

The Assessment and Exploration of Anchialine Ponds on Eleuthera, The Bahamas

Ella Fishman, Brendan Hughes, J.J L'Archevesque, Madeline Parker, Crawford Patton, Ben Skinner
Advisors: Dr. Jocelyn Curtis-Quick & Alexio Brown

Introduction

The Bahamas is home to a unique system that is rarely visited or studied. The Bahamas is primarily made of limestone sediment and over the course of millions of years, acidic rain has dissolved this sediment to form deep depressions in the ground. Today we see these depressions as Anchialine ponds. Anchialine is a Greek word meaning "near the sea." On Eleuthera, there are approximately 200 of these ponds. For example, Sweetings Pond is very special site as it is home to hundreds of seahorses of an unknown species (Masonjones, 2015, pers. comm.). The isolation of these ponds creates the perfect conditions for the development of new and unique species. Therefore, Sweetings Pond is unlikely to be the only special site. Worryingly these ponds are fragile and under threat from human disturbances such as development, pollution and the introduction of species.

Knowledge is the first step towards conservation, but these ponds are data deficient. This study was conducted to quantify the life within the ponds and assess the extent of human impacts. The data collected will help promote and inform the conservation and protection for these ponds.



Figure 1 .Map of Eleuthera with 200+ ponds pinpointed.



Figure 2. Seahorse of Sweetings Pond.

Methods

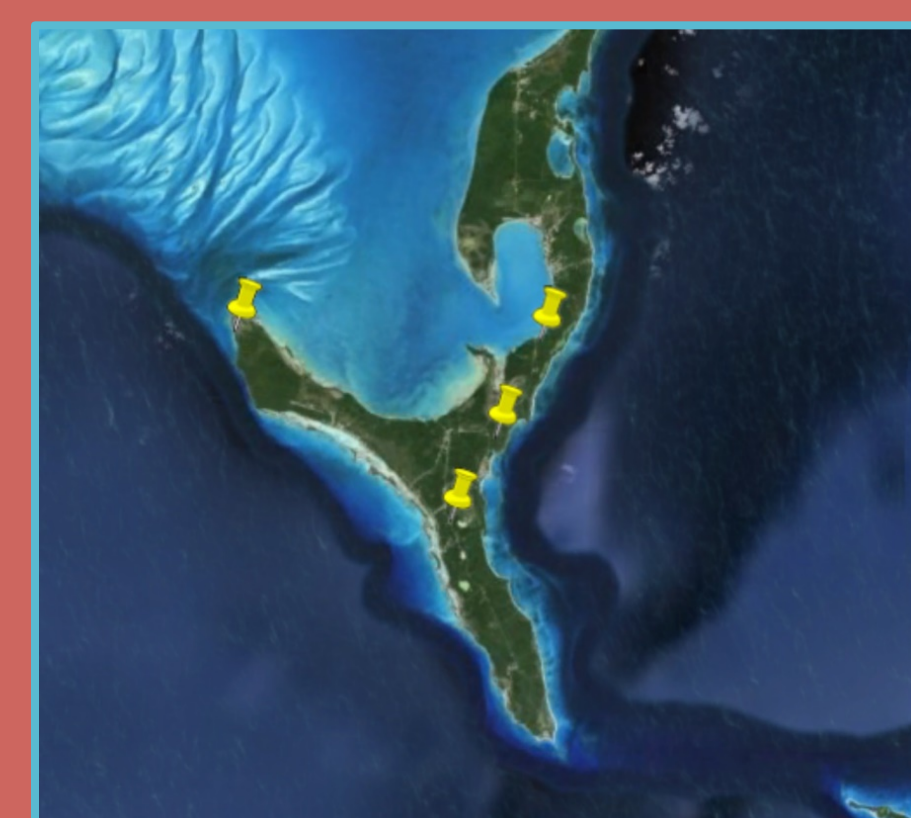


Figure 3. Ponds were located and selected using satellite imagery. This map indicates the location of the four sites studied.

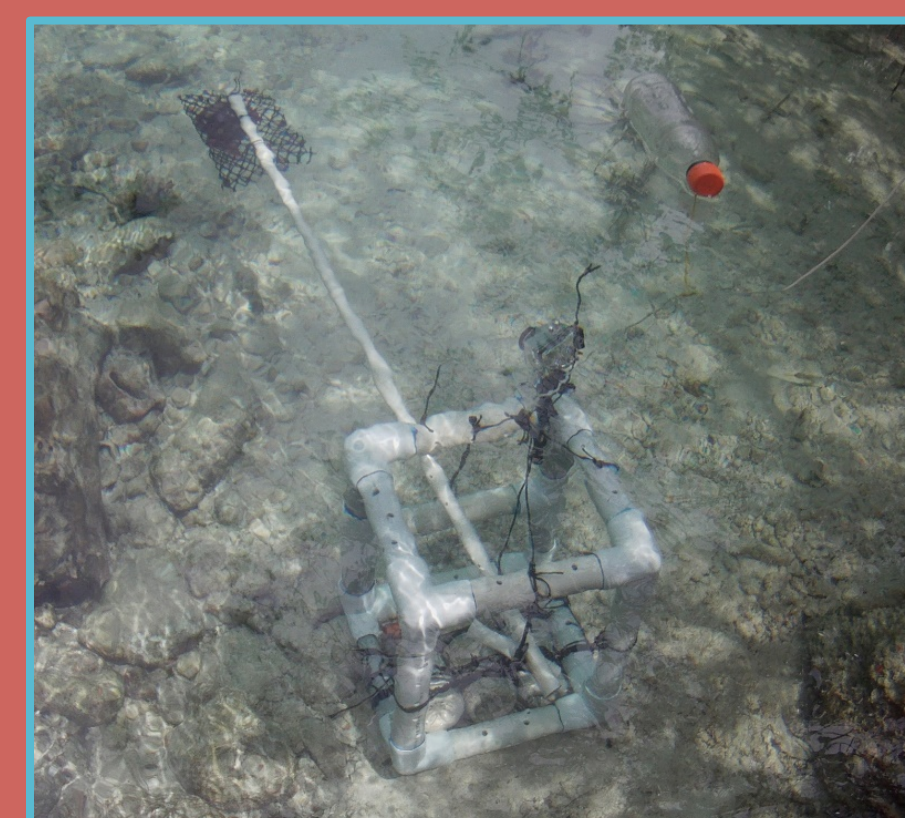


Figure 4. A BRUV (Baited Remote Underwater Video) was dropped in each pond 3 times, for 90 minutes each with a standardized type and amount of bait.

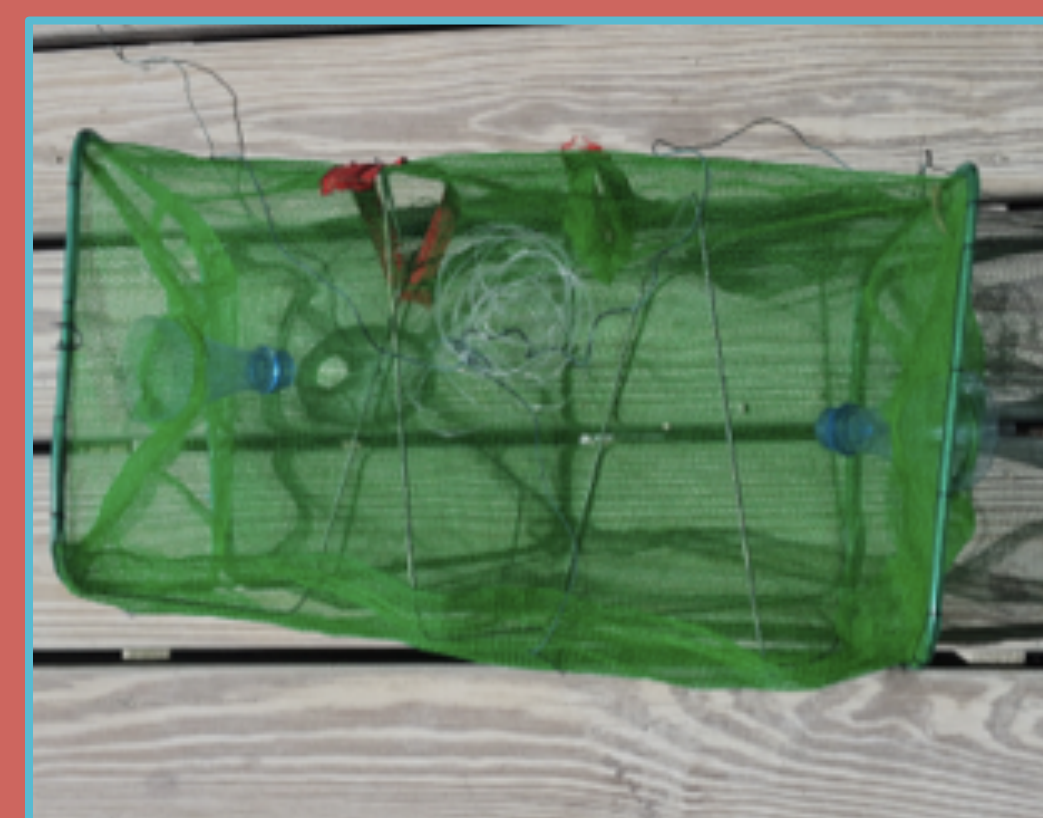


Figure 5. A baited minnow trap soaked for 90mins was used to collect organisms. The organisms caught were brought back to the lab for identification. If ID was not possible samples were sent to a taxonomist.



Figure 6. Benthic surveys were conducted by taking a picture every meter along a 30m transect to examine the benthic cover.



Figure 7. A YSI was used to measure salinity, temperature, and dissolved oxygen, and turbidity was measured using a turbidity meter.



Figure 8. The pond water was tested for levels of ammonia, nitrate phosphate. A Van Dorn bottle was used to collect 9 samples from the water column of each pond.

Purpose

The purpose of this study was to explore and assess Anchialine ponds of Eleuthera. Specifically, to identify sites with endemic species and to assess the extent of human disturbance.

Results

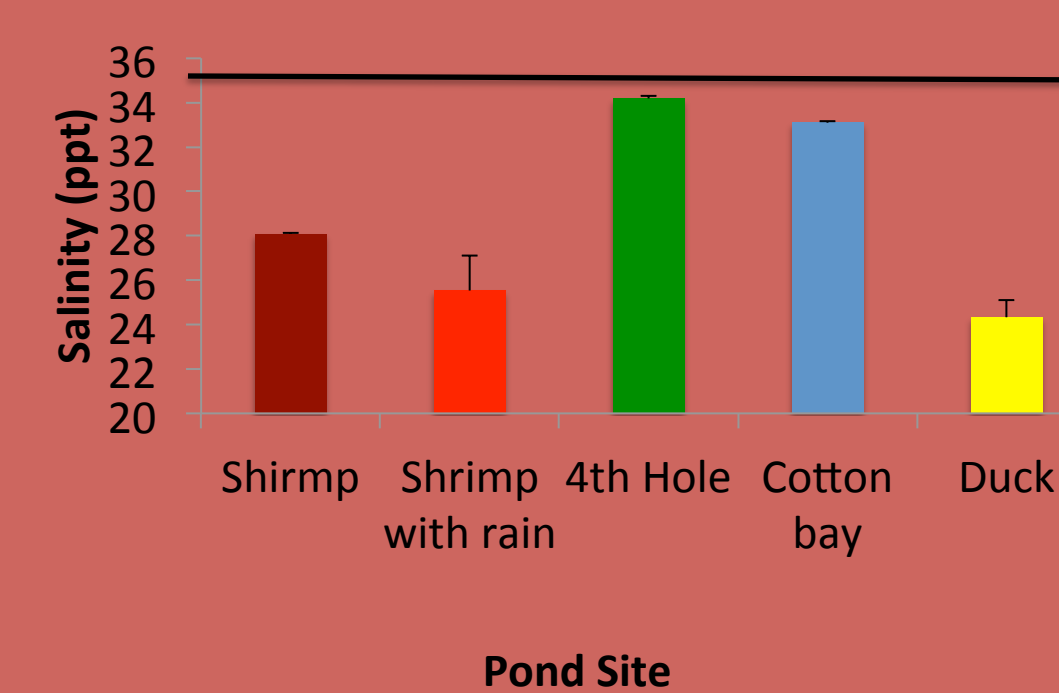


Figure 9. Average salinity values at three pond sites with standard deviations (n = 9 per site). The black line indicates ocean salinity.



Figure 10. Average turbidity value at three pond sites with standard deviations (n = 9 per site).

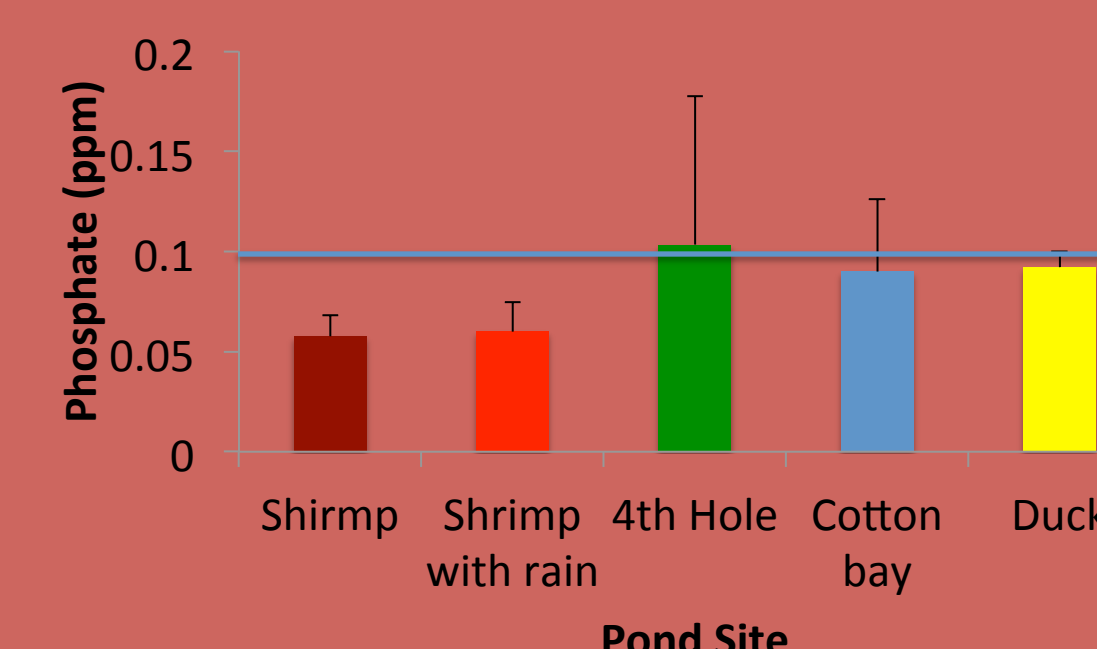


Figure 11. Average phosphate values at three pond sites with standard deviations (n = 9 per site). The blue line indicates the safe drinking water level.

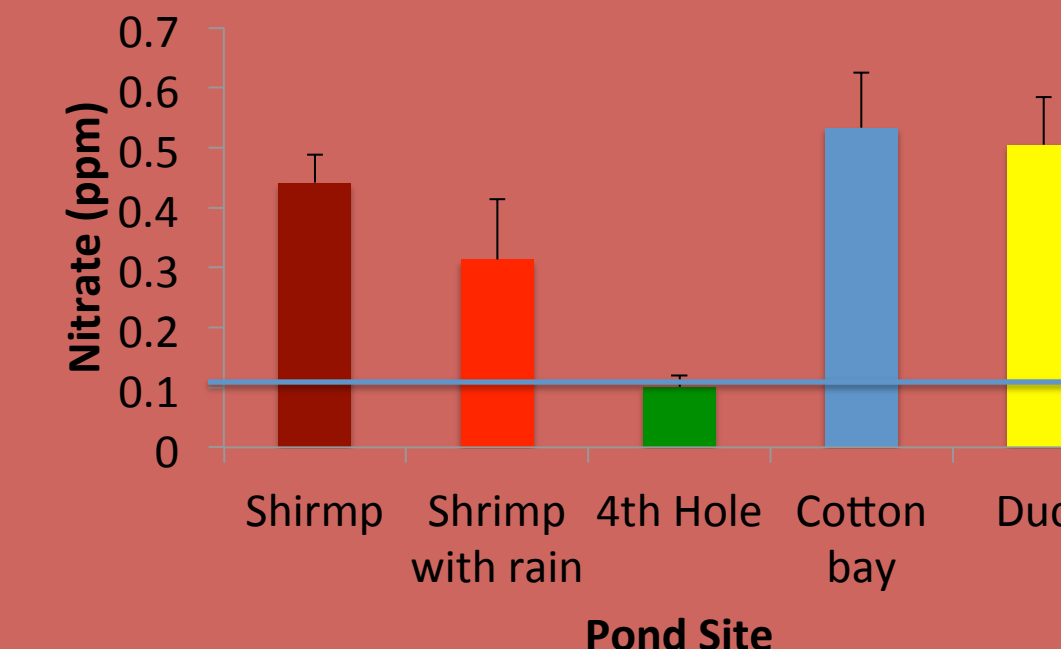


Figure 12. Average nitrate values at three pond sites with standard deviations (n = 9 per site). The blue line indicates the safe drinking water level.

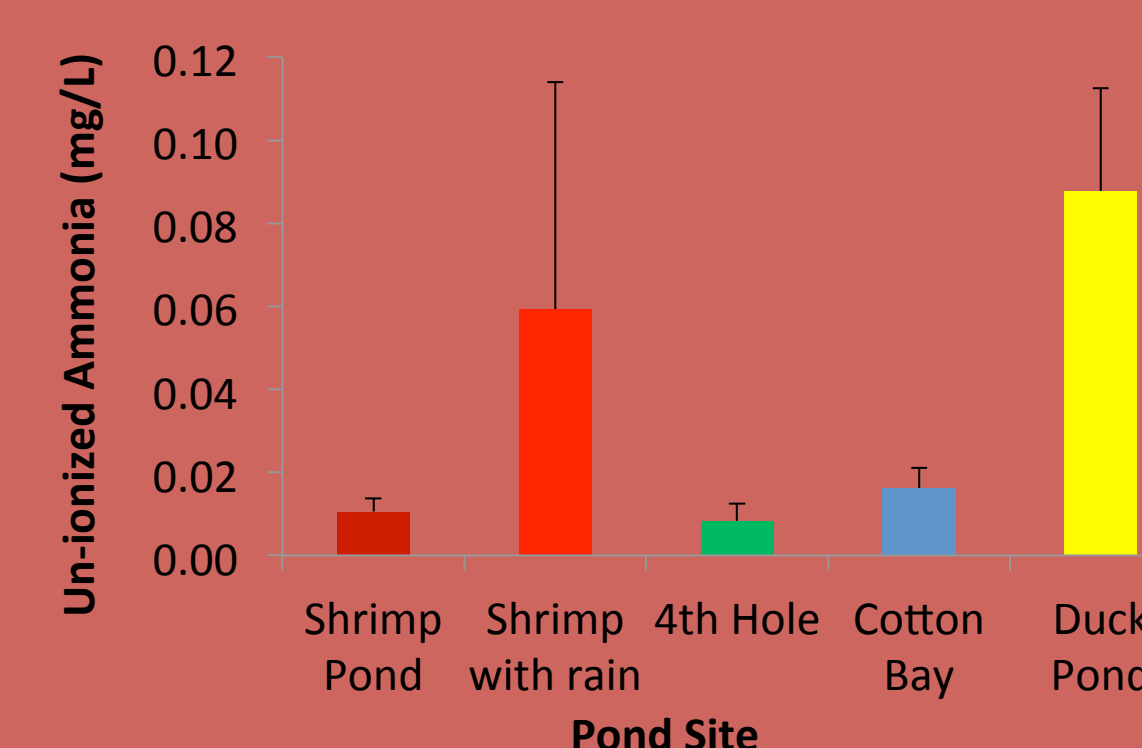


Figure 13. Average ammonia values at three pond sites with standard deviations (n = 9 per site). All vales were less than the 1 mg/L safe drinking water level.

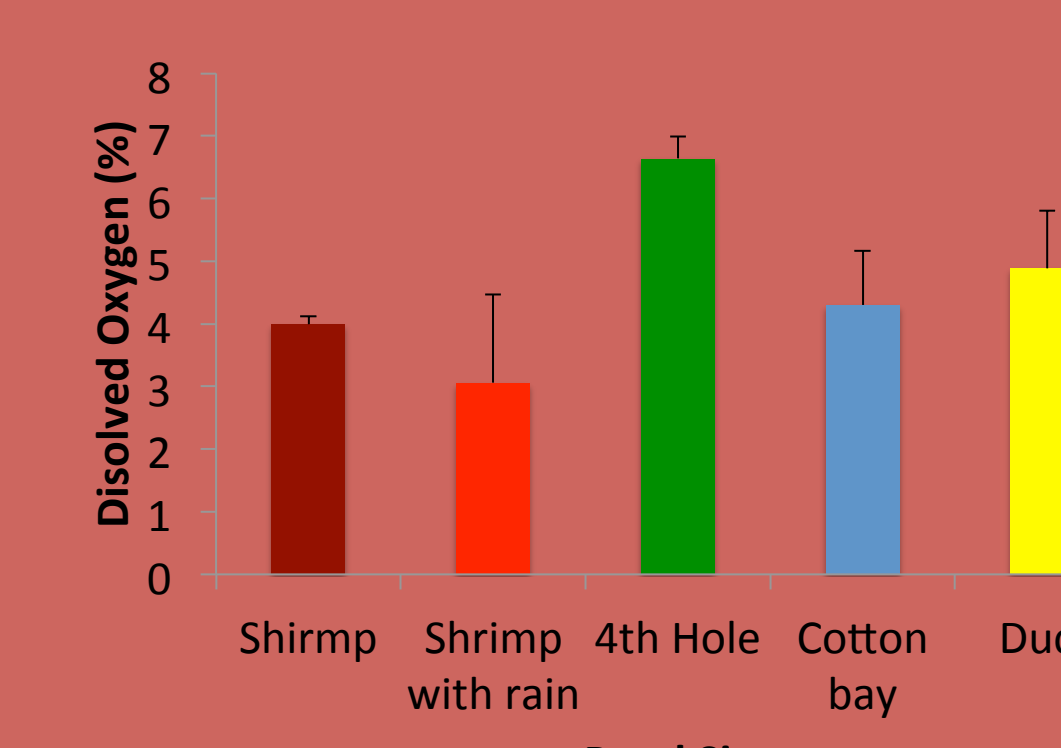


Figure 14. Average dissolved oxygen values at three pond sites with standard deviations (n = 9 per site).

Table 1: Summary of the conditions and conservation need of the of the four studied ponds. Unique species were defined as new, endemic or critically endangered species (*Note Shrimp Pond and Cotton Bay Pond contained a new or endangered species of shrimp). Predators were defined as native aquatic predatory species.

	Shrimp Pond	Duck Pond	Cotton Bay Pond	Fourth Hole Pond
Unique Species Present	YES	NO	YES	NO
Predators Present	NO	YES	NO	YES
Trash Present	NO	YES	YES	YES
Introduced or Invasive species	NO	YES	YES	YES
Pollution levels	LOW	LOW	LOW	LOW
Proximity to human development	Isolated	Near	Near	Near
Need for Conservation & Protection	HIGH	MEDIUM	MEDIUM	LOW
Need for Restoration	LOW	HIGH	MEDIUM	HIGH

Discussion

The most significant finding was the discovery of red shrimp that are either a new species, or the critically endangered Cuban Cave Shrimp (*Barbouria cubensis*) not previously reported on Eleuthera (see Fig. 15). This shrimp was found in both Cotton Bay and Shrimp Pond. Behavioral differences were observed between the shrimp in the two ponds. While shrimp in Shrimp Pond feed on the bait, the shrimp in Cotton Bay did not appear to be interested. The reason for this might be differences in predation pressure at the sites, small fish were present in Cotton Bay, but no predators were present in Shrimp Pond.



Figure 15. The unknown species of shrimp found at two of the ponds.



Figure 16. Shotgun shell found in Cotton Bay Pond.

Evidence of human impacts were found in three of the four ponds studied. Fourth Hole Pond had a culvert connecting it to the ocean, and the water was very turbid due to a nearby development. There was an abundance of trash in Duck Pond (see Fig. 16), and introduced reef snapper. In Cotton Bay Pond there was trash and shotgun shells around the edge and in the pond from people hunting the birds that visit the site. The water quality data did not indicate high levels of pollution in any of the ponds.

In summary, the findings of this study highlight the need for conservation of sites with unique species, and the need for protection and/or restoration of ponds from human disturbance. There is a huge opportunity to develop ecotourism at pond sites because less than one percent of the six million tourists that come to The Bahamas visit ponds (BNT).

The next steps are to give the results to the Bahamas National Trust and to continue researching the hundreds of remaining ponds on Eleuthera and throughout The Bahamas.

Acknowledgements

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