

A Proposal for Authentic Sustainability of the Queen Conch (*Strombus gigas*) Harvest

Una Propuesta para la Sostenibilidad Auténtico de la Concha de la Reina (*Strombus gigas*) de la Cosecha

Une Proposition pour un Developement Durable Authentique du Lambi Recolte (*Strombus gigas*)

DIANNE LAWRENCE

Strombus Gigas Alliance, Unit 555 Quicksilver, San Pedro Town, AC 000000 Belize. sgablize@yahoo.com.

ABSTRACT

We will introduce Strombus Gigas Alliance (SGA) to the Gulf and Caribbean Fisheries Institute and its members. We will describe the current state of the conch harvest (Belize); habitat shrinkage, disproportionate waste, the lowering of catch quotas, and the effect on culture and livelihoods if authentic sustainable harvest is not implemented. CITES regulations inhibit governmental policies to address these issues sufficiently.

Currently the waste of the harvest is 85-92%, saving only the cleaned white fillets for export. By implementing collection practices, barge and shore landing of whole animals, the waste is reduced to 8-15% and the majority of the mollusk is used (Bahamas). The dirty meat can be used as animal feed and fertilizer, the operculum for handicrafts, and shells for a myriad of artisanal uses and aggregate components.

Part one of our plan will detail how to involve the fishers of Belize and the conch harvesting nations of the Caribbean to save the discards of the harvest (by-products) and provide a lifelong secondary income stream for fisher-folk and their families. Part two of our plan is to use five decades of discards from the shallows of the sea while cleaning up the conch habitat and creating employment. The difficulty this plan addresses is that CITES has governance of all derivatives and by-products of the *Strombus gigas* thus hindering international trade with other Caribbean nations and the global marketplace.

KEY WORDS: Conch, sustainable, livelihoods

INTRODUCTION

This paper outlines a new approach to the conservation and sustainable development of Queen Conch and related marine shell species. We hope this new approach will secure income and employment for thousands of Caribbean conch fisher-folk. The mollusk, known internationally as the queen conch or pink conch, and scientifically as the *Strombus gigas* of the *Strombidae* family, is a Caribbean marine animal of great importance to the diet and livelihood of families throughout the Caribbean. This document, drafted by Caribbean-based Strombus Gigas Alliance outlines an innovative strategy in support of sustainable harvesting and usefulness of the entire animal for international trade.

Strombus Gigas Alliance (SGA) is a Belize-based international Non-Government Organization (NGO) concerned with promoting the sustainability of the queen conch and related marine animals. SGA aims to establish new commercially sustainable markets for the by-products of the queen conch. Our mission is to promote a prosperous and sustainable *Strombus gigas* industry. Successful marine management plans have paved the way for our suggestions for the next 20 years of queen conch management. SGA also wants to ensure that regulations affecting the global trade of the queen conch better reflect the long-term cultural and socio-economic needs of the communities whose livelihoods depend on the continued harvest of this species.

BACKGROUND

In 1985, *Strombus gigas*, queen conch, was first noted in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) document, followed by inclusion in the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention) in 1990, which also included the Queen Conch in Annex II of its Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol). The fisheries of the world were beginning to acknowledge the importance of this species and started actions towards the protection of future harvests. Following the destruction of queen conch fisheries in Florida and other U.S territories in the Caribbean, the United States of America in 1992 recommended to the Convention on International Trade in Endangered Species (CITES) that *Strombus gigas* be included in the Appendix II of CITES. Its aim was to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

The Appendix II CITES listing raised awareness of the possibility of extinction of the species if previous harvesting practices were not changed. Of note is that the listing protects the commercial significance and continued availability of the conch meat product. According to CITES 2009,

When a species is included in one of the Appendices, all parts and derivatives of the species are also included in the same Appendix unless the species is annotated to indicate that only specific parts and derivatives are included.

Seven years after the first mention of *Strombus gigas* in a CITES document the inclusion of all parts of the species came under the legislation.

Since 1995, CITES has encouraged review of the biological and trade status of the queen conch under the Significant Trade Review process and has included local, regional, national and international organizations to assist with ensuring that the species is harvested in a sustainable manner. In the 20 years since the Appendix II listing some of the significant

protection measures have been Marine Protected Areas, Harmonized Fisheries Regulations (size, weight, catch quotas, lip thickness, fishing gear usage), Seasonal Closures, Data Collection on catch and export as well as research on the *Strombus gigas* reproduction, growth, and pearl development. CITES regulations have provided the governance while independent nations provide the controls for the export and import of this commercially threatened species (Conch Heritage Network). Management plans have been implemented for the protection and sustainability of this listed species to ensure future harvests and trade. Throughout the Caribbean Ministries of Fisheries are charged with the economic and laborious responsibilities of the environment, pollution, climate change, protection of coral reefs, marine protected areas, data collection, and the seasonal fishing regulations of various species, including the recent concerns with the lionfish.

Records show that the sustainability efforts have been working. According to NOAA (2009) import data of queen conch meat to the United States showed a substantial reduction from 1998 to 2009; 1,832,000 kg to 387,000 kg respectively. The CITES Trade Review 2012 show that 11 independent countries remain of *Possible Concern*, three countries were identified as *Urgent Concern* and two remain in the category of *Trade Suspended*. Only seven countries meet the level of sustainability for the category of *Least Concern*.

CURRENT HARVESTING PRACTICES

It is necessary to kill the animal in order to gain the meat product. The meat is the main product of this commercially exploited species; the remainder is considered to be the derivatives or by-products and *are rarely the results of a direct harvest* (Mulliken 1996, Chakalall and Cochrane 1996). The by-products include the conch shell, the undesirable meat scrapings (dirty meat), the operculum, enzyme rod and the pearl, if one should happen to be found. Once the meat is removed from the shell, approved fishing practices allow the shell and all derivatives to be discarded at sea in several countries. The discard from decades of this fishing method has created underwater mounds (middens) of shells which do not biodegrade nor create reef; the discarded shells are thought to shrink the conch habitat.

Local fishers report that, if freshly cleaned conch shells are discarded in the sea, living conch will in fact abandon the area (Julie Gauthier, personal communication, December 2002).

The traditional means of harvest and wasted by-products have become detrimental to the limited habitats that nurture the queen conch to maturity. This method of fishing allows fishers with no option but to waste a majority of the animal at sea thus hindering repopulation in the vicinity. Fishers have to travel further and dive deeper to meet the quotas for their livelihoods. Though not illegal, the disproportional wasted parts of the animal are a recurrent theme with human predators, e.g. as with the shark hunt, cut off the fins and discard the carcass.

Some commonly acknowledged facts about current harvest methods of the Queen Conch are:

- i) The meat is the commercial product of the *Strombus gigas*; the remainder is called the by-product (Chakalall and Cochrane 2009, Medley 2008).
- ii) Conch is harvested at an age 3-5 years on average.
- iii) Depending on the size and age of the animal, and the processing practice, the meat accounts for only 15% of the weight of a live animal (Formoso, 2001).
- iv) The "meat weight" is averaged between 72 - 78 g per animal for processed meat and 183 g per animal for unprocessed or dirty meat (Thiele 2001).
- v) 500 kg of unprocessed queen conch meat is harvested from approximately 3,500 animals, assuming an average meat weight of 143 g (Theile 2001).
- vi) 500 kg of 100% cleaned queen conch meat at an average of 72g would equal almost 7,000 animals (Theile 2001).

The above facts can be translated into the following mathematic equations; 908 grams of live conch, minus 72 grams of average meat weight, equals an industry approved accepted waste of 836 grams per animal harvested, or 92% of derivatives supporting an 8% commercial meat catch. Referring back to the 2009 data on the reduced American imports of conch meat, 387,000 kg would require slightly more than 5.4 million animals to be caught, killed and discarded for only 8% - 15% of the total allowable catch quota. In the 2012 - 2013 harvest season the country of Belize surpassed the 2009 American import total allowable meat weight by almost 100,000 kg. The number of live animals increased as well as the shells and other derivatives that were discarded. It is important to note that the wasted meat scrapings are approximately the same amount of meat weight as the conch meat for harvest and export.

The queen conch has been divided into commercial meat products and wasted by-products under the same governance. Relegated for secondary economics (handicrafts, jewelry, fill materials) the derivatives are also regulated and restricted by the CITES agreement (Mulliken 1996, Chakalall and Cochrane 1996). This regulation has led to the seizure of thousands of shells annually and impeded the marketability of the wasted by-products. Belize has created a limited CITES permit for tourists to purchase if leaving the country with a conch shell souvenir. The limited permit seems to be a step in the right direction for shell artists and carvers, however it is difficult to find where to purchase the permit. Artisans do not sell it, nor does any government authority at the international airport. Tourists returning home from Belize continue to have their shell souvenirs confiscated (San Pedro Sun 2013).

Published October 12, 2013 (Caribbean News Now) was a decision by CITES to allow the export of by-products of the queen conch in the Turks and Caicos Islands (TCI).

In view of the hardships faced by vendors as a result of the existing legislation, the Department of Environment and Maritime Affairs (DEMA) made a formal appeal to CITES for the TCI to be allowed 'permitted' [to] export conch shells, pearls and jewelry during the closed season. CITES has now responded and has agreed to allow the export of the above mentioned products, pending revision of the existing TCI legislation and the submission of the annual CITES report from DEMA.

**PART ONE –
AUTHENTIC SUSTAINABILITY IN HARVEST**

SGA is concerned about the sustainability of the livelihood of fisher-folks and their communities. The next steps to ensure the sustainability of the conch harvest economically and culturally is by using the derivatives as a secondary income stream by opening new export markets. Fishers recognize that the shell discards into the sea are shrinking the accessible habitat. Also, an unspoken concern of fishers is that one natural disaster (hurricane, volcano, or tsunami) or a man-made disaster, like the BP oil spill in the US Gulf of Mexico, could destroy the habitat and impede the harvest for several years or possibly decades. The restrictions of the CITES legislations following the Appendix II listing is for the sustainability of a species for commercial trade. SGA supports trade, not waste.

The derivatives of the queen conch have many diverse qualities and uses which would potentially create new export markets. Currently, the by-products can be used in the country of harvest; however the staggering amount of by-products from the meat harvest prove that another commercial market is ready to be established to guarantee continuous sales for continuously wasted, yet useful, items. In the country of Belize alone, more than five million animals were harvested in the 2012 - 2013 season. If collected during harvest, the shells can provide a secondary export market and income to fishers.

The Bahamas has a requirement of barge and shore landings for the animals during harvest season. The shells are collected at different stations, graded for export and packed into containers for export to overseas markets. Some shells remain in the country for tourist souvenirs as well as beautification projects and landscaping. SGA Belize would like to aid the country of Belize in accomplishing a similar system of barge and shore landings. Belize has an artisanal fishing fleet with limited space aboard the vessels for the by-products. We propose to go out to the fishers and collect the shells directly from them with barges. We would bring the discarded waste and shells to shore and employ the communities to clean, grade, and process the shells for export. The opercula also would be collected, and the meat scrapings dried or frozen for processing as fish bait or fertilizer in closed season. As we do not wish to interfere with the process of the meat harvest, we believe that by preserving the waste for processing in the closed season will keep fishing communities employed. Of interest is the amount of wasted dirty meat is approximately the same amount of meat as the actual meat harvest.

In the Turks and Caicos, Dr. Mark Woodring patented a meat extraction tool to assist fishers in removing the conch meat without 'knocking' or breaking the shell. SGA has reworked this invention and is willing to share this new tool with the fishers for pristine shells which can reach a better market value. Using the tool to remove the meat is far easier than breaking the shell. SGA is willing to develop a new commercial market for these pristine shells. We seek the endorsement of CITES and small nation governments to be allowed to do this in a manner that can continue for decades.

An analogy for the usefulness of conch derivatives is made with the forestry companies and regulations in Canada and the USA. Forty years ago in the logging industry it was discovered that huge amounts of resources were left on the ground to rot. Trees were cut at five to seven feet above the root and branches trimmed off and discarded. Logs were moved to the mills, akin to harvesting stations, and the bark, wood chips and sawdust was burned. Today, a secondary industry has evolved using the by-products and waste of the tree harvest, e.g. the bark as landscape products, wood chips as particle boards and building materials, sawdust as paper products, and branches with needles and leaves used as mulch. In forestry, the emphasis on 'no waste' and recycling endorses usage of all parts of the tree.

Also of interest is the reclamation of sunken, underwater logs discarded in the 1800s, yet preserved by the water. These logs are highly desirable as antique wood. By removing them from rivers, lakes, and the oceans underwater logging was established. Reclaiming the sunken logs from waterways is commended by boaters for eliminating the safety threats of deadheads and environmentalist for cleaning up the habitat. Furthermore, reforestation, tree planting, has ensured a continued renewable resource of trees needed to guarantee the logging industry is sustainable. These examples from forestry are the same next steps towards authentic sustainability that can be achieved with the queen conch.

The derivatives of the queen conch can provide a usefulness towards sustainability and a secondary commercial export market as the derivatives of the tree harvest in forestry. The following are only some of the uses for the wasted by-products of the meat harvest.

- i) Operculum – art and jewelry, mosaics ,
- ii) Pistle (enzyme rod, crystalline style) – food delicacy and possibly food additive or preservative,
- iii) Dirty Meat – fertilizer, animal feed, bait,
- iv) New Shells – individual or bulk sales, carvings and art, bowls, folk instruments, tile making, calcium supplements, spa products, skin creams, amino-acids, antioxidants,
- v) Old Shells – collect old (midden) shells for land fill, aggregate, landscape materials, break waters/jetties, tufa compounds (Conch-crete TM), heat resistant products, animal feed/meal, and
- vi) Conch Pearl – natural or cultured, a rare by-product useful in jewelry throughout history.

PART TWO – AUTHENTIC SUSTAINABILITY FOR THE HABITAT

Ancient conch shell mounds, called middens, at the Marco Gonzalez Maya Site on Ambergris Caye in Belize are reported to be over 2000 years old (personal communication, Elizabeth Graham 2009). These old shells are now bleached and brittle but still recognizable as queen conch shells. They have not biodegraded over time. Nor have the underwater middens degraded from decades of discards overboard with approved conch harvesting methods. The underwater middens also remain as recognizable shells though do not create or add to the reef like the bodies of other animals. Other than small fish and octopi hiding inside the discarded shell structures, there appears to be no other benefits to marine life. Simply put, no one wants to live in a graveyard, not even the conch. Acknowledged by fishers, the discarded shells are detrimental to the habitat by causing the live conch to move to deeper waters.

Reclaiming the old or midden shells from the sea floor holds many benefits for conch harvesting nations. First, is the benefit to the habitat. Akin to the forestry industry removing underwater logs, removing the underwater shells will allow the sea grasses to grow again. It is highly likely that the range of the queen conch will return to renewed habitats. No scientific data has been found by the author to prove this theory, however nature has a tendency to thrive when given the chance.

The second benefit of cleaning up the conch habitat is environmental. Shells removed from the water can still serve a purpose. Crushed, they can become landfill, jetties and breakwaters as well as natural seawalls. Other uses of the old shells include the making of tiles, conch-crete™ for foundations, road-fill, and landscaping. Instead of tearing down mountains of rock, the discarded conch shells can be used instead. For many years, islands in the region used conch shells to build roads and fill land. The trend to use mountain hardcore and rocks came about with the convenience and affordability of transporting the raw products in desirable sizes to specific locations. But a mountain is not a renewable resource. Once a mountain is mined for the rock content, and spread all over the country, the mountain is gone forever. The meat harvest will continue. The wasted conch shells, new and old, can have a renewed purpose by being recycled.

Another benefit of cleaning the conch habitat and recycling the old, midden shells is economics. Governments and individuals pay for fill. The technology exists to crush shells into uniform sizes and screened to suit specific purposes like with rock. Where technology is not practical or affordable, simplified tools can be developed to perform the same function and be replicated inexpensively.

Recycled by-products of the conch have a market both locally and internationally. SGA Belize is prepared to help clean up the habitat, remove the midden shells, and find new markets to recycle old shells. This would create employment in closed season and provide a secondary income stream to fishers and their communities and revenue for the Government of Belize. It would also help the conch move back to renewed habitats and begin the next steps towards authentic sustainability.

CONCLUSION

The 1992 CITES Appendix II listing was a necessary wake-up call for *Strombus gigas* fisheries. We do not need to wait for a disaster to augment the conch meat harvest to have the next step towards authentic sustainability of the species now. Onshore and barge landings would allow access to the collection of derivatives which can provide a secondary income stream to fisher-folk and their communities, creating employment and business opportunities in the communities where the queen conch is harvested. This means adopting an attitude of zero-waste for a species that has waited many millennia for us to adopt it completely.

What next? Now is the time to plan for the next 20 years of sustainability. We can sit back and wait for the outcome of the Department of Environment and Maritime Affairs (DEMA) in the Turks and Caicos petition to CITES for the sale of by-products during the closed season to be resolved and individually, as independent countries follow suit. Or we can coordinate our efforts to establish a secondary export market for uses of the derivatives. SGA is willing to help reach the next level of sustainability. Ideally, SGA would like the derivatives of the conch harvest annotated from the CITES governance; it is all wasted. However, if the derivatives cannot be annotated, we request decision-makers in governments and CITES to consider our plan to develop new export markets solely from the wasted derivatives of the meat harvest. We seek your support to establish a habit of 'no waste'. This would encourage total usage of each animal and improve the sustainability of the species as a complete product for marketable trade.

LITERATURE CITED

- Appeldoorn, R.S. 1988. Age determination, growth, mortality and age of first reproduction in adult queen conch, *Strombus gigas* L., off Puerto Rico. *Fisheries Research* 6(4):363-378.
- Association of American Feed Control Officials (AAFCO). 2009. <http://ilcresources.com/feedgradecalciumpcarbonate.aspx>.
- Brownell, W.N. and J.M. Stevely. 1981. The biology, fisheries, and management of the queen conch, *Strombus gigas*. *Marine Fisheries Review* 43(7):1-12.
- Cárdenas, E.B. and D. Aldana Aranda. 2010. Histories of success for the conservation of populations of queen conch (*Strombus gigas*). *Proceedings of the Gulf and Caribbean Fisheries Institute* 62:306-312.
- Caribbean Fisheries Management Council. 2001. Pages 60-76 in: S. Theile (ed.) *Queen Conch Fisheries and Their Management in the Caribbean*. TRAFFIC Europe, Cambridge, United Kingdom.
- Chakalall, B. and K.L. Cochrane. 1996. The queen conch fisheries in the Caribbean – An approach to responsible fisheries management. In: J. Posada and G. Garcia-Moliner (eds.) *Proceedings of the First International Queen Conch Conference*. San Juan, Puerto Rico, 29-31 July 1996.
- CITES. 2002. Interpretation and implementation of the Convention - Significant trade in specimens of Appendix II species - *Strombus gigas*. *Forty-sixth meeting of the CITES Standing Committee*, Geneva, Switzerland, 12-15 March 2002. 2 pp. Also available at: <http://www.cites.org/eng/cttee/standing/46/46-16-2.pdf>.
- CITES. 2003. *Review of Significant Trade in specimens of Appendix-II species (Resolution Conf. 12.8 and Decision 12.75): Progress on the Implementation of the Review of Significant Trade (Phases IV and V)*. Nineteenth Meeting of the Animals Committee, Geneva, Switzerland.
- CITES. 2009. Appendices I, II, and III.
- CITES Trade Review (2012), *Evaluation of the Review of Significant Trade: Case Studies*, AC26/PC20 Doc. 7 Annex 5.

- Clark, S.A., A.J. Danylchuk, and B.T. Freeman. 2005. The harvest of juvenile queen conch (*Strombus gigas*) off Cape Eleuthera, Bahamas: implications for the effectiveness of a marine reserve. *Proceedings of the Gulf and Caribbean Fisheries Institute* 56:705-713.
- Coastal Zone Management Authority & Institute (CZMAI). 2014. State of the Belize Coastal Zone Report 2003–2013. CZMAI, Belize City, Belize.
- Community Conch. 2013. <http://www.communityconch.org/>. September 2013.
- Conch Heritage Network. 2013. <http://www.savetheconch.org>.
- Davis, D. and K. Olfield. 2003. Archaeological Reconnaissance of Anegada, British Virgin Islands. *Journal of Caribbean Archaeology* 4.
- Davis, M. 2005. Species profile: queen conch, *Strombus gigas*, Southern Regional Aquaculture Center Publication No. 7203.
- DuFault, A. 2013. *Underwater Logging Is Not Only a Real Thing, It's Pretty Awesome Too*. <http://www.takepart.com/article/2013/01/11/deadhead-lumber-calls-logging-history-not-jerry-garcia>.
- Food and Agriculture Organization of the United Nations (FAO) 2011. *World Markets and Industry of Selected Commercially-exploited Aquatic Species: Caribbean Queen Conch (Strombus gigas)*. <http://www.fao.org/DOCREP/006/Y5261E/y5261e07.htm>.
- Florida Atlantic University. 2009. *Creating Cultured Pearls from the Queen Conch: Scientists Unlock Mystery*. ScienceDaily. <http://www.sciencedaily.com/releases/2009/11/091104000927.htm>.
- Government of Belize, Ministries of Agriculture and Fisheries 2011. *Belize Conch Standard Definitions Poster: Belize Fisheries Educational Programme, Standardized Conch Meat Weights*. Belize Fisheries Department, Belize City, Belize.
- Horiuchi, S. and C. Lane. Oct. 1965. Digestive enzymes of the crystalline style of *Strombus gigas* Liane 1 cellulase and same other carbohydrases. *Biological Bulletin* 129(2):273-281.
- Kuhn-Spearing, L.T., H. Kessler, E. Chateau, R. Ballarini, A.H. Heur, and S.M. Spearing. 1996. Fracture mechanisms of the *Strombus gigas* conch shell: implications for the design of brittle laminates. *Journal of Materials* 31(24):6583-6594.
- Medley, P. 2008. Monitoring and managing queen conch fisheries: a manual. FAO Fisheries Technical Paper No.514. Rome, Italy.
- Ninnes, C. 1994: A review of the Turks and Caicos fisheries for *Strombus gigas* L. Pages 67-72 in: R.S. Appeldoorn and B. Rodriguez (eds.) *Queen Conch Biology, Fisheries and Mariculture*. Fundacion Cientifica Los Roques, Caracas, Venezuela.
- NOAA. 2009. National Marine Fisheries Service Fisheries Statistics and Economics Division.
- NOAA. 2011. *Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands; Queen Conch Management Measures: A Rule by the National Oceanic and Atmospheric Administration*. <https://www.federalregister.gov/articles/2011/04/29/2011-10446/fisheries-of-the-caribbean-gulf-of-mexico-and-south-atlantic-queen-conch-fishery-of-puerto-rico>.
- NOAA Fisheries, Office of Protected Resources. 2013. Queen Conch: *Strombus gigas*. <http://www.nmfs.noaa.gov/pr/species/invertebrates/queenconch.htm>
- Oceana. 2012. *Marine Wildlife Encyclopedia: Queen Conch, Strombus gigas*. Retrieved from: <http://oceana.org/en/explore/marine-wildlife/queen-conch>.
- San Pedro Sun Newspaper. 2012. *Conch Survey Conducted Countrywide*. September 06, 2012 edition.
- San Pedro Sun Newspaper. 2013. *Conch Shell Souvenirs Require a Permit for Exportation*. December 27, 2013 edition.
- Shawl, A. And M. Davis. 2005. Harbor Branch Oceanographic Institution develops recirculation systems for queen conch: captive breeding to juvenile grow-out. Pages 25-28 in: *Hatchery International*, November/December 2005.
- Stoner, A.W. 1994. Significance of habitat and stock pre-testing for enhancement of natural fisheries: Experimental analyses with queen conch *Strombus gigas*. *Journal Of The World Aquaculture Society*, 25(1):155-165.
- Theile, S. 2001. *Queen Conch Fisheries and Their Management in the Caribbean*. TRAFFIC Europe, Cambridge, United Kingdom.