**Seasonal Temperature Induced Heart-Collagen Remodeling Response in the Rainbow Darter (*Etheostoma caeruleum*)**

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**Abstract:** Acclimation to temperature changes in fish has been shown to prompt a cardiac remodeling response, with collagen protein playing a key role, although the mechanism of this response remains unclear. Currently, it is believed to be a seasonal adaptation to shifting temperatures, with studies indicating that microRNA-29b, an epigenetic non-coding RNA, targets collagen mRNA in the heart. To further explore these questions, this study characterizes the remodeling response in a wild population of rainbow darters (*Etheostoma caeruleum*) to examine seasonal effects in a natural environment. Heart tissue was collected on-site at three season timepoints (Spring, Summer, Fall 2023) from the Grand River, Grand Valley, ON. Gene expression of microRNA-29b, and three collagen type I protein transcripts (*col1a1*, *col1a2*, & *col1a3*) was measured through qPCR. Histological analysis was used to visualize and quantify the collagen protein content through picrosirius red staining. Results from qPCR revealed seasonal and sex-specific differences in expression of microRNA-29b, *col1a1*, and *col1a2*, suggesting the presence of this remodeling response in a non-model species. Understanding the impacts of temperature fluctuations and extreme weather events on local fish populations is increasingly crucial. This study contributes to a more comprehensive understanding of seasonal effects in a natural environment.