

Assessing Water Quality Parameters and Potential Migration of Fish Species With Respect to Climate Change

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INTRODUCTION

Climate Change

For many years, climate change has impacted water temperature, increased acidity in the world's oceans, shifted rainfall patterns, and increased drought and flooding in many areas. The migration of fish species will continue to be impacted if the oceans continue to warm.

Sensitivity to Change

The spawning of fish species occurs at optimal water temperatures. When those water temperatures rise, fish could migrate to cooler regions and spawn in those areas. Red drum optimally spawn in waters of 22.2°C (72°F),

Importance

Red drum are important species economically and for the ecosystem. These fish are caught recreationally and help maintain the balance of the ecosystem (RDS Status Report 2022). Red drum are found in the estuaries of the Atlantic coast as far north as Massachusetts to the waters of Key West and along the Gulf of Mexico (Figure 1.)



Figure 1. A map displaying the Red drum native waters. Source: Computer Generated Species Distribution Map. [www.aquamaps.org](https://www.aquamaps.org/receive.php?). <https://www.aquamaps.org/receive.php?>

OBJECTIVES

The objectives of this study are to:

1. Assess water quality parameters in correlation to time (2000-2025).
2. Look into climate change dynamics with respect to potential change of habitat.

METHODS

- Examining water quality parameters such as dissolved oxygen (DO), salinity, and water temperature from 2002-2024 for Sapelo Sound.
- Created a table to interpret the results of the sounds water quality, and graphs to show the increase/ decrease of the three parameters.
- The data was shared through the Department of Natural Resources water quality data.

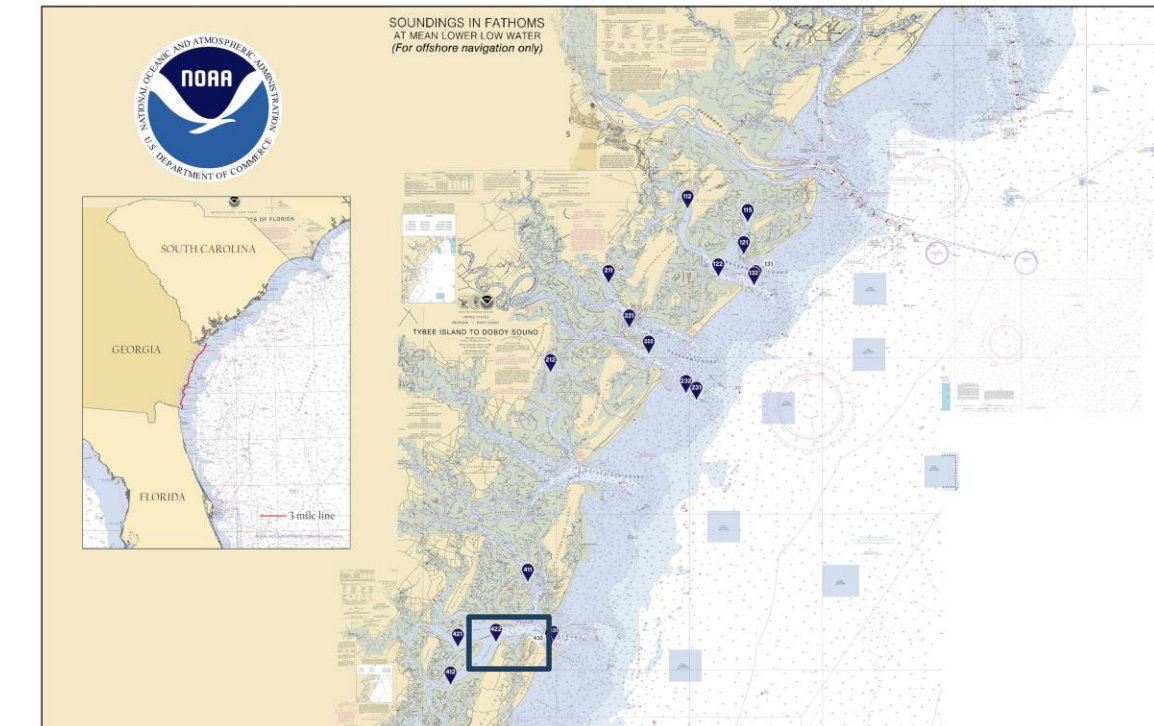


Figure 2. Site map of sampling sites. Enclosed in the box is the study site of Sapelo Sound. Source: NOAA.

RESULTS

- The results indicate a stabilization with a slight decrease in salinity. There was an increase in both water temperature and dissolved oxygen. The table indicates the impacts of these parameters; dissolved oxygen being beneficial, salinity showing no impact, and unfavorable impact for water temperature.

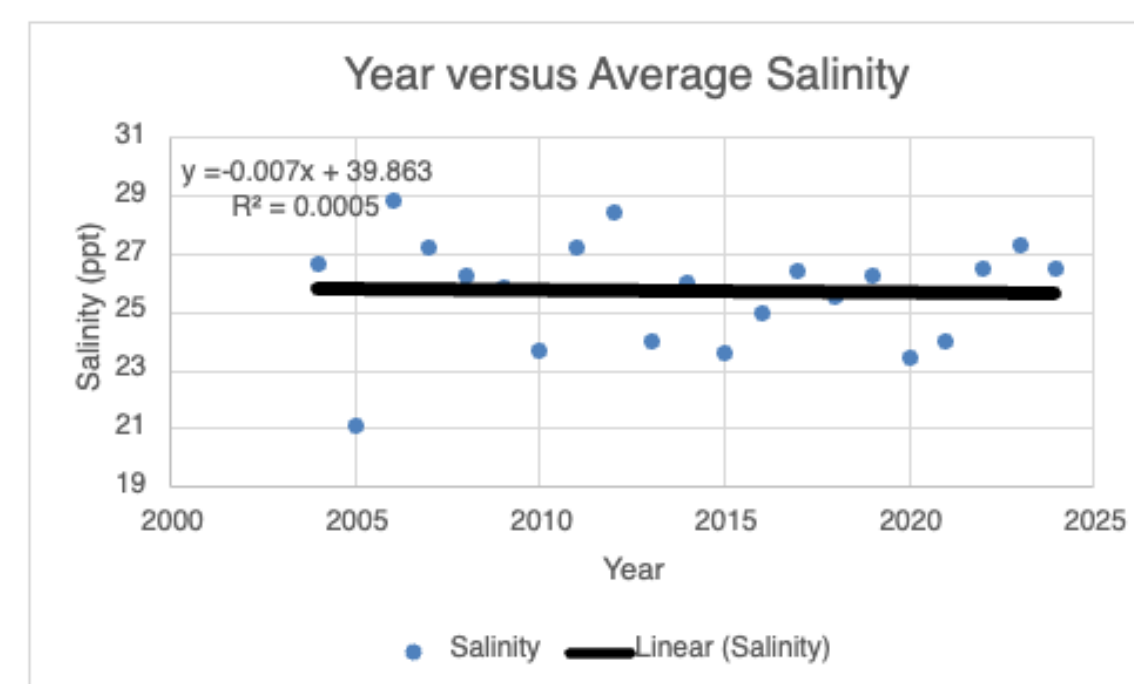


Figure 3. The graph displays a stabilization with a slight decrease in salinity with respect to time (2000-2025).

Table 1. The table below displays the rate of change per year and the interpretation of those rates of change.

Parameter	Rate of Change	Interpretation
Dissolved Oxygen	0.0564 ppm/yr	Beneficial
Salinity	-0.007 ppt/yr	No impact
Water Temperature	0.0373 °C/yr	Unfavorable

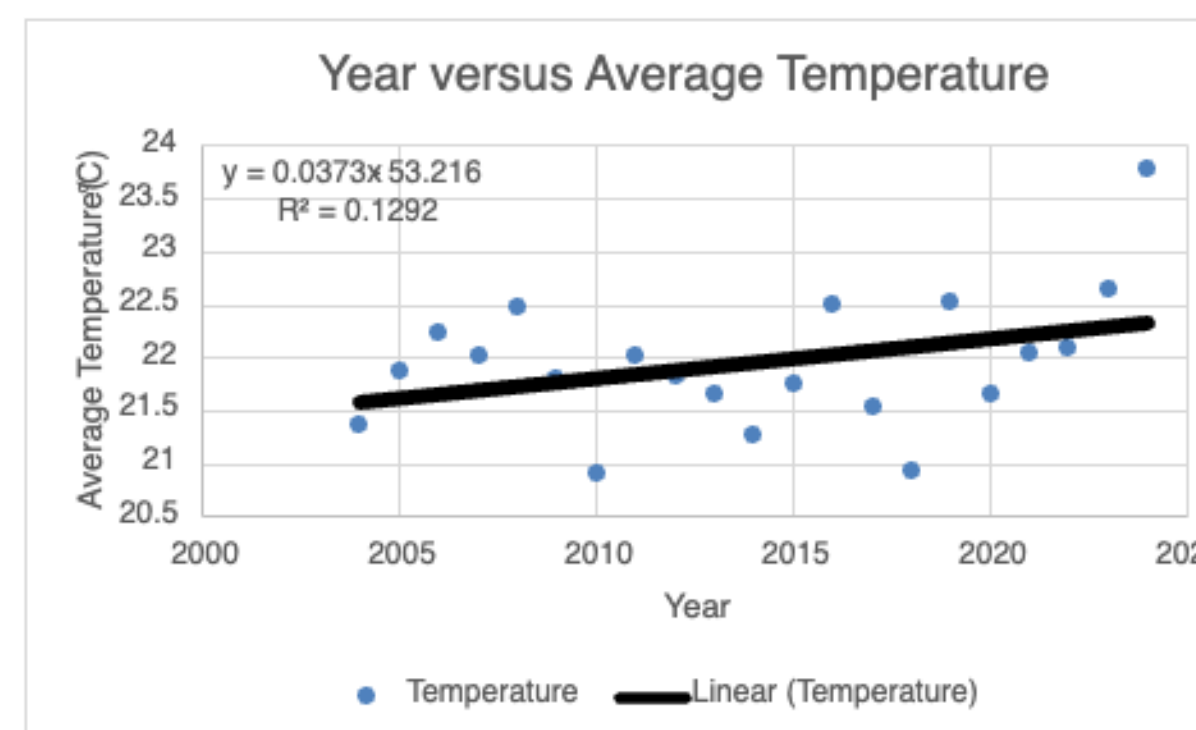


Figure 4. The graph displays an increase in average water temperature with respect to time (2000-2025).

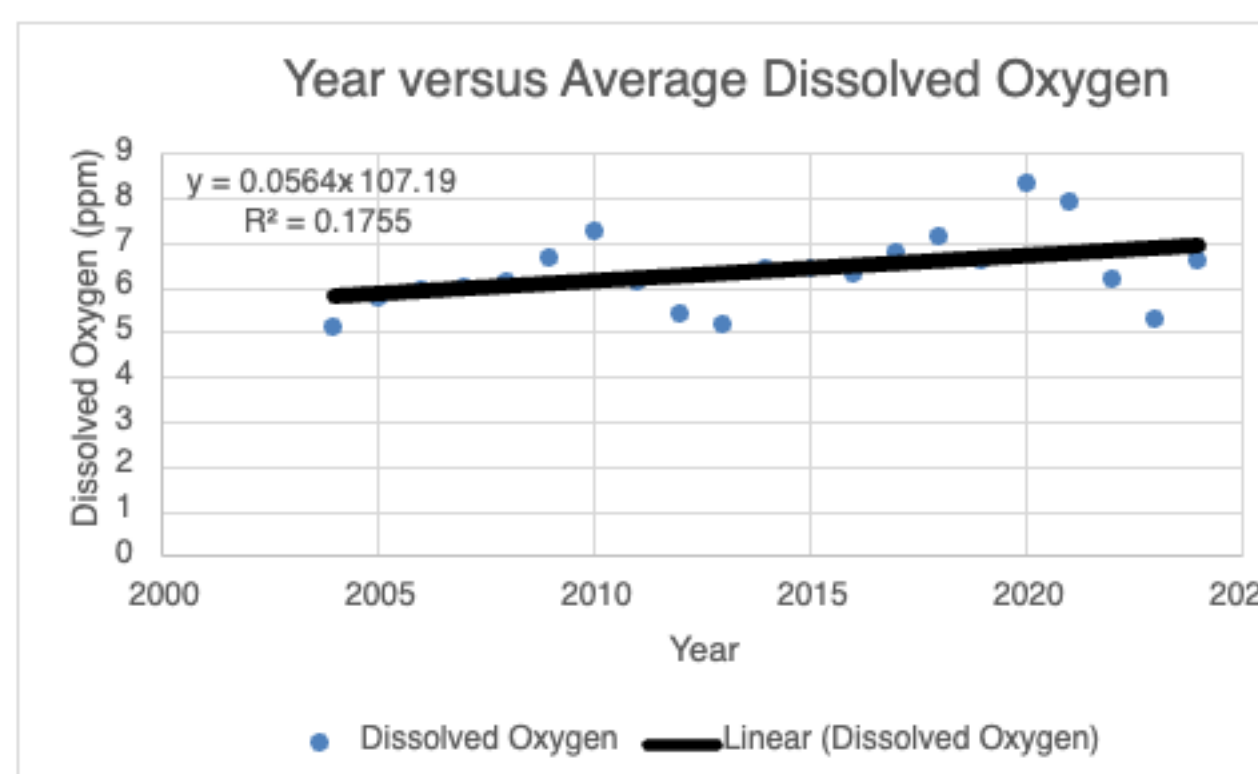


Figure 5. The graph displays an increase in average dissolved oxygen with respect to time (2000-2025).

CONCLUSIONS

Given our results, we conclude that:

- The change in salinity shows no impact on water quality conditions the slight decrease could indicate rainfall and river runoff (Figure 3.).
- The increase in water temperature could change seasonally, but over parameter is unfavorable (Figure 4.). This could be a direct result of warming waters and climate change.
- The increase in dissolved oxygen over time is beneficial to the ecosystem and could be an indication of an improvement in water quality in a local area or good circulation in the area (Figure 5.).
- The results conclude that the water quality conditions are stabilized enough for the fish to continue living and thriving in the sounds and there is no evidence of migration due to water quality conditions.
- Future studies could focus on the abundance of Red drum in the area and how climate change may affect abundance.
- The r² values in the results suggest the trends are not significant.



Figure 6. A photo of Red drum *Sciaenops ocellatus*. An identifying feature of Red drum is the distinctive black circle located at the base of the caudal fin.

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REFERENCES

- Computer Generated Species Distribution Map. [www.aquamaps.org](https://www.aquamaps.org/receive.php?). <https://www.aquamaps.org/receive.php?>
- NOAA
- Thumbnails Summary. 2020. Fishbase.