

Thermal Variability and Seasonal Migration Dynamics of Roughtail Stingray on the Jersey Coast

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INTRODUCTION

Populations of many stingray species worldwide are in need of high conservation management efforts due to their rapidly declining populations. Seasonal variances in sea surface temperature (SST) holds high importance on the movement patterns of ray species, which is highly unstudied. By connecting temperature variability to movement ecology, this study explains how warming ocean temperatures may alter distribution patterns and habitat use of this species. Understanding these patterns allows scientists to better predict when and where this species will occur in the future, which will help them implement seasonal protections and habitat conservation.

METHODS

- Analyzed the NJDEP bottom trawl survey that collected Roughtail Stingray data off the New Jersey coast every other month beginning in 1988.
- Created maps in ArcGIS, displaying this data to show distribution patterns and abundance for each season.
- Calculated Catch-Per-Unit-Effort (CPUE) for population trends.
- Analyzed and displayed SST data from NOAA's National Data Buoy Center for the New Jersey coast.

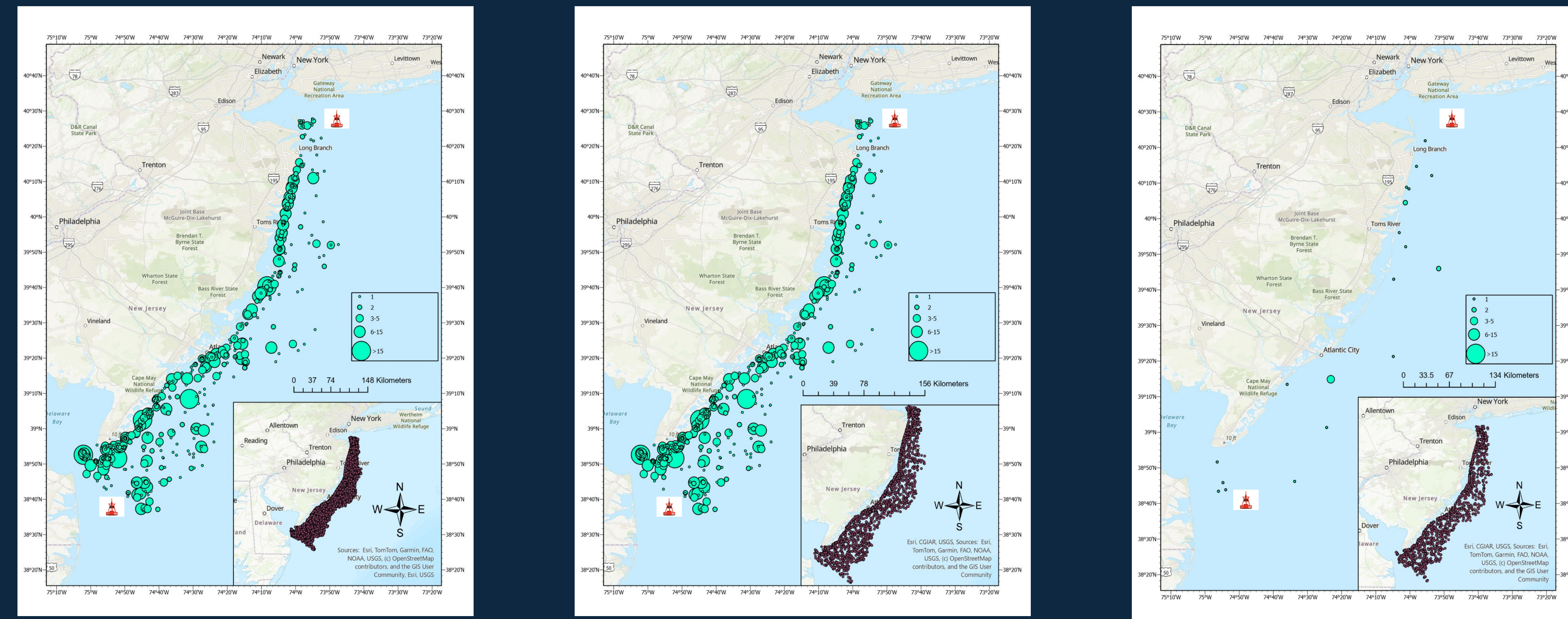


Figure 2. These maps show the abundance and distribution by season of Roughtail Stingrays captured in the NJDEP Bottom Trawl Survey. The circle size corresponds to the number of individuals captured.

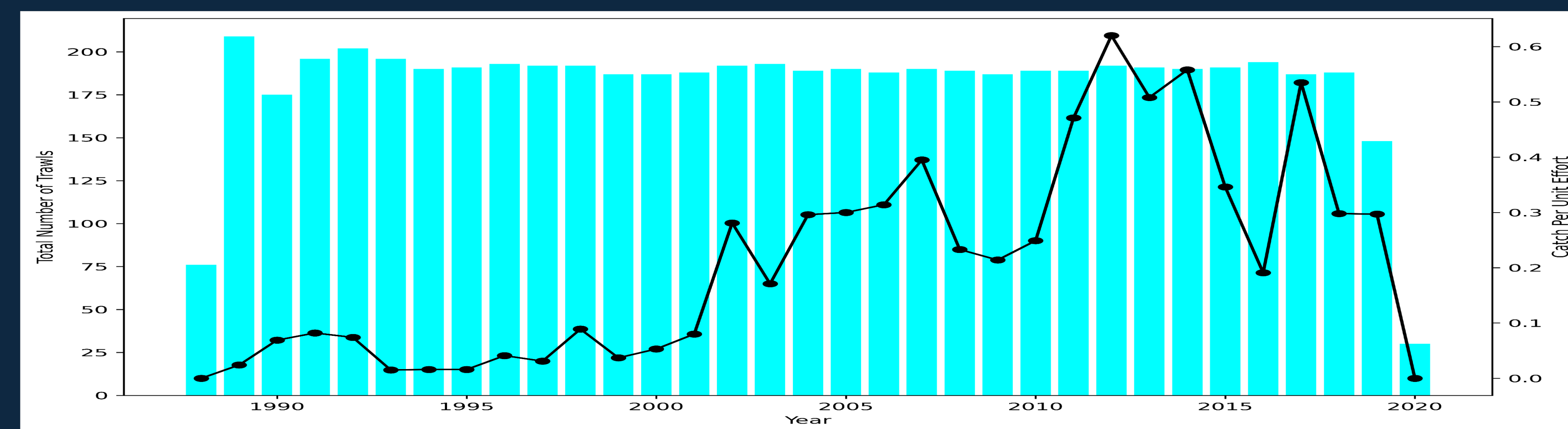


Figure 3. Yearly catch-per-unit of effort (CPUE) of Roughtail Stingrays with the total number of trawls conducted per year. This shows that as time went on, more rays were present and for a longer period of time. This is due to rising ocean temperatures and it staying warmer for longer.

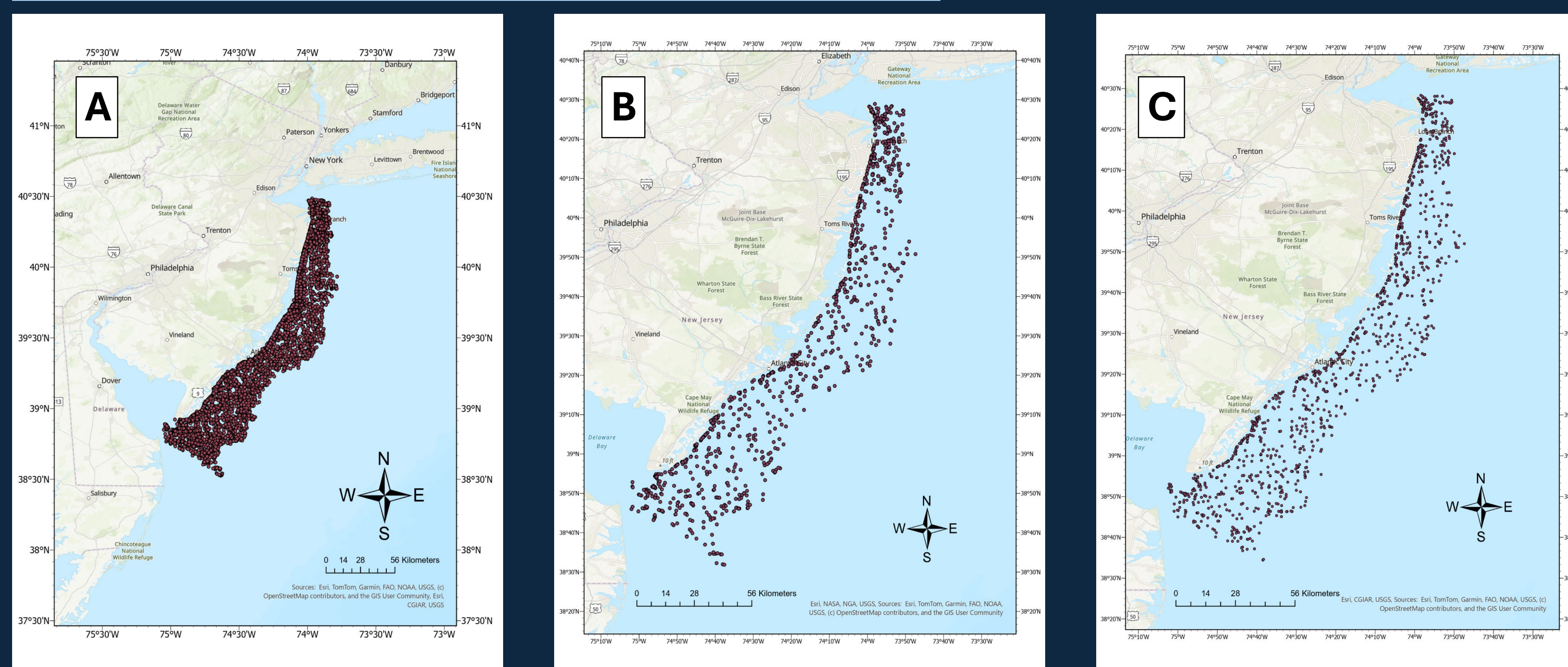


Figure 1. (A) Map displaying all of the trawls conducted during the NJDEP Trawling Survey between the years 1988-2022, (B) map displaying all of the trawls conducted during the winter months in this time frame (no ray captures), and (C) map displaying all of the trawls conducted during the spring months in this time frame (no ray captures).

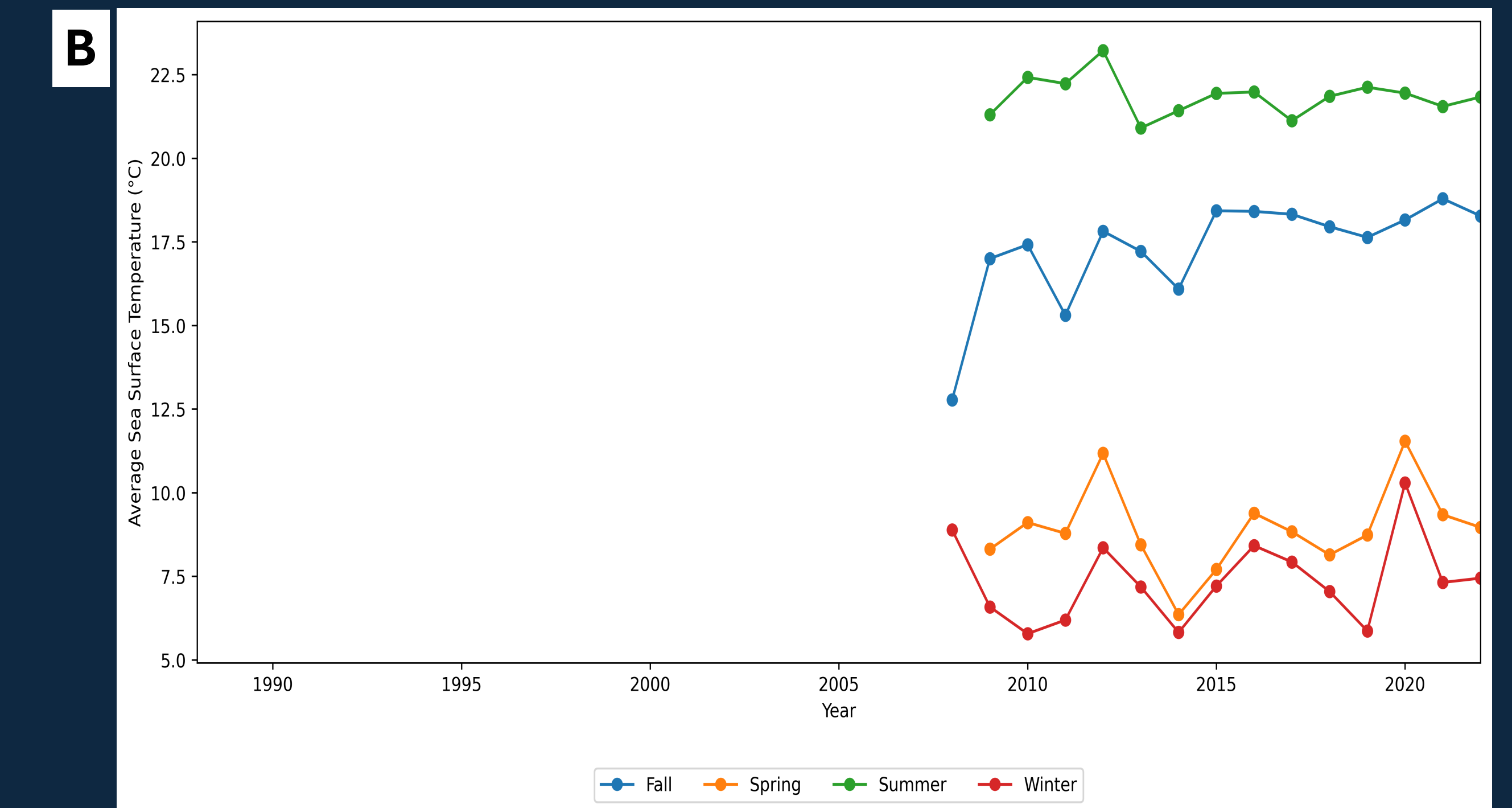
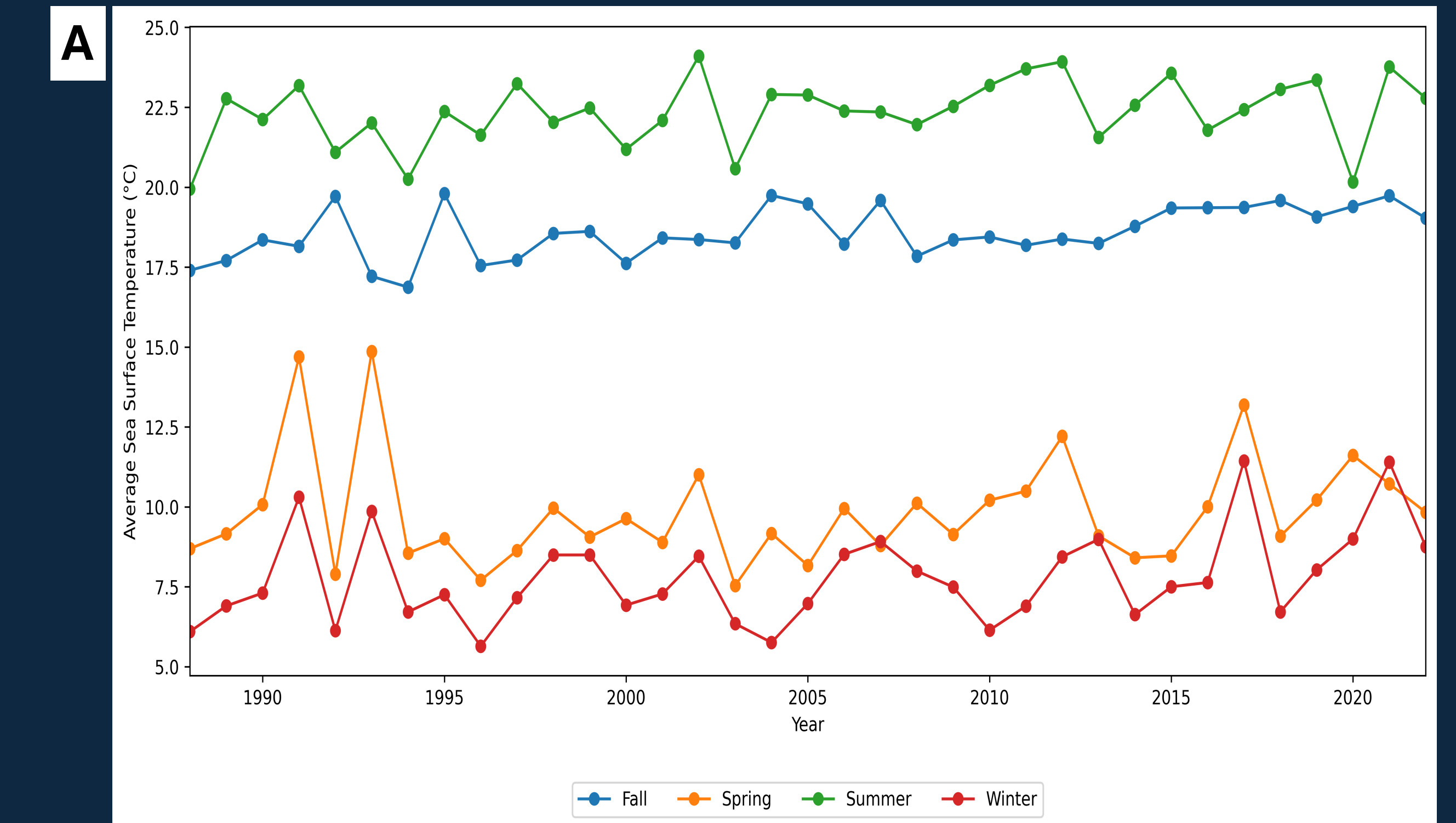


Figure 4. (A) SST data from NOAA Station 44009 (Del. Bay) from 1988-2022 and (B) SST data from NOAA Station 44065 (NY Harbour) from 2008-2022.

DISCUSSION

- Rays showed greater abundance during the summer and early fall months (June-October) in correspondence to warmer SSTs.
- Species mostly inhabits coastlines and southern NJ during the warmer months and stays around longer and in greater abundance, then begins to move offshore to deeper waters when it gets colder.

CONCLUSIONS

- Many ray species across the world are either vulnerable, threatened, or endangered and their populations are rapidly declining due to slow reproductive rates.
- This research helps us to understand temperature-based movement patterns and emphasizes the importance of incorporating environmental drivers, such as sea surface temperature into predictive models of stingray distribution. This is important for anticipating future presence of this species.

ACKNOWLEDGEMENTS

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- National Data Buoy Center. *Station 44065 – New York Harbor*. National Oceanic and Atmospheric Administration, https://www.ndbc.noaa.gov/station_page.php?station=44065. Accessed 9 Mar. 2026.
- National Data Buoy Center. *Station 44009 – Delaware Bay*. National Oceanic and Atmospheric Administration, https://www.ndbc.noaa.gov/station_page.php?station=44009. Accessed 9 Mar. 2026.