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The Effect of Water Temperature on Tiger Shark Location

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Background

The tiger shark is a keystone species in its ecosystem. As an apex predator, the tiger shark keeps the entire ecosystem in balance such as maintaining seagrass and coral reef habitats. The rise of ocean surface temperatures have become an issue over the past decades due to the increase in energy from the sun trapped by greenhouse grasses. This change in ocean surface temperature can have detrimental impacts on the ocean environment and the life cycles of many species including the tiger shark. Therefore, this project evaluates the change in location of tiger sharks in relation to water temperature.

Fig. 1 Tiger Shark (ScubaDiverMag)

Fig. 2 Australian Tiger Shark (Earth.com)

Methods

From 2001 to 2012, the Shark Control Program (SCP) has used nets and drumlines to catch and minimize the threat of shark attacks on humans throughout the Australian coasts. They were able to identify shark species, longitude, latitude, date captured and ocean water surface temperature. These identifications are mapped below of Queensland and used to calculate change in location of tiger sharks in relation to water temperature.

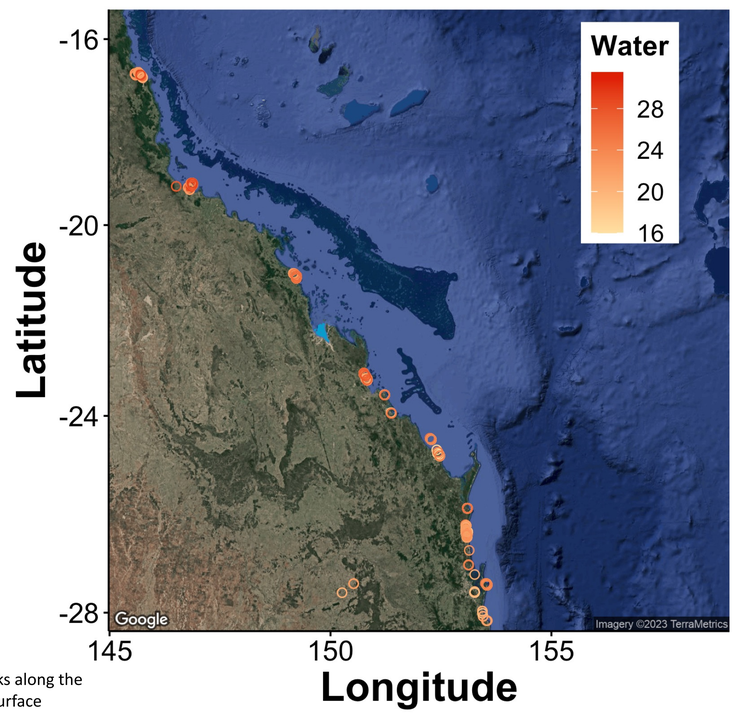

Fig. 3 Location of captured tiger sharks along the coast of Queensland and the water surface temp. at which they were caught.

Results

The water surface temperature significantly impacted Longitude (Chisq = 16.101, Df = 1, Pr(>Chisq) = 6.006e-5) and Latitude (Chisq = 17.159, Df = 1, Pr(>Chisq) = 3.439e-05) of tiger sharks on the Queensland coast. For every 1°C increase of water surface temperature, tiger shark location moves -0.04806° longitudinally (West). For every 1°C increase of water surface temperature, tiger shark location moves 0.05275° latitudinally (North).

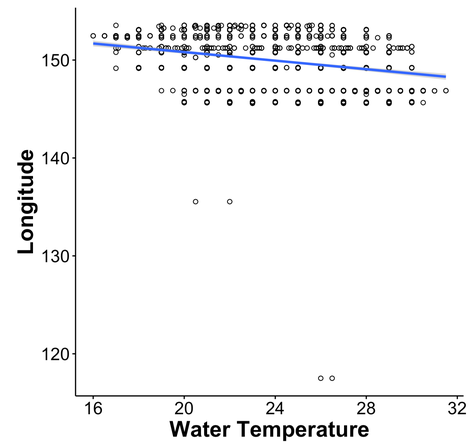

Fig. 4 Shark Longitudinal Location in relation to Water Temperature

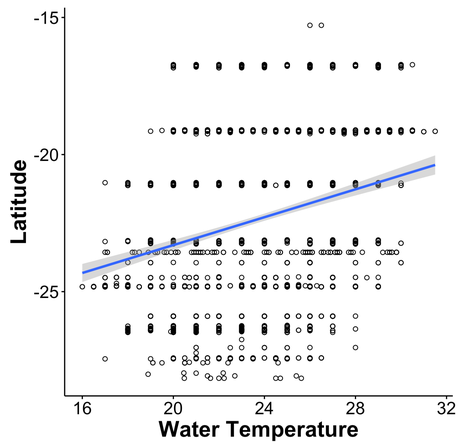

Fig. 5 Shark Latitudinal Location in relation to Water Temperature

Conclusion

The surface water temperature was found to have a potential impact on the location of tiger sharks. The tiger sharks had a trend of traveling northwest along the coast of Queensland which was unexpected because cooler waters tend to be in the southern parts of Australia. However, water temperature only accounts for 43.8% of the variation for the longitudinal movement and 44.4% of the variation for the latitudinal movement, meaning that there are other factors that account for approximately 56% of the variation of tiger shark location. Other factors such as ocean currents, food sources and supply, fishing. Other oceanic organisms are also affected by rising ocean temperatures which would also affect tiger shark location as they are on the top of food chain. More research and analysis could be done to better determine the impact of other factors on the location and movement of tiger sharks in relation to increasing water temperature.

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References

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