Research shows queen conch populations in marine reserves replenish populations beyond the reserve in The Bahamas

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A photo of a Shedd Aquarium researcher underwater measuring the size of a queen conch in The Bahamas. Credit: Shedd Aquarium/Hilary Wind

A new study published in *Conservation Science and Practice* uncovers how breeding populations of queen conch (Aliger gigas) within a protected marine reserve, where fishing is prohibited, sustain

populations beyond the borders of the reserve. This research, based on surveys conducted in The Bahamas by Shedd Aquarium and Bahamian partners, identifies where additional protections could help to ensure the survival of future queen conch generations.

In The Bahamas, queen conch is an economic and cultural keystone, but the species is in decline due to overharvest. Past research has shown that marine reserves are effective refuges for queen conch populations, and this latest study goes a step further to understand how breeding within the reserve affects populations outside the protected area.

Queen conch reproduce by laying eggs, and after the eggs hatch, the larvae drift through the water for up to four weeks before settling on the bottom to develop into adults, a process known as larval transport.

Building on previous work in collaboration with the University of Miami, Dr. Andy Kough, research biologist at Shedd Aquarium, used a biophysical larval transport model to predict where queen conch babies originating within the Exuma Cays Land and Sea Park (ECLSP) reserve are likely to settle after drifting through the water. Larval transport was analyzed for downstream areas away from the reserve to examine how protected areas within the reserve may replenish harvested areas outside the reserve.

The ECLSP has become a gold standard for marine protected areas (MPAs) and is one of 33 national parks in The Bahamas managed by The Bahamas National Trust (BNT).

Predictions from the model and consultation with the BNT and other Bahamian resource managers guided where field surveys were conducted using Shedd's research vessel, the R/V Coral Reef II. Scientists and volunteers, including Bahamian students and conservation practitioners, surveyed more than 300 locations, found and measured more than 2,600

conches, and tested whether the modeled larval transport matched where young animals were found across the island chain.

Divers discovered an abundance of juvenile queen conch downstream from the reserve, matching model predictions. The team also found the lowest abundance of adult queen conch upstream from the reserve where the model predicts that the next generation of conch should originate from.

"Establishing a breeding population upstream from the marine reserve is essential to replenish the population within the reserve," said Kough. "We hope that this research will be useful for informing future efforts to help protect this critical species."

The results also support the use of models of larval transport as a planning tool to inform queen conch conservation and management, since they broadly predicted the population distribution found in the field. Additionally, this survey showed that adult queen conch in protected areas had thicker shells than those in unprotected areas, indicating that they are relatively older animals, further reinforcing the benefits of marine reserves for protecting conch breeding aggregations.

BNT Executive Director Lakeshia Anderson-Rolle said, "The Queen Conch is an iconic Bahamian species. Though we face the potential loss of a natural resource so intrinsically tied to our culture and identity, the BNT is doing all we can along with partners to conserve it for future generations. Shedd Aquarium's research provides insight into how effective MPAs like the ECLSP can be for these kinds of conservation initiatives, and where we can pivot to be even more effective. The results inspire us to continue our critical work to advance the conservation of this keystone species with partners like Shedd.

"We aspire to model other marine protected areas after the paradigm of

the ECLSP in the hopes of producing more informative and inspiring results that can change the fate of the Queen Conch in The Bahamas," she added.

More information: Andrew S. Kough, Empirical support of predicted larval connectivity patterns demand conservation action for queen conch (Aliger gigas) in The Bahamas, *Conservation Science and Practice* (2024). DOI: 10.1111/csp2.13162

Provided by Shedd Aquarium