Using isotopes and trace elements as a tool to uncover White Sturgeon life history complexities and habitat use

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Fin ray microchemistry is a useful tool that is capable of reconstructing habitat use and migration behavior of California White Sturgeon populations

BACKGROUND
White Sturgeon are a long-lived, slow growing, and late-reproducing fish species common to estuaries and coastal habitats along the West Coast of North America.

- Vulnerable to over-exploitation
- Limited known life history information
- Better understanding of spatial distribution = improved population management

Trace element and isotopic ratios in calcified fin rays can be used as a non-lethal method to reconstruct migration patterns

STUDY OBJECTIVES
1) Explore life history strategies of CA adult populations using fin ray microchemistry
2) Determine how early fin rays calcify and begin recording life history information

METHODS
1) Laser ablate 116 wild adult fin rays collected in the San Francisco (SF) Estuary and San Joaquin River between 2012–2016
2) Laser ablate and clear/stain laboratory reared juvenile fin rays to observe when fin rays calcify and begin incorporating trace elements from their environment

ADULT WHITE STURGEON EXHIBIT DIVERSE LIFE HISTORY STRATEGIES

Primarily low Salinity / Freshwater

Several years in low salinity then migrates into medium/high salinity

Early migration into medium salinity; then returns to freshwater / low salinity

JUVENILE WHITE STURGEON FIN RAY CALCIFICATION

Fin Rays begin calcifying as early as:
30-days post-hatch or 30-mm total length

50% calcified by:
52-days post-hatch 38-mm total length

95% calcified by:
≥ 72-days post-hatch ≥ 70-mm total length

ISOTOPE AND TRACE ELEMENT INCORPORATION

Juvenile fin rays incorporated isotopes and trace elements as soon as they began to calcify

- Elements commonly used to detect migrations between different salinity zones
- Potential elements incorporated into fin rays that may provide useful markers of movement through SF Estuary or researching containment exposure

MANAGEMENT IMPLICATIONS

Results of these studies provide new insights into the movement patterns of White Sturgeon in the Sacramento-San Joaquin river system which can help resource managers identify potential environmental extinctions, and refine flow management and habitat restoration strategies to optimize potential benefit to sturgeon.

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