## Life history patterns of Arctic Alaska Inconnu (*Stenodus leucichthys*) elucidated through Sr otolith microchemistry

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## BACKGROUND

- Inconnu (Sii in Iñupiaq and нельма in Russian) are a diadromous Coregonid with lifespan >30 years and weights >26 kg (Figure 1; Brown et al. 2007; Smith et al. 2015)
- 25,000 are harvested annually near Kotzebue, Alaska, representing a vital component of food security for Indigenous and rural Alaskans (Whiting 2006)
- Only two spawning stocks are known in the Kotzebue Sound region (Kobuk and Selawik Rivers; Alt 1977)
- Inconnu are caught in coastal habitats up to 250 km from the mouths of putative natal rivers (Fraley et al. 2021), and little is known about the stock of origin and life history chronology of these fish
- Climate change and increased industrial development may affect inconnu (Moerlein and Carothers 2012). Due to their importance as a food source, they need to be monitored carefully to inform conservation action

Chukchi Sea habitats

- The majority of inconnu in coastal habitats north of Kotzebue Sound will originate from the Kobuk River due to its closer proximity • Sr otolith microchemistry will allow for limited assignment of inconnu habitat occupancy, but the undefined regional isoscape will complicate • Highly migratory life history patterns will be seen until sexual maturity, then repeating
- patterns around spawning runs

## PRELIMINARY RESULTS - NATAL ORIGIN

Figure 4: Example Kobuk (left) and Selawik River (right) inconnu reference sample otolith Sr laser ablation microchemistry values from core (left side of plot) to edge (right side). Early freshwater occupancy period is outlined in red.





Figure 8: Example otolith Strontium laser ablation microchemistry plots for inconnu captured in coastal lagoons of Cape Krusenstern National Monument from core (left side of plot) to edge (right side). Gray shading = juvenile freshwater occupancy (if apparent), blue shading = freshwater occupancy, yellow = brackish/estuarine/lagoon occupancy, and red = saltwater occupancy.







## **OBJECTIVES**

- Assign stock of origin for inconnu found in coastal
- Characterize life history chronology of coastally distributed inconnu to better understand anthropogenic and environmental threats

## HYPOTHESES

### Figure 1: An inconnu captured in a brackish NW Alaska coastal lagoon



Figure 2: Otolith prepared for laser ablation



Mean <sup>87</sup>Sr/<sup>86</sup>Sr values for early freshwater occupancy period (outlined in red in Fig. 4) for Kobuk River reference samples are all > 0.7100, while all are <0.7100 for Selawik reference samples, allowing assignation of stock of origin for individuals caught in coastal Chukchi Sea habitats

**Figure 5:** Stock of origin for *N*=14 inconnu captured in Cape Krusenstern National Monument coastal lagoons **Undefined/No** freshwater residency 21% **Kobuk River** 50% Selawik **River** 29% Marine with estuarine/lagoon forays Distance (um) 5 years old, Kotlik Lagoon



## PRELIMINARY RESULTS - LIFE HISTORY PATTERNS

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## METHODS

- Capture inconnu in coastal Chukchi Sea habitats (i.e., lagoons, see red stars on Fig. 3) and extract sagittal otoliths
- Secure otoliths from inconnu captured from Kobuk and Selawik River spawning stocks (yellow stars, Fig. 3) to use as reference for stock of origin assignation
- Grind down, thin-section, polish, and mount otoliths for aging and microchemical analyses
- Use laser ablation isotope microchemistry to analyze strontium (<sup>88</sup>Sr, <sup>87</sup>Sr/<sup>86</sup>Sr) across each otolith core-to-edge chronology (e.g., Leppi et al. 2022)
- Infer stock of origin, movements and habitat occupancy during the lives of each fish (e.g., Padilla et al. 2015)
- Identify critical habitats or life history events for which inconnu may be affected by environmental change or industrial development



## **DISCUSSION AND FUTURE WORK**

- Monument coastal lagoons, indicating that any harvest affects both populations
- regional aquatic isoscape
- habitat use





• Inconnu from both Kobuk and Selawik River spawning stocks are found in Cape Krusenstern National

• Individuals examined spent the majority of their lives in multiple brackish environments, returning to freshwaters to spawn multiple times after reaching maturity (age 9-12)

• Due to a diverse portfolio of coastal habitats that appear to be utilized by inconnu, characterization of general habitat occupancy (e.g., freshwater vs brackish) through Sr otolith microchemistry is attainable, but identification of specific water bodies is not possible without improvement of the

• Dynamic coastal habitats such as lagoons that are important for inconnu early life history should be prioritized for protection, as these habitats are most vulnerable to alterations from climate change effects (e.g., coastal erosion) and anthropogenic activities (e.g., construction of ports and causeways) Next steps: Develop regional Sr isoscape and supplement otolith information with pop-up satellite archival tag and traditional ecological knowledge data to refine knowledge of inconnu life history and