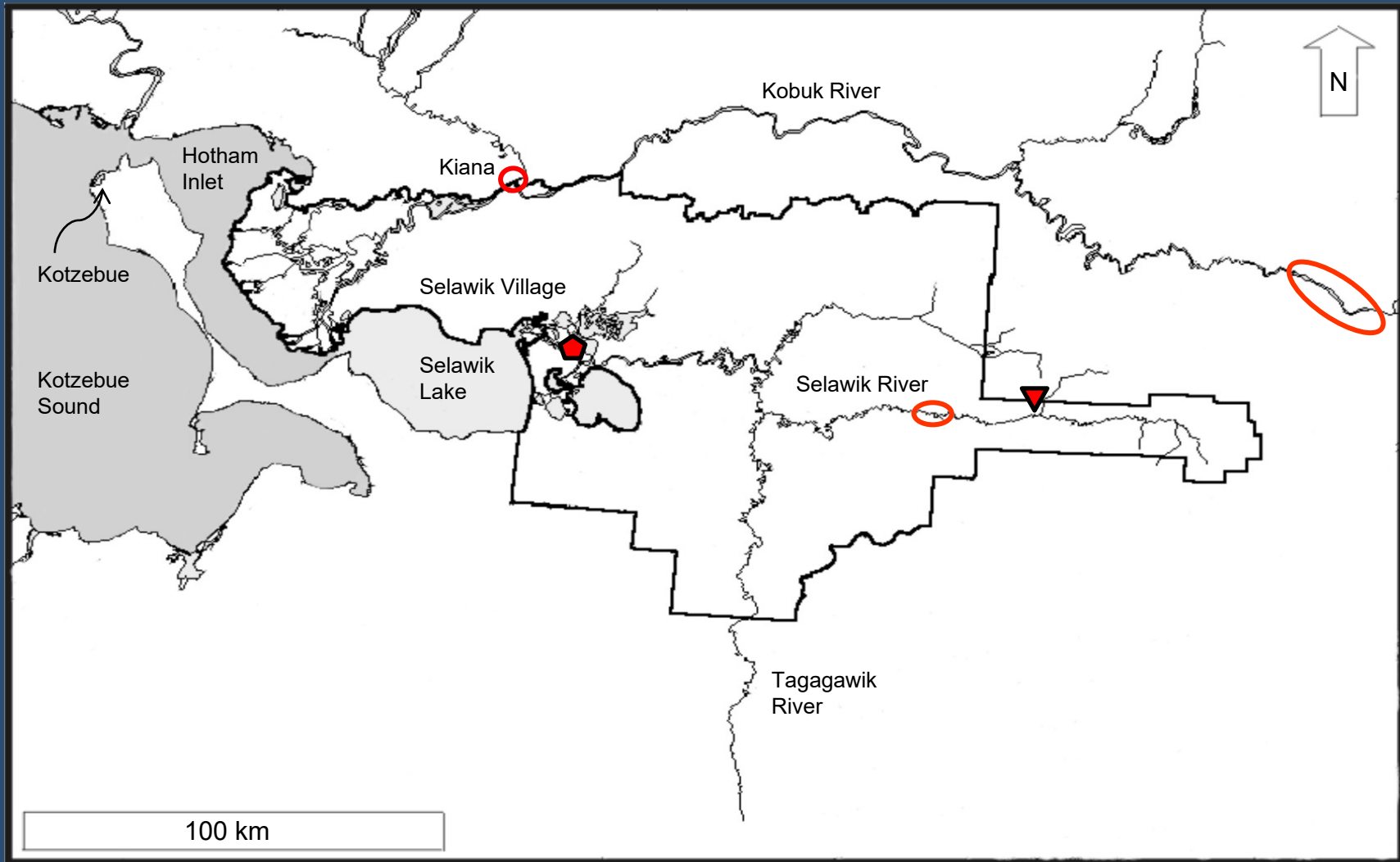


# Selawik River Sheefish Age Evaluation and Spawner Response to the Selawik River Permafrost Thaw Slump, 2011-2018 and 2023-2024



Native Village of Selawik | Selawik National Wildlife Refuge  
Northern Alaska Fish & Wildlife Field Office





# Thaw slump progression, 2004-2020







2022; Digital Globe





Selawik River

Ingruksukruk Creek  
(Shovel Creek)

2009

40 km  
(25 miles)  
from slump  
and within  
the  
Sheefish  
spawning  
area.



# Thaw Slump Statistics

- 2022 Dimensions: 310m x 325m (1,100' x 1,200')
- 2022 Slump Area: 74,000 m<sup>2</sup> (18.0 acres, a bit bigger than the Kotzebue boat harbor lake and about the area of 14 football fields)
- 2009 Fan Area: 26,000 m<sup>2</sup> (6.4 acres)
- 2009 Volume eroded: 540,000 m<sup>3</sup> (19 million ft<sup>3</sup>)
- 2009 Volume in fan: 184,000 m<sup>3</sup> (6.5 million ft<sup>3</sup>)
- 2009 Volume into river: 356,000 m<sup>3</sup> (12.6 million ft<sup>3</sup>)





Selawik River Sheefish Spawner  
Age Structure Project

# Problems that silt causes to spawning habitat

- ❖ Sheefish (sii), Humpback Whitefish (qaalgiiq), other whitefishes, and salmon need gravel stream bottom habitat for successful egg survival = protection, water and oxygen flow
- Silt can penetrate gravel substrates and restrict water flow that reduces oxygen to developing eggs;
- Silt can fill spaces between gravels and change it to a smooth rather than rough surface where eggs settle;
- Silt can cover eggs that settle into the spaces between gravels

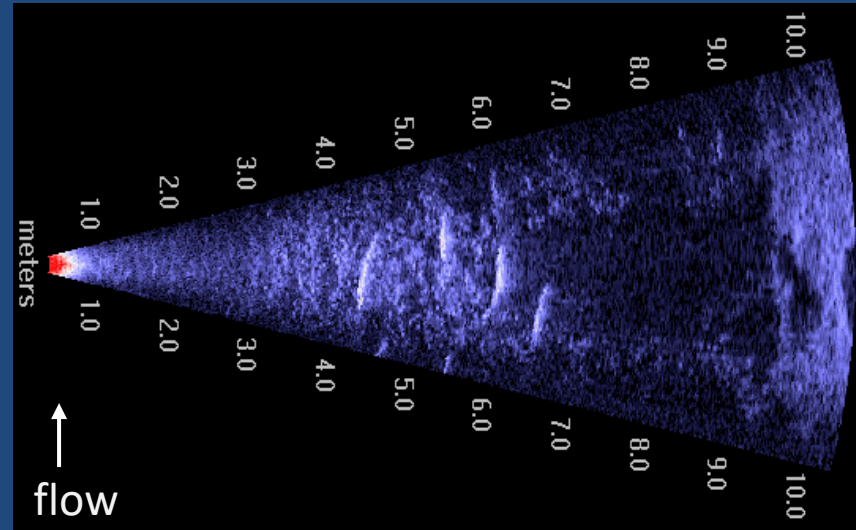




# How do we detect an impact of the slump (silt) on spawning success?

Our approach was to combine:

- Age analysis – are post-slump hatched fish showing up in the spawning population?
- Spawner abundance – numbers of fish coming back to spawn



We also included age analysis from the Kobuk River population as a way to tell if age class declines were region-wide or Selawik River specific

To analyze age, we sampled 200 male Sheefish from the upper Selawik River to collect otoliths (ear bones). Males outnumber females by about 3 to 1. Similar numbers of Sheefish were sampled from the Kobuk River.



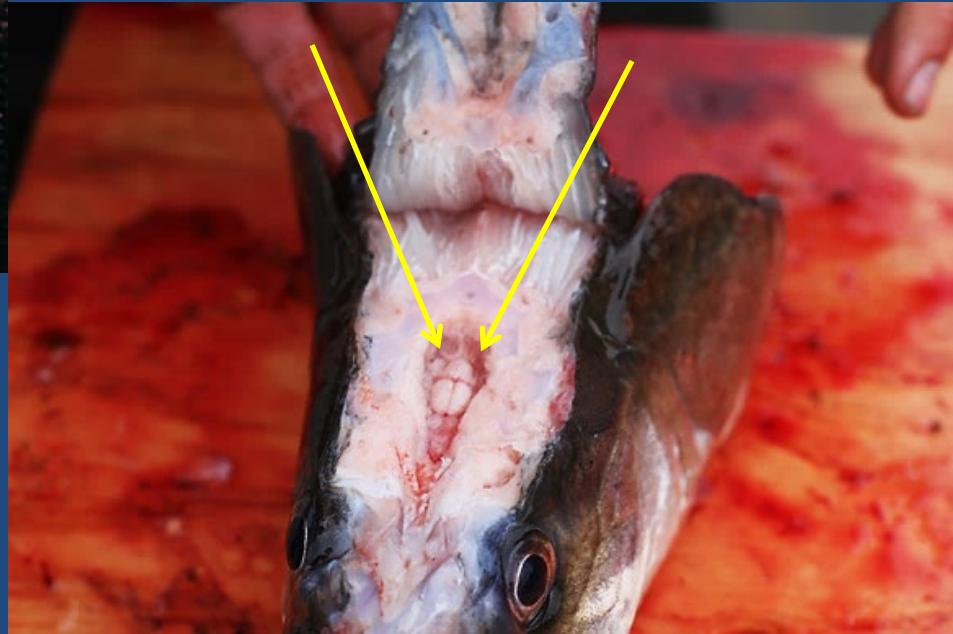




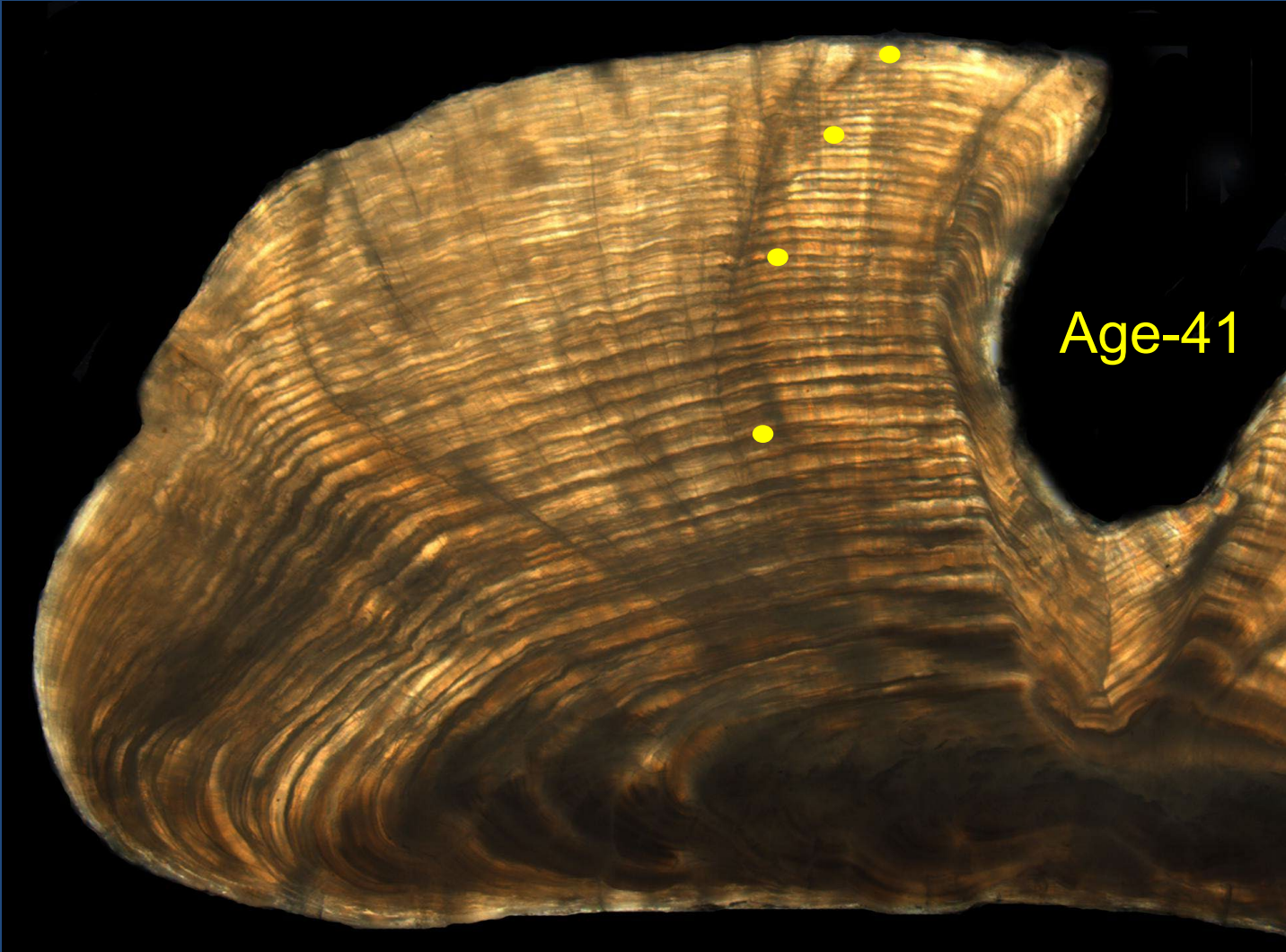
Each fish has two sets of three otoliths (ear bones) found just behind the brain.



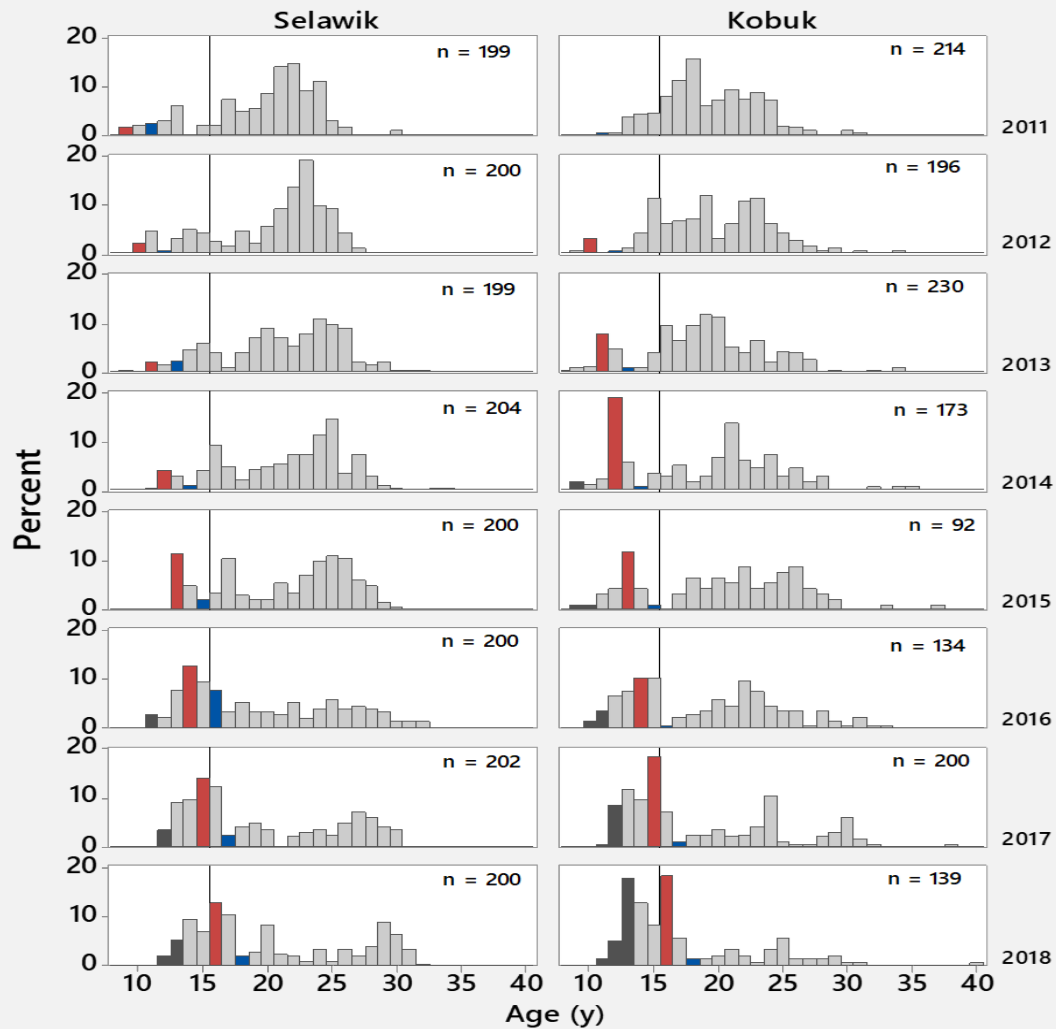
Example of cleaned and cut section of an otolith







Age-41



# Eight years of Selawik and Kobuk river age distributions, 2011-2018

In 2018:

Selawik- a small number of age 13 fish (from 2004) fewer age 12 fish, and no age 10 or 11.

Kobuk – strong age 13, small numbers of age 11, and 12 fish, and no age 10

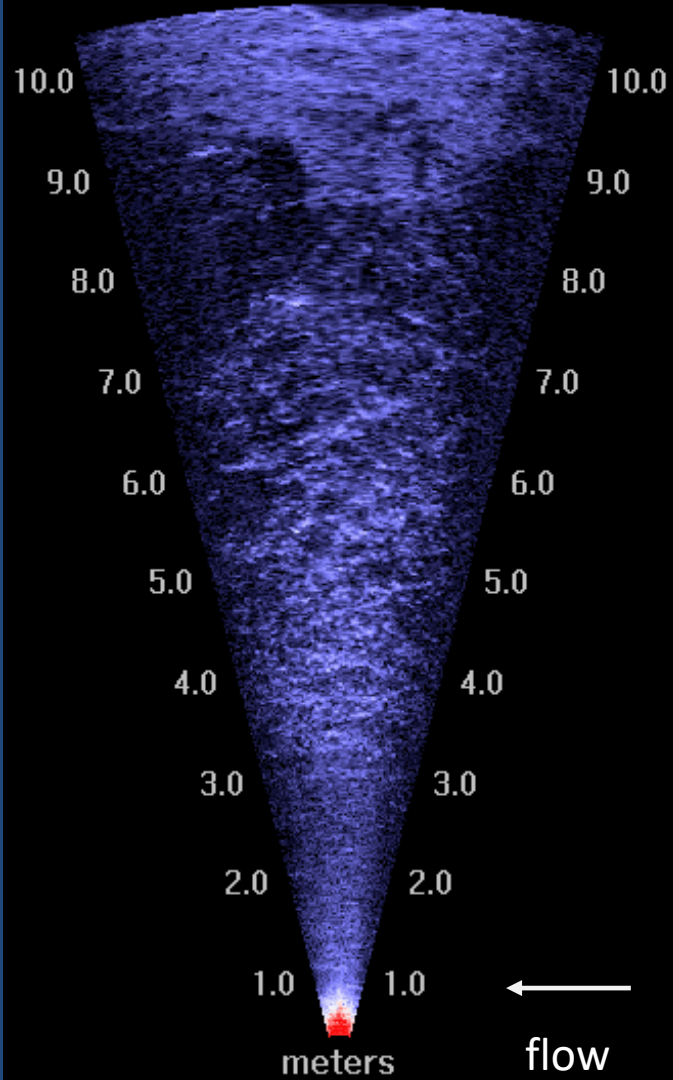
Periodic recruitment events track through the years

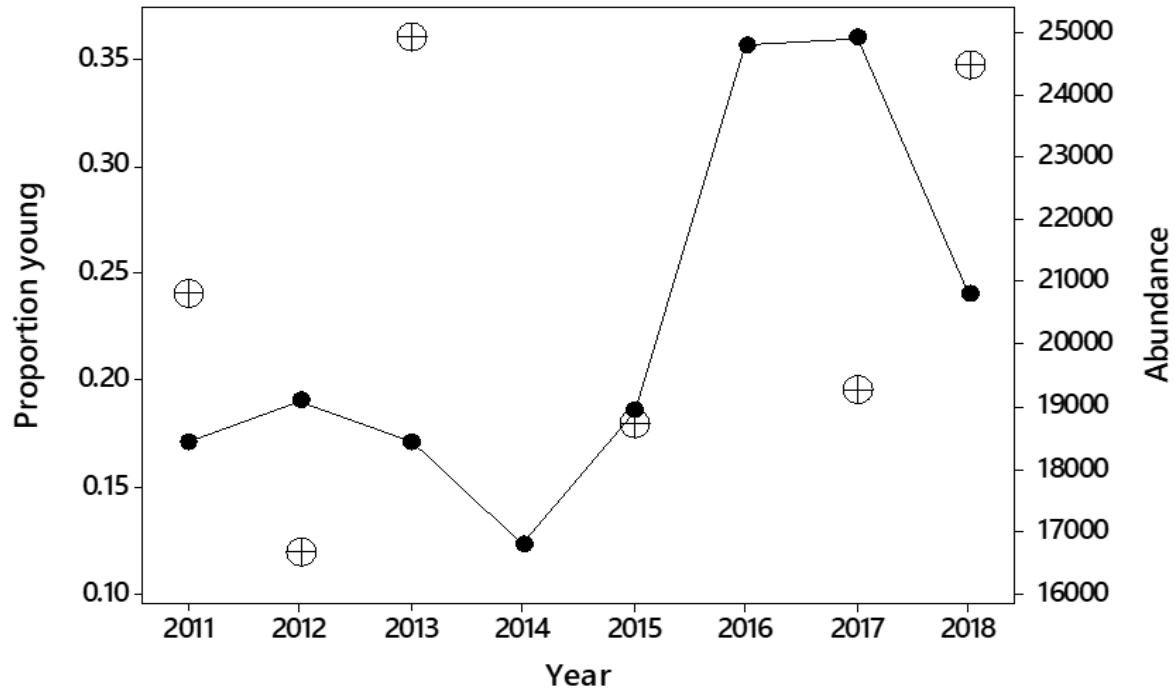


1995, 2004, and 2005 population estimates were based on mark-recapture methods that have a higher degree of uncertainty

Year	Estimate	95% CI
1995	6,000	4,000-7,800
2004	24,000	13,000-33,900
2005	46,000	25,000-67,500
2011	20,800	Count
2012	16,600	Count
2013	25,000	Count
2015	18,710	Count
2017	19,237	Count
2018	24,472	Count

Sonar is not without its drawbacks. In 2014 early icing cut counting days short and 2016 high water levels created poor fish counting conditions





Pearson's  $r = -0.123$ ,  $P = 0.817$

Young Sheefish  $\leq 15$  yrs. old and numbers of Sheefish counted at the sonar were not correlated.



# What have we discovered?

- Sheefish live well into their 30's; an advantage to repeat spawn over a life span in the face of events like the slump
- Inconnu spawners from the Selawik and Kobuk rivers appear to mature between 10 and 15 years of age
- Both the Selawik and Kobuk river populations have synchronous periodic recruitment patterns
- Our Selawik sample did not include a sufficient number of age classes from post-slump cohorts to tell whether or not the slump affected recruitment.



## 2023 and 2024 Plans

- We expect additional age classes from post-slump years to be present in the mature spawner population
- Collect additional age samples (200) from Selawik and Kobuk river Sheefish spawners and length measurements (300; catch and release in Selawik River)
- Hypothesis: Sheefish spawner success will be similar in Kobuk and Selawik river if no slump effect on reproduction success, but reduced success in Selawik River would indicate a slump effect.
- Hypothesis: Selawik River Sheefish brood years associated with the slump will be weaker compared to brood years prior to the slump.





# The Team

USFWS Northern Alaska Fish & Wildlife Field Office and Selawik NWR started a pilot project in 2011

Office of Subsistence Management funding for the project 2012-2019 and 2023-2025

Selawik members Sonny Berry, Ingram Clark and Patrick Foster Sr.

Native Village of Selawik and the Selawik NWR provided logistical and material support

ADF&G provided Sheefish otoliths and data from the Kobuk River



# Team Effort

