

How Fishing Pressure Can Influence the Evolution of Queen Conch

The queen conch (*Strombus gigas*) is a gastropod mollusk found in the western Atlantic Ocean. Queen conchs play an important role as herbivores in the marine environment. They are also culturally and economically important to countries like The Bahamas who rely on them for food and other products. Queen conch are currently listed as Appendix 1 - endangered on the Convention on International Trade of Endangered Species list [3]. It is important to understand how human actions can impact conch populations so that we can promote sustainability and mitigate for any negative effects.

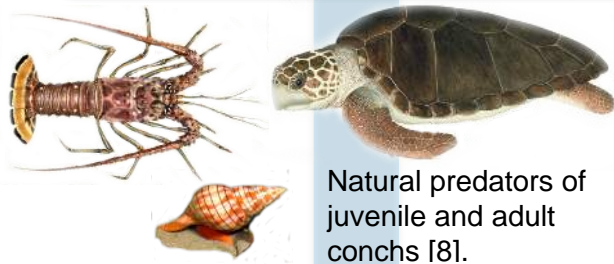


UN-FISHED POPULATION



OVER-FISHED POPULATION

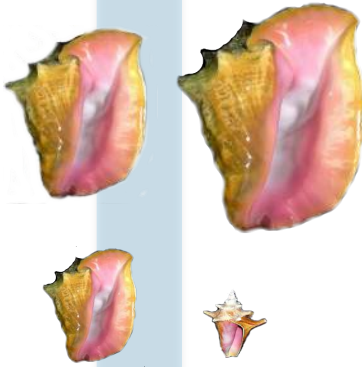
What happens to a natural population of mixed ages, sizes, and sexes?



Natural predators of juvenile and adult conchs [8].

Predation and fishing remove individuals from the population.

Predation removes an assortment of individuals of different sizes, ages and levels of reproductive fitness [8, 9].



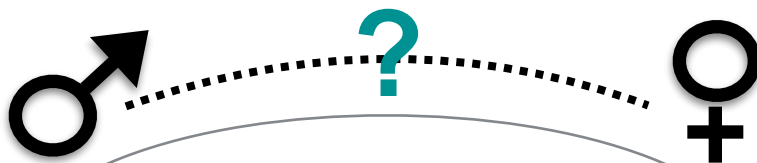
Populations are healthier when they have a diversity of individuals. There is less chance for in-breeding and populations are better able to respond to environmental changes without being extirpated [2].



Fishing practices tend to focus on the largest individuals, which give the greatest return for investment [1, 7, 11].

Removing the largest mature conchs from the population means that only the smallest adults are left behind to reproduce.

Natural Selection
Even though this population is not being fished, there are still factors that can influence evolution. Genetic mutations and changes in the environment coupled with natural selection can influence the makeup of a population. The conch that are "better suited to their environment are the ones that survive" [2, 12].



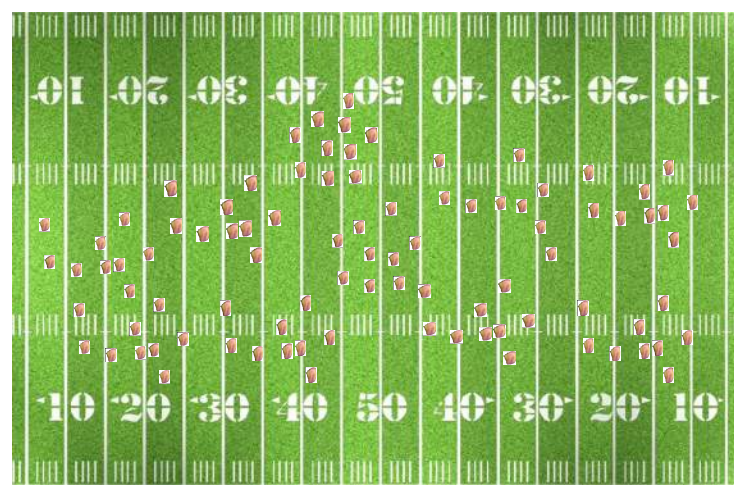
Mating is density-dependent. If there aren't enough conchs in an area, they won't be able to find a mate! This can incur an **Allee effect**, which can cause a downward spiral in population size [11].



Populations of small thick-shelled conch called "samba" have been discovered in fishing grounds in Berry Islands and Andros, Bahamas.

Mature adults are much smaller in size and reproduce less often than a typical mature conch [1, 11]. Samba conch were not observed in a local marine protected area [11].

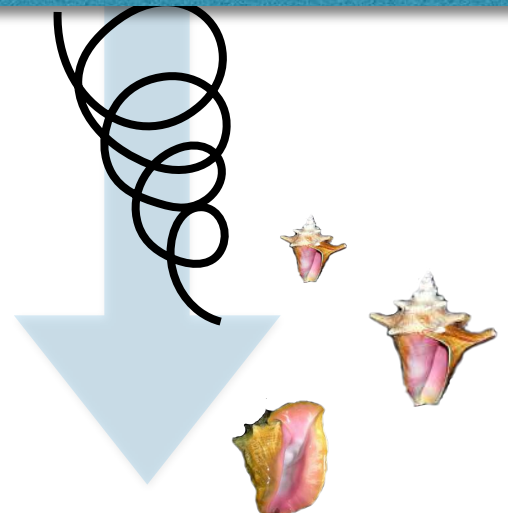
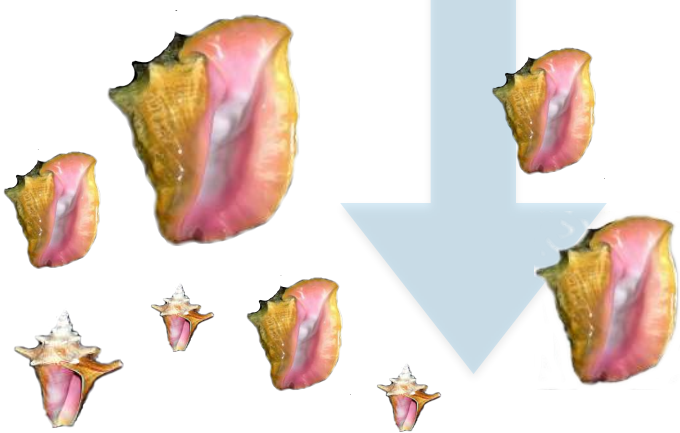
Queen conch need to come in contact with each other to mate. This strategy makes them more susceptible to factors that can reduce offspring survival [11].



A minimum of 56 mature conch per hectare is required for there to be a chance for mating success [10, 11]. A football field is approximately two hectares.

Allee Effect
At low population densities further decreases in individuals can cause a decrease in the rate of reproduction, which can self-perpetuate until the population becomes extinct. If the individuals left behind by fishermen have low capacity for reproduction this further impacts the population [4, 5, 11].

Smart and sustainable fishing practices can help avoid the Allee effect and ensure that there will be populations of conch for future generations to enjoy [6].



Which future do you want to see?

References

- [1] Berkeley et al., 2004; [2] Dobzhansky, 1950; [3] CITES, 2013; [4] Courchamp et al., 2009; [5] Gascoigne et al., 2012; [6] Kuparinen & Merila, 2007; [7] Law, 2000; [8] Randall, 1964; [9] Stoner & Glazer, 1998; [10] Stoner et al., 2000; [11] Stoner et al., 2012; [12] Webster, 2000.

For full citations see:

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