



Checkmate for the Queen conch?

The next extinction due to
over exploitation?

The Queen
Conch
(*S.gigas*)

For centuries, the inhabitants of the Bay islands have been traditionally fishing for Queen conch as a part of their livelihood. Has the time come where these actions are no longer sustainable? The work of professor Steve Dunbar, based at the Reef House Resort in Roatan, is to find out exactly that.

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Roatan is located within the Bay islands just north of the Honduran coast in

the western Caribbean. It's rich culture and spectacular dive sites make it a popular holiday destination for tourists

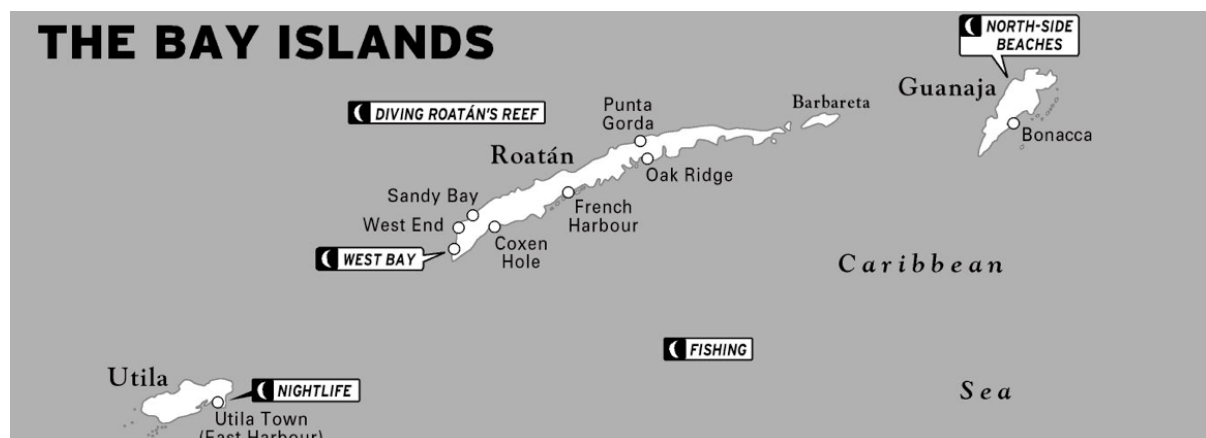
around the world. Tourism provides a huge economic stability for the islanders, although fishing is invaluable to their survival and part of their everyday life. The picturesque emerald blue-green sea surrounding the bay island is extremely species rich, although over fishing is putting many species in danger, one of which is the Queen Conch. Honduras was responsible for 40% of total Conch export going into the USA in 2001; although even with legislation and banning of fishing practices that are put in place to protect these invaluable marine organisms, if demand for Conch based products remains as high as recorded in 2001, fishing practices will continue to threaten this species.

The work of Steve Dunbar of Loma Linda University is based at the Reef-house resort overlooking the southern Roatan reef on the east end of the island. This small but homely resort offers home cooked meals, small cabaña rooms and access to fantastic dives sites all along the extensive reef systems. On arrival Steve shows us the 35x15m sea grass bed that has been sectioned out in front



Steve Dunbar of Loma Linda University, California, USA.

of the resort for Conch to be collected, observed and used for data collection, (as well as being a good snorkelling area for guests). "This pen used to be really safe as the previous owner's dog called Mutely scared off the locals from stealing the Conch, but since the owners have recently changed, we find empty Conch shells thrown back into the pen that have been drilled into for their meat by local kids" said Steve; "it's a real problem here, but it's a part of their livelihood,



Roatan is located within the island chain of the Bay Islands off mainland Honduras in the Western Caribbean Sea. (Photo provided by Moon.com, The Bay Islands)

changing habits that have been imbedded in local culture for centuries is extremely difficult.”

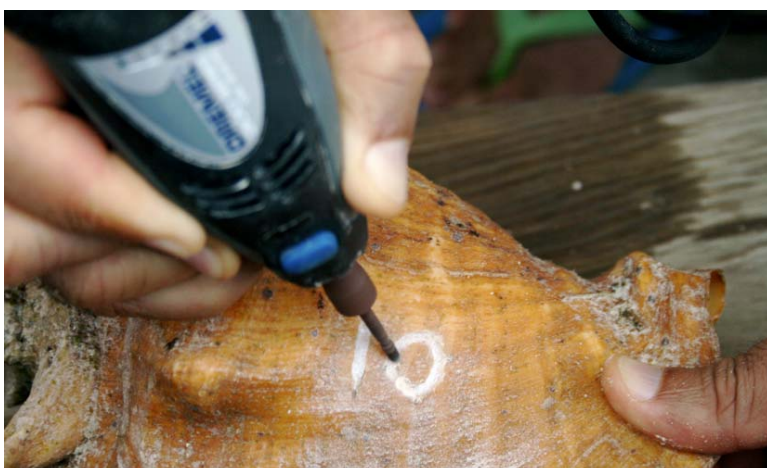
Whilst spending our first afternoon under the golden sunset with Steve, we learn that the Queen Conch are particularly susceptible to over fishing due to their morphology and life cycle; they are slow growing marine molluscs that have delayed reproduction, usually reaching sexual maturity around 27-28 months old. This inevitably means that it is hard to recover depleted populations as they need time to

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mature and reproduce to recruit their population numbers; especially under such intensive fishing practices like these in the Bay Islands. They inhabit sandy-bottomed

areas at around depths of 10-25 meters deep, well in-range of local fisherman free divers and scuba divers. Being marine snails, they search the sea floor for food extremely slowly using their muscular foot to drag them along the substrate; this leaves them no chance of escape from predators. As the juvenile Conch has relatively the same meat content as their mature counterparts, mostly all individuals

that are found are caught therefore destroying any population dynamics. Population numbers have depleted so much so that now only 10-15 individuals are found per hectare in the Bay Island regions. A normal population should have around 200 mature Queen Conch per hectare in order to reach a level of healthy recruitment to hold the population.



Above: The reefhouse research pun used to hold the Queen Conch for research

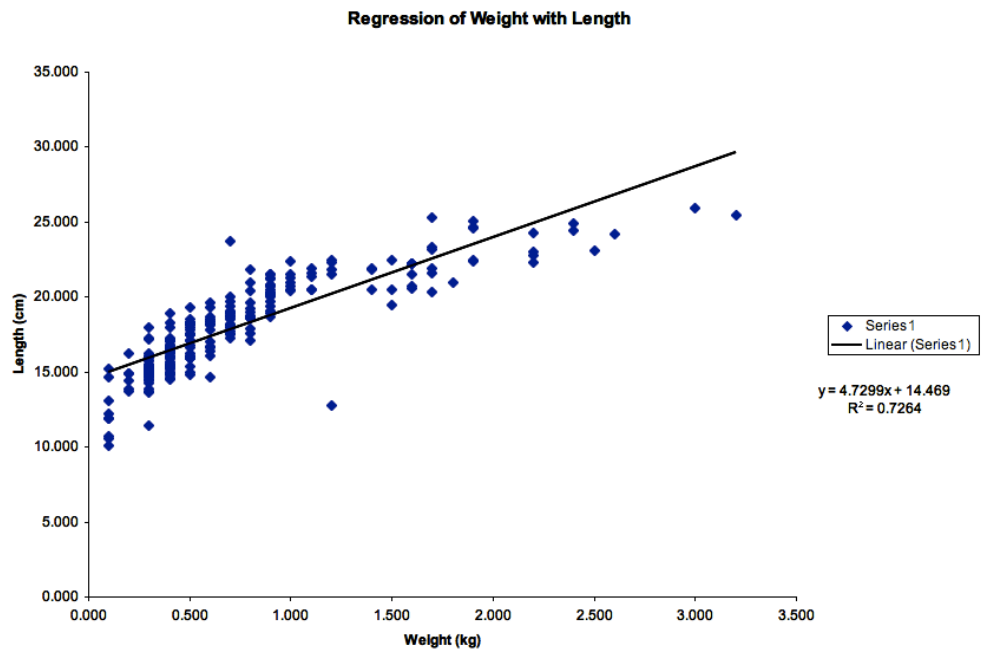
Below: The dremmel tool to drill numbers into the Conch shells.

The research being done at the Reef House by Steve is focused on looking at the growth and recruitment rates of the Queen Conch. This information will give invaluable insight into the complex population dynamics and ecology of these animals. This knowledge can then be applied to specific conservation efforts and legislation to limit Conch fishing without having detrimental effects to future population numbers around the Bay Island, and other areas of the Caribbean.

The reef house had all the equipment needed to undertake full data collection for Steve's research. In order to accurately calculate the growth of Conch over a time period, a beginning weight, shell length, shell width and lip thickness had to be measured in order to then be compared to the same individual later on in time.

Labelling the Conch consisted of drilling a number into the conch shells using a dremmel tool. This meant that when re-sampling the Conch in a year's time for their second measurements, they could easily be identified. On the 25th July 2007, data collection started which meant that no more Conch would be added into the pool, therefore any new Conch found in the pool after the data collection start date would be offspring of the current occupants. The 3rd phase of measurements were needed to add to Steve's data base, so for 10 days, 300 Conch were individually measured for their weight, length, width and lip thickness by Tim and I. Any newly produced juveniles found within the pen from previous years were also recorded, given a shell number then placed back into the research pool until next time.

Once all the data had been collected and collaborated, regression analysis on each of the measurement categories against each other were carried out; these were the Conch: 1) shell length v weight, 2) Shell width v weight, 3) lip thickness v weight, 4) shell length v shell width, and 5) shell length v shell lip thickness. The R squared result for 1) showed a value of 0.7264, meaning that one



Regression analysis Graph showing the R Squared value for Shell Length v Weight. (Graph provided by Steve Dunbar, Loma Linda University)

can predict the weight of a Conch by using its length as 72.64% of the time, that prediction will be accurate. Knowing this, it is therefore plausible to predict the weight of a Conch by only measuring its length, making data collection in the field much more logistically simple needing fewer pieces of equipment on dive vessels and in the water. The R squared values for the other comparisons were not as strong as the first, and it seemed that the lip thickness is the least easy to predict against other categories. This is not surprising as it takes queen Conch over 22 months to mature, this all being dependent on the individual and environmental conditions. The energy consumption needed metabolically to produce sexual organs and gametes is extremely high in many animals, meaning that reduced food sources and unfavourable environmental conditions may delay the sexual maturity of Conch until limiting factors improve. As the larger Conch had been originally collected from different sites all



Steve at the Reef House bar, entering into the computer Conch measurement data.

along the southern reef system, it would explain their different maturation times due to these factors.

This work carried out by Steve is still in progress although assumptions can be made at this early stage to the basic growth patterns of the Queen Conch. Steve's work concerning the recruitment of Queen Conch still needs more data collection as from the original stocks caught in 2007, the juvenile development is still lagging a year behind the mature adults. With a few more years of data collection and research, Steve will be able to predict the recruitment rates of known population numbers, and what management changes need to be made in order to reach these required targets. Currently, the Honduran government does know about the increasing threat to the Queen Conch from organisations such as the convention on international trade in endangered species of wild fauna and flora (CITES agreement), and has started to make progress to protect the species. No-take reserves and closed fishing seasons are under current legislation although due to enforcement issues,

“We’re going to make a difference to sea turtle conservation in Central America!”

policing is very poor and illegal fishing practices are still out of control. This is mainly due to the top-down management style having governments enforce legislation onto the local people. Maybe a better management style that has been successfully used in other less economically developed countries (LEDC's), is to pass knowledge to the coastal communities and allow them to manage their coastal areas and fish stocks themselves. This management style of letting the local communities look after their own resources will improve not only reef and coastal policing (as the community will be directly involved), but as fish stocks and catch improve, word of mouth will encourage other surrounding communities to adopt these management styles. In order for this to work, emphasis will have to be made on helping the community and not trying to take over and change their traditions and practices. This seems to be the best compromise between the two conflicting parties, and once the trust between the government and local people has strengthened, they may be able to work together in the future in order to preserve this invaluable economic and environmental resource.

Steve's work in Honduras is not only limited to the Queen Conch, he spends a majority of his time on the mainland as well as Roatan working with the endangered Turtle species of the Caribbean. In 2006, he formed and became the president of the Protective Turtle Ecology Centre for Training, Outreach and

Research (proTECTOR). “We’re growing quickly, but there’s potential for so much more to do. We’re going to make a difference to sea turtle conservation in Central America!” says Steve. Working and educating the local people at grass roots levels is how the organisation aims to conserve and protect these now highly endangered sea Turtles. Projects now include Turtle Awareness and Protection Studies (TAPS), which involves tracking juveniles along the coast of Roatan, satellite tracking (SatTrack) and the national Nesting Beach Monitoring Network (NBMN). These projects are now extremely important to contributing to understanding Turtle ecology and the threat to sea turtles from humans worldwide. All species specifically found in Honduras, including Hawksbills, Greens and Leatherbacks are all classed as either ‘endangered’ or ‘critically endangered’. The tagging and Turtle measurement work carried out by Steve and his research assistants helps to obtain data in order to understand the circumstance in by which Turtles get caught in nets by local fishermen. The key to protecting Turtles is by having a wide range of conservation methods that protect each life stage of the Turtles. In the past, emphasis has been made on protecting the laying adults and the hatchlings on specific known Turtle beaches, and although this does increase the survival ratio of the juveniles, it is the sub-adults (16-21 years old) and the novice breeders (22 years old) that are at the most threat due to intensive fishing methods. This population stage model study produced by Crouse et al. in 1987 concluded that even if all the conservation efforts of protecting the hatchlings was 100% successful, the other pressures declining the Turtle populations



ProTECTOR logo. (Provided by turtleprotector.org)

later in life would still unfortunately cause population declines and outweigh the efforts of protecting the juveniles. Due to this, legislation has changed for the better and the use of Turtle Exclusion Devices (TED’s) inbuilt into commercial fishing nets is now widely used. Unfortunately, Turtle populations are still in the decline worldwide. All these projects and data collections organised by Steve and others like him around the world hold invaluable insight into the life of these amazing creatures, and ultimately, the more knowledge we can obtain, the better applied conservation methods and legislation can be put into practice to ensure the survival of the endangered sea Turtle species in Honduras and around the globe.

The work Steve does in his spare time shows his dedication and love for the marine environment. Getting out there into the field and making relationships and life-long friends with the locals (who usually assume that westerners are trying to tell them to change their lifestyle), is in its self an amazing feat. These projects are known to make a difference, regardless of how far down the line these changes can physically be recognised. Steve lives for his work, and I personally want to thank him for his time and knowledge that he has not only passed onto me, but all whom he works with. Preserving

the marine environment and all associated with it is paramount, and it is extremely reassuring to know that we have scientists in the height of their fields out there like Steve on the front line actively making a difference, especially in the current climate of global warming, war and extinctions. This work is ultimately for the good of our children, hopefully, they won't be as complacent and naïve with our planet as past generations have been.



I would like to thank Steve Dunbar for all his patience and time; I hope this article can somehow show you how appreciative we both are. Ed and Capin' Julie, thank you both for keeping us fed and thoroughly watered, I'm sure we'll both be down soon to come keep you company. Thank you to Mike and all the Reef House crew for looking after us and making us feel welcome; and of course David Swain and Seavert, for being there and helping us with our research when we needed extra hands. Big up to Tim 'the haymaker' Heyes, pleasure to travel with you buddy, and a massive thanks to The 'Big Dog', this wouldn't have been possible without out you. x

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