

Physiological responses to capture stress in juvenile male nurse sharks (*Ginglymostoma cirratum*) across different seasons of the year

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ABSTRACT

Currently, 37% of sharks and ray species are on the IUCN Red List. Studies assessing physiological changes related to the survival of sharks during captures have significantly contributed to their conservation, considering that the stress response of these individuals during bycatch can lead to sub-lethal consequences even if released immediately. Therefore, the objective of this study was to understand, through physiological biomarkers, the impact of seasonality on the stress response during capture in juvenile male nurse sharks (*Ginglymostoma cirratum*). Samples (N=81) were collected between 2017-2021 in Biscayne Bay, Florida. Blood samples were centrifuged to separate the plasma. Total osmolality (mmol/kg) was quantified using an osmometer, and concentrations of lactate (mmol/L), total proteins (g/dL), chloride (mmol/L), triglycerides (mg/dL), cholesterol (mg/dL), glucose (mmol/L), sodium (mmol/L) and potassium (mmol/L) were quantified using Labtest® kits and colorimetric methods with a spectrophotometer. The biomarkers were compared across summer, fall, winter, and spring to evaluate whether there were significant differences. Statistical analyses were performed with ANOVA test followed by Tukey's test, and it was observed that summer is the season that showed significant change in the individuals physiology. There was an increase in lactate and glucose concentrations during the summer, possibly due to elevated glucocorticoids in the bloodstream. The increase in blood lactate might lead to metabolic acidosis, and even though lactate concentrations in nurse sharks are relatively low, an increase was observed during these periods. Additionally, cholesterol also had a significant change in summer. One hypothesis is that, due to changes in environmental conditions, juveniles may need to adjust their feeding strategies to meet their energy demands. Therefore, nutritional condition could be a potential factor influencing the stress intensity caused by capture. As a more stress-resistant species, the nurse shark might serve as a model for studying and developing strategies that aid in conservation.

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