00, de fecha 23 de agosto del año 2000; el decreto. No. 224-01, de fecha 13 de febrero del año 2001 y el decreto No.1088-01, de fecha 3 de noviembre del año 2001.

Art. 103.- Se deroga 'el artículo 89. de la ley 3003, del 12 de julio de 1951.

Art.- 104.- La presente ley deroga las siguientes leyes, decretos y reglamentos y cualquier disposición legal que le sea contraria:

- Ley 5914, del 22 de mayo de 1962, sobre Pesca;
- Ley 635, del 2 marzo de 1,965, que modifica el apartado g) del artículo 45 de la ley de Pesca, No.5914, .de fecha 22 de mayo de 1962.
- Ley 565, del 1° de abril de 1970, que modifica el apartado c) del artículo 45 de la ley No. 5914, del 22 de mayo del 1962;
- Ley 557, del 17 de septiembre de 1973, que modifica el artículo 22 de la ley 5914;
- Decreto 1345, del 31 de mayo de 1967, que dicta medidas con el propósito de evitar la extinción de determinadas especies marinas (langosta, cangrejos y carey);
- Decreto 1002, del 21 de febrero de 1967, que declara zona de crianza dentro de los límites de la provincia de La Romana, todo el paso del Catuán, hasta Punta Aljibe, y de ésta hasta la isla Saona, comprendiendo la bahía de Catalina;
- Decreto 2515, de 1972, que prohíbe la captura de cangrejos hembras y de ostiones en el río Cumayasa;
- Decreto 2714, del 2 de octubre de 1972, :que deroga el decreto 2163, del 14 de abril de 1972;