

# How will the predicted ocean temperatures of 2100, impact larval development of *Lobatus (Strombus) gigas* in the Caribbean region?

Madison Jane Pollard (pollmj@mail.broward.edu) | Broward College

## Introduction

- The Caribbean region is adversely impacted by climate change.
- Calcareous shelled organisms are at risk of inhibited larval development at high ocean temperatures.
- Given predicted sea-surface temperatures due to global climate change for the year 2100 (by NOAA) researchers are predicting at which temperatures these changes could affect larval development of Queen Conch, *Lobatus (Strombus) gigas*.
- Larval mollusks of other species of conch have showed maximal growth and survival rates under ideal temperatures (24-28°C), with survival rates decreasing at high temperatures and low pHs (Aranda & Manzano, 2017).

## Research Question

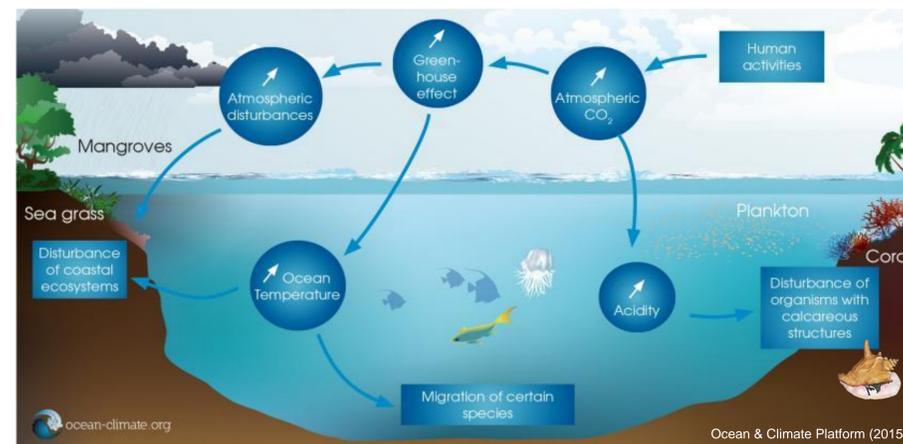
How will the predicted ocean temperatures of 2100, impact larval development of *Lobatus (Strombus) gigas* in the Caribbean region?

## Evidence

- Carbon emissions from human activities (e.g., burning of fossil fuels, deforestation) are causing ocean warming which has affected marine organisms at multiple trophic levels (NOAA, 2020).
- The ocean absorbs 30% of the carbon dioxide released into the atmosphere, as atmospheric CO<sub>2</sub> increases, so will that absorption percentage. (NOAA, 2020).
- Sea snails used to predict the outcome of ocean warming and acidification.
  - Shells placed in sea water with pH and carbonate levels projected for the year 2100 were observed to slowly dissolve after 45 days.
- By 2100, the CO<sub>2</sub> levels are predicted to rise to 936ppm making the global temperature rise by about 5-6°C (NOAA, 2020).

## Explanation

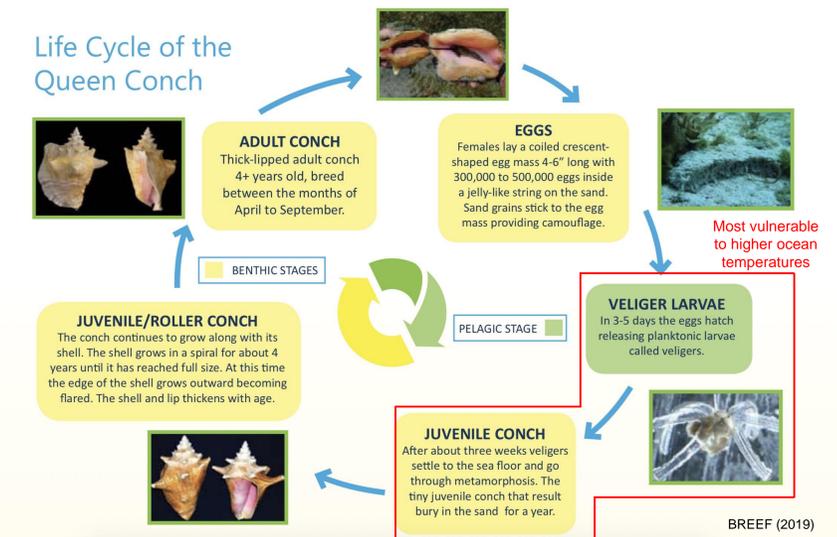
- Rising ocean temperatures and acidification can have adverse impacts on larval development of *L. gigas*.
- As carbon dioxide increases in the ocean, carbonate for calcium carbonate production decreases.
- At 30 °C larvae had the fastest growth rates, but survival tended to be lower (23%). While at 28 °C larvae had the highest survival rate (35%) (Aranda & Manzano, 2017).
- Temperature seemed to have more of a direct impact on earlier stages of larvae of *L. gigas* than those closest to settlement (Aranda & Manzano, 2017).



## Impacts

- Risk of extreme decline in geographic populations
  - Larval dispersal and habitat loss
- *L. gigas* are economically important due to their commercial value; second largest fishery in the Caribbean.
  - Decrease in harvest for fisheries.
  - Change in prices for consumers.
- *L. gigas* clears microscopic algae, which helps keep algae in check for seagrass bed habitat.
  - Loss in ideal seagrass bed habitat.
- Crucial part of the food web (e.g., loggerhead sea turtle and lobster).

## Life Cycle of the Queen Conch



## Recommendations/Conclusion

- *L. gigas* are particularly vulnerable due to their slow life history and ease at harvesting (e.g., 4 yrs to sexually mature and shallow habitats).
- Regulations on harvesting *L. gigas* in the Caribbean
- Priority for *L. gigas* to be listed under the Endangered Species Act
- The Caribbean should mitigate their contribution to greenhouse gases given they are an area that has great potential for hydro-electric, geothermal, wind and solar energy.

## References

- Aranda, D. A., & Manzano, N. B. (2017). Effects of near-future-predicted ocean temperatures on early development and calcification of the queen conch *Strombus gigas*. *Aquaculture International*, 25, 1869-1881. <http://doi.org/10.1007/s10499-017-0153-y>
- BREEF. (2019). *Conching: Lips and legislation* [Photograph]. BAHSEA. <https://bahseacom.wordpress.com/2019/04/16/conching-lips-and-legislation/>
- Brierley, A. S., & Kingsford, M. (2009). Impacts of climate change on marine organisms and ecosystems. *Current Biology*, 19 (14), 602-614. <http://doi.org/10.1016/j.cub.2009.05.046>
- Byrne, M. (2011). Impact of ocean warming and ocean acidification on marine invertebrate life history stages: vulnerabilities and potential for persistence in a changing ocean. *Oceanography and Marine Biology*, 49, 1-42.
- National Marine Fisheries Service. (2012). Queen conch, *Strombus gigas* (Linnaeus 1758) status report. [https://www.cio.noaa.gov/services\\_programs/prplans/pdfs/ID236\\_Queen\\_Conch\\_Final\\_Status\\_Report.pdf](https://www.cio.noaa.gov/services_programs/prplans/pdfs/ID236_Queen_Conch_Final_Status_Report.pdf)
- NOAA. (April 2020). *Ocean acidification*. <https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-acidification>
- Ocean & Climate Platform. (2015). *Consequences of CO2 increase on the ecosystems* [Photograph]. <https://ocean-climate.org/en/ocean-climate-climate-change-6/>
- WPclipart. (n.d.). *Queen Conch* [Photograph]. [https://www.wpclipart.com/animals/aquatic/shell\\_and\\_shellfish/conch/queen\\_conch.png.html](https://www.wpclipart.com/animals/aquatic/shell_and_shellfish/conch/queen_conch.png.html)