Prevalence of *Toxoplasma gondii* in the stranded common bottlenose dolphin (*Tursiops truncates)* population and its prey species in Charleston, South Carolina, U.S.A.

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Introduction

- Charleston, South Carolina is classified as one of the most vulnerable East Coast metropolitan areas to sea-level rise and tidal flooding and projections show as increase in both frequency and intensity [1]
- Nuisance flooding causes contaminants from the city to drain into the harbor and these contaminants can be harmful to marine life (Fig. 1A) [2].
- *Toxoplasma gondii,* a protozoan parasite that infects most species of homothermic animals, enters the marine ecosystem through coastal runoff after infected felids shed oocysts into the environment (Fig. 1B) [3].

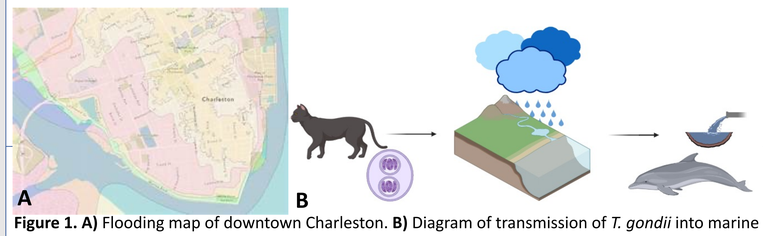
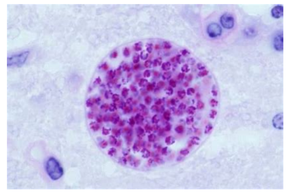


Figure 1. A) Flooding map of downtown Charleston. **B)** Diagram of transmission of *T. gondii* into marine environment.

- The common bottlenose dolphin (*Tursiops truncates)* is one of many marine mammals that can become infected with toxoplasmosis and experience several severe clinical signs [4].

Tursiops truncates



Toxoplasma gondii

Questions

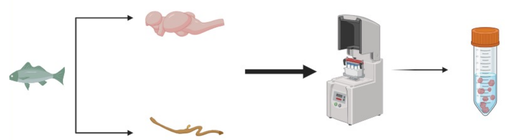
- Is *T. gondii* DNA present in stranded dolphin tissue samples?
- How does prevalence of *T. gondii* DNA in stranded dolphin tissue samples differ across years?
- Is *T. gondii* DNA present in the digestive tract of fish prey species of the common bottlenose dolphin?
- Is *T. gondii* DNA present in brain and muscle tissue of fish prey species of the common bottlenose dolphin?
- How does *T. gondii* DNA presence vary across fish prey species of the common bottlenose dolphin?

Methods

Sample Preparation & Collection

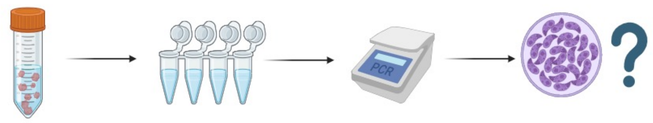
- Pre-existing tissue samples from necropsies ranging from 2010-2022 and additional samples from the Low Country Marine Mammal Network will be used for analysis.
- Dolphin brain and tissue samples will be homogenized before undergoing PCR analysis.

- Common fish prey species will be supplied by the South Carolina Department of Natural Resources (SCDNR) Inshore Fisheries section. Both digestive tract organs and brain tissues will be homogenized before undergoing PCR analysis separately.



PCR Tissue Analysis

- PCR will be conducted on each homogenized dolphin and fish tissue sample to determine *T. gondii* DNA presence or absence. The B1 gene will be targeted using the B22 and B23 primers.
- Comparisons between years, type of tissue and species will be drawn after analysis of all individual samples is completed.



Expected Results

Dolphin PCR

- We expect to see increasing presence of *T. gondii* DNA in stranded bottlenose dolphin across the historical dataset.
- We expect increase flooding events and runoff to correlate directly with presence of *T. gondii* DNA in the common bottlenose dolphin (Fig. 2).

Prey Species PCR

- We expect to find *T. gondii* DNA in both the digestive tract and brain tissue of common fish prey species of the common bottlenose dolphin.
- Presence in both tissues would suggest that these prey species may be a direct source of toxoplasmosis infection for the common bottlenose dolphin.

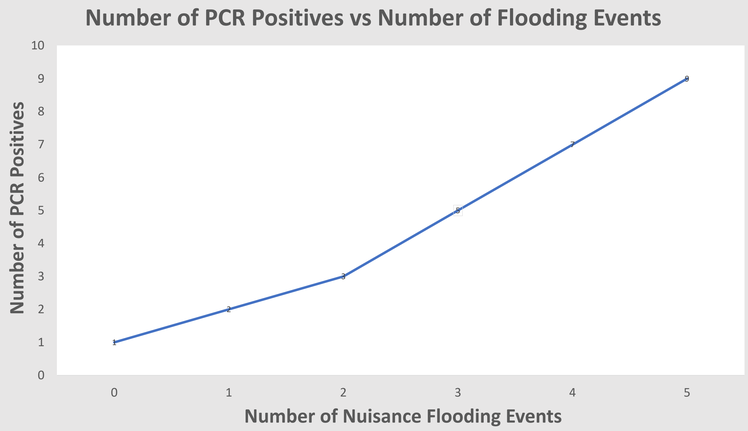


Figure 2. Number of PCR positive samples compared to the number of yearly nuisance flooding events. .

Future Directions

*Using historical data from NOAA stranded dolphin samples, we aim to understand:

*How prevalent *T. gondii* DNA is in the stranded common bottlenose dolphin population and its prey species.

*How the common bottlenose dolphin contracts toxoplasmosis in the marine environment

*How the prevalence of *T. gondii* DNA in stranded common bottlenose dolphin samples may be paired with runoff trends throughout time (2010-present).

Acknowledgements

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References

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[2] Runkle, J., Svendsen, E. R., Hamann, M., Kwok, R. K., & Pearce, J. (2018). Population Health Adaptation Approaches to the Increasing Severity and Frequency of Weather-Related Disasters Resulting From our Changing Climate: A Literature Review and Application to Charleston, South Carolina. *Current environmental health reports*, *5*(4), 439–452. https://doi.org/10.1007/s40572-018-0223-y
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